

Fauna of India



DIPTERA

(VOLUME - X)

SARCOPHAGIDAE

B.C. NANDI



This fauna volume on Sarcophagidae (flesh flies) deals with the introduction, brief history of the taxonomy, biology, distribution and morphological characters of different taxa including their taxonomic keys. Over 3,000 species of flesh flies are known all over the world of which 163 species under 50 genera and three subfamilies from India and the adjacent countries are described in the present volume. Available biological information highlighting the importance of the most of the species and their local and world distributions are also incorporated.

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FOREWORD

Dr. B. C. Nandi has written this fauna volume on Sarcophagidae after making extensive faunistic survey and doing valuable contribution for the last two decades. He has handled a lot of specimens from different museums and studied most of the type material. Now the present volume deals with three subfamilies comprising of 163 species under 50 genera. India being one of the megadiversity countries represent a diversity of habitats and multitude of life forms and Dr. Nandi has explored the group to make the present volume as comprehensive a scientific account as possible. Detailed description of all taxa and their biology has made the volume a rich source for morphological as well as biological information. Information on local and world wide distribution of the species and the richly illustrated and detailed keys to all taxa will find the volume a ready reference guide for identification. The volume contains excellent illustrations. The volume will provide an excellent resource material and will inspire the workers as a starting point for continued research on this group.

I think this major work as a fauna volume will be an asset and be of considerable importance to the students of Sarcophagidae due to its detailed description of all taxa and their related information. It is expected that this volume will be welcomed not only by the taxonomists but also by the agricultural and medical entomologists.

Kolkata
January, 2002

J.R.B. Alfred
Director
Zoological Survey of India

PREFACE

The Sarcophagidae of India and the adjacent countries has long been a neglected group and the present fauna volume is the comprehensive scientific description of the entire family of this area. The classification, taxonomy and nomenclature of a total of 163 species under 3 subfamilies have been revised and now the subfamily Miltogrammatinae is represented by 22 genera, Paramacronychiinae by 1 genus and Sarcophaginae by 27 genera. Usable identification keys are provided for all the taxa and their morphological characters have been summarised. The important features of adult morphology of all the species along with extensive illustrations of male genitalia (few females) have been incorporated and the available original type species have been examined. An attempt has been made to synthesize all the available records of the biology of the species. The information on local and world distribution of the species has been recorded mainly based on catalogues and the recent fauna volume. The faunistic survey was made to avail most of the local examples and few specimens were borrowed from different museums for study. A list of total number of species from all Indian states and union territories and the adjacent countries have been included.

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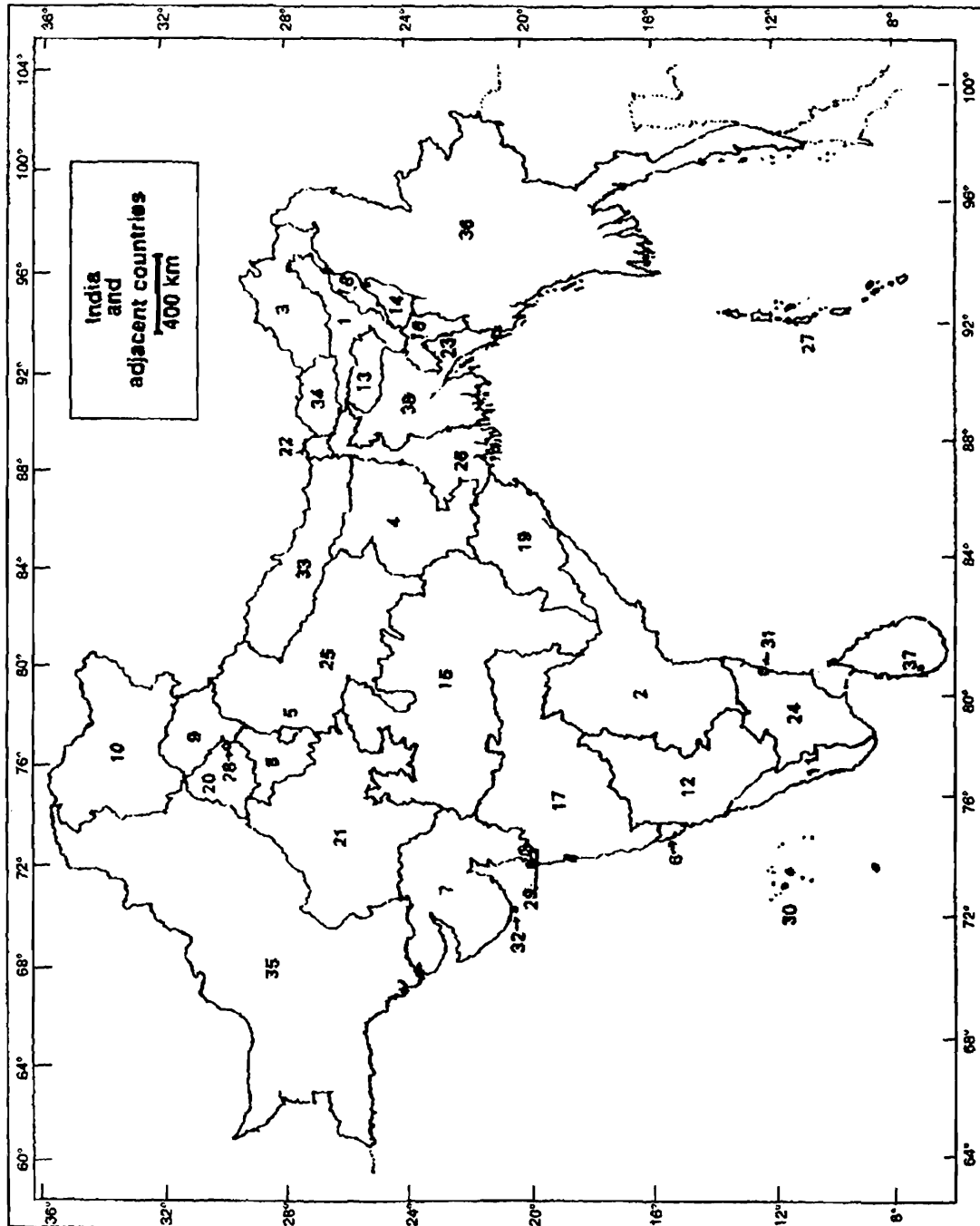
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INTRODUCTION

Taxonomic studies on sarcophagid flies remained poorly known in India and adjacent countries till 1922. Senior-White (1924) revised these flies from the Oriental region and described a lot of new species. Later on, a comparative account of these flies from this area had been published by Senior-White *et al.* (1940) where they include these flies under the subfamily Sarcophaginae of the family Calliphoridae.

Extensive faunistic explorations have been done in India during the last twenty two years. A total of 163 species of Sarcophagidae have been reported from different states and union territories of India and the adjacent countries (vide map). Now the flies of this area are represented by 3 subfamilies: Miltogrammatinae, Paramacronychiinae and Sarcophaginae. The Miltogrammatinae are represented by twenty two genera in the tribes Amobiini, Miltogrammatini, Phyllotelini and Metopiini. The poorly known Paramacronychiinae are represented by one genus in the tribe Paramacronychiini and the well known subfamily Sarcophaginae are represented by twenty seven genera in the tribes Raviniini, Protodexiini and Sarcophagini. Nothing is known regarding the Paramacronychiinae and Miltogrammatinae from Bhutan and reports of this flies from Pakistan and India still appear to be very meager in comparison to other countries and further collections will help to exploit the total flies of these two subfamilies.

The sarcophagid flies from this area were described mainly by Fabricius (1794), Böettcher (1912a, b, 1913), Baranov (1934, 1938b), Senior-White (1922, 1923 a,b, 1924, 1925, 1927, 1930), Senior-White *et al.* (1940), Lopes (1961, 1964, 1976), Rohdendorf (1966), Kano and Shinonaga (1969, 1994), Lopes and Kano (1969), Shinonaga and Lopes (1975), Verves (1979 a, b, 1991), Sugiyama *et al.* (1988), Pape (1989, 1994), Sugiyama (1988) and Nandi in a series of papers (1975-1995) on several collecting trips from different parts of India. The present fauna volume describes a total of 163 species out of the world fauna of about 3,000 (Verves, 1989c) belonging to fifty genera and includes all available taxa known from India and adjacent countries, viz. Bangladesh, Bhutan, Myanmar, Nepal, Pakistan and Sri Lanka. Khan (1974) described *Sarcophaga microperitromata* and Bilqees, Ali & Khan (1984) *Sarcophaga karachiensis* as two new species from Karachi on the basis of only third instar larva. I think it is a bad practice to describe a new species from larvae on this group.



Map of India showing statewise position of sarcophagid species
(for details please see page no. 595-596)

The present author has been unable to find a few species from this area which have been reported by earlier authors. In those cases, non-Indian specimens have been borrowed from other Institutions as far as possible. Available type specimens have been studied.

The Miltogrammatinae and Paramacronychiinae can be identified mostly by external morphology and only in a few cases will a study of the male genitalia be necessary. Regarding the subfamily Sarcophaginae the specific identification can often only be made by a detailed study of the male genitalia and most of the females are still impossible to identify because the detailed structures of female genitalia have remained still insufficiently known.

The present state of knowledge regarding the biology of the group is still far from complete, particularly for the Indian Miltogrammatinae and Paramacronychiinae.

Most of the terminologies and abbreviations used in the present work are those followed by Kano *et al.* (1967). There are difference of opinions regarding the generic and subgeneric delimitations within the group and the author has mostly followed the generally accepted taxonomic classification as put forth by Rohdendorf (1965), Lopes *et al.* (1977) and Verves (1986, 1989d) who were and is the recognised authorities on the Sarcophagidae. In my opinion this classification is the most phylogenetically informative.

The purpose of the present work is to present a taxonomic studies of the Sarcophagidae of India and the adjacent countries. Nomenclature and classification are based on the most revisionary works. Detailed illustrations are provided of all male and some female genitalia as well as other important features of the adult morphology. Keys to the taxa are provided at all levels and possible information on local and world distribution and biology of the species are given. Cut-off date for faunal entries was set at 31st December, 1995.

Family SARCOPHAGIDAE

The family Sarcophagidae comprises a group of medium-sized to fairly large flies of 4 mm to 18 mm in length that are widely distributed all over the world except the arctic region. These flies are generally greyish to black with silvery to golden or yellowish pollen. Eyes medium or large and mostly without hairs but sometimes with very fine hairs, dichoptic and frons narrower in males than females. Third antennal segment larger, rarely short and arista usually long, may be flattened and plumose along basal half but sometimes bare or pubescent. Proclinate orbital bristles in both sexes or only in females. Vibrissae may or may not be differentiated. Palpi black or yellowish. Thorax mostly with three dark longitudinal stripes or sometimes entirely grey or black or blackish but without long golden hairs. Presutural acrostichal bristles absent or feebly developed or sometimes moderately developed. Post-humeral bristles 1 or 2 pairs or sometimes rarely present. Opercular mesothoracic spiracles present. Propleuron may be bare or with short hairs. Hypopleuron with a row of well developed bristles. Notopleural bristles strong and may be with or without additional hairs. Postscutellar not convex. R_1 bare or with short setae. Wings generally hyaline or infuscated along anterior margin. Wing vein M_{1+2} curved sharply forward and approaches to R_{4+5} at the anterior margin of wing. R_{4+5} closed or open. Basicosta mostly black but sometimes yellowish. Costal spines well developed or not differentiated. Mid tibia with 1 or 2 or without anterodorsal bristles. Hind coxa may be bare or with fine hairs on posterior surface. Abdomen with or without silvery-grey pollen forming more or less tessellate pattern, but totally without shining metallic blue or green. Second abdominal sternite not covered by lateral margins of first and second tergites. Fifth sternite strongly modified or may be simple in form. Other male abdominal sternites cover the margin of corresponding tergites.

Male genitalia with 2-3 segments and are generally complex, diverse and carry the most diagnostic characters for specific identification. The penis is very large and complicated built. Inner forceps are larger than outer forceps. The females are usually without ovipositor. Most of the flies are larviparous but they sometimes deposit embryonated eggs. Larvae are elongated, conical and are of cyclorrhaphous type and with a series of tubercles at the posterior margin. Posterior spiracles are situated in a deep cavity.

These flies usually breed in animal carcasses, organic garbages and dung and they are also attracted to such media. Some species are parasitic on insects. Most of the Sarcophagidae may be mechanical carriers of different germs and the larvae of some species produce myiasis in different parts of various animals.

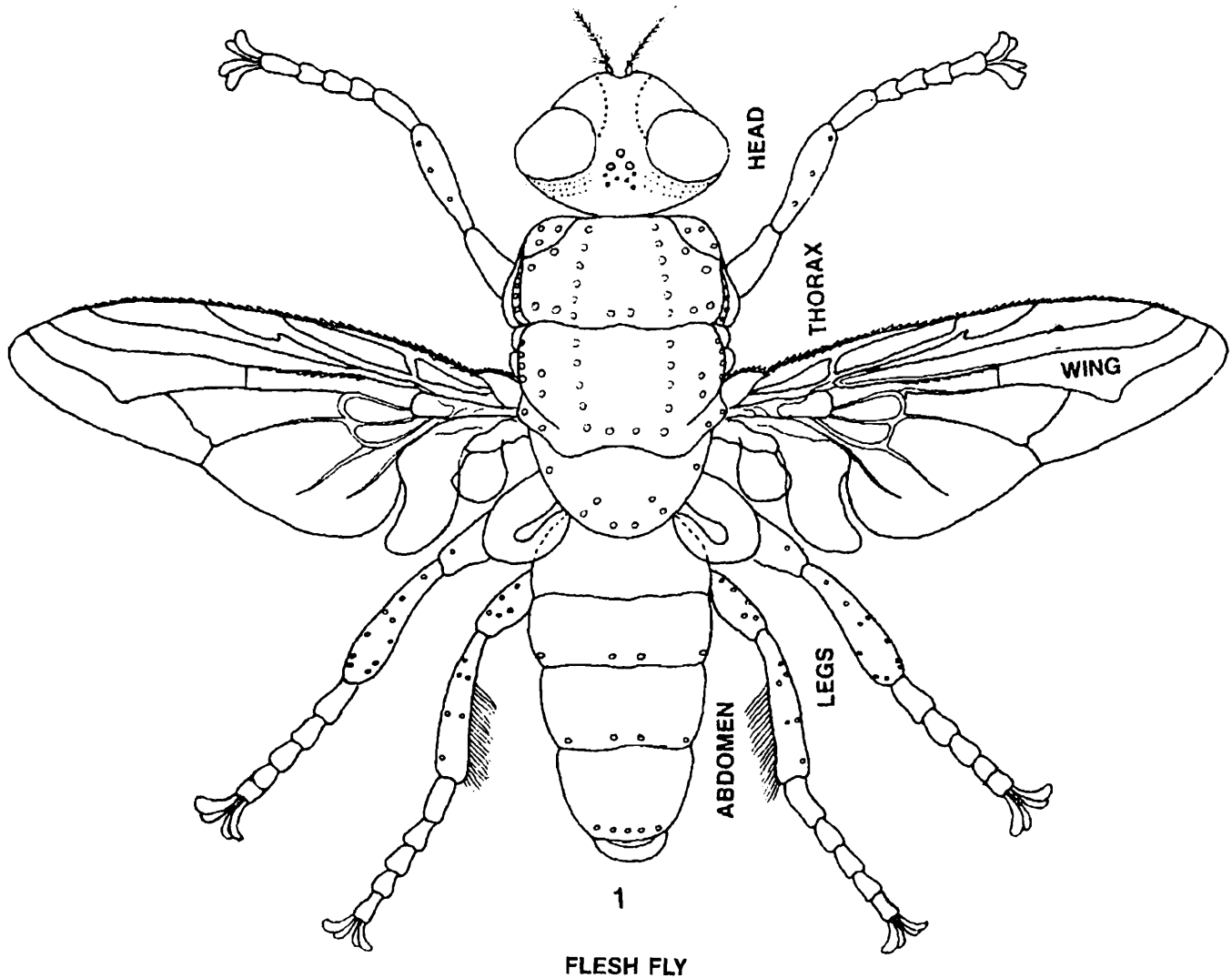


Fig. 1. Dorsal view of flesh fly.

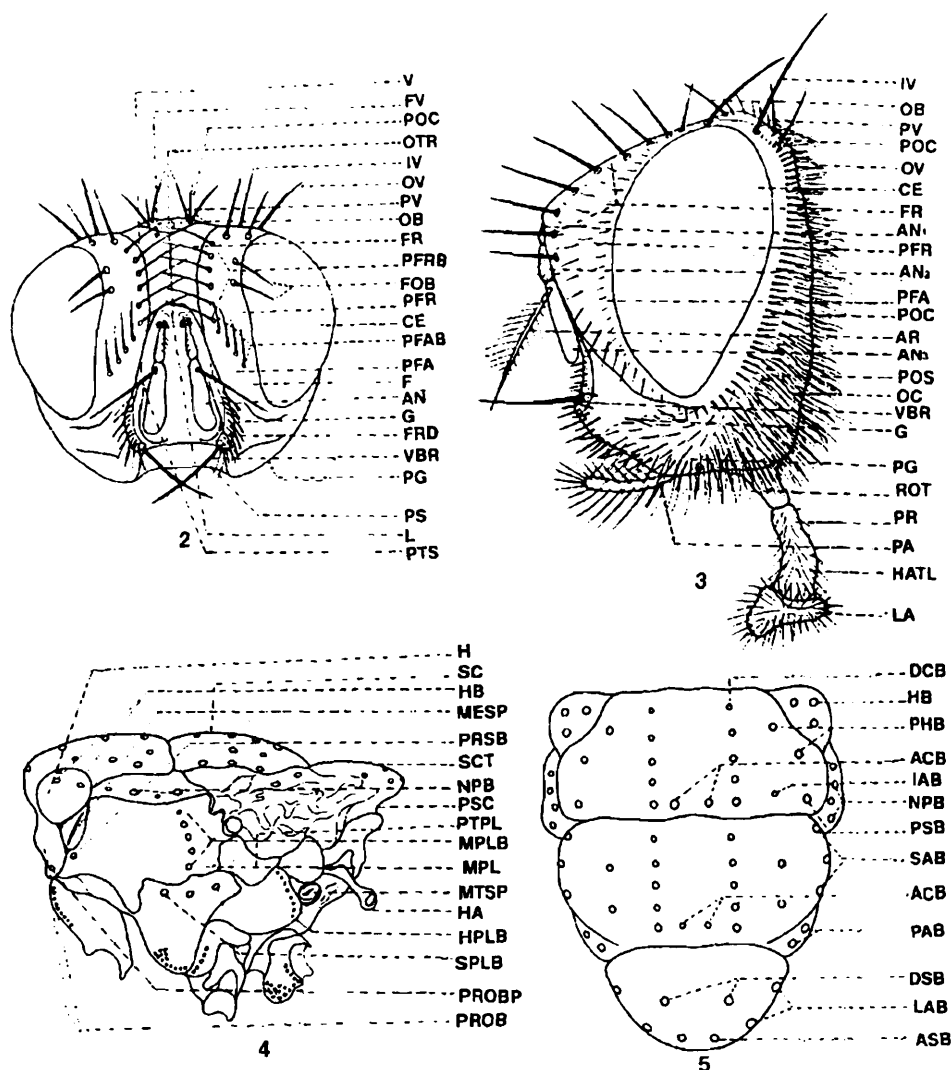


Fig. 2. Dorsal view of male head : an = antennae, ce = compound eye, f = face, fob = fronto-orbital bristle, fr = frons, frd = facial ridge, fv = frontal vitta, g = gena, iv = inner vertical, 1 = lunula, ob = orbital bristle, otr = ocellar triangle, ov = outer vertical, pfa = parafacial, pfab = parafacial bristle, pfr = parafrontal, pfrb = parafrontal bristle, pg = post gena, poc = postocellar bristle, ps = peristome, pts = ptilinal suture, pv = post vertical, v = vertex, vbr = vibrissae.

Fig. 3. Lateral view of male head : an₁ = first antennal segment, an₂ = second antennal segment, an₃ = third antennal segment, ar = arista, ce = compound eye, fr = frons, g = gena, hatl = haustellum, iv = inner vertical, la = labella, ob = ocellar bristle, oc = occiput, ov = outer vertical, pa = palpi, poc = postocular cilia, pfa = parafacial, pfr = parafrontal, pg = post gena, poc = postocular bristle, pos = postocular setae, pr = proboscis, pv = post vertical, rot = rostrum, vbr = vibrissae.

Fig. 4. Lateral view of thorax : h = humerous, ha = halter, hb = humeral bristle, hp = hypopleuron, hplb = hypopleural bristle, mesp = meso-thoracic spiracle, mpl = mesopleuron, mplb = mesopleural bristle, mtsp = metathoracic spiracle, npb = notopleural bristle, prob = propleuron, propb = propleural bristle, prsb = prostigmatic bristle, prosp = prothoracic spiracle, psc = postscutellum, ptpl = pteropleuron, sc = scutum, sct = scutellum, splb = sternopleural bristle.

Fig. 5. Dorsal view of thorax : acb = acrostichal bristle, asb = apicoscutellar bristle, dcb = dorsocentral bristle, dsb = discoscutellar bristle, hb = humeral bristle, iab = intra-alar bristle, lab = lateroscutellar bristle, npb = notopleural bristle, pab = post-alar bristle, phb = post-humeral bristle, psb = presutural bristle, sab = supra-alar bristle.

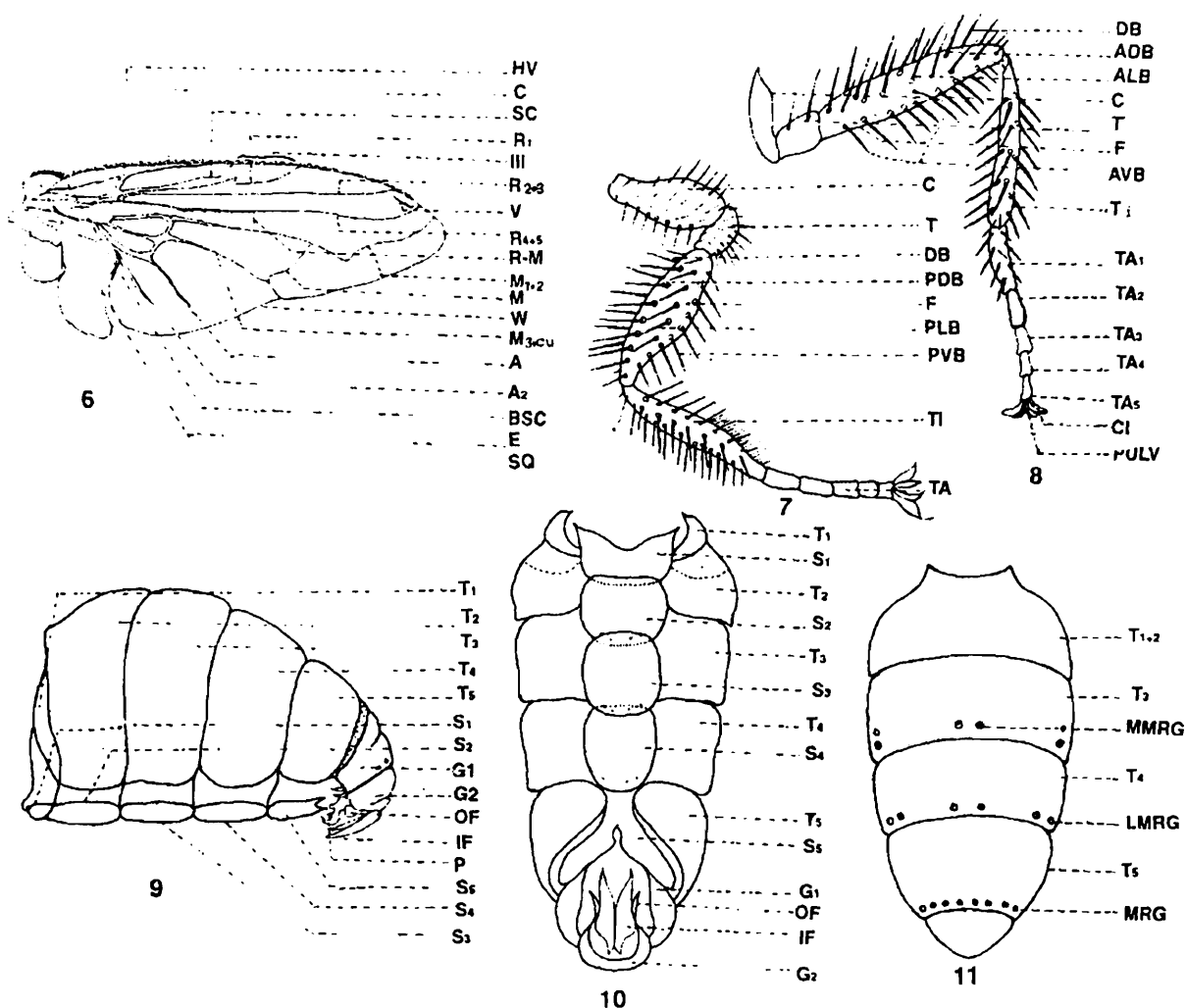


Fig. 6. Wing : A₁ = first anal vein, A₂ = second anal vein, bcs = basicostal setae, c = costa, e = epaulet, III = third costal segment, V = fifth costal segment, hv = humeral cross vein, m = medial cross vein, M₁₊₂ = upper cross vein, r-m = radio-median cross vein, sc = subcosta, w = wing, R₁ radius, R₂₊₃ = radial veins -2, R₄₊₅ = radial veins -3, sq =squama, t_p = lower marginal cross vein.

Fig. 7. Posterior view of leg : C = coxa, db = dorsal bristle, F = femur, pdb = posterodorsal bristle, plb = posterolateral bristle, pvb = posteroventral bristle, avb = anteroventral bristle, T = trochanter, Ta = tarsus, Ti = tibia.

Fig. 8. Anterior view of leg : adb = anterodorsal bristle, alb = anterolateral bristle, avb = anteroventral bristle, C =coxa, db = dorsal bristle, F = femur, T = trochanter, Ta 1 = first tarsomere, Ta 2 = second tarsomere, Ta 3 = third tarsomere, Ta 4 = fourth tarsomere, Ta 5 = fifth tarsomere, Cl = claws, pulv = pulvinus.

Fig. 9. Lateral view of male abdomen : G1 = first genital segment, G2 = second genital segment, if = inner forcep, of = outer forcep, p = paraphallus, S1 = first sternite, S2 = second sternite, S3 = third sternite, S4 = fourth sternite, S5 = fifth sternite, T1 = first tergite, T2 = second tergite, T3 = third tergite, T4 = fourth tergite, T5 = fifth tergite.

Fig. 10. Ventral view of male abdomen : abbreviations same as in Fig. 9.

Fig. 11. Dorsal view of male abdomen : T1 + 2 =first and second tergites, T3 = third tergite, T4 =fourth tergite, T5 =fifth tergite, lmrgr = lateral marginal bristle, mmrg = median marginal bristle, mrg = marginal bristle.

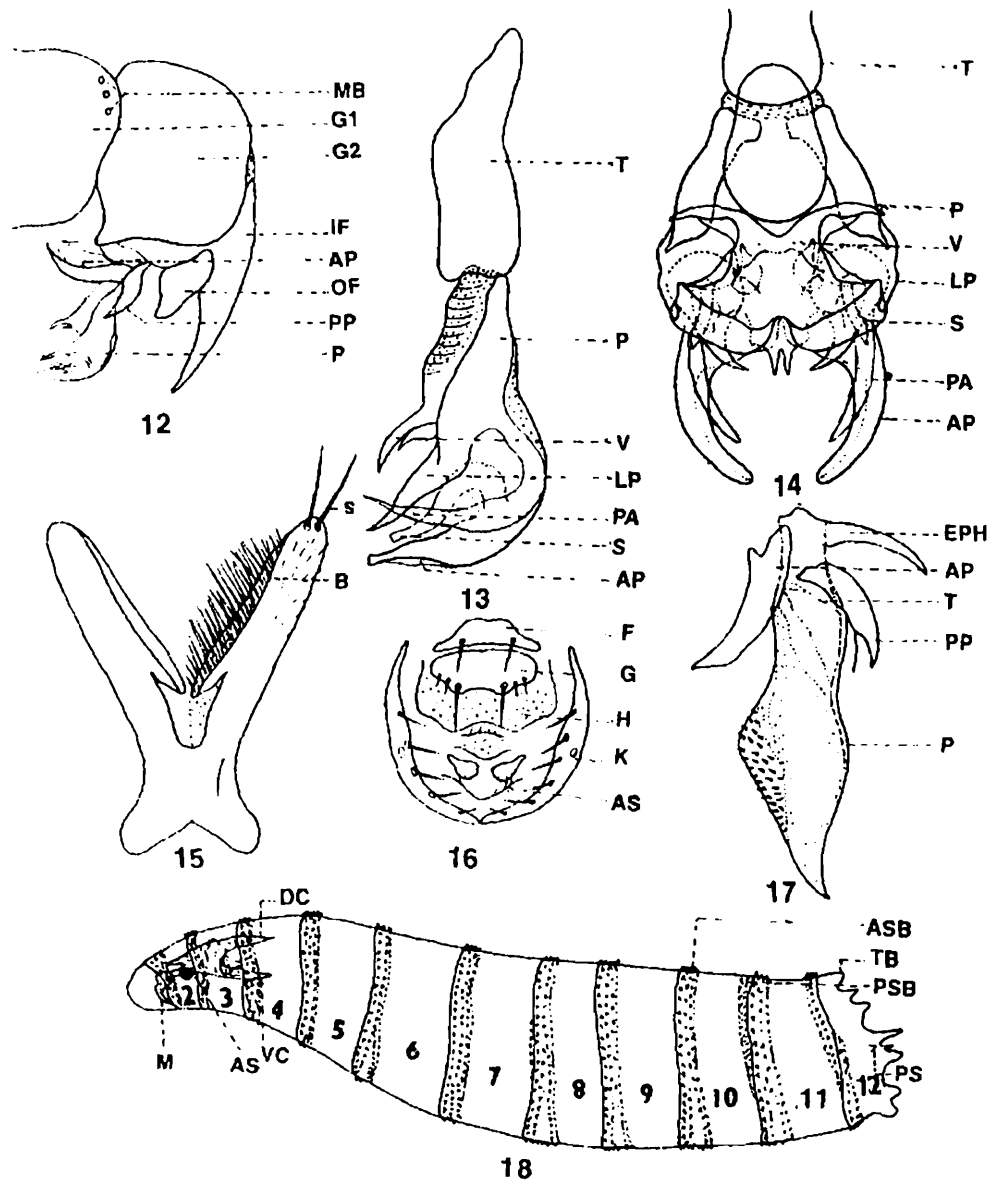


Fig. 12. Male genitalia (lateral view) : ap = anterior paramere, G1 = first genital segment, G2 = second genital segment, if = inner forcep, mb = marginal bristle, of = outer forcep, p = penis, pp = posterior paramere.

Fig. 13. Penis of sarcophagid fly (lateral view) : ap = apical plate of paraphallus, lp = lateral plate of paraphallus, p = paraphallus, pa = apophysis of apical plate of paraphallus, s = styli of glans, t = theca of penis, v = ventralia.

Fig. 14. Penis of sarcophagid fly (ventral view) : abbreviations same as in Fig. 13.

Fig. 15. Fifth sternite of male : b = brush of spine, s = stout spine.

Fig. 16. Female genitalia of sarcophagid fly (ventral view) : as = anal sternite, f = sixth sternite, g = seventh sternite, h = eighth sternite, k = seventh tergite.

Fig. 17. Penis of miltogrammatid fly (lateral view) : ap = anterior paramere, eph = epiphallus, pp = posterior paramere, p = paraphallus, t = theca of penis.

Fig. 18. Third stage larva of sarcophagid fly (lateral view) : AS = anterior spiracle, ASB = anterior spine band, DC = dorsal cornu, M = mandible, PSB = posterior spine band, PS = posterior spiracle, TB = tubercle, VC = Ventral cornu.

Key to subfamilies

1. Hind coxa without hairs on posterior surface; notopleuron with 2 strong bristles; male sternites 3-4 concealed.....2
 Hind coxa with hairs on posterior surface; notopleuron with 2 strong primary and 2 smaller sub primary bristles; male sternites 3-4 freeSarcophaginae
2. Legs short, usually with claws, sometimes elongated in male (Subtribe Senotainiina); body length rarely more than 6 mm; coloration variable, often with pale areas in contrast with black bands and spots; first genital segment free and usually with 2 transverse rows of bristles; male genitalia with 3 segments.....
Miltogrammatinae
 Legs long, bristly with long claws in male; body length 5-20 mm; body covered with pale dusting; first genital segment fused to second genital tergite and with a single row of transverse bristles; male genitalia with 2 segments
 Paramacronychiinae

Subfamily 1. MILTOGRAMMATINAE Brauer and Bergenstamm, 1889

These are medium sized flies usually larviparous or ovolarviparous and the colours are blackish with greyish, silvery or golden pollen, often with conspicuously round black abdominal bands and spots.

Head : Eyes generally large and the front facets sometimes greatly enlarged in females; frons about equibroad and with proclinate orbital bristles in both sexes; palpi filiform to stoutly clavate but usually more slender in male; third antennal segment one to seven times that of the second; arista bare, pubescent or rarely short plumose; 2 to numerous pairs of proclinae parafacial bristles in male and rarely absent in female; parafacial with or without short hairs; vibrissae may be present or absent.

Thorax : May be grey, black or with three long stripes on dorsal surface; propleuron usually bare but at times pilose or setose; presutural acrostichal bristles often absent; postsutural dorsocentral bristles usually present; outer post-humeral bristles rarely present; postsutural dorsocentral bristles 1 to 5, usually 3; 2 strong notopleural bristles present and with or without additional hairs; preacrostichal bristles often absent; hypopleuron and mesopleuron each with a row of several bristles; apicoscutellar bristles usually absent especially in female or partly developed.

Wings : Hyaline; costal spines usually strong; R_1 often with setae; R_{4+5} usually open, rarely closed to long petiolate; epaulet pale brown; squama large, broad and bare.

Legs : Short or in some cases long with short or long claws; hind coxa bare on posterodorsal surface; mid femur of male with few bristles; mid tibia usually with 1

anterodorsal bristle, seldom with 2; hind tibia without villosity; preapical bristles on hind tibia weak.

Abdomen : Usually grey with various black patterns but sometimes wholly black or with greyish pollen, rarely with checkered pattern or with a row of shining black spots on second, third and fourth abdominal tergites; median marginal bristles on third tergite usually present; fifth abdominal sternite of male usually unclleft, triangular and without a brush of strong spines internally; female genitalia rarely with ovipositor; seventh and eighth tergites developed laterally; male genitalia possess three segments, although in some cases reduction or partial fusion of the segments occur; dorsal surface of the first genital segment is the sixth tergite, the seventh and eighth sclerites are fused and comprises the second genital segment; first genital segment retains the row (rarely a tuft) of marginal bristles; posterior to this are the paired inner and outer forceps which are usually elongated, straight or curved and pointed at tips; anterior and posterior parameres are rather uniform among closely related species but sometimes provide important characters for identification; paraphallus somewhat uniform in the species and with a single undivided dorsal plate and terminal processes; epiphallus may be present or absent.

Cephalopharyngeal sclerite of first stage larvae are of the plesiomorphic type in the Miltogrammatinae with regard to well developed median sclerite and more or less well developed paired mandibles.

The subfamily Miltogrammatinae (original spelling Miltogramminae) consists of sixty five genera and more than 600 species (Verves, 1989d). Rohdendorf (1967b, 1971, 1975a), Rohdendorf and Verves (1980) and Verves (1986) divided this subfamily into four tribes : Senotainiini, Miltogrammatini, Metopiini and Phyllotelini. But later on, Verves (1989d) divided it into six tribes : Phyllotelini, Amobiini, Miltogrammatini, Chorezmyiini, Oebaliini and Metopiini, out of which only four tribes : Amobiini, Miltogrammatini, Phyllotelini and Metopiini are treated here. Verves (1989d) divided this subfamily based on different external characters including structure of genitalia and some features of first instar larvae and he made a hypothesis of the phylogenetic relationship among the subtribes and genera. 41 species under twenty two genera are reported here.

Biology : The Miltogrammatinae usually breed in the nests of Vespidae, Sphecidae, Apidae, Eumenidae and Trypoxylionidae. In 13 species of the present treatment have been recorded from their hosts (Verves, 1989d). Some of the adult flies are attracted to nectar and damaged fruits of different kinds of trees. Larvae of one new world genus have been recorded as predators of sea turtle eggs and hatchlings (Lopes, 1982). Some larvae are predators or guests in the nests of Hymenoptera, Orthoptera and Isoptera.

World wide in distribution.

Key to tribes

1. Eyes very large2
Eyes usually normal in size3
2. Head hemispherical; numerous fine proclinate and 1-2 strong reclinate fronto-orbital bristles present; claws and pulvilli normal in both sexesAmobiini
Head conical; 2-3 fronto-orbital bristles present; claws and pulvilli elongated in maleMetopiini
3. Head subquadrate; eyes without hairs; arista not flattened but may be elongated or rod-like; abdominal tergites with dark marginal band or tessellate.....Miltogrammatini
Head more or less with protruded profrons; eyes with hairs; arista flattened or leaf-like in male; abdominal tergites with three dark spots.....Phyllotelini

Tribe Amobiini Townsend

This tribe is characterised by having large eyes; head hemispherical; frons narrow; numerous (more than 6) hair-like proclinate fronto-orbital bristles; arista long; claws and pulvilli normal in both sexes; presence of well developed vibrissae, short and widened paraphallus; absence of epiphallus and reduction of arms of paraphallus excepting well developed median process; large hypopharyngeal sclerite is present in first stage larva.

This tribe has only two well defined genera : *Amobia* Robineau-Desvoidy, 1830 and *Australometopia* Malloch, 1930 of the subtribe Amobiina. Verves (1986) and Lopes (1989) placed the genus *Amobia* under the subtribe Senotainiina, but Verves (1989d) re-shifted it to the tribe Amobiini and synonymized this tribe with Australometopiina Rohdendorf. About 20 species have so far been reported under this tribe.

These flies are found in intrazonal bushwood associations and prefer larviposit in certain types of host-nests, such as eumenid and sphecid wasps and solitary bees (Verves, 1989d).

This tribe is cosmopolitan in distribution.

Subtribe Amobiina Rohdendorf

This is a small subtribe and Lopes *et al.* (1977) placed it under the tribe Senotainiini and included all the Oriental species under the genus *Amobia*.

Genus 1. Amobia Robineau-Desvoidy, 1830

1830. *Amobia* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. Sci. Inst. Fr.*, (2) 2 : 96.

Type species : *Amobia conica* Robineau-Desvoidy, 1830 = (*Tachina singata* Meigen, 1824).

1889. *Pachyophthalmus* Brauer and Bergenstamm, *Denkschr. Akad. Wiss. Wien. Kl. math. naturw.*, **56** : 117.

Type species : *Tachina signata* Meigen, 1824.

1892. *Sarcomacronychia* Townsend, *Trans. Am. ent. Soc.*, **19** : 100.

Type species : *Sarcomacronychia unica* Townsend, 1892 (= *Miltogramma erythrura* Wulp, 1890).

1952. *Senotainiella* Zumpt, *Proc. R. ent. Soc. Lond.*, (**B**), **21** (1-2) : 13.

Type species : *Senotainiella decolor* Zumpt, 1952 (= *Sphixapata pelopei* Rondani, 1859).

Morphology : Head rounded in profile; frontal vitta parallel; orbital bristles proclinate, 1-2 pairs and hair-like; fronto-orbital bristles numerous and short; antennal insertion below centre of eye; eyes large; vibrissae well developed; antennae of medium length; arista long, bare and thickened only on basal half; mid tibia with or without 1 anterodorsal bristle; claws and pulvilli as long as or longer than fifth tarsomere; phallus absent.

Discussion : This is a rather small genus and Verves (1989d) divided it into two subgenera : *Amobia* Robineau-Desvoidy, 1830 and *Sarcomacronychia* Townsend 1892. Only one genus *Amobia* is present in this area. Kurahashi (1974) described 1 new species from the Indo-Australian area and Rohdendorf (1955) reported some species from Russia. Draber-Mónko (1966) revised the Palaearctic species under the genus *Pachyophthalmus* Brauer and Bergenstamm. Lopes *et al.* (1977) and Verves (1986) reported 3 species each from the Oriental and the Palaearctic regions and only 1 species occurs in the Australasian and Oceanian regions (Lopes, 1989).

Biology : Most of the species are kleptoparasites with a wide range of hosts among solitary Vespidae, Sphecidae and Apidae and they attack both terrestrial and arboreal hosts (Downes, 1955; Pape, 1987b). Lopes (1969b) reported species of this genus from nests of Trypoxylionidae, Sphecidae and Eumenidae and few larvae are also found in the nests of wasps-*Trypoxylion politum* and *Odynerus cassicornis* (Vespidae) (Kurahashi, 1970). Larvae of a few species have been described and drawn by Thompson (1921).

Distribution : This genus is cosmopolitan in distribution.

Subgenus *Amobia* Robineau-Desvoidy, 1830

1830. *Amobia* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. Sci. Inst. Fr.*, (2) **2**: 96.

Type species : *Amobia conica* Robineau-Desvoidy, 1830 (= *Tachina signata* Meigen, 1824).

1989. *Amobia* (as subgenus) : Verves, *Jap. J. Med. Sci. Biol.*, **42** : 120.

Morphology : Head rounded; antennae moderate in size; arista long; claws and pulvilli long; orbital region silvery; frontal bristles 9-18 pairs and hair-like; thorax with three longitudinal stripes.

This is a small subgenus and represented by 3 species in the Oriental and Palaearctic regions, all of which are also present in this area. Pape (1987b) reported 2 species under the genus *Amobia* from Fennoscandia and Denmark.

The species of this subgenus are mostly kleptoparasitic in the nests of Sphecidae and Eumenidae.

Key to species

1. Presutural *ac* present; paraphallus widened apically*signata* (Meigen)
 Persutural *ac* absent; paraphallus not widened apically 2
2. Sides of frons with silvery white pollen; paraphallus only slightly widened in apical part; posterior paramere terminally rounded*pelopei* (Rondani)
 Sides of frons with bright golden yellow pollen; paraphallus distinctly widened in apical part; posterior paramere terminally angular*auriceps* (Baranov)

1. *Amobia (s. str.) signata* (Meigen)

(Figs. 19-27)

1824. *Tachina signata* Meigen, *Syst. Besch.*, 4 : 303.

1936. *Amobia africana* Curran, *Am. Mus. Nov.*, 836 : 5.

1936. *Amobia capensis* Curran, *Am. Mus. Nov.*, 836 : 6.

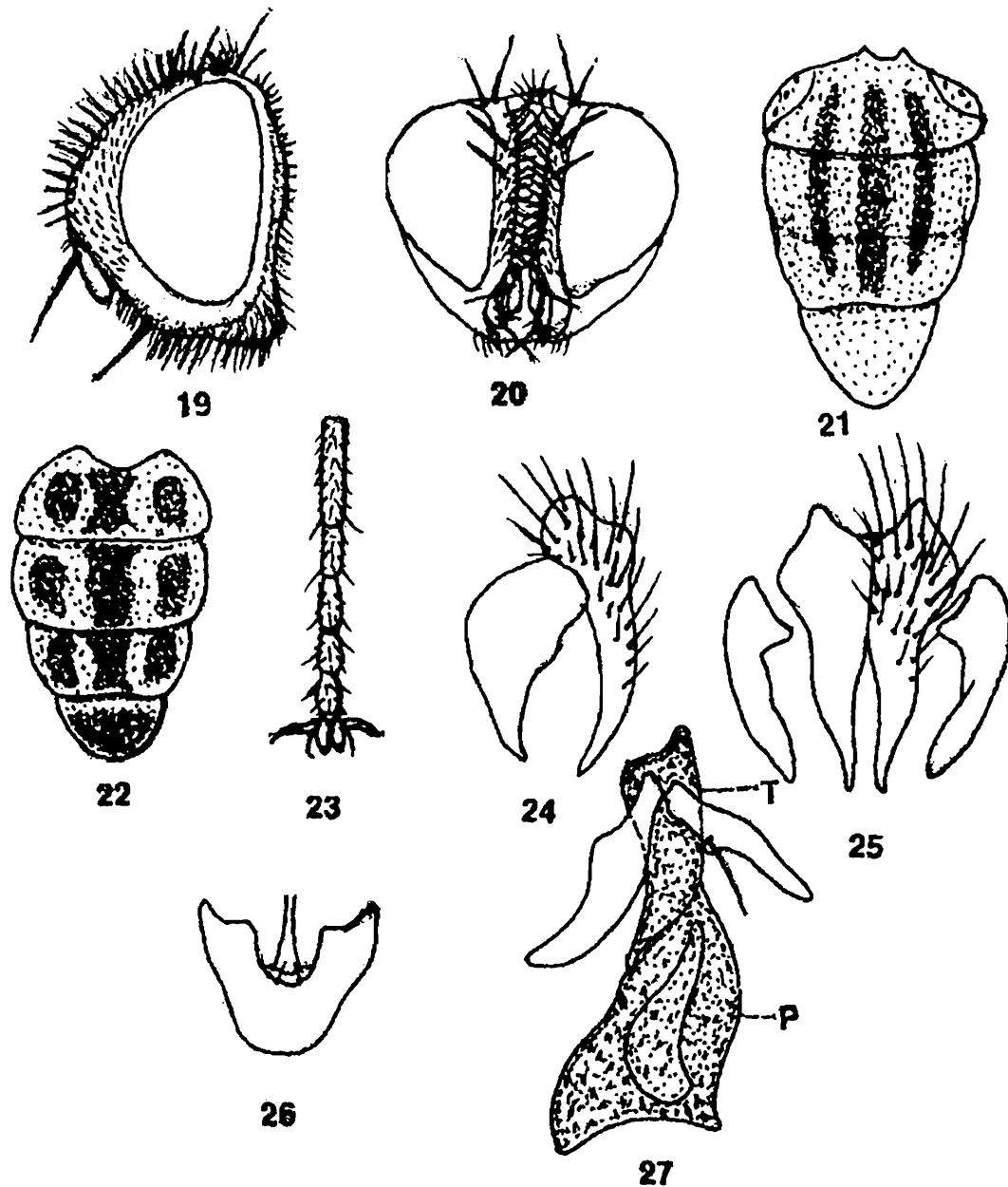
1986. *Amobia (s.str.) signata* : Verves, *Cat. Palae. Dipt.*, 12 : 61; Pape, 1987, *Fauna ent. scand.*, 19 : 46.

Male : Body length 5.0–8.5 mm.

Head : Rounded in profile and blackish with silvery pollen; eyes very large and light brownish; width of frons 0.28 of one eye; frontal vitta parallel, blackish with grey pollen, slightly narrowed anteriorly and about twice that of each parafrontal at ocellar region; parafrontal blackish with grey pollen and short black hairs; parafacial with long hairs on upper 0.5–0.7, silvery pollen and its width at face level with base of antennae about 0.12–0.14 times that of one eye width; antennae black, third antennal segment about 1.5 times that of second; arista long, bare, much longer than third segment of antennae and thickened up to basal 0.4; facial ridge bare and black; vibrissae well developed with 4–5 supra vibrissal bristles; vibrissal angle slightly developed; frontal bristles 14–15 and not reaching up to antennal segment, anterior 6-7 proclinate, posterior 4 reclinate; orbital bristles 2 pairs and reclinate; gena black

and genal groove with densely haired; post gena black with black hairs; inner vertical bristle well developed, outer vertical about half of inner vertical, post vertical and postocellar not detectable; ocellar region black with few short black hairs; proclinate ocellar bristle short which is equal to last frontal bristle; a row of regular postocular setae, rest of the area with blackish hairs; palpi black; proboscis short and greyish.

Thorax : Grey with grey pollen and three distinct longitudinal brown stripes, the median one is not extending up to scutellum; *ac* 1+2; *dc* 2+3; *ia* 1+2; *ps* 1; *h* 3; *ph*



Figs. 19-27 : *Amobia (s. str.) signata* (Meigen). 19, Head ♂ (lateral view); 20, Head ♂ (frontal view); 21, Thorax (dorsal view) ; 22, Abdomen (dorsal view); 23, Fore tarsus (dorsal view); 24, Inner and outer forceps (lateral view); 25, Inner and outer forceps (posterior view); 26, fifth sternite; 27, Penis (lateral view).

2; *np* 2; *pa* 2; *sa* 1+2; *st* 1+1+1; *mpl* 4; *hpl* 6–8; propleura bare; scutellum greyish, silvery pollen and with a pair of lateroscutellar, a pair of apicoscutellar and a pair of weak discoscutellar bristles.

Wings : Hayline with brown veins; R_1 bare ; R_{4+5} with short setae located dorsally on basal node to r-m and 1-2 short setae on ventral surface of basal node of R_{4+5} ; fifth costal segment slightly greater than the third, the former with short setae along anterior margin of its basal half; costal spines short; epaulet black; basicostal scale slightly yellowish; squama white; halter slightly yellowish; bend of m 130° and without process; t_p almost straight.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with 1 bristle on anterodorsal surface on distal two-thirds; mid femur with 1 bristle medially on anterolateral surface, 2 bristles on posterodorsal surface on distal end and a row of bristles along posteroventral surface; mid tibia with 1 bristle each on anterodorsal, anteroventral and posterodorsal surfaces on distal two-thirds; hind femur with a row of bristles along anterodorsal surface and 1 bristle on anteroventral surface distally; hind tibia with 1-2 bristles medially on anterodorsal surface; claws and pluvilli well developed, claws as long as fifth tarsomere and first tarsomere about total of two to fifth tarsomers.

Abdomen : Densely grey with well developed three spots on all tergites which are more or less coalesce on tergite fifth; second tergite with 1-2 pairs of median and 2 lateral marginal bristles, third with 2 pairs of median and 1 pair of lateral marginal bristles, fourth and fifth each with a row of marginal bristles of which the median pair has advanced to more anterior position; sternites first to fourth with long hairs apically; fifth sternite cup-shaped with 2 long hairs at the groove; inner forceps elongated and curved gradually; outer forceps wide at base, slightly curved apically and pointed; anterior and posterior parameres elongated; epiphallus absent; paraphallus short, widened apically and blunt at end.

Female : Body length longer than that of male and the description is almost similar to that of male but for the following differences : inner eye facets distinctly enlarged; parafacial hairs slightly shorter and sparser; claws and pulvilli shorter than fifth tarsomere.

Material examined : 1♂, Cypern : Ayia Napa; 10 km. west of Capo Greco, 13-23. vi. 1983, B. Petersen (det. by T. Pape; dep. in ZMUC).

Discussion on species : Verves (1986) synonymized this species with many species of the Palaearctic region. It can be distinguished from other species of the genus by the structure of paraphallus and presence of presutural *ac* bristle. This species may be separated form *A. (s. str.) auriceps* (Baranov) by the colour of parafacial and

parafrontal and also by the structures of inner forceps and paraphallus, and from *A. (s.str.) pelopei* (Rondani) by the colour of eye, structures of paraphallus and parameres.

Biology : This species has been recorded from the nests of *Ancistrocerus* sp., *Eumenes* sp., *Odynerus* sp., *Discoellus* sp., *Synagris* sp. (Vespidae); *Cerceris* sp., *Crossocerus* sp., *Ectemnius* sp., *Pemphredon* sp., *Psen* sp., *Psenulus* sp., *Sceliphron* sp., *Trypoxylon* sp., (Sphecidae) and *Andrena* sp., *Megachile* sp., *Osmia* sp. (Apidae) (Pape, 1987b). It is also a parasite on the acridid grasshopper (*Aeolopus strepens*) (Théodorides, 1954) and *Pelopeus* sp. (Vespidae) (Lopes *et al.*, 1977). Cuthbertson (1935) reported the development of this species in the nests of mud-wasps (*Sceliphron eckloni*) and Pape (1987b) recorded the breeding of it from nests of *Odynerus reniformis* (Gmelin), *O. spinipes* (Linnaeus) and *Magachile rotundata* (Fabricius). First instar larva of this species has been described and drawn by Thompson (1921).

Distribution : India ; JK (Kashmir); Albania; Algeria; Austria; Azerbaijan; Belgium; Bulgaria; Canary Islands; China; Cyprus; Czech Republic; Denmark; East Siberia; Egypt; France; Germany; Great Britain; Hungary; Ireland; Italy; Kazakhstan; Kyrgyzstan; Libya; Lithuania; Malta; Moldova; Mongolia; Poland; Romania; Russia; Serbia; Slovakia; Spain; St. Helena; Sweden; Switzerland; Tajikistan; Tunisia; Turkmenistan; Ukraine; United Kingdom; Uzbekistan; West Siberia and Yugoslavia (former).

Type deposited : *Holotype* ♂, MNHN, not studied.

Discussion on type : This species has a variable character and Curran (1936) described twice this species from South Africa. Zumpt (1961) studied the type species of *A. africana* and *A. capensis* of Curran and confirmed that both the species are conspecific with *A. signata* (Meigen) which he placed under the genus *Pachyophthalmus* Brauer and Bergenstamm, 1889. Richards (1935) studied the Malayan species and mentioned that *A. signata* (Meigen) is a separate species.

2. *Amobia (s. str.) pelopei* (Rondani)

(Figs. 28–36)

1859. *Sphixapata pelopei* Rondani, *Dipt. ital. prodr.*, **3** : 228.

1935. *Pachyophthalmus pelopei* : Rohdendorf, *Die Fliegen. Palae. Region*, **11** : 95.

1952. *Senotainiella decolor* Zumpt, *Proc. R. ent. Soc. Lond.*, (B), **21** (1-2) : 14.

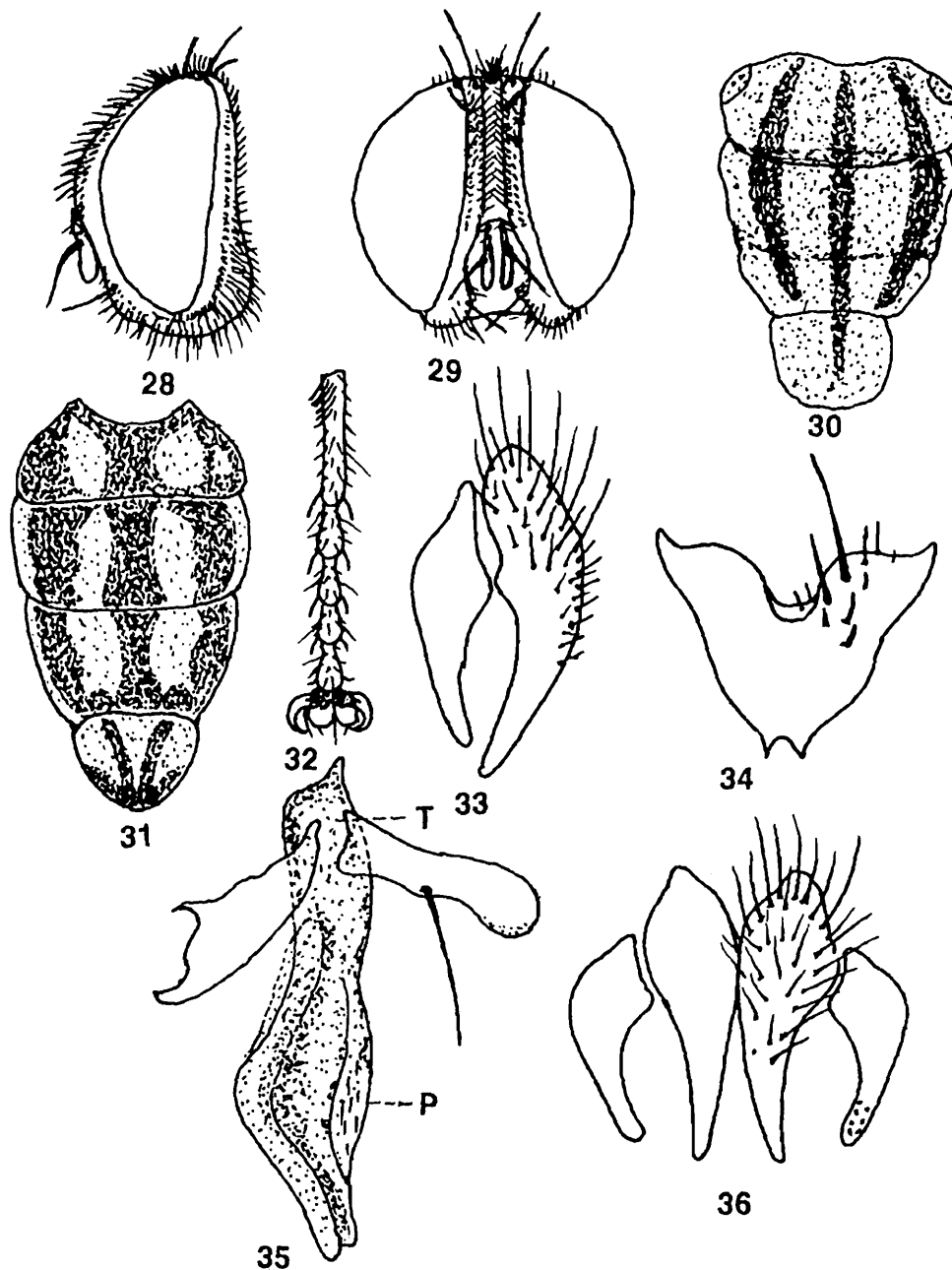
1961. *Senotainiella pelopei* : Zumpt, *Explor. Parc natn. Virunga*, **98** : 62.

1977. *Amobia pelopei* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 558.

1987. *Amobia (s. str.) pelopei* : Verves, *Ént. Obozr.*, **66** (3) : 653.

Male : Body length 9 mm.

Head : Brownish with silvery pollen; eyes very large and deeply brownish; width of frons 0.30 that of one eye and slightly widened at the antennal groove; frontal vitta parallel, black, equal to that of each parafrontal at ocellar region and with short hairs on anterior end; sides of frons and parafacial bare but with silvery pollen; parafrontal black with short hairs and parafacial width at face level with base of antennae 0.25 that of one eye width; antennae black, third antennal segment about twice that of second; arista long, bare, suppressing the vibrissae and thickened up to basal 0.35;



Figs. 28-36 : *Amobia* (s. str.) *pelopei* (Rondani). 28, Head ♂ (lateral view) ; 29, Head ♂ (frontal view) ; 30, Thorax (dorsal view) ; 31, Abdomen (dorsal view); 32, Fore tarsus (dorsal view); 33, Inner and outer forceps (lateral view); 34, fifth sternite; 35, Penis (lateral view); 36, Inner and outer forceps (posterior view).

facial ridge bare with few short hairs; vibrissae moderately developed with 2 supra- and 6 subvibrissal bristles; frontal bristles 14-18, reaching up to antennal segment, anterior 2 proclinate and posterior 2 reclinate; orbital bristle 1 pair and reclinate; gena black with few short black hairs; post gena black with greyish hairs; inner vertical bristle moderately developed, outer vertical short and about half of the inner vertical, post vertical and post ocellar very short; ocellar region greyish with proclinate ocellar bristle which is slightly greater than last frontal bristle and with few short hairs; a row of regular postocular setae, rest of the area with greyish hairs; palpi slender; proboscis black and short.

Thorax : Black, silvery dusted and with three black longitudinal stripes, the median one extends up to middle of scutellum and the laterals extend up to end of mesonotum; *ac* 0+1; *dc* 1+2; *ia* 0+2; *ps* 1; *h* 2; *ph* 2; *np* 3-4; *pa* 2; *sa* 2; *st* 1+1; *mpl* 8-9; *hpl* 6-8; propleura bare; scutellum greyish with 2 pairs of lateroscutellar, a pair of apicoscutellar and a pair of moderately developed discoscutellar bristles.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with 3-4 short setae located dorsally and extending up to basal one-fourth from the basal node to r-m and 2 short setae on ventral surface of basal node of R_{4+5} ; R_{4+5} widely open; fifth costal segment slightly greater than the third, the former with short setae throughout its length on anterior margin; costal spines short; epaulet black; basicostal scale slightly yellowish; squama white with broad yellow margin; halter light brown; bend of m with right angle but without process; t_p slightly curved.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with 1 bristle on anterodorsal surface on distal one-third and 2 bristles on posterodorsal surface on distal one-fourth; mid femur with a row of bristles each along anteroventral and posteroventral surfaces, 2 bristles on posterodorsal surface on distal one-fifth and a row of 3-4 bristles medially on anterodorsal surface; mid tibia with a row of 3 bristles along middle portion of posterodorsal surface on basal two-thirds; hind femur with a row of long bristles each along anterodorsal and posterodorsal surfaces; hind tibia with a row of bristles each along anterodorsal and posterodorsal surfaces and 1 long bristle on anteroventral surface on distal two-thirds; claws and pulvilli long, claws almost equal to fifth tarsomere and first tarsomere about total of two to fourth tarsomeres.

Abdomen : Greyish with grey dusted and three longitudinal rows of more or less triangular oval spots and these markings are variable; second and third abdominal tergites each with a pair of median marginal bristles and the former with 1 and the latter with 5 lateral marginal bristles; tergites fourth and fifth each with a row of marginal bristles and fifth with terminal black marking; sternites first to fourth with

long hairs ; fifth sternite notched in the middle and provided with 2–3 long bristles on anterior margin ; inner and outer forceps curved with slightly pointed hook ; posterior paramere long, terminally rounded and with 1 long bristle ; epiphallus absent ; paraphallus short, widened at the middle and slightly dilated in apical part.

Female : Unknown.

Material examined : 1♂, Yugoslavia : Adria Pag, 6.vii. 1933, N. Baranov (det. by T. Pape ; dep. in SMUC).

Discussion on species : This species may be easily distinguished from *A. (s.str.) auriceps* (Baranov) by the structures of apical plate of paraphallus, inner forceps, posterior paramere and also by the colour of parafrontal and parafacial. Kurahashi (1974) made *A. pelopei* (Rondani) a synonym of *auriceps* (Baranov) but Verves (1979 b) compared the species of Sri Lanka with the Palaearctic specimens and confirmed that these are separate species. This conception was followed by Lopes (1989) who also synonymized it with *Pachyophthalmus alienus* Dodge, 1953. Zumpt (1952) described *Senotainiella decolor* from Natal, South Africa, but in 1961 he synonymized this species with *Sphixapata pelopei*. Pape (1988) studied the male type specimen of *Amobia (s. str.) pelopei* (Rondani) and designated it as *Lectotype* which is in good condition and mounted with a conspecific female. He identified it as *Amobia pelopei* (Rondani). The female pinned with the male *Lectotype* was labelled as *Paralectotype*. Dear (1980) placed this species under the genus *Senotainiella* Zumpt, 1952.

Biology : The larvae of this species develop in the nests of *Sceliphron destillatorium*, *S. omissum*, *S. spirifex*, *Rhynchium atrium* and *Chloridea obsoleta* (Sphecidae) and *Pelopeus* sp., *Symmorphus* sp., *Eumenes pyriformis petiolaris* and *Stenodynerus* sp. (Vespidae) (Kurahashi, 1974). Richards (1935) reported the attraction of this species to the wasps of the genus *Sceliphron* which drank water necessary for building mud-nests and also mentioned it as parasitic on these wasps. Zumpt (1961) recorded the breeding of this species from *Sceliphron spirifex*.

Distribution : India ; TN (Coimbatore) ; SL (Colombo) ; Afghanistan ; Armenia ; Australia ; Austria ; Azerbaijan ; Czech Republic ; East Siberia ; France ; Germany ; Gruzia ; Hawaiian Islands ; Hungary ; Italy ; Malaysia ; Papua New Guinea ; Philippines ; Poland ; Russia ; South Africa ; Switzerland ; Taiwan ; Turkestan ; Turkmenistan ; Ukraine ; Uzbekistan ; West Siberia and Zimbabwe.

Type deposited : Holotype ♂, MZLS, not studied.

3. *Amobia (s.str.) auriceps* (Baranov) (Figs. 37-44)

1935. *Pachyophthalmus auriceps* Baranov, *Zagreb Vet. Arh.*, 5 : 558.

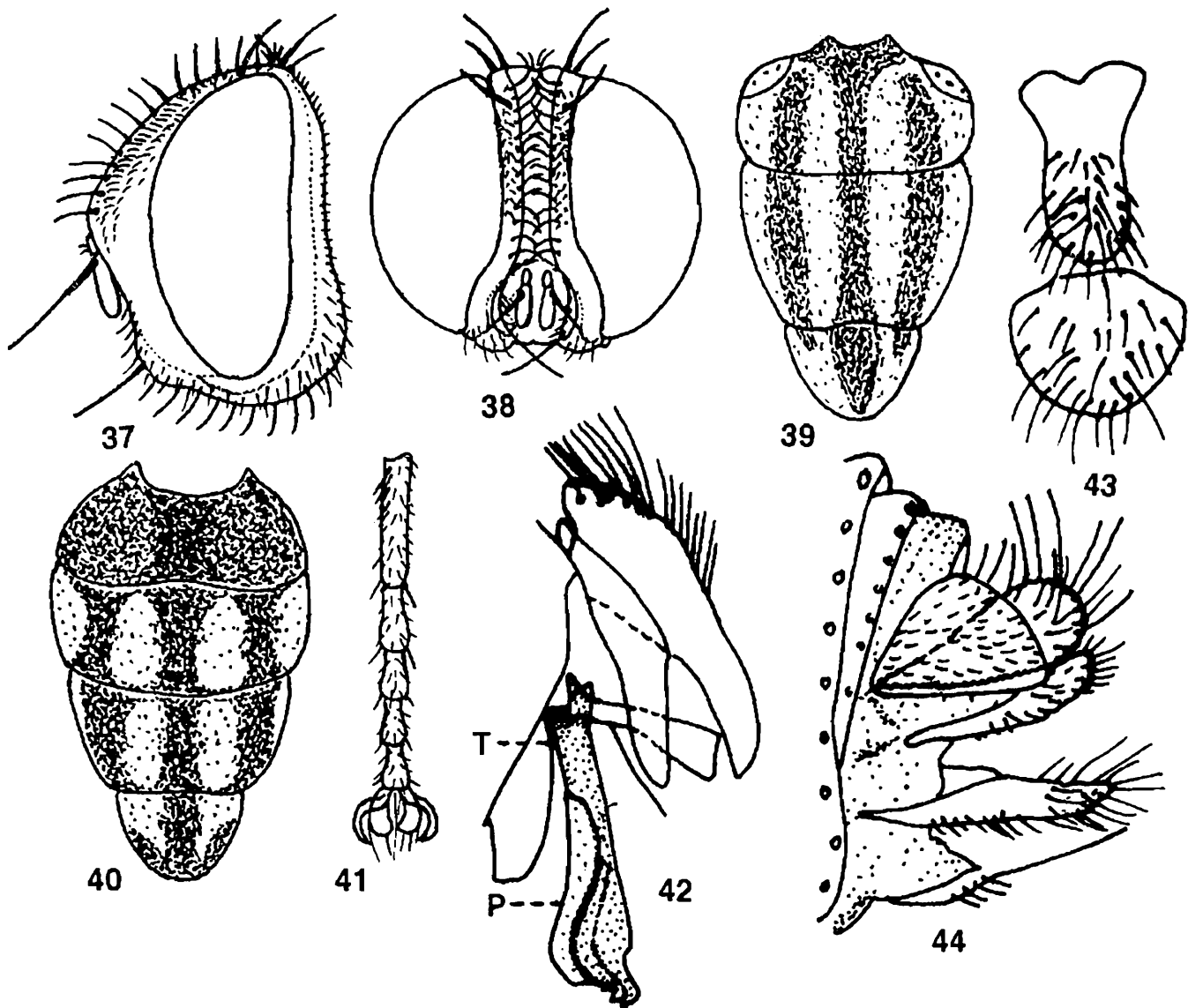
1941. *Amobia auriceps* : Henning, *Ent. Beih. Berlin-Dahlem*, **8** : 183.

1953. *Pachyophthalmus alienus* Dodge, *Proc. Hawaii. ent. Soc.*, **15** (1) : 131.

1987. *Amobia* (s. str.) *auriceps* : Verves, *Ént. Obozr.*, **66** (3) : 653.

Male : Body length 7–8.6 mm.

Head : Brownish with golden pollen ; eyes very large, slightly brownish and with silvery pollen ; width of frons 0.30 that of one eye ; frontal vitta parallel, greyish with golden pollen, slightly narrowed in both ends and about twice that of each parafrontal ; parafacial slightly black with golden pollen and short black hairs ; sides of frons and



Figs. 37-44 : *Amobia* (s. str.) *auriceps* (Baranov). 37, Head ♂ (lateral view) ; 38, Head ♂ (frontal view) ; 39, Thorax (dorsal view) ; 40, Abdomen (dorsal view); 41, Fore tarsus (dorsal view); 42, Penis (lateral view, after Verves, 1979); 43, Abdominal sternites ♀ (after Verves, 1979); 44, Side view of genitalia ♀ (after Verves, 1979).

parafacial with bright golden yellow pollen and short hairs and width of parafacial at base of antennae 0.18 times that of one eye width ; antennae black, short, third segment about twice that of second and its apical end less widened ; arista long, bare and thickened up to basal 0.5 ; facial ridge black with golden pollen ; vibrissae well developed and vibrissal ridge with 3–4 moderately developed supra -and 5–6 subvibrissal bristles ; vibrissal angle slightly developed ; frontal bristles 13–14 and not reaching up to base of antennae, anterior 6–7 proclinate and posterior 3–4 reclinate ; orbital bristles 1 pair and reclinate ; gena black but without hairs ; post gena black with greyish hairs ; inner vertical bristle well developed, outer vertical short about half of inner vertical, post vertical short and less than outer vertical ; post ocellar slightly more than vibrissae ; ocellar region black with few short hairs and a pair of reclinate ocellar bristles which are slightly greater than last frontal bristle ; a row of regular postocular setae, rest of the area with short greyish hairs ; palpi slender; proboscis short and blackish.

Thorax : Grey with three black longitudinal stripes and the median one reaches up to end of scutellum ; *ac* 0+1 ; *dc* 1+2 ; *ia* 1+1 ; *ps* 1 ; *h* 2 ; *ph* not traceable ; *np* 3 ; *pa* 2 ; *sa* 1+2 ; *st* 1+1 ; *mpl* 7 ; *hpl* 7 ; propleura bare ; scutellum blackish with 2 pairs of lateroscutellar, a pair of apicoscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 2–3 short setae located dorsally and extending up to half from the basal node to r-m and 2 short setae on ventral surface of basal node of R_{4+5} ; fifth costal segment longer than the third, the former with short setae along anterior margin of its whole length ; costal spines shorter or absent ; epaulet black ; basicostal scale yellowish-brown ; squama whitish ; halter yellowish ; bend of m 120° ; t_p slightly curved.

Legs : Dark black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2 bristles on anterodorsal surface and 1–2 bristles on posteroventral surface on basal two-thirds ; mid femur with a row of bristles along anterodorsal surface medially, a row of bristles along anteroventral surface and 2 bristles on posterodorsal surface distally ; mid tibia with 1 bristle each on anterodorsal and anteroventral surfaces on distal one-third ; hind femur with a row of bristles each along anterodorsal and anteroventral surfaces ; hind tibia with 1 bristle each on anterodorsal and posterodorsal surfaces on basal two-thirds ; claws and pulvilli long, claws as long as fifth tarsomere, first tarsomere as long as the total of two to fifth tarsomeres.

Abdomen : Dark with greyish pollen ; second tergite entirely black, third and fourth each with 1 median and 2 lateral stripes, fifth with 1 median and few very short apical lateral stripes ; second and third abdominal tergites each with a pair of median marginal bristles but second with 2 and third with 5 lateral marginal bristles,

fourth and fifth each with a row of marginal bristles ; first to fourth sternites each with short hairs basally and long hairs distally ; fifth sternite v-shaped and the lateral arms sparsely with setae ; genital segment dark ; inner and outer forceps almost straight and wide ; anterior paramere wide at middle ; posterior paramere long, wide at end and terminally angular ; epiphallus absent ; paraphallus short, widened at middle, distinctly dilated in apical part and apically straight.

Female : Almost similar to male but with the following differences : parafacial grey ; frons narrower and wings slightly shorter than male.

Material examined : 1 ♂, Sri Lanka : Anu Dist. ; Hunuwilagama, 22-26.v.1976, P.B. Karunaratne (det. Yu. G. Verves ; dep. in USNM).

Discussion on species : This species may be distinguished from *A. (s.str.) pelopei* (Rondani) by the colour of parafacial and parafrontal and also by the structure and shape of paraphallus. Lopes *et al.* (1967) synonymized this species with *A. (s.str.) pelopei* (Rondani). Later on, Verves (1987) synonymized *Pachyophthalmus alienus* Dodge with *A. (s.str.) auriceps* (Baranov).

Biology : Verves (1979b) reported the collection of this species from the nest of *Delta pyriforme pyriforme* (Eumenidae) and Sabrosky and Crosskey (1970) noted it from the nest of mud wasp storing probably from *Amyna punctatum* larvae. Dodge (1953) reported *P. alienus* as parasite in the nest of *Eumenes pyriforme petiolaris* and Lopes *et al.* (1977) recorded from the nests of *Sceliphron* sp., *Pelopeus* sp. and *Eunemes* sp.

Distribution : India ; TN (Coimbatore); SL (Anu Dist., Colombo) ; Australia ; Hainan Island ; Hawaiian Islands ; Laos; Malaysia; Papua New Guinea; Philippines and Taiwan.

Type deposited : *Holotype* ♂, lost ; *Lectotype* ♂, USNM, not studied.

Discussion on types : One male was designated as *Lectotype* by Sabrosky and Crosskey (1970) and its genitalia are on a slide which is in USNM. *Paralectotypes* are in BMNH and USNM. Sabrosky and Crosskey (1970) studied the *Lectotype* material and found the type is in good condition.

Tribe **Miltogrammatini** Brauer and Bergenstamm

The tribe Miltogrammatini (=Miltogrammini) was characterised by Zumpt (1952) as having seventh and eighth tergites fused in the male post abdomen ; the sixth spiracle lying in the tergite and the seventh in the inter segmental membrane, or both spiracles are found in the latter ; fifth sternite with more or less pronounced posterior emargination and sometimes provided with some bristly hairs; wings hyaline except in a few cases ; arista elongated ; head subquadrate ; eyes usually enlarged with 0-4 proclinate orbital bristles but without hairs ; arista not flattened ; abdominal tergites with dark marginal band or tessellate.

This tribe is the largest group among the Miltogrammatinae. Allen (1926) made a good contribution on this tribe from North America and reported a lot of species. Venturi (1953, 1960) revised the species of this tribe and all Italian Miltogrammatinae. Verves (1986) reported twenty four genera under this tribe from the Palaearctic region. Ten genera under five subtribes : Senotainiina Rohdendorf, Pterellina Rohdendorf, Miltogrammatina Rohdendorf, Apodacrina Rohdendorf and Craticulinina Rohdendorf are present in this area. Pape (1987b) revised many genera from Fennoscandia and Denmark and published a good contribution on these flies including their biology.

Most of the species are kleptoparasites in the nests of Apidae and Sphecidae (Hymenoptera). Most of the larvae are laid at or near the entrance to nests of burrowing Hymenoptera (Shewell, 1987).

Distribution of this tribe is world wide.

Key to subtribes

1. Claws and pulvilli at least as long as fifth tarsomere in both sexes.....Senotainiina
Claws and pulvilli shorter than fifth tarsomere in both sexes 2
2. Third antennal segment short and not more than three times that of the second 3
Third antennal segment elongated and more than three times that of the second 4
3. Vibrissae well developed..... Pterellina
Vibrissae absent or hair-like.....Miltogrammatina
4. Third antennal segment three to five times that of the second ; facial ridge bare or with short hairsApodacrina
Third antennal segment six times that of the second ; facial ridge with a row of strong bristles Craticulinina

Subtribe **Senotainiina** Rohdendorf

This subtribe is the most plesiomorphic and Kurahashi (1970) characterised it by having long claws and pulvilli in male ; abdominal tergites with 8 spots on dorsum ; R_{4+5} closed or open and mostly have yellowish antennae and elongated proboscis.

Verves (1986) placed this subtribe under the tribe Senotainiini but in 1989d he placed it under the tribe Miltogrammatini and divided it into two genera : *Afrosenotainia* Rohdendorf, 1935 and *Senotainia* Macquart, 1846. Only one genus *Senotainia* is present in this area.

The larvae of this subtribe are living in the nests of wasps and bees (Sphecidae and Apidae) and may be reared from these. Downes (1955) reported the use of nectar by some species of the genus *Senotainia* and mentioned that some of the females locate the larval food by trailing host wasps carrying prey to their nests. Some of the members of this subtribe are parasitic on honey bees also.

This subtribe is widely distributed and most of the species have been reported from the Nearctic, Afrotropical and Palaearctic regions.

Genus 2. *Senotainia* Macquart, 1846

1846. *Senotainia* Macquart, *Mém. Soc. Sci. Agric. Lille* : 295.

Type species : *Senotainia rubriventris* Macquart, 1846.

1891. *Arrenopus* Brauer and Bergenstamm, *Denkschr. Akad. Wiss. Wien. Kl. math.-naturw.*, **58** : 360.

Type species : *Sphixapata piligena* Rondani, 1865.

1929. *Myiapis* Séguy, *Encycl. ent.*, (B II), *Dipt.*, **5** (5) : 69.

Type species : *Miltogramm tricuspis* Meigen, 1838.

1934. *Pariogymnia* Enderlein, *Sber. Ges. naturf. Freunde Berl.*, **4** : 189.

Type species : *Miltogramma tricuspis* Meigen, 1838.

1934. *Poecilonychia* Enderlein, *Sber. Ges. naturf. Freunde Berl.*, **4** : 189.

Type species : *Sphixapata albifrons* Rondani, 1859.

1936. *Plionychia* Enderlein, *Die Tierwelt Mitteleur.*, **6** (2) : 223.

Type species : *Tachina conica* Fallén, 1810.

Morphology : Abdominal tergites with three dark spots on dorsum ; claws and pulvilli long in both sexes, sometimes normal in female and claws of fore leg slightly shorter than fifth tarsomere ; R_{4+5} open or closed with 1 or 2 small basal setae on upper surface ; arista thickened to near its tip, long and reaching beyond the vibrissae ; orbital bristles clearly developed ; frons not protruded ; parafacial rather broad with short hairs or setae or rarely bare ; propleura may be with black hairs or without hairs ; eyes hairy or bare ; abdomen without translucent yellowish red lateral places but often with protruding terminalia.

Discussion : This is a rather well defined genus and Zumpt (1952) united two genera *Lamprometopia* Macquart, 1846 and *Senotainia* Macquart, 1946 but *Senotainia* has page-priority over *Lamprometopia* and the former is used by most authors. Verves (1989d) was of the opinion that these two genera are quite different and placed them under the tribe Miltogrammatini. This genus has been divided into three subgenera :

Senotainia Macquart, 1846, *Sphixapata* Rondani, 1859 and *Chaetometopia* Malloch, 1930 and only the last two subgenera are available here. A total of 5 species have been reported from India.

Biology : The adult flies of this genus frequent sandy areas and they are probably all parasitic in the nests of fossorial wasps-*Bicyrtes* sp. The genus has been recorded from nests of Sphecidae and Apidae where the larvae also develop. Descriptions of the larvae of some species have been reported by Thompson (1921) and Allen (1926).

Distribution : This genus is widely distributed in all Zoogeographical regions except the Oceania. Only 1 species occurs in the Australasian region.

Key to subgenera

1. Propleura without black hairs except in few cases ; R_{4+5} open ; hind tibia with apical posterodorsal bristles.....*Sphixapata* Randani
Propleura with black hairs ; R_{4+5} closed ; hind tibia without apical posterodorsal bristles.....*Chaetometopia* Malloch

Subgenus *Sphixapata* Rondani, 1859

1859. *Sphixapata* Rondani, *Dipt. ital. prodr.*, 3 : 225.

Type species : *Sphixapata albifrons* Rondani, 1859.

Morphology : Submentum short, its length about three to four times than its width ; propleura without black hairs ; parafacial bare or with sparse very short hairs ; hind tibia with apical posterodorsal bristles ; frons not protruding but narrowed anteriorly ; frontal bristles moderately developed ; vibrissae well developed ; orbital bristles 3 pairs, 1 proclinate and 1 reclinate.

This is a rather small subgenus and Verves (1986) reported 8 species from the Palaeartic region. Only 2 species have been reported from India, and a total of 4 species are present in this area.

This subgenus is distributed in the Palaeartic, Oriental and Afrotropical regions.

Key to species

1. Third antennal segment more than one and a half times that of the second.....2
Third antennal segment less than one and a half times that of the second.....*anamalaica* Verves
2. Abdomen with well defined spots.....3
Abdomen with ill-defined spots.....*albifrons* (Rondani)

3. Parafacial with few short hairs ; frontal bristles few ; thorax with elongated median stripes.....*himalayica* Rohdendorf
 Parafacial with many short hairs ; frontal bristles many ; thorax with T-shaped stripes..... *nepalica* Rohdendorf

4. *Senotainia (Sphixapata) anamalaica* Verves

(Figs. 45-53)

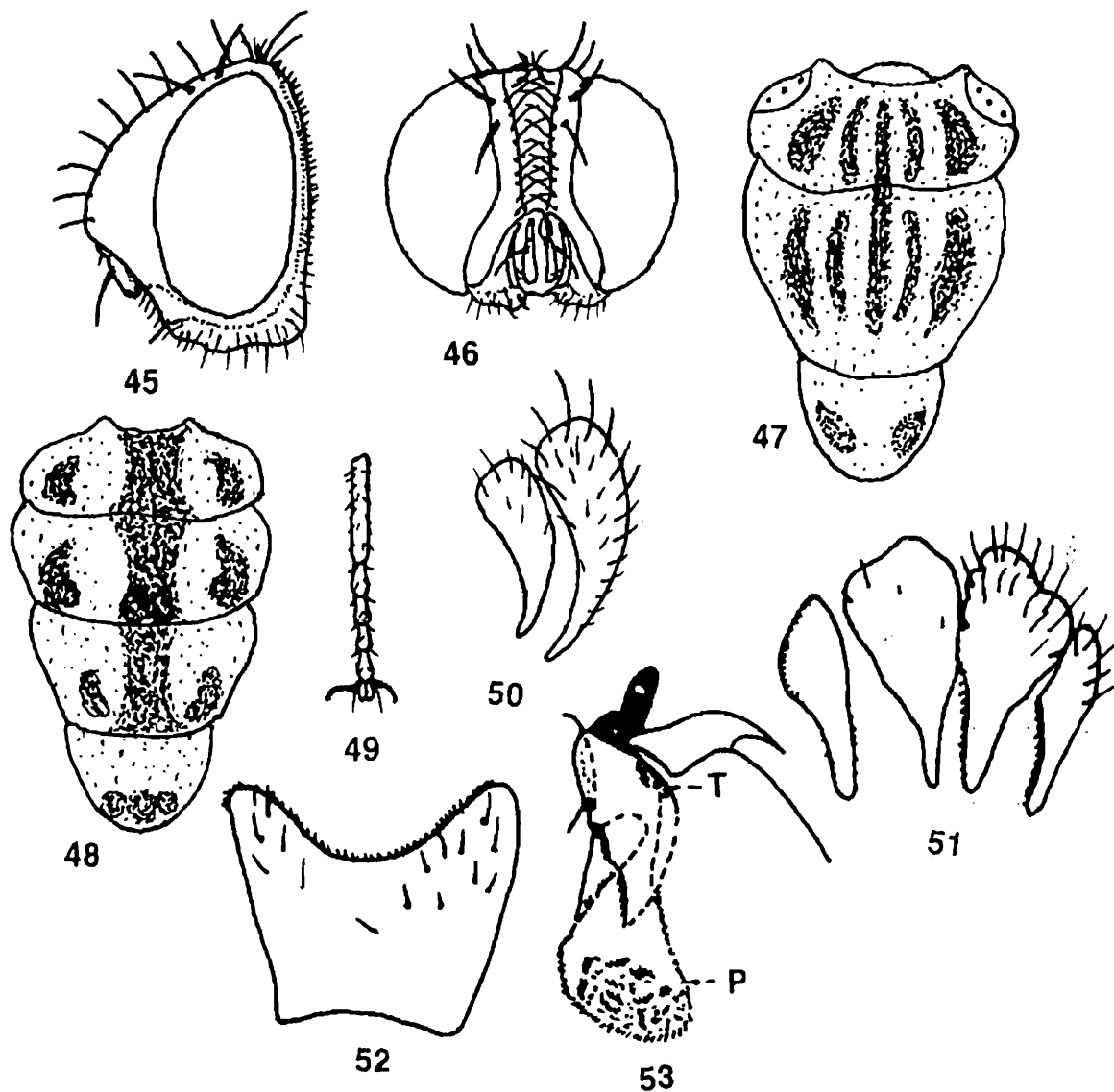
1988. *Senotainia (Sphixapata) anamalaica* Verves, *Vest. Zool.*, **3** : 11.

Male : Body length 5.0–6.6 mm.

Head : Blackish grey with silvery pollen ; width of frons 0.45 that of one eye and frons not projecting forwards ; frontal vitta black and 1.5 – 1.7 times that of the frons in middle and gradually narrowed anteriorly ; parafacial and parafacial silvery grey-yellowish, bare and width of parafacial at face level with base of antennae 0.28 times that of one eye width ; antennae greyish-black and widened at the tip ; third antennal segment 1.2 – 1.3 times that of the second ; arista bare, elongated and thickened up to basal 0.35 ; facial ridge bare ; vibrissae very short, vibrissal angle appreciably above the mouth margin ; subvibrissal bristles 5 ; frontal bristles 7–9 and reaching up to about the antennal base, anterior 3 proclinate and posterior 2 shorter and reclinate ; orbital bristles 3, 1 proclinate and 2 reclinate ; gena silvery-greyish yellow ; post gena black with short blackish hairs ; inner vertical bristle well developed, outer vertical short and shorter than twice that of inner vertical, post vertical very short, shorter than postocellar and about half of outer vertical ; ocellar region brownish with few short hairs and a pair of proclinate bristles ; ocellar bristles longer than posterior frontal bristle ; a row of postocular setae, rest of the area with short greyish hairs ; palpi yellowish ; proboscis short and black.

Thorax : Greyish with deep greyish yellow pollen and five narrow longitudinal dark stripes before suture, behind of which the lateral stripes well developed and the middle stripes ill-defined ; lateral surface of thorax with contrast black spots ; *ac* 2 – 3 + 2 – 3 (strong) ; *dc* 1 – 2 + 3 ; *ia* 1+3 (only presutural pairs strong) ; *h* 3 ; *ph* 1 ; *np* 2 ; *pa* 2 ; *sa* 2 ; *st* 1+1 ; *mpl* 5 ; *hpl* 5–8 ; propleura bare ; scutellum blackish at the sides and with a pair of apicoscutellar, 2 pairs of lateroscutellar and 3 pairs of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with 1–2 short setae on dorsal surface of basal node of r_1 -m and 1 short setae on ventral surface of basal node of R_{4+5} ; R_{4+5} open ; fifth costal segment slightly longer than the third, the former with short spines along more than basal one-third of its anterior margin ; costal spines short ; epaulet black ; basicostal scale yellowish ; squama greyish-white ; halter greyish ; bend of m with straight angled but without process ; t_p short and straight.



Figs. 45-53 : *Senotainia (Sphixapata) anamalaica* Verves. 45, Head ♂ (lateral view); 46, Head ♂ (frontal view); 47, Thorax (dorsal view); 48, Abdomen (dorsal view); 49, Fore tarsus (dorsal view); 50, Inner and outer forceps (lateral view); 51, Inner and outer forceps (posterior view); 52, Fifth sternite; 53, Penis (lateral view).

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2 bristles apart medially on posterodorsal surface ; mid femur with 2 bristles on posterodorsal surface on distal end, a row of bristles with few short setae along posteroventral surface and 1 bristle with few short setae along anterodorsal surface ; mid tibia with 1 bristle on anterodorsal surface on one-third of distal end and 2 bristles spart on posterodorsal surface medially ; hind femur with a row of bristles along anterodorsal surface, 2 bristles basally each on anteroventral and posteroventral surfaces and 1 bristle terminally on anteroventral surface ; hind tibia with a row of bristles along anterodorsal surface and 1 bristle each on anteroventral and

posterodorsal surfaces on basal three-fifths ; claws and pulvilli long, claws 1.3 of fifth tarsomere, first tarsomere slightly greater than total of two to third tarsomeres.

Abdomen : Conical, greyish with a wide median and 2 short lateral spots on second, third and fourth tergites, fifth with 3 short spots terminally, second without median but with 3 lateral marginal bristles, fourth and fifth each with a row of marginal bristles ; sternites first to fourth with short hairs basally and long bristle-like hairs terminally ; fifth sternite cup-shaped with few short hairs ; genital segments black, big and with deep grey pollen ; inner and outer forceps slightly curved ; anterior paramere wide medially and gradually tapering ; posterior paramere sharply pointed apically with 1 long hair ; paraphallus wide at the middle and blunt at end.

Female : Unknown.

Material examined : *Holotype* ♂, India : Anamalai Hills ; Cinchona, ix. 1956, P.S. Nathan ; *Paratype* ♂, same data as *Holotype*.

Discussion on species : This species is similar to *S. (Sphixapata) albifrons* (Rondani) but may be distinguished from it by the round structure of apical part of paraphallus, silvery grey yellowish colour of frons and gena, light yellow pollen on the body and the absence of process of vein m in wings. Pape (1992) (personal communication) informed that this species might be identical to *S. albifrons*, but after studying the type specimen the author is confident that this species is quite separable from *S. albifrons* by the bare and wide parafacial, less developed vibrissae, more elongated and fewer frontal bristles. Moreover, the abdominal spot pattern, structure of fifth sternite and narrowed frons in this species are quite distinctive.

Biology : Nothing is known regarding the biology of the species.

Distribution : India ; TN, Anamalai Hills (Cinchona).

Type deposited : *Holotype* ♂, ZML, studied.

Discussion on type : The author studied the type and found that the head, right fore and mid legs are missing in the *Holotype*. Otherwise, the condition of the *Holotype* and *Paratype* are good. Genitalia of *Holotype* have been pulled out and are attached to the abdomen of the specimen.

5. *Senotainia (Sphixapata) albifrons* (Rondani)

(Figs. 54–62)

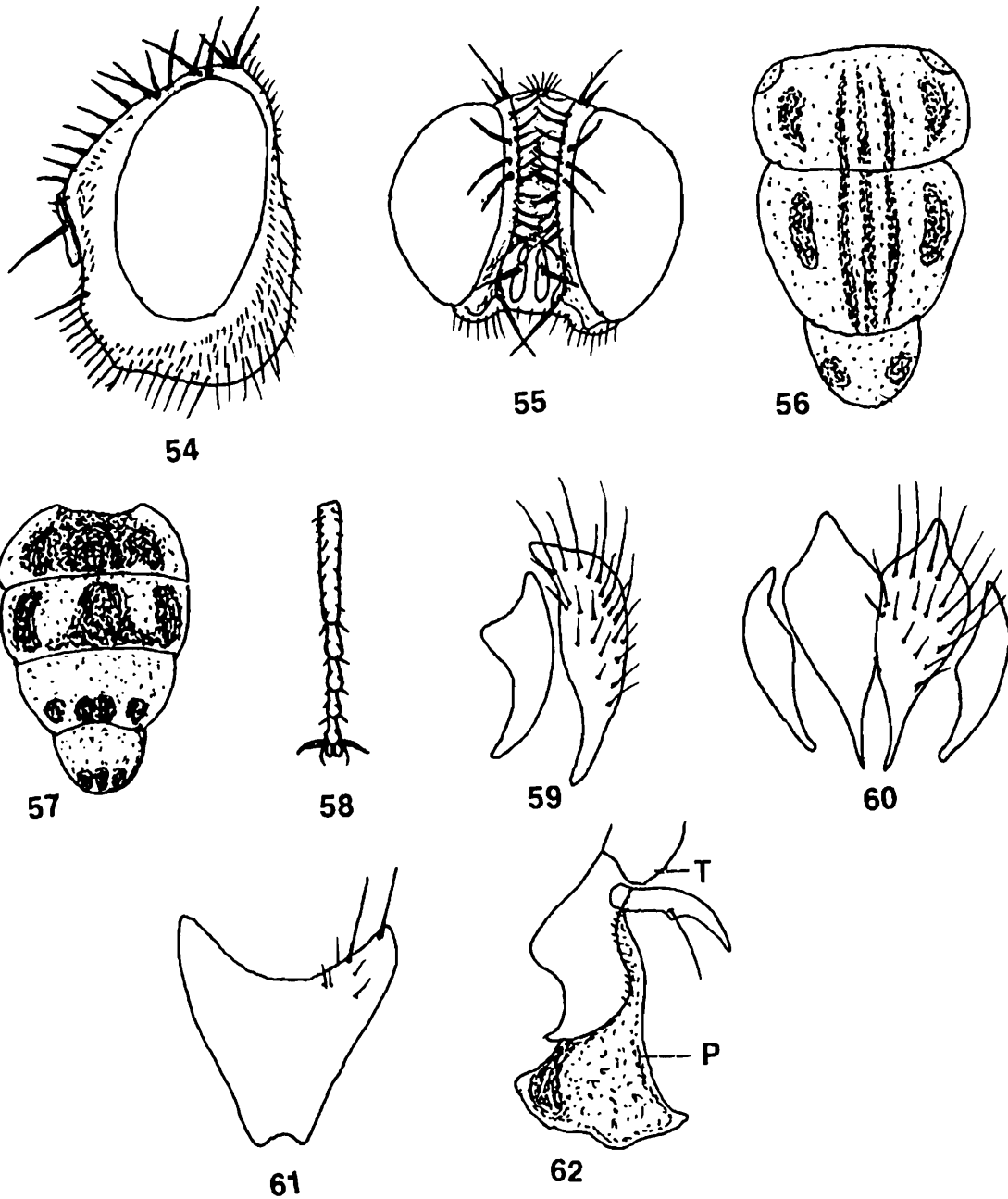
1859. *Sphixapata albifrons* Rondani *Dipt. ital. prodr.*, **3** : 225.

1986. *Senotainia (Sphixapata) albifrons* : Verves, *Cat. Palae. Dipt.*, **3** : 65.

1987. *Senotainia albifrons* : Pape, *Fauna ent. scand.*, **19** : 43.

Male : Body length 4.3–8.5 mm.

Head : Blackish-brown with silvery pollen and frons slightly projecting forwards ; frons widened uniformly and width of frons 0.40 - 0.45 that of one eye ; frontal vitta



Figs. 54-62 : *Senotainia (Sphixapata) albifrons* (Rondani). 54, Head ♂ (lateral view); 55, Head ♂ (frontal view); 56, Thorax (dorsal view); 57, Abdomen (dorsal view); 58, Fore tarsus (dorsal view); 59, Inner and outer forceps (lateral view); 60, Inner and outer forceps (posterior view); 61, Fifth sternite; 62, Penis (lateral view).

black in dorsal view and more silvery grey in anterior view and its width in the middle 1.3 times that of each parafrontal ; parafrontal and parafacial blackish-grey and covered with fine hairs ; parafacial silvery pollen with few short scattered hairs and its width at face level with base of antennae 0.18-0.20 times that of one eye width ; antennae black, slightly reddish on apical part of second segment, third segment about twice that of second ; arista bare, elongated and thickened up to basal 0.4 ; facial ridge silvery black with 4 short bristles above the lower eye margin ; vibrissae

short with 8-9 subvibrissal bristles ; frontal bristles 11 and reaching up to about the base of antennae, posterior 2 reclinate, anterior 6 proclinate ; orbital bristles 3, 2 proclinate and 1 reclinate ; gena black, silvery pollen and with short black hairs ; post gena black with short bristles ; inner vertical bristle well developed, outer vertical short and about one-third that of inner vertical, post vertical shorter than postocellar and about two-thirds the outer vertical ; ocellar region black with few short hairs and a pair of proclinate orbital bristles ; ocellar bristle greater than last frontal bristle ; a row of postocular setae, rest of the area with short greyish hairs ; palpi yellow ; proboscis black and medium in length.

Thorax : Dark in colour, grey dusted pollen and with three median slender stripes and two lateral spots before suture and three indistinct median and two lateral spots after suture ; *ac* 3+3 ; *dc* 2-3+3 ; *ia* 1+4 - 5 ; *ps* 1 ; *h* 2-3 ; *ph* 3 ; *np* 2 ; *pa* 3 ; *sa* 3+2 ; *st* 1+1 ; *mpl* 6 ; *hpl* 6 ; propleura bare with grey dusted ; scutellum slightly grey dusted with indistinct lateral spots and a pair of lateroscutellar, a pair of apicoscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 1-2 short setae located dorsally on basal node to r-m and 1-2 short setae on ventral surface of basal node of R_{4+5} ; R_{4+5} open ; fifth costal segment one and half times that of the third, the former with short spines along more than basal half of its anterior margin ; costal spines short ; epaulet black ; basicostal scale yellow ; squama white ; halter yellowish ; bend of m forwards and at right angle ; t_p slightly curved.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2 bristles apart on posterodorsal surface on distal half ; mid femur with a row of short and 1 long bristles along basal half of anterodorsal surface, 1 bristle on posterodorsal surface distally and a row of 2-3 short hair-like bristles along basal half of anteroventral surface and a row of short spines each along distal half of anteroventral and posteroventral surfaces ; mid tibia with 1 bristle each on anterodorsal and posterodorsal surfaces on distal end and 2 bristles medially apart on posterodorsal surface ; hind femur with a row of bristles along anterodorsal surface and 2 short and 1-2 long bristles along anteroventral surface ; hind tibia with a row of bristles each along anterodorsal and posterodorsal surfaces on distal one-third ; claws and pulvilli long, claws 1.2 of fifth tarsomere ; first tarsomere slightly longer than total of two to third tarsomeres, fifth 1.3 of the fourth tarsomere.

Abdomen : Dark in colour with grey dusted ; second tergite dark, third with ill-defined median and 2 lateral spots, the median spot fused posteriorly with lateral spots but without median marginal bristles, fourth with similar spots but very poorly defined ; second tergite with a pair of median and 3 lateral marginal bristles, third with a pair of short median and 3-4 lateral marginal bristles, fourth and fifth each

with a row of marginal bristles ; sternites second to third each with long fine bristles on hind margin ; fifth sternite v-shaped with 2 hairs apically ; male genitalia dark in colour, not elongated and often visible in lateral view; inner and outer forceps moderately broad but strongly pointed ; anterior paramere broad with serrate on dorsal margin ; posterior paramere short, curved and pointed apically ; paraphallus with distinct hump on dorsal part.

Female : Colour of the body variable but more grey than the male ; abdominal spots sometimes absent.

Material examined : 1 ♂, Sri Lanka : Rat. Dist. ; Sinharaja Forest (Weddagala), 18-21. vi. 1976, K.V. Krombein, P.B. Karunaratne and S. Karunaratne (Dep. in USNM).

Discussion on species : This species may be distinguished from *S. (Sphixapata) anamalaica* Verves by the colour of parafrontal and parafacial and by the structure of frontal vitta which is parallel in *S. albifrons* but gradually narrowed in *S. anamalaica* and also by the structures of fifth sternite and paraphallus. Moreover, the thoracic and abdominal spot patterns in this species are quite distinguishable from other species of this genus.

Biology : Verves (1979b) reported the larvae from the nests of *Sphex leuconotus*, *Sphex subtruncatus* (Sphecidae), *Prionnyx pollens* (Sphecidae) and *Philanthus triangulum* (Philanthidae).

Distribution : India ; JK (Tangmarg) ; SL (several localities) ; Afghanistan ; Algeria ; Armenia ; Austria ; Azerbaijan ; Botswana ; Bulgaria ; China ; Czech Republic ; Denmark ; Egypt ; Finland ; France ; Germany ; Greece ; Great Britain ; Hungary ; Italy ; Japan ; Kazakhstan ; Kenya ; Kyrgyzstan ; Lithuania ; Moldova ; Mongolia ; Nigeria ; North Korea ; Poland ; Romania ; Russia ; Saudi Arabia ; Slovakia ; South Africa ; Spain ; St. Helena ; Sweden ; Taiwan ; Tajikistan ; Tanzania ; Tunisia ; Turkmenistan ; Ukraine ; Uzbekistan ; West Siberia ; Yugoslavia ; Zaire and Zimbabwe.

Type deposited : Lectotype ♂, MZLS, not examined.

Discussion on type : According to Pape (1988) the type location is erroneously given as Vienna by Townsend (1938) probably caused by a confusion with the type-designation of *Sphixapata* Rondani (= *Senotainia* Macquart) by Brauer and Bergenstamm (1889). Pape also labelled 4 male and 2 female specimens present in Museo Zoologico de "La Specola" as *Paralectotypes* which were identified as *Amobia signata* (Meigen). Dear (1980) placed this species under the genus *Senotainia* and synonymized this genus with *Sphixapata*.

6. *Senotainia (Sphixapata) himalayica* Rohdendorf

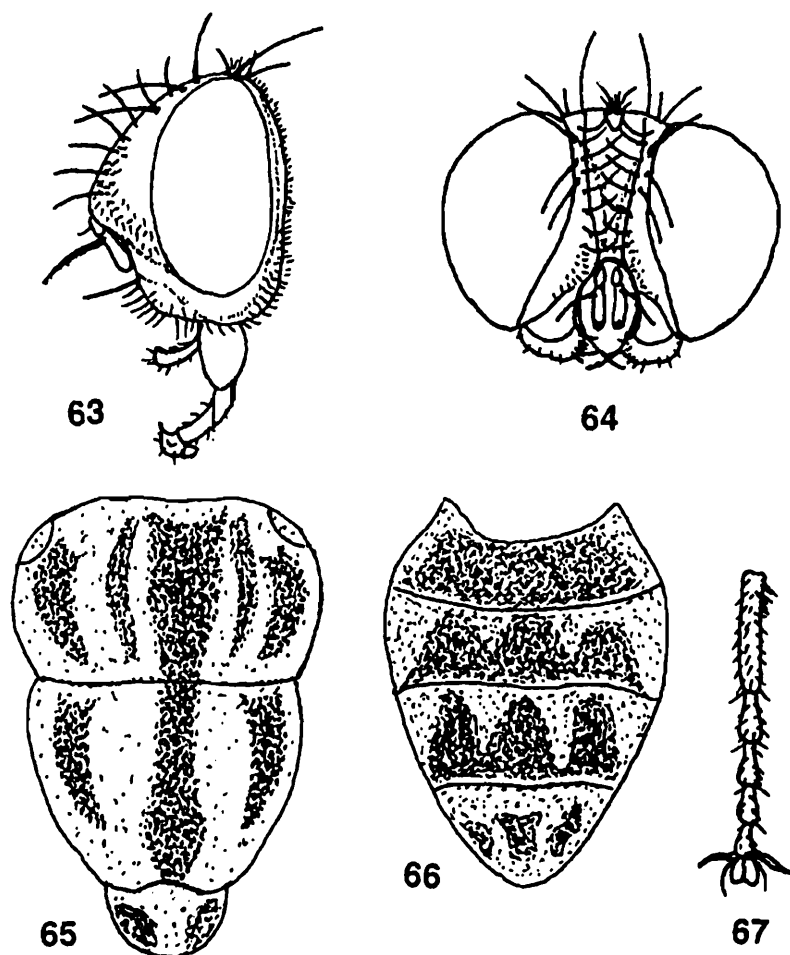
(Figs. 63-67)

1966. *Senotainia (Sphixapata) himalayica* Rohdendorf, *Bull. Br. Mus. nat. Hist. (Ent.)*, B, 17 (10) : 461.

1977. *Senotainia himalayica* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region, 3* : 558.

Male : Body length 4.0 mm.

Head : Dark with silvery pollen ; eyes black ; width of frons about 0.40 that of one eye and frons not projecting forwards ; frontal vitta pale brown, almost yellow with yellow dusting and its width about twice that of each parafrontal ; parafrontal black, almost bare and with short black hairs in front ; parafacial black with few short hairs and its width at face level with base of antennae about 0.25 times that of one eye width ; antennae moderate in size, apical part of second antennal segment reddish-brown, third segment black and 2.6 times that of the second ; arista elongated, straight, thickened up to 0.4 and with short sparse hairs ; facial ridge black with 2 short bristles ; vibrissae well developed and almost equal to arista ; vibrissal angle slightly developed with 6 supravibrissal bristles ; frontal bristles 7 and extending up to base of antennae, posterior 2 reclinate, anterior 3 proclinate ; orbital bristles 3, 2 proclinate and 1 reclinate ; gena greyish with short black spines ; post gena slightly grey with



Figs. 63-67 : *Senotainia (Sphixapata) himalayica* Rohdendorf. 63, Head ♂ (lateral view); 64, Head ♂ (frontal view); 65, Thorax (dorsal view); 66, Abdomen (dorsal view); 67, Fore tarsus (dorsal view).

greyish hairs ; outer vertical bristle long, inner vertical twice as long as the outer vertical, post vertical very short, shorter than postocellar and about two-fifths that of outer vertical ; ocellar region black with few short hairs and a pair of proclinate ocellar bristles, ocellar bristles less than inner vertical ; a row of regular postocular setae besides postocular cilia, rest of the area with greyish hairs ; palpi moderately long and greyish at tip ; proboscis short and black.

Thorax : Dark in colour, densely dusted and with three elongated median stripes and 2 lateral spots before suture, the median stripe broader and darker than the other stripes, behind the suture with 1 median stripe which reaches up to scutellum and lateral spots reach up to level of two-thirds of mesonotum ; *ac* 2-3+2 (only posterior pair strong) ; *dc* 2+3 (strong) ; *ia* 1+1 ; *ps* 1 ; *h* 3 (1 short) ; *ph* 3 (1 short) ; *np* 2 ; *pa* 3 ; *sa* 2 ; *st* 1+1 ; *mpl* 4 ; *hpl* 6 ; propleura bare ; lateral part of scutellum deep black and with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of setae along basal half of basal node to r-m but without setae on ventral surface of basal node of R_{4+5} ; R_{4+5} open ; fifth costal segment equal to the third, the former with short spines along basal half of its anterior margin ; costal spines short ; epaulet black ; basicostal scale whitish with slightly yellow tinge ; squama milky white ; halter brownish ; bend of m 130° ; t_p straight.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2 bristles apart on posterodorsal surface on distal two-thirds ; mid femur with 1 bristle medially on anterolateral surface, 2 bristles distally on posterodorsal surface, a row of short setae with 2 long bristles along posteroventral surface and a row of setae along distal half of anteroventral surface ; mid tibia with 1 bristle each on anteroventral and posteroventral surfaces on distal one-third and 2 bristles apart on posterolateral surface on distal half ; hind femur with a row of bristles along posterodorsal surface and 1 bristle each on posteroventral and anterodorsal surfaces on distal two-fifths ; hind tibia with a row of bristles along posterodorsal surface and 1 bristle each on posteroventral and posterodorsal surfaces on distal two-fifths, claws greater than fifth tarsomere and fifth tarsomere about two and half times that of first tarsomere.

Abdomen : Dark in colour, egg-shaped, blunt at apex and only the border of sclerites pale and yellowish ; second tergite almost completely black, third and fourth each with well developed median and 2 poorly developed lateral spots, fifth with poorly defined 3 spots, second tergite without median but with 3 lateral marginal bristles, third with a pair of short median and 4 lateral marginal bristles, fourth and fifth each with a complete row of long and strong marginal bristles ; sternites second and third with erect bristles and first and fourth with a pair of long bristles on posterior margin ; genitalia pale dusted and moderate in size.

Female : Almost similar to male but here frons and face narrower ; body colour pale ; frons about equal to 0.23 of head width ; abdominal spots on fifth tergite absent.

Material examined : *Holotype* ♂, East Nepal : Taplejung Dist. ; Sangu, 1, 830 m, 9.x.1961, R.L. Coe.

Discussion on species : According to Rohdendorf (1966) this is an interesting species due to its small size, well developed abdominal spot pattern, bare propleura and long third antennal segment. This species differs from *S. (Sphixapata) nepalica* Rohdendorf by the colour of frontal vitta, eye, well developed frontal bristles, long proboscis and hairy parafacial and also from *S. anamalaica* Verves by the colour of eye, frontal vitta and abdominal spot pattern.

Biology : Collected from mixed vegetation on stream.

Distribution : Ne ; Sangu.

Type deposited : *Holotype* ♂, BMNH, studied.

Discussion on type : The type is in good condition and the male genitalia were not dissected out.

7. *Senotainia (Sphixapata) nepalica* Rohdendorf

(Figs. 68-72)

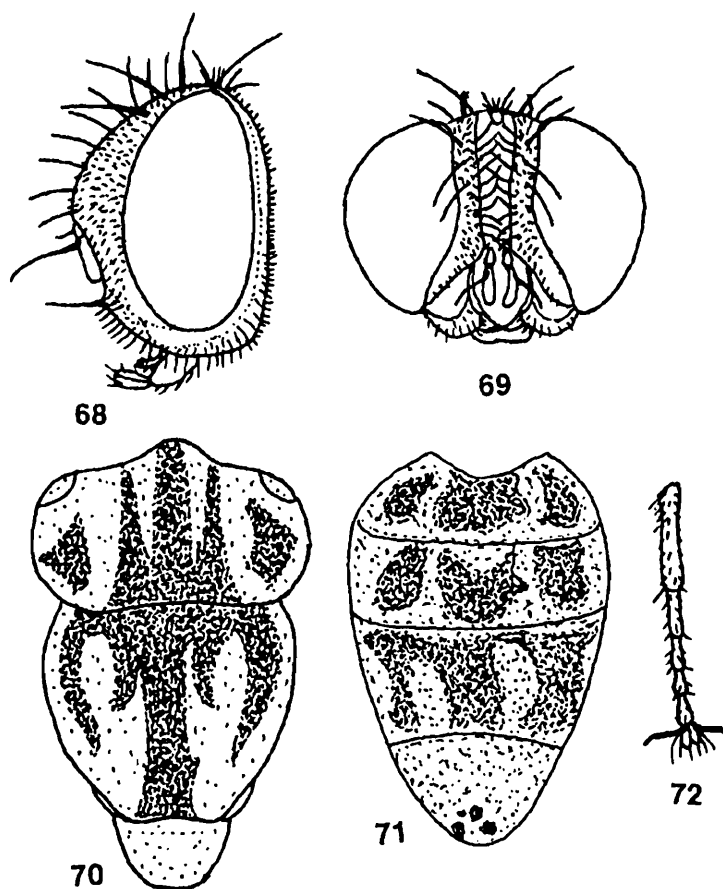
1966. *Senotainia (Sphixapata) nepalica* Rohdendorf, *Bull. Br. Mus. nat. Hist. (Ent.)*, B, 17 (10) : 460.

1977. *Senotainia nepalica* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, 3 : 558.

Male : Body length 6.1 mm.

Head : Dark in colour and silvery grey ; eyes black with brownish tinge ; width of frons 0.45 that of one eye and frons not projecting forwards ; frontal vitta black, narrow, undusted and with silvery pollen, its width in front of ocellar triangle twice that of each parafrontal and narrowest point of frons about 0.42 of one eye width ; parafrontal black, silvery pollen and with 6-7 short hairs ; parafacial black, slender and with two irregular rows of short hairs near the anterior border, its width at face level with base of antennae 0.20 times that of one eye width ; antennae black, apical part of second segment reddish-brown, third segment short and 1.55 times that of the second ; srista elongated, thickened up to basal 0.35, second segment as long as broad, the thickened part of third segment equal to one-third of the slender part ; facial ridge black with 3 short bristles ; vibrissae long, strong and slightly shorter than antennal length ; vibrissal angle prominent, slightly above mouth margin and with 6-7 subvibrissal bristles ; frontal bristles 8-9 and reaching up to base of antennae, posterior 2 reclinate, anterior 2-3 proclinate and posterior pairs shortest and weakest ;

orbital bristles 3, 2 proclinate and 1 reclinate ; gena black with silvery pollen and black hairs ; post gena black with greyish hairs ; outer vertical bristle rather fine and short, inner vertical two and half times that of the outer vertical, post vertical short and less than half of inner vertical, postocellar slightly less than outer vertical ; ocellar region brownish-black with few short reclinate hairs and 1 moderately long proclinate bristle ; ocellar bristles slightly less than inner vertical and about as long as last frontal bristle ; a row of regular postocular setae besides postocular cilia, rest of the area with black and whitish hairs ; palpi short, slender and yellowish ; proboscis brownish-black, short and labellae of proboscis with in the from of pair of setulose horn-shaped processes.



Figs. 68-72 : *Senotainia (Sphixapata) nepalica* Rohdendorf. 68, Head ♂ (lateral view); 69, Head ♂ (frontal view); 70, Thorax (dorsal view); 71, Abdomen (dorsal view); 72, Fore tarsus (dorsal view).

Thorax : Dark colour, dense yellowish-grey pollen and with three subequal median stripes and 2 broad lateral spots before suture, behind suture 3 median stripes which form T-shaped structure and reaching up to the hind margin of mesonotum where it is broadened, 2 lateral median stripes abbreviated and extent up to the point just first posterior *dc*, lateral stripes behind suture broader and elongated ; *ac* 1+3 (only presutural and posterior post pair strong) ; *dc* 3+3 (anterior pair weak) ; *ia* 1+1 ;

ps 1 ; *h* 3 ; *ph* 3 (short) ; *np* 2 ; *pa* 2 ; *sa* 2 ; *st* 1+1 ; *mpl* 5 ; *hpl* 17 ; propleura with few short setae ; lateral parts of scutellum deep blackish-brown, the median part pale grey and with 2 pairs of lateroscutellar, a pair of apicoscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with 2 short setae located dorsally on basal node to r-m and 1 setae on ventral surface of basal node of R_{4+5} ; R_{4+5} open ; fifth costal segment one and half times that of the third, the former with short spines along its whole of anterior margin ; costal spines short ; epaulet black ; basicostal scale yellowish ; squama white ; halter brownish and slightly yellow ; bend of m 130° ; t_p almost straight.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2 bristles apart on distal half of posterodorsal surface and 1 bristle on anteroventral surface on distal one-third ; mid femur with 1 bristle medially on anterodorsal surface and few short setae along anterior and posterior margins of ventral surface on distal half, few short hair-like bristles along anteroventral surface and 2 bristles distally on posterodorsal surface ; mid tibia with 1 bristle each on anterodorsal and anteroventral surfaces at about one-third on distal end and 2 bristles apart on posteroventral surface medially ; hind femur with a row of 5 hair-like bristles along basal two-thirds of anterodorsal surface and a row of hair-like bristles along basal half of posteroventral surface ; hind tibia with a row of bristles along anterodorsal surface, 2 bristles apart on posterodorsal surface and 1 bristle on anteroventral surface on distal one-third ; claws and pulvilli moderately long, claws 1.2 times of the fifth tarsomere, 3 times of the first and 1.2 times the total of fourth and fifth tarsomeres.

Abdomen : Black, egg-shaped, conical at end, slightly elongated and with large black spots ; second tergite with well defined median and large lateral spots, the median spot fused anteriorly with the lateral spots, third with similar spots but the median spot larger and more sharply defined, fourth with slender oblique lateral spots and a very small dot-like median spot, fifth with 3 small spots and densely grey dusted ; border of tergites and sternites pale in colour ; second tergite without median but with 3 long lateral marginal bristles, third with 2 short median and 3 long lateral marginal bristles, fourth and fifth each with a complete row of marginal bristles ; sternite second with long hairs apically along posterior margin, others with short hairs ; fifth sternite v-shaped ; male genitalia pale dusted, not particularly large ; inner foreceps curved apically.

Female : Unknown.

Material examined : *Holotype* ♂ , East Nepal : Taplejung Dist., Dobhan, 1,220m, 28.1.1962, R. L. Coe.

Discussion on species : This species differs from *S. (Sphixapata) albifrons* (Rondani)

by having setae on propleura, slender and hairy parafacial, well developed abdominal spots pattern, broader frons and peculiar type of thoracic stripes. This species differs from *S. anamalaica* by the colour of eye, wideness of frons and thoracic spots pattern. Rohdendorf (1966) was doubtful regarding the systematic position of this species due to several unusual characters, such as setulose propleura and the structure of proboscis. He mentioned it might represent a distinct genus.

Biology : This species has been collected from cut rice steppes above River Maewa.

Distribution : Ne ; Dobhan.

Type deposited : *Holotype* ♂, BMNH, studied.

Discussion on type : The right wing is slightly damaged and the ♂ genitalia were not dissected. Otherwise, the condition of the type is good.

Subgenus *Chaetometopia* Malloch, 1930

1930. *Chaetometopia* (as genus) Malloch, *Proc. Linn. Soc. N. S. W.*, **55**(4) : 429.

Type species : *Chaetometopia cinerea* Malloch, 1930.

1989. *Chaetometopia* (as subgenus of *Senotainia*) : Verves, *Jap. J. Med. Sci. Biol.*, **42** : 122.

Morphology : Eyes black ; presence of strong black hairs in the centre of propleura ; third antennal segment black and about twice that of the second ; R_{4+5} closed and mostly yellow ; hind tibia with 2 bristles apically on anterodorsal surface but without apical posterodorsal bristles ; arista elongated and longer than third antennal segment ; sternopleural bristles 2 and with few hairs ; claws moderately developed ; third and fourth abdominal tergites with well developed 3 spots which extend up to most of their entire length.

This is a monotypic subgenus and Malloch (1930) treated it as a separate genus and distinguished it from *Senotainia* Macquart, 1846 and *Protomiltogramma* Townsend, 1916 by the presence of strong black hairs in the centre of propleura. Verves (1989d) treated it as subgenus of the genus *Senotainia* due to the presence of black third antennal segment and closed R_{4+5} . Lopes (1989) kept it as a separate genus.

Nothing is known regarding the bionomics of the species of this subgenus.

This subgenus is distributed in the Oriental and Australasian and Oceanian regions.

8. *Senotainia (Chaetometopia) cinerea* (Malloch)

(Figs. 73-81)

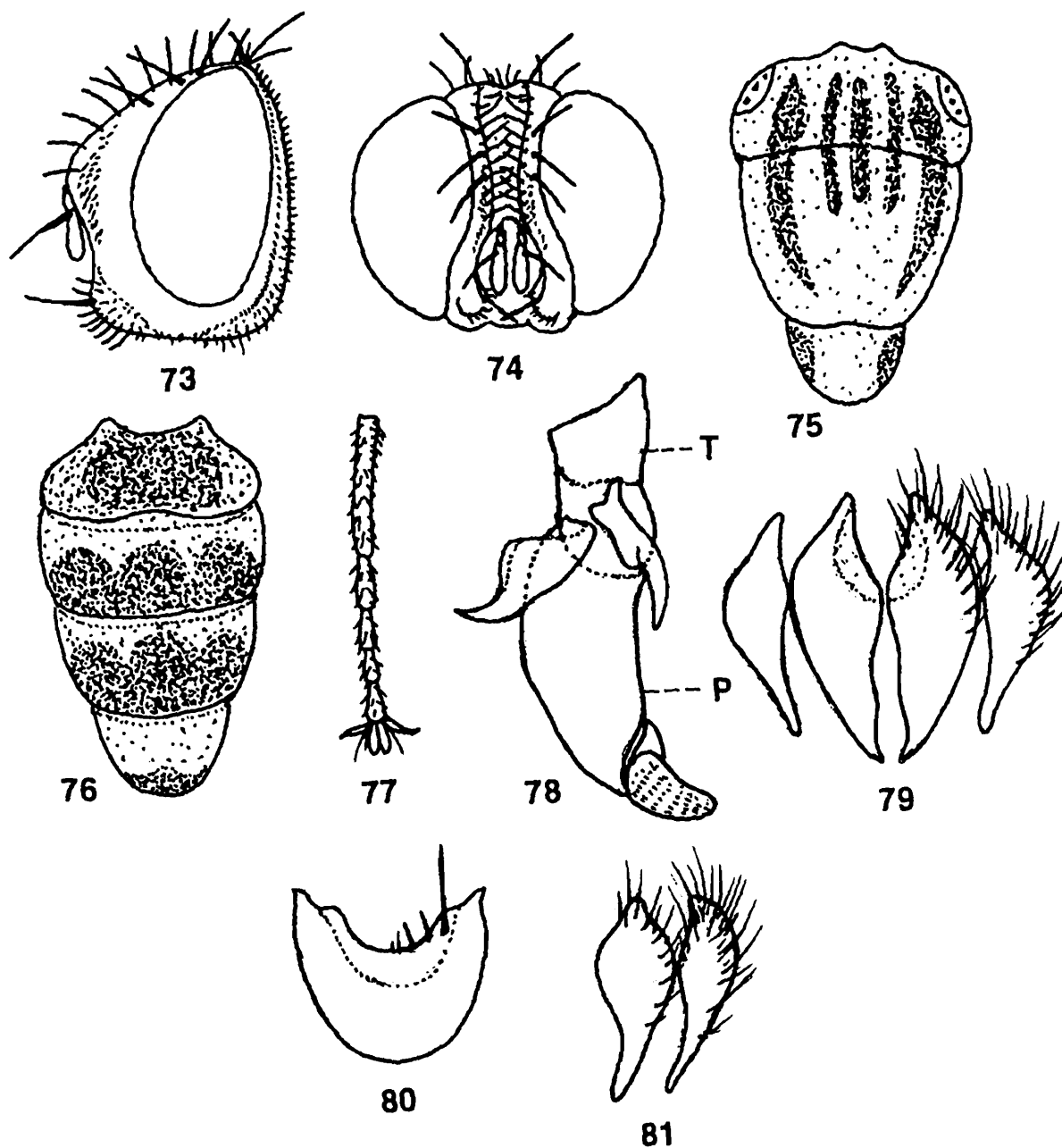
1930. *Chaetometopia cinerea* Malloch, *Proc. Linn. Soc. N. S. W.*, **55** (4) : 429.

1989. *Chaetometopia cinerea* : Lopes, *Cat. Dipt. Aust. and Oceanian Regions*, **86** : 122.

1989. *Senotainia (Chaetometopia) cinerea* : Verves, *Jap. J. Med. Sci. Biol.*, 42 : 112.

Male : Body length 4 mm.

Head : Black with entirely whitish grey-dusted ; eyes black ; width of frons about 0.30 that of one eye in the middle and slightly widened at both ends ; frontal vitta greyish-black and slightly greater than each parafrontal at ocellar region ; parafrontal with silvery pollen but without hairs ; parafacial slightly reddish, silvery pollen, with



Figs. 73-81 : *Senotainia (Chaetometopia) cinerea* (Malloch). 73, Head ♂ (lateral view); 74, Head ♂ (frontal view); 75, Thorax (dorsal view); 76, Abdomen (dorsal view); 77, Fore tarsus (dorsal view); 78, Penis (lateral view); 79, Inner and outer forceps (posterior view); 80, Fifth sternite; 81, Inner and outer forceps (lateral view).

few hairs and its width at face level with base of antennae about 0.16 that of one eye width ; antennae black and base of third antennal segment slightly reddish, third segment greyish-black and about twice that of second ; arista elongated, longer than third antennal segment and thickened at basal 0.4 ; facial ridge bare and slightly brownish ; vibrissae well developed, equal to that of arista but longer than third antennal segment and with 2 supra- and 5–6 subvibrissal bristles ; frontal bristles 10, short and reaching up to about base of antennae, anterior 3–4 proclinate and posterior 2 reclinate ; orbital bristles 3, 2 proclinate and 1 reclinate ; gena slightly black with black hairs ; post gena blackish with greyish hairs ; inner vertical bristle well developed, outer vertical half the inner vertical, post vertical very short ; ocellar region black with few short hairs and a pair of proclinate divergent ocellar bristles ; a row of regular postocular setae, rest of the area with greyish hairs ; palpi short and yellow ; proboscis elongated and grey.

Thorax : Black, densely grey-dusted with five longitudinal black stripes before suture and the median 3 stripes disappear a little behind suture ; *ac* 2+3 ; *dc* 2–3+3 ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 1 ; *np* 2 ; *pa* 2 ; *sa* 3 ; *st* 1+1 ; *mpl* 5 ; *hpl* 6 ; propleura with black hairs at the centre ; scutellum blackish at sides and with 2 pairs of leteroscutellar, a pair of long apicoscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with 1 setae located dorsally on basal node to r–m but without setae or in some case 1 setae on ventral surface of basal node of R_{4+5} ; R_{4+5} closed ; fifth costal segment slightly shorter than twice that of the third, the former with short setae almost throughout its length on anterior margin ; costal spines short ; epaulet black ; basicostal scale slightly yellowish ; squama white ; halter yellowish ; bend of m 120° with short process ; t_p straight.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2 bristles apart medially on posterodorsal surface, fore tarsus bare and elongated ; mid femur with 1 bristle medially on anterodorsal surface, a row of few hair-like bristles each along basal half of anteroventral and posteroventral surfaces and 2–3 bristles on distal part of posterodorsal surface ; mid tibia with a row of 2 strong and few short bristles along anterodorsal surface and 1 bristle each on posterodorsal and posteroventral surfaces on distal two-fifths ; hind femur with a row of bristles along anterodorsal and few hair-like bristles along anteroventral surfaces basally ; hind tibia with 2 bristles apart medially on anterodorsal surface, 1–2 bristles on posterodorsal and 1 bristle on anteroventral surfaces on distal two-fifths ; claws and pulvilli moderately long ; first tarsomere about equal to total of second to fourth tarsomeres, fifth tarsomere about 1.3 that of fourth.

Abdomen : Cylindrical and tapering to apex with heavy grey dusted and usual three black spots on third and fourth tergites which reach up to next segment, second

blackish but without median and third with a pair of short median marginal bristles, second with 3 and fourth with 4 lateral marginal bristles, fourth with a pair of median and 4–5 lateral marginal bristles, fifth slightly brownish on posterior one-third and with a row of lateral marginal bristles ; sternites first to fourth with 2 long hairs on posterior end ; fifth sternite v-shaped, slightly grooved at the anterior end and with 2 long bristles and few short hairs ; inner forceps gradually tapering at the end ; outer forceps wide at the base and abruptly pointed at end ; anterior paramere wide at middle ; posterior paramere abruptly pointed at end ; paraphallus wide uniformly, slightly curved and almost blunt at posterior end and terminal portion transparent with short setae.

Female : Unknown.

Material examined : *Holotype* ♂, Darwin : Qld., G. F. Hill, (det. by D. H. Colless ; dep. in ANIC) ; 1 ♂, Australia : Qld. Annam River ; 3 km. W. by S. of Black Mt., 28.ix.1980 (det. by D. H. Colless, Malaise trap; dep. in ANIC).

Discussion on species : This species described originally from Australia and can be distinguished from other species by the characters of black hairs on propleura, narrow frons, spots on third and fourth abdominal tergites and well developed apical scutellar bristles. This species was first reported from India by Lopes (1989), who placed it under the genus *Chaetometopia* Malloch.

Biology : So far nothing is known regarding the biology of the species.

Distribution : India ; A (Silchar), B (Pusa), K (Midigare), Kt (Trivandrum), TN (Cinchona) ; SL (Ham Dist.) ; Australia ; Bangladesh; Indonesia (Kalimantan) ; Laos; Malaysia ; Papua New Guinea ; Philippines ; Singapore; Solomon Islands and Thailand.

Type deposited : *Holotype* ♂, ANIC, examined.

Discussion on type : The right fore leg is missing and the genitalia were not dissected out. Otherwise, the condition of the type is good.

Subtribe **Pterellina** Rohdendorf

This subtribe is plesiomorphic and is characterised by having parafacial bare or with microscopic hairs and well developed presutural acrostichal bristles which may be absent in some cases ; male have short claws and pulvilli ; third antennal segment short ; vibrissae well developed.

Verves (1989d) synonymized this subtribe with the tribe *Sogdianomyiina* Rohdendorf and divided it into four genera : *Pterella* Robineau-Desvoidy, 1863, *Chaetapodacra* Rohdendorf, 1925, *Protomiltogramma* Townsend, 1916 and *Eremasiomyia* Rohdendorf, 1927, of which only three genera except *Chaetapodacra* are present in this area.

This subtribe is distributed in the old world.

Key to genera

1. Presutural *ac* absent ; vibrissae not so developed or absent.....2
 Presutural *ac* present ; vibrissae well developed.....*Pterella* Robineau-Desvoidy
2. Acrophallus with elongated process ; frontal bristles less in number and not more than 10 pairs.....*Eremasiomyia* Rohdendorf
 Acrophallus without elongated process ; frontal bristles many in number and more than 10 pairs.....*Protomiltogramma* Townsend

Genus 3. *Pterella* Robineau-Desvoidy, 1863

1863. *Pterella* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, **2** : 121.

Type species : *Miltogramma grisea* Meigen, 1824.

1863. *Setulia* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, **2** : 124.

Type species : *Setulia cerceridis* Robineau-Desvoidy, 1863 (= *Miltogramma grisea* Meigen, 1824).

1927. *Sogdianomyia* Rohdendorf, *Zool. Anz.*, **71** (5–8) : 157.

Type species : *Sogdianomyia trichiosoma* Rohdendorf, 1927.

1934. *Pseudosphecapata* Enderlein, *Sber. Ges. naturf. Freunde Berl.*, **4** : 189.

Type species : *Miltogramma convergens* Pandelle, 1895.

1935. *Prometheomyia* Rohdendorf, *Die Fliegen Palaearct. Region*, **11** : 66.

Type species : *Setulia dagestanica* Rohdendorf, 1935.

Morphology : Head generally large with well developed vibrissae in both sexes ; third antennal segment short and not more than 2–3 times that of the second ; abdominal pattern checkered ; presutural acrostichal bristle present and dorsocentral bristle strong ; frontal bristles numerous ; generally 2 proclinate and 1 reclinate orbital bristles ; vertex with densely haired ; claws and pulvilli normal in both sexes ; mid tibia with 1 strong and often with some weak anterodorsal bristles ; wings more or less shining due to reduced clothing hairs ; R_{4+5} broadly open ; fifth tergite often with ventrally hairs which are directed forward and somewhat upward.

Discussion : This is a rather small genus. Zumpt (1961) revised the Ethiopian species of this genus and reported a total of 7 species. Nesbitt (1976) made a good contribution on this genus and prepared key to all the available species in the Ethiopian and Madagascan Zoogeographical regions. Zumpt and Nesbitt did not separate *Pterella* and *Protomiltogramma*. Dear (1980) reported a total of 13 species from the Afrotropical region. Verves (1986) reported 12 species from the Palaearctic region and synonymized this with *Sogdianomyia* Rohdendorf, 1927. Only 1 species has been reported from the

Oriental region under the subgenus *Pterella* R. D., 1863 which is also present in India.

Biology : Some species of *Pterella* are available in the nests of Bombycidae, Sphecidae and Acrididae. Larva of one species (as under genus *Setulia*) has been drawn and described by Thompson (1921). Kurahashi (1970) recorded the rearing of a species from the nest of *Bembix* sp. (Sphecidae).

Distribution : This genus is present in the Palaearctic, Afrotropical, Oriental and Australasian and Oceanian regions.

Subgenus *Pterella* Robineau-Desvoidy, 1863

1863. *Pterella* Robineau-Desvoidy, *Hist. nat. Dipt. Paris.*, 2 : 121.

Type species : *Miltogramma grisea* Meigen, 1824.

Morphology : Head large ; third antennal segment less than or about two times that of the second ; parafacial yellow with pale hairs ; vibrissae moderately developed ; mid tibia with strong anterodorsal bristles ; R_{4+5} broadly open ; latero-clinate ocellar bristles present ; frontal bristles many and strong ; frontal vitta uniform.

This is a small subgenus with most species in the Palaearctic and Afrotropical regions. Some of the species have been recorded from Acrididae and the nests of Sphecidae.

9. *Pterella* (s. str.) *krombeini* Verves

(Figs. 82-87)

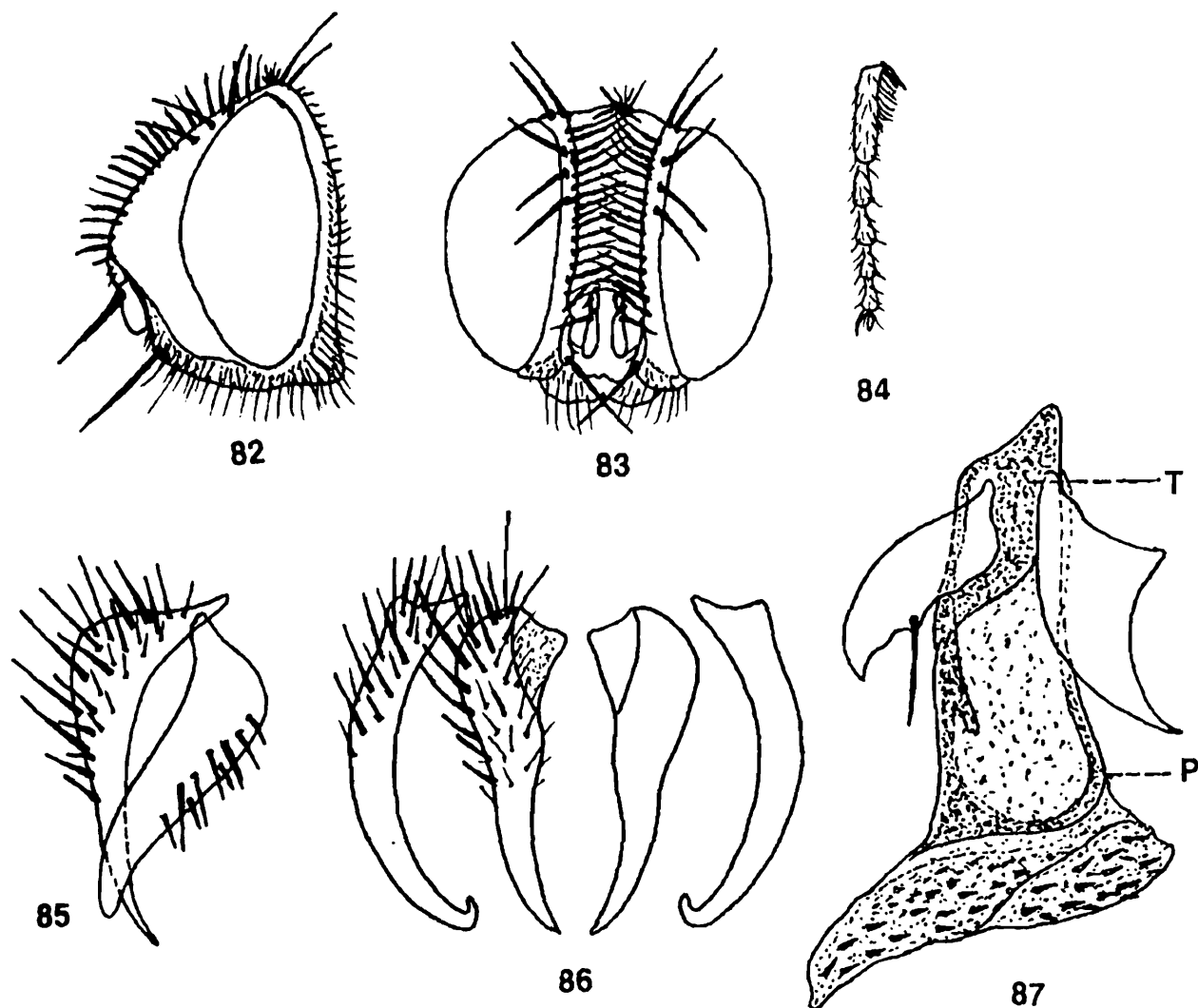
1979. *Pterella* (s.str.) *krombeini* Verves, *Ent. Rev. Wash.*, 58 (4) : 160.

Male : Body length 6.5–7 mm.

Head : Yellowish ; eyes black ; frons narrow, moderately projecting forwards and its width in the middle 0.50 – 0.50 times that of one eye ; frontal vitta yellowish, uniform, silvery pollen and its width in the middle 2.5 times that of each parafrontal ; parafacial and parafrontal slightly yellowish with silvery pollen, the former with pale short hairs and its width at face level with base of antennae 0.30 times that of one eye width ; antennae yellowish-brown, third antennal segment 1.7 times that of the second ; arista bare, elongated and thickened up to 0.7 ; facial ridge grey-yellowish but without hairs ; vibrissae well developed with 3–5 supra vibrissal bristles ; vibrissal angle appreciably above mouth margin ; frontal bristles 13–15, posterior 4–5 reclinate and anterior 5–6 proclinate ; orbital bristles 3, strong, 2 proclinate and 1 reclinate ; gena yellowish with short hairs ; post gena yellowish with black hairs ; inner vertical bristle well developed, outer vertical two-thirds the inner vertical, post vertical and post ocellar not traceable ; ocellar region brownish with few short hairs and a pair of latero-clinate ocellar bristles ; vibrissae slightly greater than ocellar bristles ; a row of

regular postocular setae, rest of the area with black hairs ; palpi slightly yellowish ; proboscis long and brownish.

Thorax : Blackish with grey pollen and three broad dark longitudinal stripes ; *ac* 1-2+1-2 ; *dc* 1+2-3 ; *ia* 1+2 ; *ps* 1 ; *h* 2-3 ; *ph* 2 ; *np* 2 ; *pa* 2 ; *sa* 2 ; *st* 2+1 ; *mpl*



Figs. 82-87 : *Pterella* (*s. str.*) *krombeini* Verves. 82, Head ♂ (lateral view); 83, Head ♂ (frontal view); 84, Fore tarsus (lateral view); 85, Inner and outer forceps (lateral view); 86, Inner and outer forceps (posterior view); 87, Penis (lateral view).

6-7 ; *hpl* 7-8 ; propleura bare ; scutellum black with a pair of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins and more or less shining ; R_1 bare ; R_{4+5} with 2 short setae located dorsally on basal node to r-m and 2 short setae on ventral surface of basal node of R_{4+5} ; R_{4+5} broadly open ; fifth costal segment about twice that of the second, the former with short spines along basal half of its anterior margin ; costal spines short ; epaulet black ; basicostal scale yellow ; squama white ; halter slightly yellow ; bend of m 120° and without process ; tp strongly s-shaped.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of short bristles along anterodorsal surface and 1 bristle on posterodorsal surface on distal one-third, fore tarsus without erect hairs or bristles ; mid femur with 2 bristles on posterodorsal surface on distal end and few short hair-like bristles along anteroventral surface ; mid tibia with 2 bristles apart medially on posterodorsal surface at about basal two-thirds, 2 bristles on anterodorsal surface on distal one-third and 1 bristle on anteroventral surface on distal end, mid tarsus with 1 bristle on anterodorsal surface ; hind femur with a row of hair-like bristles along anteroventral surface and a row of bristles along anterodorsal surface ; hind tibia with a row of bristles along anterodorsal surface ; claws and pulvilli short, claws half of the fifth tarsomere ; first tarsomere about the total of two to fourth tarsomeres.

Abdomen : Dark with yellowish pollen and dark checkered markings ; second tergite entirely black, third and fourth each with dark checkered markings and indistinctly developed median stripes, second and fourth each with a complete rows of hair-like marginal bristles, third with a pair of median and 4–5 lateral marginal bristles, fifth entirely dark with short rows of bristles ; sternites first to fourth with short hairs ; genitalia shiny black ; inner forceps slender, s-shaped and terminally pointed ; outer forceps long, slender, curved and with a distinct apical knob-shaped dilation ; anterior paramere wide at middle, curved and pointed apically ; posterior paramere hook-like with long bristles ; paraphallus short and stout ; apical part of paraphallus dorsally recurved with spines.

Female : Almost similar to male but can be distinguished from male by longer third antennal segment which is twice that of second and lighter golden pollen in frons and parafacial.

Material examined : 1 ♂, India : Kashmir ; Dal Lake (Nagin), v. 1946, R. A. Senior-White.

Discussion on species : This species may be distinguished from other species of the genus by well developed yellowish pollen grains on head, blackish eye, presence of dark median stripes on third and fourth abdominal tergites and by the distinctive structure of male genitalia, especially knob-like dilation at the end of outer forceps.

Biology : Nothing is known regarding the biology of the species.

Distribution : India ; JK (Nagin) ; SL (Palatupana, Gillimale).

Type deposited : *Holotype* ♂, USNM, not examined.

Genus 4. *Protomiltogramma* Townsend, 1916

1916. *Protomiltogramma* Townsend, *Can. Ent.*, **48** : 154.

Type species : *Protomiltogramma cincta* Townsend, 1916.

1927. *Thereomyia* Rohdendorf, *Zool. Anz.*, **71** (5-8) : 163

Type species : *Miltogramma fasciata* Meigen, 1824.

1934. *Sisyropecta* Enderlein, *Sber. Ges. naturf. Freunde Berl.*, 4 : 188.

Type species : *Miltogramma fasciata* Meigen, 1824.

Morphology : Average sized flies with bright reflection ; presutural acrostichal bristle absent ; width of frons 0.35 that of head ; acrophallus elongated but without well developed process ; forehead and face equal in length ; vibrissae fully developed ; bristles on ocellar region strong and situated higher on the mouth margin ; R_{4+5} open ; frontal bristles more than 10 ; veins moderately strong ; claws of male short ; abdomen egg-shaped ; postabdomen of male large ; fifth abdominal tergite of male with cluster of long bristles.

Discussion : This is a rather large genus and is represented by 8 distinct species in the Palaearctic region. Lopes (1989) reported only 5 species from the Australasian and Oceanian regions and only 4 species are reported here which are also available in India.

Biology : Nothing is known regarding the biology of the species of this genus.

Distribution : This genus is mostly distributed in the Afrotropical, Oriental, Palaearctic and Australasian and Oceanian regions.

Key to species

1. Frontal vitta widened anteriorly ; third segment of antennae thicker proximally ; thoracic stripes distinct 2
 Frontal vitta uniform ; third segment of antennae widened uniformly ; thoracic stripes not distinct *rufiventris* (Baranov)
2. Apical plate of paraphallus straight and rod-like *seniorwhitei* (Verves)
 Apical plate of paraphallus slender and curved posteriorly 3
3. Inner forceps broader at base ; abdomen without stripes
 *obscurior* (Villeneuve)
 Inner forceps slender ; abdomen with distinct stripes *nandii* (Verves)

10. *Protomiltogramma rufiventris* (Baranov)

(Figs. 88-93)

1938. *Setulia (Miltogrammadium) rufiventris* Baranov, *Bull. ent. Res.*, 29(4) : 414.

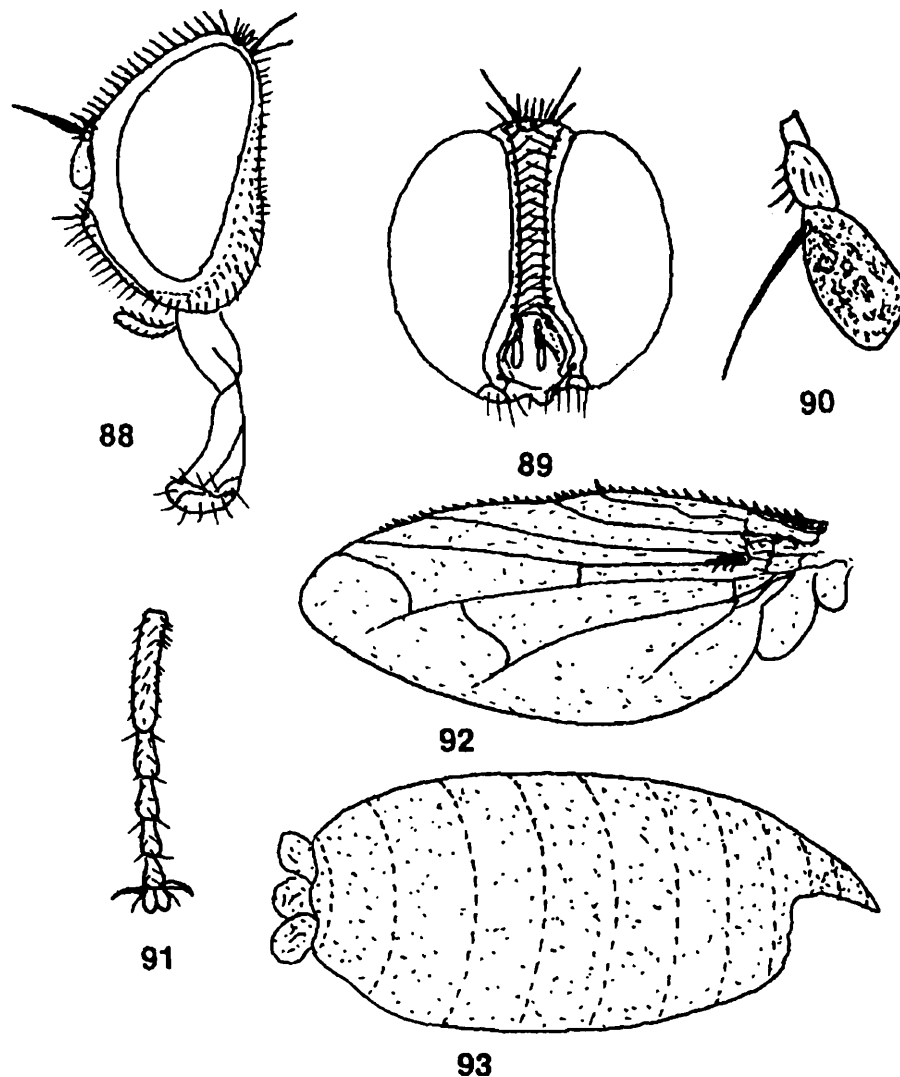
1977. *Pterella rufiventris* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, 3 : 559.

1987. *Protomiltogramma rufiventris* : Vervès, *Ént. Obozr.*, 66(3) : 656.

Male : Body length 6 mm.

Head : Greyish with yellow pollen ; eyes brownish and slightly blackish ; width of frons 0.35 that of one eye ; frontal vitta widened uniformly, yellowish with yellow

pollen and its width about twice that of each parafrontal ; parafacial yellowish but without hairs and its width at face level with base of antennae 0.18 times that of one eye width ; antennae yellowish, third antennal segment widened uniformly and one and half times that of the second ; arista elongated, yellowish and thickened up to basal 0.65 ; facial ridge yellowish with a row of 3 short supra vibrissal bristles ; vibrissae not differentiated and vibrissal angle less prominent ; frontal bristles 17, short and not reaching up to base of antennae, posterior 1 stronger and reclinate, anterior 2 proclinate ; orbital bristles not traceable ; gena short, bare, slightly blackish



Figs. 88-93 : *Protomiltogramma rufiventris* (Baranov). 88, Head ♂ (lateral view); 89, Head ♂ (frontal view); 90, Arista; 91, Fore tarsus (dorsal view); 92, Wing; 93, Puparium.

and with silvery pollen ; post gena blackish, silvery pollen and with few greyish hairs ; inner vertical bristle well developed, post vertical about half of the inner vertical but twice that of the post ocellar, outer vertical slightly longer than half of inner vertical, post vertical not traceable ; ocellar region black with few short hairs ; ocellar bristles can not be separated from ocellar hairs ; a row of regular postocular

setae, rest of the area with black hairs ; proboscis very long and slightly blackish ; palpi very short and yellowish.

Thorax : Greyish, slightly blackish with 1 indistinct median and 2 lateral blackish stripes which gradually constricted near presutural region ; lateral side of thorax with whitish pollen ; *ac* 0+1 ; *dc* 1+2 ; *ia* 2+1 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 2 ; *pa* 2 ; *sa* 2 ; *st* 1+1 ; *mpl* 4 ; *hpl* 7 ; propleura bare ; scutellum slightly blackish, its tip slightly hyaline, yellowish and with 2 pairs of lateroscutellar, a pair of apicoscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with 2 short setae located dorsally on basal node to r-m and 1 short setae on ventral surface of basal node of R_{4+5} ; fifth costal segment slightly greater than third, the former with short spines along basal half of its anterior margin ; costal spines very short ; epaulet black ; basicostal scale yellowish ; squama whitish ; halter slightly yellowish ; bend of m 130° with slight process ; t_p almost straight.

Legs : Greyish-black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 1 short bristle medially on posterodorsal surface and 1 on dorsal surface distally ; mid femur with a row of bristles along anterodorsal surface and 1 bristle on anteroventral surface basally ; mid tibia with a row of long and few short bristles along anterodorsal surface and 1 bristle on posterodorsal surface on distal one-third ; hind femur with a row of bristles along anterodorsal surface and 2 hair-like bristles basally and 1 short setae distally on anteroventral surface ; hind tibia with a row of bristles along anterodorsal surface and 4 hair-like bristles along anteroventral surface medially ; claws and pulvilli short, claws about 0.6 times that of fifth tarsomere ; first tarsomere with few setae basally and about the same length as that of total of two to fourth tarsomeres.

Abdomen : Greyish with distinct dorsal marking and the abdomen is missing in the *Holotype* which cannot be described in detail.

Puparium : Reddish-brown in colour.

Female : Unknown.

Material examined : *Holotype* ♂, India : Bihar ; Pusa, 10.v. 1924, N. Baranov. It is noted in label that abdomen missing when collected.

Discussion on species : This species may be distinguished from other members of the genus by the structure of antennae, width of frontal vitta and indistinct thoracic stripes.

Biology : Nothing is known regarding the biology of this species. Sabrosky and Crosskey (1970) reported it as parasitic.

Distribution : India ; B (Pusa).

Type deposited : *Holotype* ♂, BMNH, examined.

Discussion on type : The above description was based on type material and it was found that the abdomen was missing and there was no genitalia preparation. Right wing and left hind leg are missing in *Holotype*. Sarbrosky and Crosskey (1970) studied the type material and named it as *Setulia (Miltogrammidium) rufiventris* (Baranov). They reported it as *Lectotype* by present designation. They also designated one male as *Paralectotype* which is now in the United States National Museum, Washington. It has same data as *Lectotype* and the specimen was labelled earlier as *Paratypus* by Baranov. Here genitalia in situ and head is missing. The *Lectotype* is labelled as *Miltogramma rufiventris* sp. n. in Baranov's writing but without his name on the label.

11. *Protomiltogramma seniorwhitei* (Verves)

(Figs. 94-98)

1979. *Thereomyia seniorwhitei* Verves, *Ent. Rev. Wash.*, **58**(4) : 162.

1987. *Protomiltogramma seniorwhitei* : Verves, *Ént. Obozr.*, **66**(3) : 656.

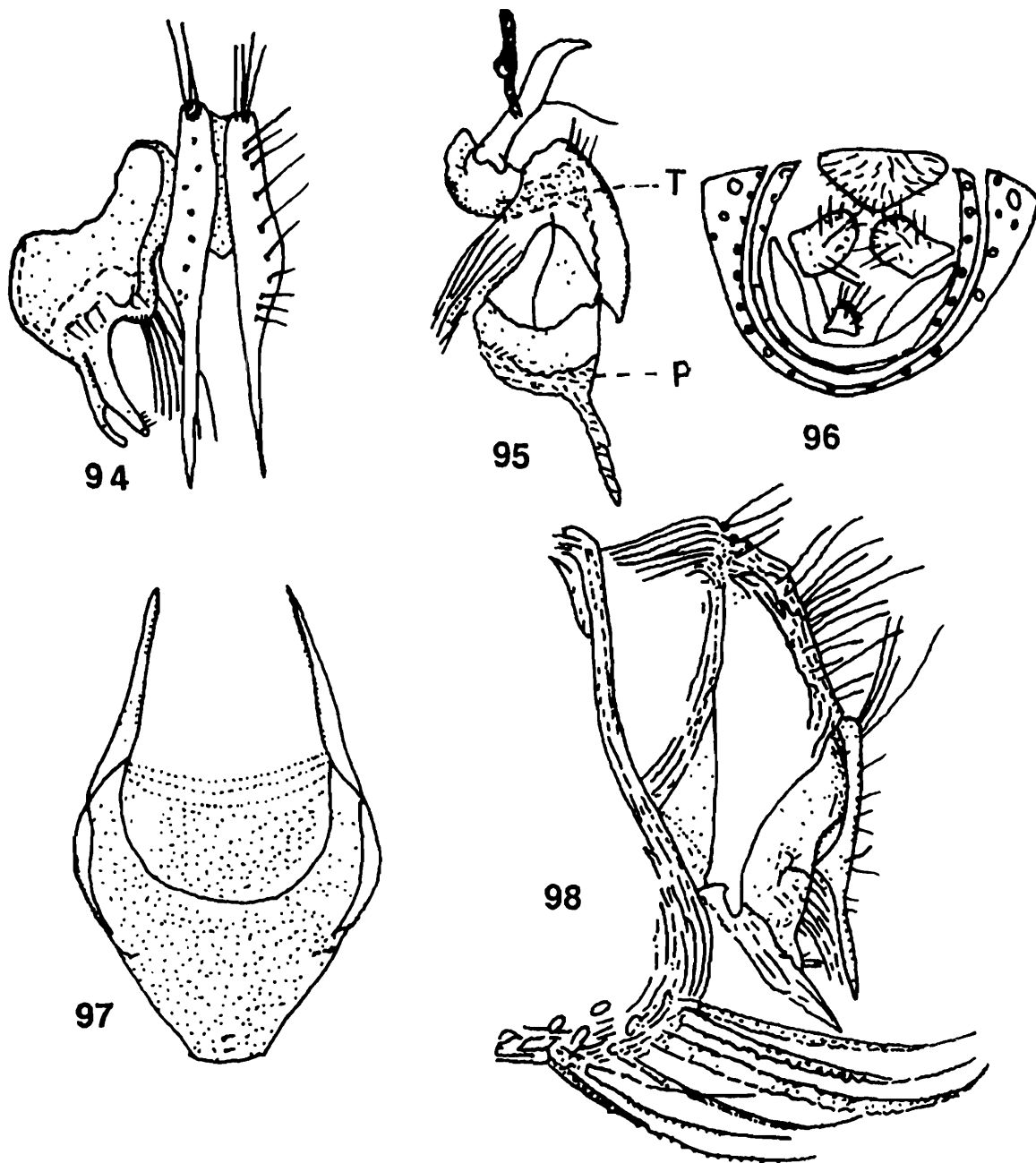
Male : Body length 5.0 to 7.5 mm.

Head : Blackish with dense pollen ; width of frons 0.50 to 0.56 that of one eye ; frontal vitta yellow, slightly widened anteriorly and frons projecting forwards ; parafacial deep greyish with silvery pollen ; parafrontal slightly blackish with silvery pollen ; width of parafacial at face level with base of antennae 0.14 to 0.19 times that of eye width which is practically bare and only with sparse short light hairs near the eye margin ; antennae yellow, slightly thickened in proximal 0.3 to 0.4, third antennal segment 2.6–3 times that of the second ; arista elongated, thickened up to basal half, this part yellow and apical part black but without setae or hairs ; facial ridge blackish with a row of 6–8 bristles ; vibrissae not differentiated ; vibrissal angle less prominent and slightly above mouth margin ; frontal bristles 12-16, strong, decussate, posterior 5-8 reclinate, anterior 2-3 proclinate ; a pair of short supra vibrissal bristles above vibrissal angle ; orbital bristles 3 with short hairs, 2 pairs proclinate and 1 pair reclinate ; gena very narrow and covered with dark short hairs ; post gena greyish with white pollen and short hairs ; ocellar triangle black with short bristles ; inner vertical bristle well developed, outer vertical slightly shorter than the inner vertical, post vertical and post ocellar not detectable ; a row of regular postocular setae, rest of the area with blackish hairs ; proboscis long and black ; palpi yellow and slender.

Thorax : Dark grey, silvery pollen and with 1 distinct median and 2 broader lateral dark longitudinal stripes before sutures ; *ac* 0+1 ; *dc* 1+2–3 ; *ia* 1+2–3 ; *ps* 1 ; *h* 2-3 ; *ph* 1-2 ; *np* 2 ; *pa* 2 ; *sa* 3 ; *st* 2+1 ; *npl* 7 ; *hpl* 7-8 ; propleura bare ; scutellum with yellowish-grey pollen, valvety spots laterally and with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of about 6-7 short setae located dorsally and extending up to more than basal half from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment 2.2 to 2.7 times that of the third, the former with short spines along more than basal half of its anterior margin ; costal spines short; epaulet black ; basicostal scale yellow ; squama milky white ; halter brownish ; bend of m 90° ; t_p arcuate.

Legs : Black ; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with 1 bristle on



Figs. 94-98 : *Protomiltogramma seniorwhitei* (Verves). 94, Inner and outer forceps ♂ (from above); 95, Penis (lateral view); 96, Rear view of genitalia ♀; 97, Fifth sternite; 98, Tip of abdomen ♂ (form above); (after Verves, 1979).

dorsal surface on distal end, fore tarsus of usual structure but without stout bristles ; mid femur with 2 bristles on distal one-fourth of posteroventral surface ; mid tibia with 1 bristle each on anterodorsal and anteroventral surfaces on distal one-fifth, mid tarsus with 1 posteroventral bristle ; hind femur with few hairs along basal end and 1 bristle on distal end of ventral surface ; hind tibia with 2 bristles mid way on anteroventral surface, hind coxa with hairs on posterior surface ; claws and pulvilli short ; claws shorter than fifth tarsomere.

Abdomen : Reddish along sides and below especially on second and third tergites, dorsal surface with brownish-black narrow bands and yellowish-silvery pollen on anterior thirds but without lateral marginal bristles, fourth and fifth each with a complete row of long marginal bristles ; sternites first to fourth with short hairs ; fifth sternite v-shaped, weakly sclerotised and with long projection posteriorly but without bristles ; genital segments blackish with pollen ; inner forceps long, narrow, poorly sclerotised and slightly recurved on apical portion ; outer forceps membranous, irregularly shaped, basally broad with double-ended apical processes and distinct ventral plate bearing tuft of long bristles ; anterior paramere broad and terminally pointed ; posterior paramere narrow, hook-like and with 1 bristle on posterior side; epiphallus absent ; paraphallus with long irregularly shaped spines, its apical part long, straight, rod-like and bearing spines.

Female : Distinguished from male by the following structures : third antennal segment shorter and 2.1–2.6 times that of the second ; absence of tuft of bristles on fifth sternite ; ninth tergite with 2 plates which are devoid of bristles ; anal plate membranous, triangular and with long bristles; tenth sternite triangular with numerous hairs.

Material examined : *Holotype* ♂, Sri Lanka : Pol. Dist.; Pimburettana, 13 miles South of Mannampitiya, 9–12. xi. 1970, D. S. Flint Jr. ; *Paratype* ♂, Sri Lanka : Col. Dist.; Ratmalana, near airport, 21.iv. 1975, K. V. Krombein ; 1♂, Sri Lanka : Anu. Dist.; Hunuwilagama, near Wilpattu, 28.x.–3.xi.1976, G. F. Hevel.

Discussion on species : This species is very similar to *P. nandii* (Verves) but is distinguished from it by the structures of paraphallus, anterior paramere and by the stripe pattern on abdomen. This species is also distinguished from *P. santosdiasi* (Zumpt, 1961) by narrow frons and third antennal segment.

Biology : This species has been recorded from the nest of *Sphex obscurus* (Sphecidae).

Distribution : SL ; Pimburettana, Ratmalana, Hunuwilagama.

Type deposited : *Holotype* ♂, USNM, examined.

Discussion on type : The condition of the types are good except that the tarsus of right leg of *Holotype* is damaged. Genitalia are with the type species. The author also studied one male specimen which has been identified by T. Pape as *Pterella seniorwhitei* (Verves) in 1987.

12. *Protomiltogramma obscurior* (Villeneuve)

(Figs. 99-105)

1916. *Setulia obscurior* (as var. of *fasciata* Meigen) Villeneuve, *Ann. S. Afr. Mus.*, **15** : 509.
 1934. *Thereomyia obscurior* : Rohdendorf, *Bull. Soc. ent. Égypte*, **18** (1-2) : 14.
 1952. *Setulia obscurior* : Zumpt, *Proc. R. ent. Soc. Lond.*, (B), **21**(1-2) : 9.
 1976. *Pterella obscurior* : Nesbitt, *Ent. News*, **87**(3-4) : 94 ; Zumpt, 1961, *Expl. Parc natn. Virunga*, **98** : 101.
 1986. *Protomiltogramma obscurior* : Verves, *Cat. Palae. Dipt.*, **12** : 82 ; Verves, 1987, *Ént. Obozr.*, **66**(3) : 657.

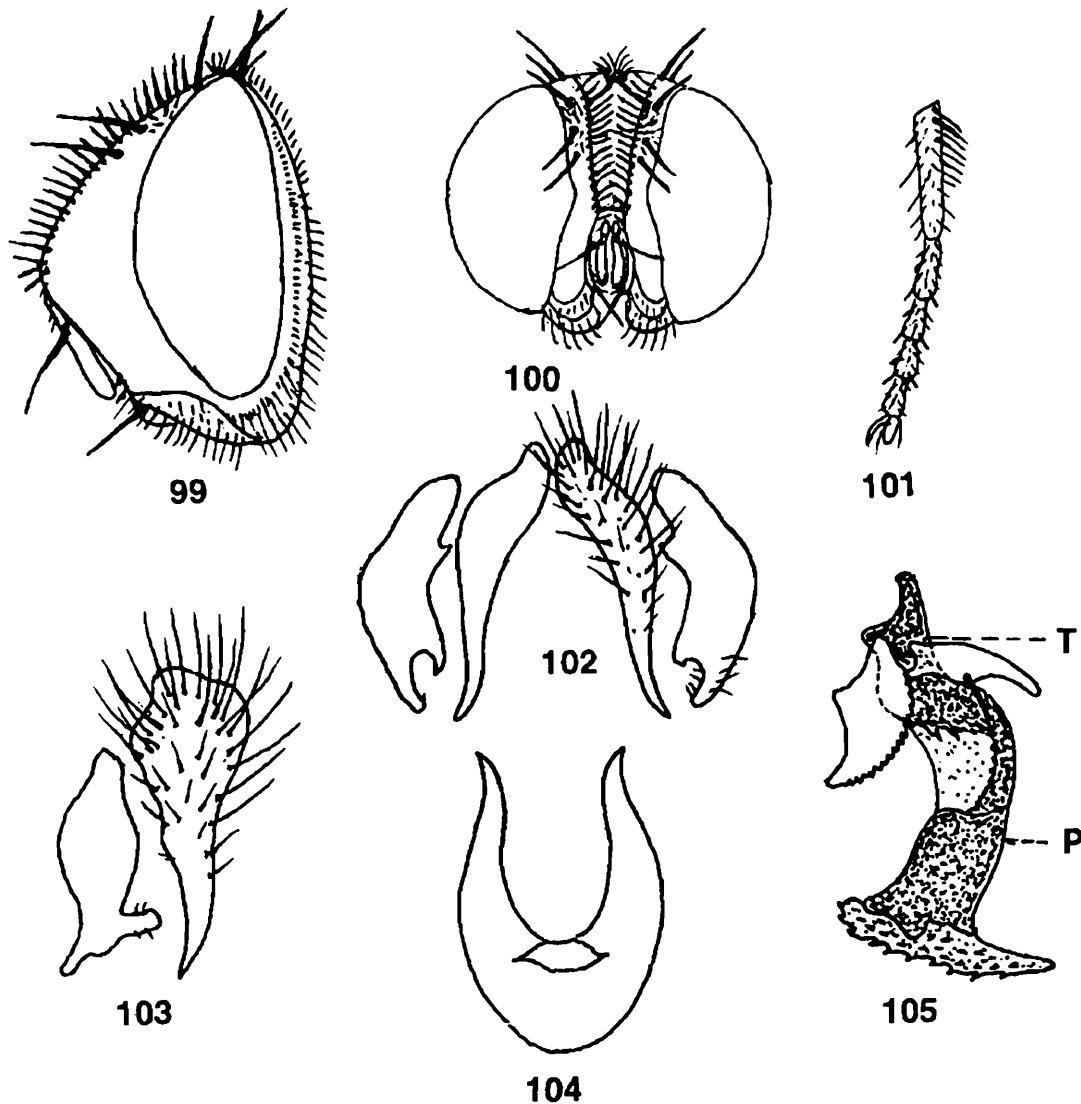
Male : Body length 6–11 mm.

Head : Greyish ; eyes golden to yellow ; width of frons 0.58 that of one eye and frons slightly projecting forwards ; frontal vitta reddish-yellow with yellowish pollen and slightly widened towards posterior end, its width at ocellar region one and half times that of one parafacial width ; parafacial at face level with base of antennae 0.14 times that of one eye width ; antennae yellow to orange, third antennal segment uniform and about twice that of second ; arista elongated, thickened and most of its basal half yellow, its tip black and reaching about up to vibrissae ; vibrissae not differentiated ; facial ridge slightly yellowish with 3 supra- and 4-5 subvibrissal bristles ; frontal bristles 11-17, reaching up to base of antennae, anterior 5-6 proclinate and posterior 5-6 reclinate ; orbital bristles 3, 2 proclinate and 1 reclinate ; gena golden yellow ; post gena slightly blackish with white hairs ; inner vertical bristle well developed, outer vertical two-thirds that of inner vertical, post vertical short and half of inner vertical, post ocellar not traceable ; ocellar region black with a pair of ocellar bristles and few short hairs ; a row of regular postocular setae, rest of the area with short greyish hairs ; palpi yellow, slender and slightly curved ; proboscis predominantly black.

Thorax : Black with light grey or black narrow longitudinal stripes which are more or less distinct and the sides with white pollen ; *ac* 0+1 ; *dc* 1+3 ; *ia* 2 ; *ps* 2 ; *h* 3 ; *ph* not distinct ; *np* 3 ; *pa* 2 ; *sa* 2 ; *st* 2+1 ; *mpl* 7 ; *hpl* 9 ; propleura bare ; scutellum slightly reddish and with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 4 short setae located dorsally and extending up to one-third from the basal node to r-m and 2 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment twice that of the second, the former with short spines along basal three-fifths of its anterior margin ; costal spines short ; epaulet black ; basicostal scale yellow ; squama white ; halter yellow ; bend of m 130° ; t_p slightly curved.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface, a row of bristles along posterior margin of ventral surface and 1 bristle on posterodorsal surface ; fore tibia with 1 bristle on distal part of posterodorsal surface ; mid femur with 2-3 bristles along middle portion of anterodorsal surface, a row of bristles along



Figs. 99-105 : *Protomiltogramma obscurior* (Villeneuve). 99, Head ♂ (lateral view); 100, Head ♂ (frontal view); 101, Fore tarsus (dorsal view); 102, Inner and outer forceps (posterior view); 103, Inner and outer forceps (lateral view); 104, Fifth sternite; 105, Penis (lateral view).

basal half of anteroventral surface and 2 hair-like bristles on posteroventral surface on distal one-third ; mid tibia with 1 long bristle on anterodorsal surface on basal two-fifths, 2 bristles on posterodorsal and 1 on posteroventral surfaces on basal two-thirds ; hind femur with 2-3 bristles along anteroventral surface on distal one-third and 2 bristles on posteroventral surface on basal one-third ; hind tibia with a row of long bristles along anteroventral surface, a row of 4 shorter bristles along anterodorsal surface and with unequal bristles along posterodorsal surface on distal one-

third ; claws and pulvilli short and equal in length ; first tarsomere slightly less than total of two to fourth tarsomeres.

Abdomen : Shiny black, without stripes and longer than broad, its lateral and ventral sides reddish-yellow ; anterior margin of tergites broadly white or with yellowish pollen ; second and third tergites with 2 but fourth with 3-4 lateral marginal bristles, fifth with cluster of long bristles ; sternites first to fourth with short hairs; fifth sternite deeply cup-shaped with projecting lateral arms and short window ; inner forceps broader at base, apically almost straight and pointed ; outer forceps deeply incised terminally ; anterior paramere wide with spines posteriorly ; posterior paramere almost straight ; paraphallus strongly curved with spinous elongated process.

Female : Almost similar to male but differs from it by the followings : length shorter, about 5 mm. According to Zumpt (1961) the female can not be differentiated from other groups of this complex of *P. angustifrons* (Villeneuve).

Material examined : 1 ♂, South Africa :-Natal Museum; Kosi Bay ; Esheary, 16-19.iii.1982, D. A. Barraclough (det. by T. Pape ; dep. in ZUMC).

Discussion on species : This species can be distinguished from *P. nandii* (Verves) by the structures of paraphallus, inner and outer forceps and also by the colour of third antennal segment. According to Thomas Pape (Personal communication) specimens from South Africa and India are probably two different species and the *Lectotype* designation should be given for Indian specimen. I do not have Indian specimens to compare it along with this description to ascertain whether they are conspecific or different species. Villeneuve (1916) described *obscurior* a variety of *fasciata* Meigen and reported that the specimen from the coast of Malabar has facets of eye somewhat variable, red colour of the sides disappear and is almost totally absent on the abdomen of male, both orbits golden-yellow and vibrissae are a little more raised. He also added that "this species is distinguished from the Palaearctic species of *fasciata* Meigen by the well defined dark lines in the anterior part of tergum"

Biology : Nothing is known regarding the biology of this species except that mostly occur in bushy areas.

Distribution : India ; K (Coast of Malabar) ; Botswana ; Egypt ; Kenya ; Nigeria; South Africa and Zaire.

Type deposited : Villeneuve (1916) did not label the specimens as type but Zumpt (1961) labelled a *Lectotype* which is now in the collection of NMP, not studied.

12. *Protomiltogramma nandii* (Verves)

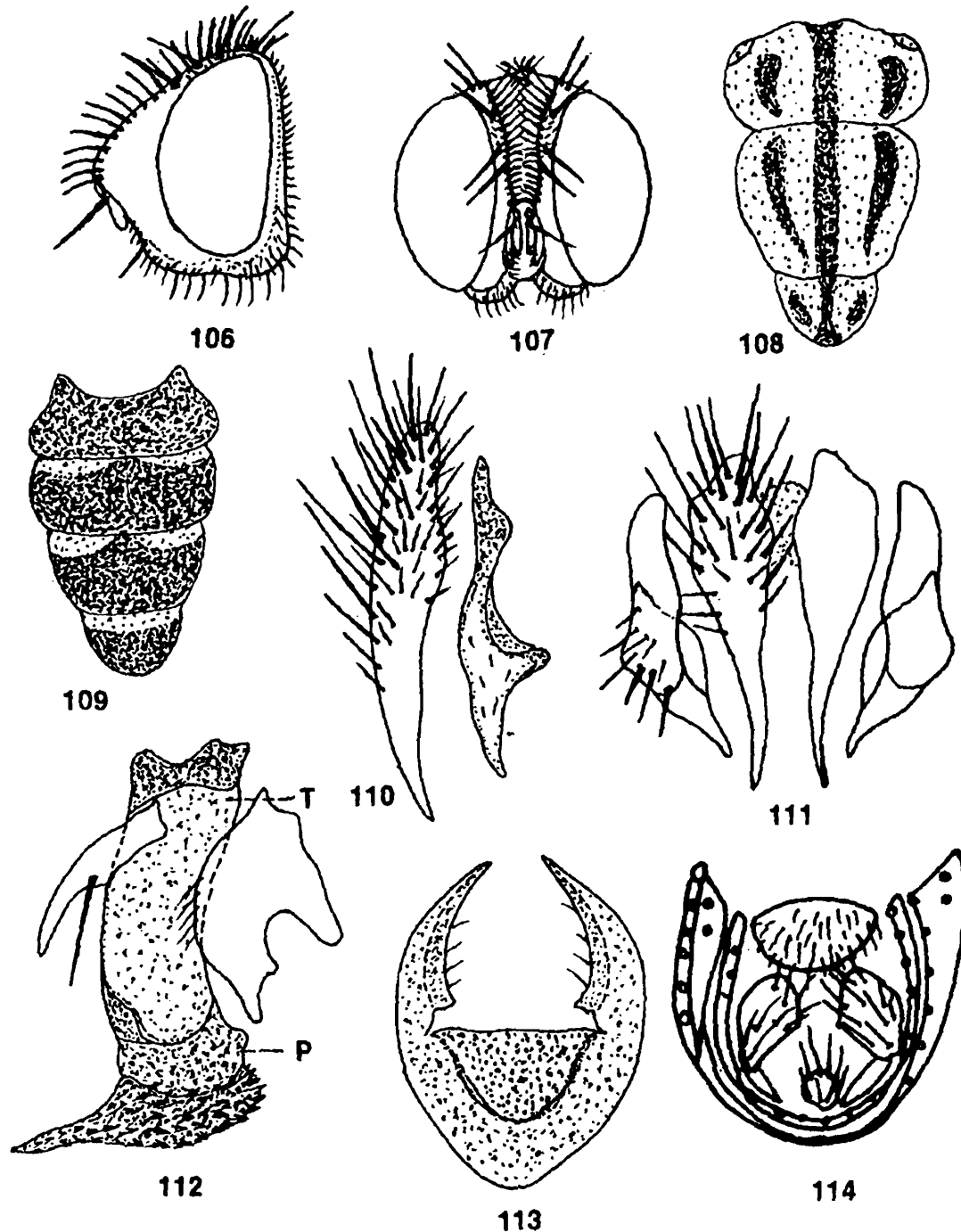
(Figs. 106-114)

1979. *Thereomyia nandii* Verves, *Ent. Rev. Wash.*, 58(4) : 162.

1987. *Protomiltogramma nandii* : Verves, *Ént. Obozr.*, **66**(3) : 654.

Male : Body length 7.0–7.5 mm.

Head : Blackish with dense pollen ; width of frons 0.44-0.55 that of one eye and frons projecting forwards ; frontal vitta yellow with silvery pollen ; parafacial deep



Figs. 106-114 : *Protomiltogramma nandii* (Verves). 106, Head ♂ (lateral view); 107, Head ♂ (posterior view); 108, Thorax (dorsal view); 109, Abdomen (dorsal view); 110, Inner and outer forceps (lateral view); 111, Inner and outer forceps (posterior view); 112, Penis (lateral view); 113, Fifth sternite; 114, Rear view of genitalia ♀ (after Verves, 1979).

greyish, silvery pollen and sparsely covered with delicate hairs, its width at face level with base of antennae 0.15 times that of one eye width ; parafrontal slightly blackish with silvery pollen ; antennae yellowish and thickened mid way, third antennal segment uniform and 2.2 to 2.5 times that of the second ; arista elongated, thickened up to basal half, this portion yellow and upper portion black but without setae or hairs ; facial ridge blackish with a row of 5-6 black hairs ; vibrissae very short ; vibrissal angle appreciably above mouth margin ; frontal bristles 14-20, strong and decussate, anterior 5-6 proclinate, posterior 4-5 reclinate ; orbital bristles 3 with few short hairs, 1 pair proclinate and 2 pairs reclinate ; gena very narrow and covered with light hairs ; post gena greyish with white pollen and short hairs ; ocellar triangle black with short bristles ; ocellar bristles very short ; postocellar not distinguishable ; inner vertical bristle well developed, outer vertical three-fifths the inner vertical, post vertical absent ; one row of regular postocular setae, rest of the area with blackish hairs ; proboscis long and black ; palpi yellow and slender.

Thorax : Dark grey with pollen and 1 median and 2 broad distinct lateral dark longitudinal stripes ; *ac* 0+1 ; *dc* 0-1+1-2 ; *ia* 0-1+2 ; *ps* 1 ; *h* 2-3 ; *ph* 1 ; *np* 2 ; *pa* 2 ; *sa* 3 ; *st* 1+2 ; *mpl* 5-6 ; *hpl* 5-7 ; propleura bare ; scutellum greyish with lateral black and 1 red spot on distal end and with a pair of apicoscutellar, 2 pairs of lateroscutellar and pair of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of about 3-4 bristles dorsally and extending up to basal half from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment slightly greater than the third ; the former with short spines along basal two-thirds of its anterior margin ; costal spines short ; epaulet black ; basicostal scale yellow ; squama creamy white ; halter brownish ; bend of m 90° ; t_p arcuate.

Legs : Black ; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 1 bristle on dorsal surface on distal end, fore tarsus of usual length ; mid femur with 1 bristle each on anterodorsal, anteroventral and posteroventral surfaces ; mid tibia with 1 bristle on posteroventral surface ; hind femur with a row of bristles along anterodorsal surface ; hind tibia with 1 bristle on anteroventral surface on distal two-fifths ; pulvilli and claws short and claws shorter than fifth tarsomere.

Abdomen : Reddish-brown with wide black stripes on all tergites ; third to fifth abdominal tergites each with complete row of long marginal bristles ; sternites first to fourth with short hairs ; fifth sternite with broad, comparatively short posterior pointed processes and provided with window ; genital segments blackish ; inner forceps heavily sclerotised, pointed terminally and with long recurved hairs ; outer forceps straight, not bifurcated, membranous, dilated in the middle, slightly shorter than the inner forceps and with curved rod-like apical portion ; anterior paramere

long and broad; posterior paramere long and pointed ; apical plate of paraphallus abruptly blunt but with straight processes and the median process wide with spines.

Female : Slightly larger in size than male and about 8.5 to 9.0 mm ; sternopleural bristles numerous ; female genitalia with poorly sclerotised irregularly shaped anal plate and tenth sternite semicircular and membranous.

Material examined : 1 ♂, India : Tamil Nadu ; Tirunneveli, Dohnavur, 101 m, 30.ix.1938, BMNH.

Discussion on species : This species is similar to *P. obscurior* (Villeneuve) but may be distinguished from it by the structures of inner forceps and apical plate of paraphallus. It is also distinguished from *P. seniorwhitei* (Verves) by the structures of fifth sternite and apical plate of paraphallus.

Biology : Nothing is known regarding the biology of the species.

Distribution : India ; TN (Tirunneveli) ; SL (Put. Dist., Kala-Oya, Ham. Dist., Hambantole, Palatupana).

Type deposited : *Holotype* ♂, USNM, not studied.

Genus 5. *Eremasiomyia* Rohdendorf, 1927

1927. *Eremasiomyia* Rohdendorf, *Zool. Anz.*, **71**(5-8) : 158.

Type species : *Eremasiomyia erythrogastra* Rohdendorf, 1927.

Morphology : Presence of 5 pairs of orbital bristles ; frons one-third the width of head ; frontal bristles very weak and not more than 10 ; frontal vitta at middle one-fourth the width of frons ; presutural acrostichal and dorsocentral bristles absent ; sides of thoracic shield without hairs and spots ; inner and outer forceps elongated ; acrophallus of male genitalia with elongated process.

Discussion : This is a rather small genus and Verves (1986) reported 10 valid species from the Palaearctic region. Only 1 species is reported from the Oriental region as well as from this area.

Biology : So far as the literature is concerned nothing is known regarding the biology of the species.

Distribution : This genus is distributed in the Palaearctic and Oriental regions.

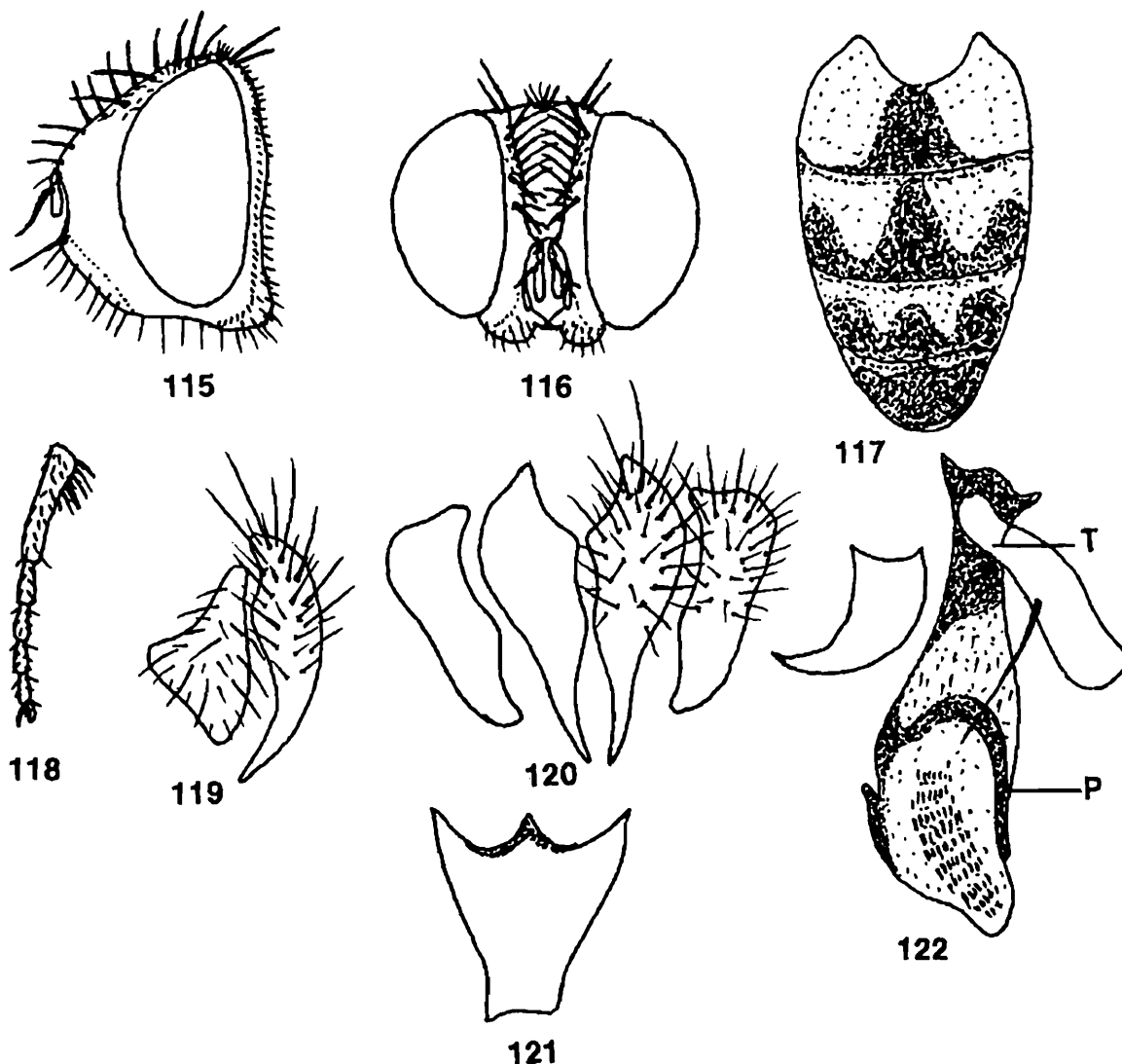
14. *Eremasiomyia orientalis* Verves

(Figs. 115-122)

1979. *Eremasiomyia orientalis* Verves, *Ent. Rev. Wash.*, **58**(4) : 163.

Female : Body length 5.0–6.0 mm.

Head : Reddish yellow ; eyes red ; width of frons 0.33 that of one eye and frons projecting forwards ; frontal vitta yellow, silvery pollen, broadened posteriorly and its width at ocellar region twice in the middle and 1.5 times that of each parafrontal ; parafacial and parafrontal slightly yellowish, the former with few short hairs near the orbital region ; width of parafacial at face level with base of antennae 0.24 times that of one eye width ; antennae yellow, third antennal segment 1.8 times that of the second ; arista elongated, thickened up to 0.50 and this portion is yellow and distal portion dark ; facial ridge brownish and bare ; vibrissae not developed ; 5-6 subvibrissal bristles above vibrissal angle ; frontal bristles 9-10, reaching up to antennal base, anterior 4-5 proclinate and posterior 3-4 reclinate ; orbital bristles 3, 2 proclinate and 1 reclinate ; gena yellowish and covered with yellowish-white pollen ; post gena



Figs. 115-122: *Eremasiomyia orientalis* Verves. 115, Head ♂ (lateral view); 116, Head ♂ (frontal view); 117, Abdomen (dorsal view); 118, Fore tarsus (lateral view); 119, Inner and outer forceps (lateral view); 120, Inner and outer forceps (posterior view); 121, Fifth sternite; 122, Penis (lateral view).

blackish with yellowish pollen and short hairs ; inner vertical bristle well developed, outer vertical slightly shorter than inner vertical, post vertical slightly longer than half of outer vertical ; ocellar region black, without noticeable ocellar bristles but with few erect hairs ; a row of regular postocular setae, rest of the area with greyish hairs; palpi medium in length, yellow and its terminal end slightly dilated ; proboscis greyish and long.

Thorax : Black with grey yellow pollen and weakly developed longitudinal stripes ; *ac* 0+1 ; *dc* 0+2 ; *ia* 1+2-3 ; *ps* 1 ; *h* 3 ; *ph* 1 ; *np* 2 ; *pa* 2 ; *sa* 2 ; *st* 1+1 ; *mpl* 4-5 ; *hpl* 5-6 ; propleura bare ; scutellum greyish with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with row of 4 short setae located dorsally and extending up to one-fourth from the basal node to r-m and 1-2 short setae on ventral surface of basal node of R_{4+5} ; fifth costal segment 2.2 times that of the third, the former with short spines along its whole length on anterior margin ; costal spines short ; epaulet black ; basicostal scale yellow ; squama milky white ; halter brownish ; bend of m 120° ; t_p almost straight.

Legs : Black ; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia without differentiated bristles ; mid femur with 2 bristles terminally on posterodorsal surface and a row of bristles along anteroventral surface on basal half ; mid tibia with 2 bristles on anterodorsal surface medially and 1 bristle each on anteroventral and anterodorsal surfaces at about one-third the distance from the distal end, mid tarsus with 2 bristles on anterodorsal surface ; hind femur with 3 bristles along posterodorsal surface on distal end, 1 bristle on posteroventral surface at about one-third the distance from the distal end and with long hairs along ventral surface on basal end; hind tibia with a row of bristles along posterodorsal surface ; claws and pulvilli very short, claws about 0.4 of fifth tarsomere ; first tarsomere about total of two to fourth tarsomeres.

Abdomen : Slightly black and densely covered with silvery yellow pollen ; second tergite with elongated median spot, third with median triangular elongated spot reaching up to anterior marginal wall and the lateral stripes occupying one-third of posterior end, fourth with lateral stripes and indistinctly median spot on posterior two-thirds, fifth entirely black ; second and third tergites without median marginal bristles but fourth and fifth each with a row of marginal bristles ; sternites first to fourth with short hairs.

Male : Differs from female by the followings : frontal vitta not broadened ; frontal bristles 12 ; orbital bristles 3 ; mid tibia without anterodorsal bristles ; inner forceps long, curved and pointed at end ; outer forceps wide at end ; anterior paramere

curved and pointed ; posterior paramere uniformly thickened and blunt at end ; paraphallus wide at middle, straight at end and gradually tapering.

Material examined : *Holotype* ♀, Sri Lanka : Ham. Dist.; Palatupana Park Office, 3.ii.1975, K. V. Krombein ; 1 ♀, Sri Lanka : Ham. Dist. ; Palatupana, 3-6. ii.1975, K.V. Krombein ; 1 ♂, Sri Lanka : Pol. Dist. ; Pannika Villu, Wilpattu National Park, 14-15.ii.1979, K. V. Krombein.

Discussion on species : This species is distinguishable from other species of the genus by having rounded eyes, yellow parafacial and parafrontal, totally black thorax, wider frons in posterior part and short claws.

Biology : Nothing is known regarding the biology of the species.

Distribution : SL ; Palatupana, Pannika Villu and Kurunegala.

Type deposited : *Holotype* ♀, USNM, examined.

Discussion on type : The condition of the type is good. Abdomen was dissected out, mounted on a card-board and pinned with the specimen. The author also studied 1♀ and 1♂ specimen from the United States National Museum, Washington, which have been identified as *Pterella orientalis* (Verves) by Pape and the male genitalia have been drawn and described from this specimen.

Subtribe **Miltogrammatina** Rohdendorf

This subtribe is characterised by hair-like vibrissae which may be present or absent ; divided eighth tergite in female abdomen and absence of tenth tergite ; third antennal segment short ; claws and pulvilli normal in both sexes ; first stage larvae have a large hypopharyngeal sclerite along with relatively developed clypeal arch and well developed maxillae.

Rohdendorf (1930, 1935) divided this subtribe into seven genera but some authors especially Zumpt (1961) and Pape (1987b) synonymized most of the genera with *Miltogramma* Meigen. Genus *Miltogramma* is superficially similar to *Pterella* R. D. but the vibrissae are not distinguishable from the peristomal bristly hairs in *Miltogramma* and the fore tarsus of male is often equipped with hairs or bristles. Verves (1986) reported thirteen genera from the Palaearctic region, of which only *Cylindrothecum* Rohdendorf, 1930 *Miltogramma* Meigen, 1803, *Miltogrammidium* Rohdendorf, 1930 and *Anacanthothecum* Rohdendorf, 1930 are present in this area. Shewell (1987) gave it subtribal status due to the presence of row of setae on hypopleuron and absence of comb-like setae on mid femur of male.

Most of the larvae of this subtribe are inquilines of Hymenopteran nests and the species of the subtribe are distributed in the Palaearctic, Oriental, Australasian and Oceanian and Afrotropical regions.

Key to genera

1. Frons narrow and less than 0.30 that of one eye width ; male fore tarsus without specialized hairs *Cylindrothecum* Rohdendorf
 Frons wider and more than 0.35 that of one eye width ; male fore tarsus with specialized hairs 2
2. Both parafrontal and parafacial with hairs *Miltogramma* Meigen
 Only parafrontal with hairs 3
3. Abdomen with three spots on tergites ; face not projecting forwards
 *Anacanthothecum* Rohdendorf
 Abdomen with black band on hind margin of each tergite ; face slightly projecting forwards *Miltogrammidium* Rohdendorf

Genus 6. *Miltogramma* Meigen, 1803

1803. *Miltogramma* Meigen, *Mag. Insektenk.*, 2 : 280.

Type species : *Miltogramma punctatum* Meigen, 1824.

1863. *Hamulia* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, 2 : 110.

Type species : *Miltogramma punctatum* Meigen, 1824.

1930. *Stephanodactylum* Rohdendorf, *Die Fliegen Palaee. Region*, 11 : 36.

Type species : *Miltogramma punctatum* Meigen, 1824.

1930. *Miltogramma* Rohdendorf, *Die Fliegen Palaee. Region*, 11 : 29 (as distinct subgenus).

Type species : *Tachina oestracea* Fallén, 1820.

1934. *Euryophrya* Enderlein, *Sber. Ges. naturf. Freunde Berl.*, 4 : 189.

Type species : *Miltogramma germari* Meigen, 1824.

1934. *Rohdendorfia* Townsend, *Ent. News*, 45 : 213 (Junior homonym of *Rohdendorfia* Smirnov, 1924).

Type species : *Tachina oestracea* Fallén, 1820.

1935. *Rohdendorfia* Townsend, *Ent. News*, 46 : 104 (New name for *Rohdendorfia* Townsend, 1934).

Morphology : Small to medium sized flies with rather large yellow head; eyes bare; parafacial broad with few hairs ; parafrontal with short hairs ; frontal vitta wide ; vibrissae not distinguished from genal or facial bristles or may be absent ; vibrissal angle well above lower facial margin ; frontal bristles many ; orbital bristles short, 3-5 and often with 4 proclinate and 1-2 reclinate ; third antennal segment one and half to two and two-thirds that of second ; arista not flattened ; supravibrissal bristles prominent ; wings somewhat shining or hyaline due to reduced clothing hairs; claws

and pulvilli normal in size in both sexes ; mid tibia with more than 1 (2 or more) anterodorsal bristles ; fore tarsus often with short first tarsomere.

Discussion : This is a well defined and large genus. Rohdendorf (1930, 1935) subdivided this genus into several subgenera but Verves (1986) divided it into three subgenera : *Dichiracantha* Enderlein, 1934, *Myiochromum* Rohdendorf, 1980 and *Miltogramma* Meigen, 1803. Only the subgenus *Miltogramma* is present in this area. Draber-Mónko (1969) and Kurahashi (1970) revised the Polish and the Japanese species respectively. Dear (1980) reported 12 species from the Afrotropical and Verves (1986) 26 species from the Palaeartic regions. Only 2 species have been reported from the Oriental region, out of which only 1 species is present here.

Biology : Some species of this genus have been reported from the nests of Apidae and Sphecidae (Bezzi and Stein, 1907 ; Séguy, 1941a ; Pape, 1987b). Larval descriptions of some species have been done by Draber-Mónko (1969). First instar larvae of few species of this genus have been described by different authors from the Palaeartic and Nearctic regions (Lopes, 1983).

Distribution : This genus is old world in distribution with most species in the Palaeartic region. Very little is known from the Oriental region.

Subgenus *Miltogramma* Meigen, 1803

1803. *Miltogramma* Meigen, *Mag. Insektenk.*, **2** : 280.

Type species : *Miltogramma punctatum* Meigen, 1824.

1930. *Miltogramma* Rohdendorf, *Die Fliegen Palaearct. Region*, **11** : 29 (as subgenus of *Miltogramma* Meigen, 1803).

Type species : *Tachina oestracea* Fallén, 1820.

Morphology : Medium sized flies with wide frontal vitta ; head large and yellow; frons 0.35-0.40 that of eye width ; frontal bristles short and many ; orbital bristles short ; third antennal segment about twice that of the second ; fore tarsus with long hairs ; abdominal tergite with dark marginal band ; parafacial and parafacial with hairs.

This is a rather large subgenus with most species in the Palaeartic region. Verves (1986) reported 15 species from this region. Only 2 species have been reported from the Oriental region, of which only 1 species is present in the area studied.

This subgenus is kleptoparasitic in the nests of Apidae and Sphecidae. Kurahashi (1970) recorded the rearing of a species from *Ammophila* sp. (Sphecidae) and *Colletes* sp. Draber-Mónko (1969) recorded the association of this species with different Hymenopteran hosts.

This subgenus is distributed in the old world.

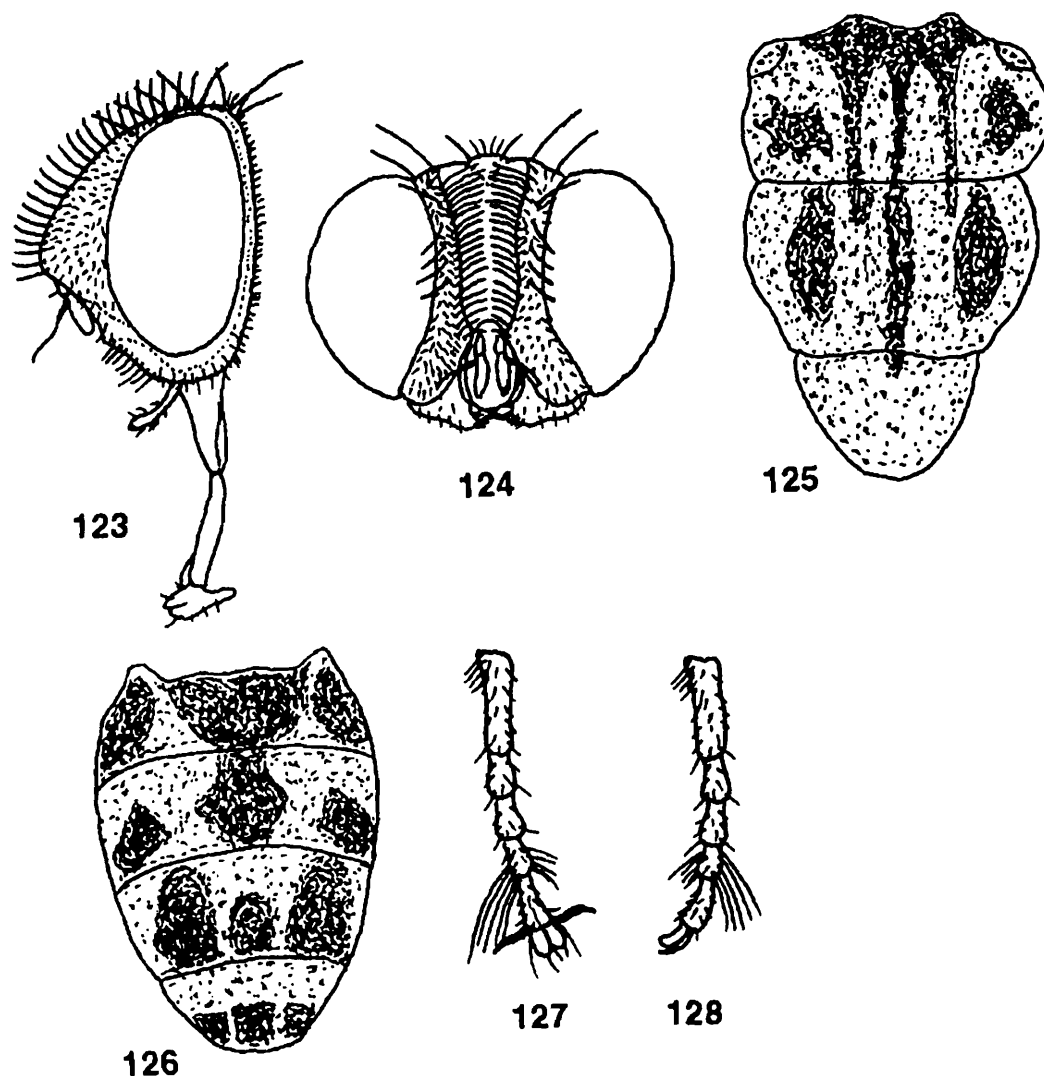
15. *Miltogramma (s. str.) nepalicum* Rohdendorf

(Figs. 123-128)

1966. *Miltogramma (s. str.) nepalicum* Rohdendorf, *Bull. Br. Mus. nat. Hist. (Ent.)*, B, **17** (10) : 460 ; Verves, 1986, *Cat. Palae. Dipt.*, **12** : 73 ; Lopes, Kano, Shinonaga and Kurahashi, 1977, *Cat. Dipt. Orient. Region*, **3** : 559.

Male : Body length 9.0 mm.

Head : Brownish golden ; eyes black with reddish tinge or bristles ; width of frons about 0.40 that of one eye and frons slightly projecting forwards ; frontal vitta broad, reddish-brown and only brownish-black in front but without pollen, the posterior part slightly widened and its width just above level of antennae about 0.42 that of one eye width ; parafrontal and parafacial with golden yellow pollen and both with dense fine black hairs ; parafacial width at face level with base of antennae 0.25 that of one eye



Figs. 123-128 : *Miltogramma (s. str.) nepalicum* Rohdendorf. 123, Head ♂ (lateral view); 124, Head ♂ (frontal view); 125, Thorax (dorsal view); 126, Abdomen (dorsal view); 127, Fore tarsus (dorsal view); 128, Fore tarsus (lateral view).

width ; antennae black and moderate in length, third segment 1.9 times that of the second ; arista short and thickened up to basal 0.65 ; facial ridge with fine black bristles extending from vibrissal angle to the level of apex of third antennal segment; vibrissae not prominent but with 6 subvibrissal bristles ; vibrissal angle prominent and above the mouth margin ; frontal bristles 22-25, very fine, partially crossed and reaching up to below base of antennae ; gena brightly golden with black hairs; post gena yellowish with yellow hairs ; inner vertical bristle well developed and slightly greater than outer vertical, post vertical short and one-third of inner vertical ; orbital bristles 4-5, very fine, almost indistinguishable and mixed with frontal bristles ; ocellar triangle golden ; ocellar bristles 4-5, short, hair-like and curved laterally ; a pair of rows of irregular postocular setae, rest of the area with greyish hairs ; palpi yellowish ; proboscis long, black and slightly brownish at tip.

Thorax : Dark in colour, with densely yellowish grey dusted and usually three slender longitudinal median stripes and two lateral spots before suture which are not sharply defined behind suture, the median stripe extends up to scutellum but 2 short lateral stripes extend up to three-fifths ; *ac* 0+1 ; *dc* 2+4 (only posterior 2 strong); *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 1 ; *np* 2 ; *pa* 2 ; *sa* 2 ; *mpl* 9 ; *hpl* 10 ; propleura bare ; scutellum black laterally, brownish dorsally and with a pair of apicoscutellar, 2 pairs of short lateroscutellar and a pair of very short discoscutellar bristles ;

Wings : Yellowish with brown veins ; R_1 bare ; R_{4+5} with 2 short setae located dorsally on basal node to r-m and 1 setae on ventral surface of basal node of R_{4+5} ; fifth costal segment slightly shorter than third, the former with short spines throughout its length on anterior margin ; costal spines short ; epaulet black ; basicostal scale brownish ; squama pale yellow ; halter brownish or yellow ; bend of m 130° ; t_p slightly arcuate.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 1 bristle on middle portion of posterolateral surface ; mid femur with a row of short bristles along anterodorsal surface, 3 bristles along posterolateral surface on distal end, 3 short hairs along basal one-third of anteroventral surface and comb-like setae along distal half of anterodorsal and posterolateral surfaces ; mid tibia with 1 bristle each on posterodorsal and anterodorsal surfaces on basal two-thirds and 1 bristle on anteroventral surface on distal one-third ; hind femur with a row of short bristles along anterodorsal surface, a row of bristles along anteroventral surface and few long hairs along posteroventral surface on basal end ; hind tibia with a row of bristles along anterodorsal surface, a row of bristles with short hairs along middle portion of anteroventral surface and 2 bristles apart on middle of posteroventral surface ; claws and pulvilli moderately long, claws half that of fifth tarsomere ; fifth tarsomere more

than twice that of fourth and slightly shorter than first tarsomere ; presence of many long hairs along anterior and a few short hairs along posterior margins of fourth tarsomere.

Abdomen : Dark black with densely light golden brown pollen ; sides of second, third and fourth tergites slightly pale, second with dark median dorsal spot, third with rather diffuse dorsal spots at sides and a very small almost dot-like spot in the middle of hind margin, fourth with 2 broad lateral stripes and almost indistinguishable median spots, fifth with 3 small well defined spots on hind margin ; second and third tergites without median marginal bristles, but third and fourth each with 2 short lateral marginal bristles, fourth and fifth each with a row of short marginal bristles; sternites first to fourth with short hairs ; postabdomen rather large ; genital tergites shining black.

Female : Unknown.

Material examined : *Holotype* ♂, East Nepal : Taplejung Dist., Sangu, 1, 975 m, 17.x.1.xi.1961, R. L. Coe.

Discussion on species : This species differs from *M. taeniatum* (Meigen) by densely yellow dusted head, median spots on third and fourth abdominal tergites and possession of hairs along anterior and posterior margins of fourth tarsomere of fore tarsus and also from *S. anamalaica* Verves and *S. albifrons* (Rondani) by the structure and colour of frons and number of frontal bristles.

Biology : The specimen was collected from edge of mixed forest.

Distribution : Ne ; Sangu.

Type deposited : *Holotype* ♂, BMNH, examined.

Discussion on type : Right fore and hind legs are missing. Dorsal part of third and fourth abdominal tergites are slightly damaged and male genitalia were not dissected out.

Genus 7. *Cylindrothecum* Rohdendorf, 1930

1930. *Cylindrothecum* Rohdendorf, *Die Fliegen Palaearct. Region*, 11 : 31 (as subgenus of *Miltogramma* Meigen, 1803).

Type species : *Cylindrothecum necopinatum* Rohdendorf, 1930 (= *Miltogramma ibericum*, Villeneuve, 1912).

1933. *Eumiltogramma* Townsend, *Jl. N. Y. ent. Soc.*, 40 : 443.

Type species : *Eumiltogramma angustifrons* Townsend, 1933.

1986. *Cylindrothecum* : Verves, *Cat. Palaearct. Dipt.*, 12 : 71 (as distinct genus).

Morphology : Body colour dark ; post abdomen of male wide and big in size ; parafacial and parafacial with short hairs ; frontal vitta narrow, parallel and 0.30

times that of eye width ; vibrissae not developed ; orbital bristles 3-4 and short ; parafrontal narrow and slightly widened apically ; antennae wider and third antennal segment 1.7 times that of the second ; fore tarsus of male without hairs ; abdomen without checkered pattern but with median black stripe ; mid tibia with 1 short and 1 long bristles on anterodorsal surface ; supravibrissal bristles very short ; anterior paramere elongated ; paraphallus highly specialized.

Discussion : This is a very small genus and Verves (1986) reported 2 species from the Palaearctic region which are also present here. Pape (1986) considered this genus under *Miltogramma*.

Biology : So far as the literature is concerned nothing is known regarding the biology of the species of this genus.

Distribution : This genus is distributed in the Palaearctic, Oriental and Australasian and Oceanian regions.

Key to species

1. Antennae black to blackish-brown ; penis without subapical bulging ; posterior paramere strongly curved and pointed*ibericum* (Villeneuve)
Antennae light orange ; penis with subapical bulging ; posterior paramere less curved and blunt*angustifrons* (Townsend)

16. *Cylindrothecum ibericum* (Villeneuve)

(Figs. 129–138)

1912. *Miltogramma ibericum* Villeneuve, *Annls hist. -nat. Mus. natn. hung.*, **10** : 508.

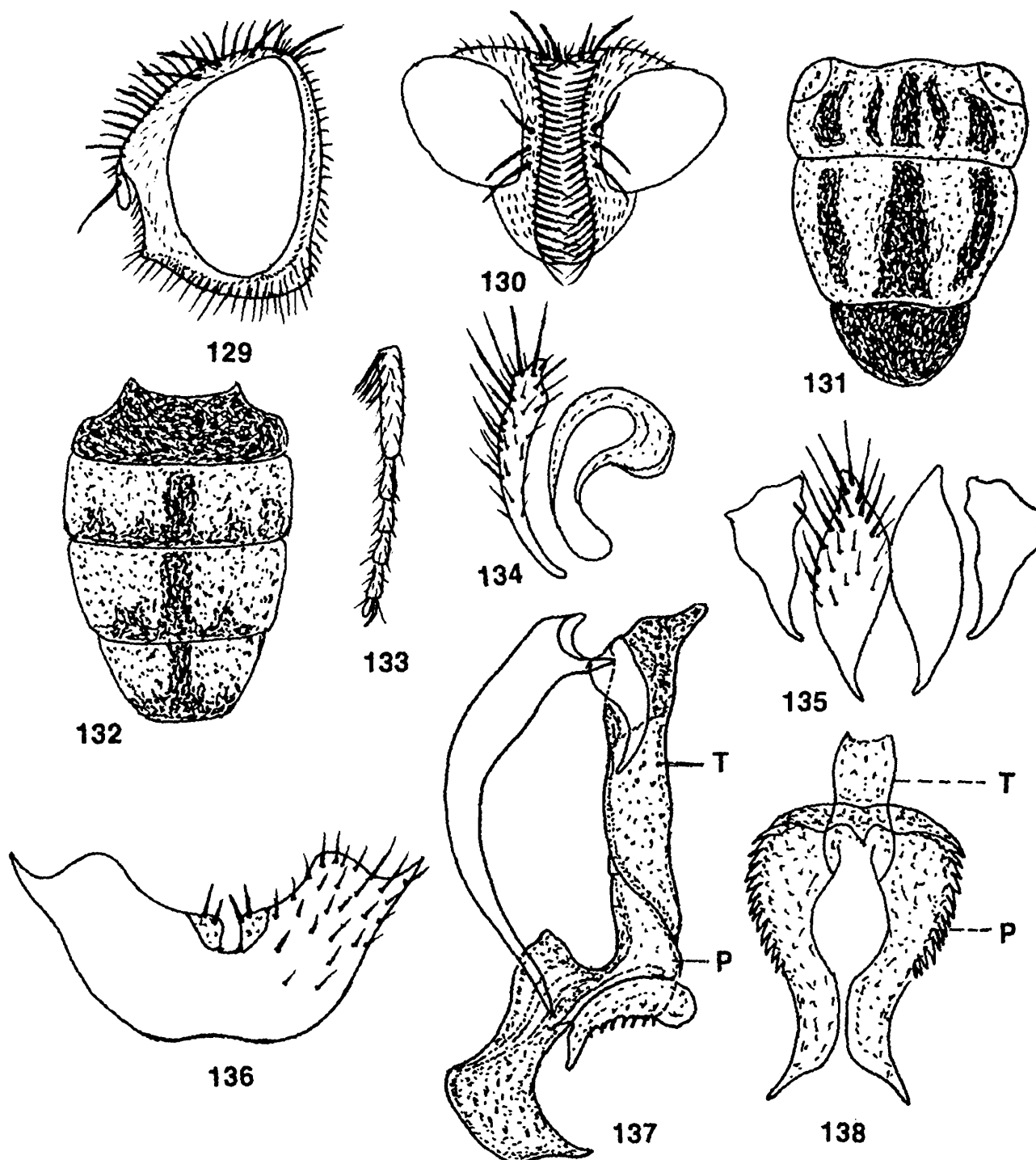
1930. *Miltogramma (Cylindrothecum) necopinatum*, Rohdendorf, *Die Fliegen. Palae. Region*, **11** : 31.

1986. *Cylindrothecum ibericum* : Verves, *Cat. Palae. Dipt.*, **12** : 71 ; Lopes, 1989, *Cat. Dipt. Aust. and Oceanian Regions*, **86** : 722.

Male : Body length 6 mm.

Head : Round and brownish-black ; width of frons 0.30 that of one eye width ; frontal vitta brownish and slightly broadened anteriorly ; parafrontal slightly greyish with few short hairs and brownish pollen ; parafacial slightly yellowish with brown pollen and hairs and its width at face level with base of antennae 0.12 that of one eye width ; antennae blackish to brown, inserted just below the centre of eye and slightly yellowish at the base of third segment, third antennal segment almost 1.7 times that of the second, the former slightly widened at the terminal 0.4 ; arista elongated, black and thickened along basal half ; facial ridge yellowish with a row of 6 hairs near the eye margin ; vibrissae not developed ; vibrissal angle less developed and slightly above mouth margin ; supravibrissal bristles very short and many ; frontal

bristles 15, anterior 5 proclinate, posterior 4 reclinate ; gena yellowish, silvery pollen but without hairs ; post gena slightly yellowish with black hairs ; orbital bristles 2, short and proclinate ; ocellar triangle black with short hairs ; post ocellar bristle slightly developed ; inner vertical bristle well developed, outer vertical short and less



Figs. 129-138 : *Cylindrothecum ibericum* (Villeneuve). 129, Head ♂ (lateral view); 130, Head ♂ (frontal view); 131, Thorax (dorsal view); 132, Abdomen (dorsal view); 133, Fore tarsus (lateral view); 134, Inner and outer forceps (lateral view); 135, Inner and outer forceps (posterior view); 136, Fifth sternite; 137, Penis (lateral view); 138, Penis (ventral view).

than half of the inner vertical, post vertical not developed ; a row of regular postocular setae, rest of the area with blackish hairs ; palpi yellow and long ; proboscis long and black ;

Thorax : Dark grey with 1 median and 2 lateral wide longitudinal stripes ; *ac* 0+1 ; *dc* 3+3 ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 1 ; *np* 3 ; *pa* 2 ; *sa* 2 ; *mpl* 6 ; *hpl* 5 ; propleura bare ; scutellum greyish with grey pollen and with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 3 short setae located dorsally and extending up to basal end of r-m and a row of 4–5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment slightly longer than the third, the former with short spines along whole length of its anterior margin ; costal spines short ; epaulet black ; basicostal scale yellowish ; squama whitish ; halter brown ; bend of m 120° ; t_p almost straight.

Legs : Black ; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia without hairs but with 1 bristle on distal end of posterodorsal surface ; mid femur with a row of short bristles along posterodorsal surface ; mid tibia with a row of bristles along posterodorsal surface, 1 short and 1 long bristles on anterodorsal and 1 bristle on posteroventral surfaces on basal two-thirds ; hind femur with a row of bristles along basal end and 1 bristle on distal end of ventral surface ; hind tibia with 2 bristles medially along anteroventral surface ; claws moderately long ; pulvilli short ; tarsus without hairs.

Abdomen : Blackish ; second tergite black entirely, second and third tergites without marginal bristles, third with black stripe on two-thirds of its posterior end, rest of the area with white pollen bearing 3–4 lateral marginal bristles, fourth with black stripe entirely and with a row of 8 marginal bristles, fifth with black stripe on three-fourths and with a row of 12 marginal bristles ; sternites first to fourth with short hairs ; fifth sternite cup-shaped with few short hairs and slight notch at the middle ; genital segments black ; inner forceps very narrow, curved and with short hairs ; outer forceps wide at basal end, curved and oval at outer end ; anterior paramere long, strongly curved and pointed at end ; posterior paramere short and slightly curved at end ; epiphallus absent ; paraphallus sclerotised ; apical plate of paraphallus wide at end, shovel-shaped, pointed apically but without spines, the median process well recognised.

Female : Unknown.

Material examined : 1 ♂, India : Kashmir ; Dalchigam Rakh, 6.vii.1921, BMNH

Discussion on species : This species is similar to *C. angustifrons* but may be distinguished from it by the structure of penis and colour of antennae. Moreover, the chaetotaxy of legs are also quite distinguishable in this species from *angustifrons*.

Biology : Nothing is known regarding the biology of the species.

Distribution : India ; JK (Dalchigam Rakh) ; Algeria ; Austria ; China ; East Siberia ; Far East ; Finland ; Hungary ; Italy ; Korea ; Malaysia ; Papua New Guinea ; Spain ; Taiwan ; Ukraine ; Vietnam and West Siberia.

Type deposited : Lectotype ♂, ZMB, not studied.

17. *Cylindrothecum angustifrons* (Townsend)

(Figs. 139–145)

1933. *Eumiltogramma angustifrons* Townsend, *Jl. N.Y. ent. Soc.*, **40** : 444.

1970. *Miltogramma takanoi* Kurahashi, *Kontyû*, **38** (2) : 100.

1986. *Cylindrothecum angustifrons* : Verves, *Cat. Palae. Dipt.*, **12** : 71 ; Lopes, 1989, *Cat. Dipt. Aust. and Oceanian Regions*, **86** : 722.

Female : Body length 6–7 mm.

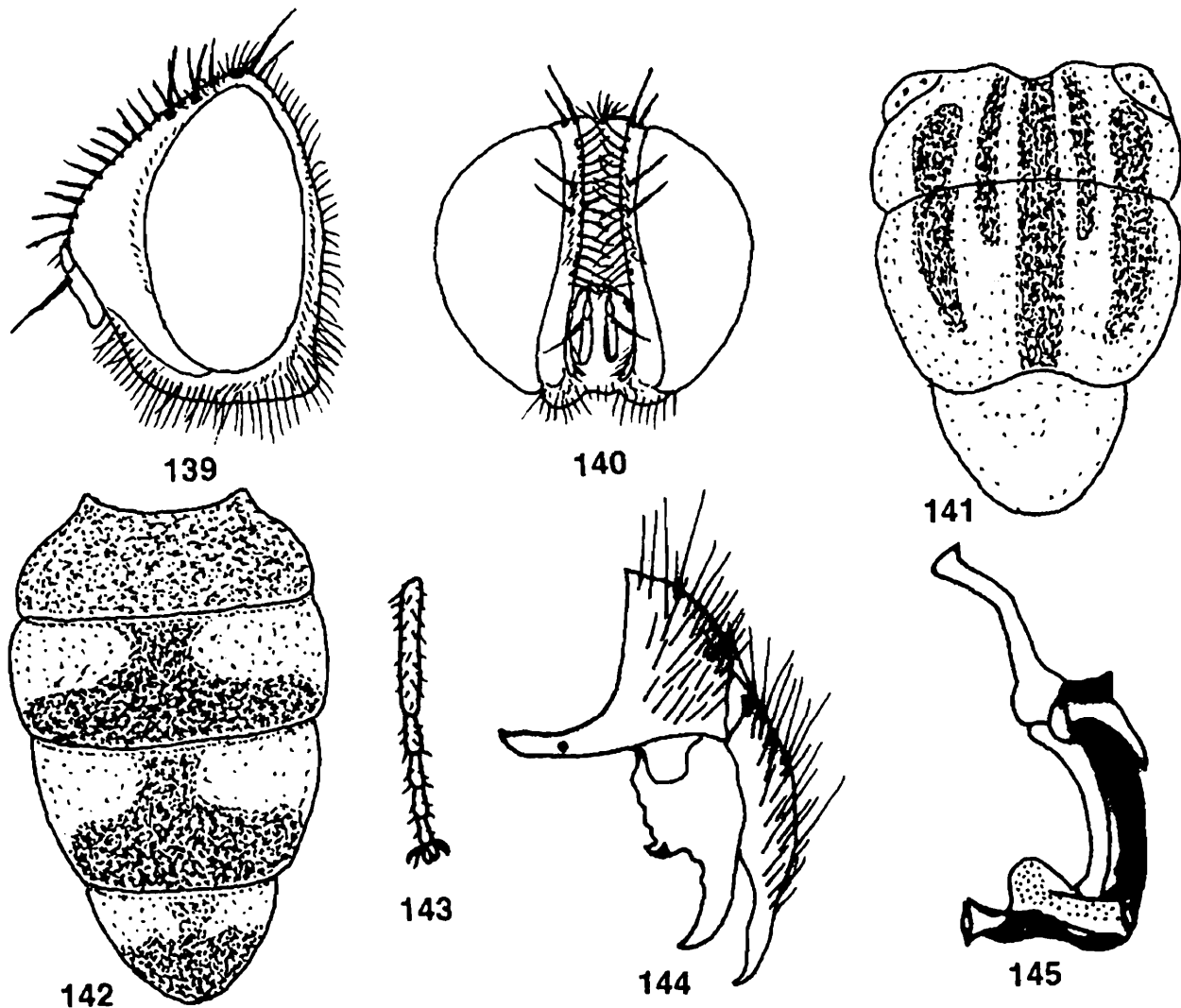
Head : Greyish with silvery pollen ; width of frons 0.40–0.45 that of one eye ; frontal vitta yellow, silvery pollen and slightly broadened anteriorly but frons not projecting forwards ; parafrontal brownish-black, silvery pollen and with short hairs near the eye margin ; parafacial brown with silvery pollen but without hairs near the eye margin ; width of frons at face level with base of antennae 0.14–0.16 times that of one eye width ; antennae light orange, slightly dilated in proximal 0.4, third antennal segment uniform, and three times that of the second ; arista elongated, thickened up to 0.7, this portion is slightly black but without hairs ; facial ridge yellowish, silvery pollen and with a row of 8–9 short bristles ; vibrissae not developed ; vibrissal angle less prominent and at same level as mouth margin ; frontal bristles 14–15, posterior 2–3 reclinate, anterior 7 proclinate ; orbital bristles 2 and reclinate ; ocellar triangle brownish with few short hairs ; gena yellowish, silvery pollen but without hairs ; post gena yellowish but without hairs ; post ocellar bristle not distinguishable ; inner vertical bristle well developed, outer vertical slightly shorter than inner vertical, post vertical same as outer vertical ; a row of regular postocular setae, rest of the area with short black hairs ; proboscis long and brownish ; palpi yellow and slender.

Thorax : Dark grey with distinct silvery pollen and 1 median and 2 lateral marginal stripes before suture ; *ac* 0+1 ; *dc* 1+2–3 ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 1 ; *np* 3 ; *pa* 2 ; *sa* 3 ; *mpl* 7 ; *hpl* 7–8 ; propleura bare ; scutellum black with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with 2 short setae located dorsally and extending up to a short distance from basal node to r-m and 1-3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment slightly longer than the third, the former with short spines along three-fourths of its anterior margin ; costal

spines short; epaulet blackish; basicostal scale yellowish; squama milky white; halter brown; bend of m 130° ; t_p slightly zigzag fashion.

Legs: Black; fore femur with a pair of rows of short bristles along anterodorsal surface and a row of bristles along posteroventral surface; fore tibia with a row of



Figs. 139-145 : *Cylandrothecum angustifrons* (Townsend). 139, Head ♂ (lateral view); 140, Head ♂ (frontal view); 141, Thorax (dorsal view); 142, Abdomen (dorsal view); 143, Fore tarsus (dorsal view); 144, Inner and outer forceps (lateral view, after Kurahashi, 1970); 145, Penis (lateral view, after Kurahashi, 1970).

bristles along posterodorsal surface and 1 bristle each on posterodorsal and posteroventral surfaces on more than basal half; mid femur with 2 bristles on distal part of posteroventral surface; mid tibia with a row of hair-like bristles along anteroventral surface; hind femur with a row of bristles along anteroventral surface and 2 bristles on posterodorsal surface on distal end; hind tibia with few short bristles along anterodorsal surface, few short hairs along basal half of posterodorsal surface and 1 bristle on posteroventral surface on distal one-third; claws short

and shorter than fifth tarsomere ; pulvilli shorter than claw but without hairs on tarsus.

Abdomen : Greyish-black ; second segment entirely black but without marginal bristles, third and fourth each with bands of black stripes along posterior half, the median band reaches three-fourths of its anterior margin but third without and fourth with few short marginal bristles, fifth with a complete black posterior band which reaches almost up to anterior border in median portion and with a row of long marginal bristles ; sternites first to fourth with short hairs.

Male : Genital segments black, reddish in part ; inner forceps terminally pointed but medially broad ; outer forceps wide at basal end but with groove at outer end ; anterior paramere short ; posterior paramere long, slightly curved and almost blunt at end ; epiphallus absent ; paraphallus sclerotised ; apical plate of paraphallus wider at subterminal end and provided with spines but blunt apically.

Material examined : 1 ♀, India : Assam ; Doom Dooma, 13m, 2.xii.1943, D. F. Hardy (det. by T. Pape ; dep. in ZMUC).

Discussion on species : This species can be distinguished from *C. ibericum* by the colour of antennae, structures of penis and anterior paramere. Moreover, the abdominal bands are quite distinguishable here from *ibericum*.

The male specimen was not available for the present study and its description provided here is from Kurahashi (as *takanoi*, 1970).

Biology : Nothing is known regarding the biology of this species.

Distribution : India ; A (Doom Dooma) ; China ; Japan ; Laos ; Papua New Guinea ; Philippines ; Solomon Islands ; Taiwan ; Thailand and Vietnam.

Type deposited : *Holotype* ♂, probably USNM, not studied.

Genus 8. *Anacanthothecum* Rohdendorf, 1930

1930. *Anacanthothecum* Rohdendorf, *Die Fliegen Palaearct. Region*, 11 : 33 ; Verves, 1986, *Cat. Palaearct. Dipt.*, 12 : 67.

Type species : *Tachina testaceifrons* von Roser, 1840.

Morphology : Colour grey but without black spots ; parafacial with short hairs ; parafacial without hairs ; face not projecting forwards ; abdomen with black spots on around third tergite ; vibrissae not differentiated ; supravibrissal bristles prominent and long ; orbital bristles long and 4–6 pairs ; mid tibia with 1 long and 1 short bristles on anterodorsal surface ; frontal bristles long ; fore tarsus with few hair-like bristles along anterodorsal surface.

Discussion : This is a very small genus and only 1 species has been reported from the Palaearctic and Oriental regions. Pape (1986) placed all the species of this genus under the genus *Miltogramma*. Verves (1986) differed from Pape and considered *Anacanthothecum* as a distinct genus.

Biology : So far as the literature is concerned nothing is known regarding the biology of the species but this species is probably associated with nests of solitary aculeate Hymenoptera.

Distribution : This genus is distributed in the Palaearctic and Oriental regions.

18. *Anacanthothecum testaceifrons* (von Roser)

(Figs. 146-152)

1840. *Tachina testaceifrons* von Roser, *CorrespBl. württ. landw. Ver. Stuttg.*, (n.s.), **17** (1) : 57.

1859. *Miltogramma pilitarsis* Rondani, *Dipt. ital. prodr.*, **3** : 218.

1928. *Miltogramma testaceifrons* var. *nuditarse* Villeneuve, *Bull. Anns Soc. r. ent. Belg.*, **68** : 52.

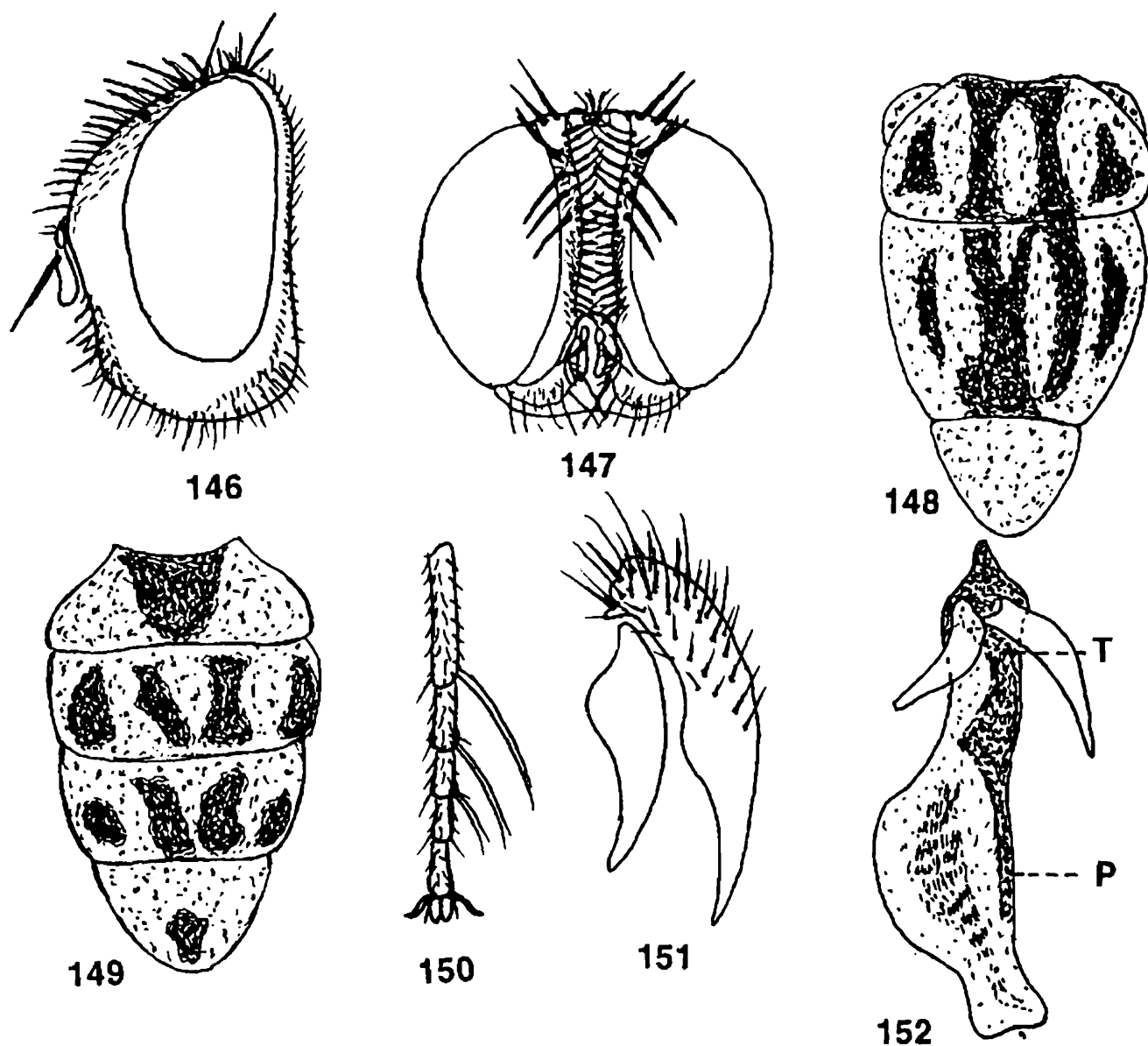
1979. *Anacanthothecum testaceifrons* : Mihályi, *Fauna Hung. Dipt.*, **15** (16) : 72 ; Verves, 1986, *Cat. Palae. Dipt.*, **12** : 67.

Male : Body length 4–5 mm.

Head : Yellowish-grey ; eyes brownish ; width of frons 0.35 that of one eye and frons not protruding forwards ; frontal vitta yellowish, slightly dilated anteriorly but broadened posteriorly ; parafrontal and parafacial yellowish-brown with silvery pollen, the former with short hairs near orbital region, the latter with few hairs anteriorly and its width at face level with base of antennae 0.20 that of one eye width ; antennae brown to orange, third segment blackish and 1.5 to 2.0 times that of the second ; arista elongated, thickened up to basal 0.6 ; facial ridge bare and yellowish ; vibrissae not differentiated ; vibrissal angle slightly above mouth margin and with a row of 5–6 supravibrissal bristles ; frontal bristles 12–13, long and reaching up to base of antennae, anterior 3–4 proclinate, posterior 1–2 reclinate ; orbital bristles 4, long, 3 proclinate and 1 reclinate ; gena slightly brownish with short greyish hairs ; post gena brownish, silvery pollen and with black hairs ; ocellar triangle black with moderately long hairs ; ocellar bristles not differentiated ; inner vertical bristle well developed, outer vertical short and about three-fifths that of inner vertical, post vertical and post ocellar not distinguishable ; a row of regular postocular setae, rest of the area with greyish hairs ; palpi long and yellowish ; proboscis brownish.

Thorax : Grey with greyish pollen and with two median and two lateral stripes in each segment ; *ac* 0+1 ; *dc* 2+4 ; *ia* 2+1 ; *ps* 1 ; *h* 3 ; *ph* 1 ; *np* 2 ; *pa* 2 ; *sa* 2 ; *st* 1+1 ; *mpl* 5 ; *hpl* 6–7 ; propleura bare ; scutellum with yellowish-grey pollen and with a pair of strong apico-scutellar, 2 pairs of lateroscutellar and 1 pair of moderately strong discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with 2 short setae located dorsally and extending up to basal node to r-m and 1 short setae on ventral surface of basal node of R_{4+5} ; fifth costal segment slightly greater than third, the former with short



Figs. 146-152 : *Anacanthothecum testaceifrons* (von Roser). 146, Head ♂ (lateral view); 147, Head ♂ (frontal view); 148, Thorax (dorsal view); 149, Abdomen (dorsal view); 150, Fore tarsus (dorsal view); 151, Inner and outer forceps (lateral view); 152, Penis (lateral view).

setae along less than basal half of its anterior margin ; costal spines not strong ; epaulet black ; basicostal scale yellowish ; squama white ; halter milky white ; bend of m 130° ; t_p straight with short process.

Legs : Blackish ; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 1 bristle on posterodorsal surface on distal two-thirds, fore tarsus with 2-3 long hairs along anterodorsal surface of first, second and third tarsomeres ; mid femur with a row of 4-5 short bristles each along basal half of anteroventral and posteroventral surfaces and 1 bristle on posterodorsal surface at about distal one-sixth ; mid tibia with 2-3 bristles along posteroventral surface basally ; hind femur with a row of bristles along

anterodorsal surface and 2–3 bristles along posteroventral surface ; hind tibia with a row of bristles each along anterodorsal and posterodorsal surfaces and few long hairs medially along anteroventral surface ; claws and pulvilli short and claw 0.5 times that of fifth tarsomere, first tarsomere slightly less than total of two to fourth tarsomeres.

Abdomen : Greyish with blackish median broad spot on second tergite, third and fourth each with 2 median and 2 lateral spots, fifth only with 1 median spot, third with long median marginal bristles, fourth and fifth each with a row of marginal bristles, second and third each with 3 short lateral marginal bristles ; sternites first to fourth with short hairs ; inner and outer forceps elongated and pointed apically, the latter about half of the former ; anterior and posterior parameres short and pointed ; paraphallus wide at middle, blunt at end and almost straight.

Female : Unknown.

Material examined : 1 ♂, India : Kashmir Valley ; Tangmarg, 17.viii.1978, Copenhagen Zoological Museum Expedition (det. by Pape ; dep. in ZMUC).

Discussion on species : This species is very distinctive by having few parafrontal bristles, orbital bristles more elongated, second segment of antennae more reddish, long anterodorsal bristles on fore tarsus and also by less developed orbital and supravibrissal bristles.

Biology : Draber-Mónko (1966) reported the association of this species with flowers of *Scleranthus perennis*, *S. annuus*, *Aegopodium podagraria* and *Matricaria chamomilla*.

Distribution : India ; JK (Tangmarg) ; Africa ; Armenia ; Austria ; Azerbaijan ; Byelorussia ; Czech Republic ; France ; Germany ; Hungary ; Italy ; Kazakhstan ; Kyrgyzstan ; Lithuania ; Moldova ; Mongolia ; Morocco ; Poland ; Russia ; Serbia ; Slovakia ; Spain ; Sweden ; Tajikistan and Ukraine.

Type deposited : Holotype ♂, ZMB, not examined.

Genus 9. *Miltogrammidium* Rohdendorf, 1930

1930. *Miltogrammidium* Rohdendorf, *Die Fliegen Palaee. Region*, 11 : 33 (as subgenus of *Miltogramma* Meigen, 1803).

Type species : *Miltogramma taeniatum* Meigen, 1824.

1834. *Stichophrys* Enderlein, *Sber. Ges. naturf. Freunde Berl.*, 4 : 188.

Type species : *Miltogramma rutilans* Meigen, 1824.

Morphology : Fairly average sized flies with bright colour ; frons and face narrow and face slightly projecting forwards ; frontal vitta mostly parallel ; gena very narrow ; antennae black and may be short or long ; third antennal segment one and half to two and two-thirds that of the second ; fore tarsus of male with hairs ; abdomen of

male moderate in size and with black stripes on third to fifth tergites on posterior end ; R_{4+5} open and often narrow at the border of wing ; presence of 4 short proclinate and 1 long reclinate orbital bristles ; parafrontal with few hairs ; parafacial without hairs ; subvibrissal bristles many but very short.

Discussion : This is a fairly large genus and Rohdendorf (1935) described many new species from the Palaearctic region. Verves (1986) reported 21 species from the Palaearctic region which are distributed in two subgenera : *Miltogrammidium* Rohdendorf, 1930 and *Pseudomiltogramma* Rohdendorf, 1930. Only the subgenus *Miltogrammidium* is present in this area.

Biology : Nothing is known regarding the biology of the species of this genus.

Distribution : This genus is distributed in the Palaearctic and Oriental regions.

Subgenus *Miltogrammidium* Rohdendorf, 1930

1930. *Miltogrammidium* Rohdendorf, *Die Fliegen Palaearct. Region*, 11 : 33.

Type species : *Miltogramma taeniatum* Meigen, 1824.

Morphology : Brownish to reddish colour with silvery pollen ; frontal vitta slightly narrowed anteriorly ; abdomen with black median and posterior bands ; outer forceps curved ; vibrissae not detectable ; presence of hairs on fore tarsus.

This is a rather large subgenus and Verves (1986) reported 16 species from the Palaearctic region. Pape (1987b) did not recognise the subdivision of the genus *Miltogramma*. Only 1 species has been reported from this area under this subgenus. Nothing is known regarding the biology of the species. It is distributed in the Palaearctic and Oriental regions.

19. *Miltogrammidium* (s. str.) *taeniatum* (Meigen)

(Figs. 153-159)

1824. *Miltogramma taeniatum* Meigen, *Syst. Besch.*, 4 : 228.

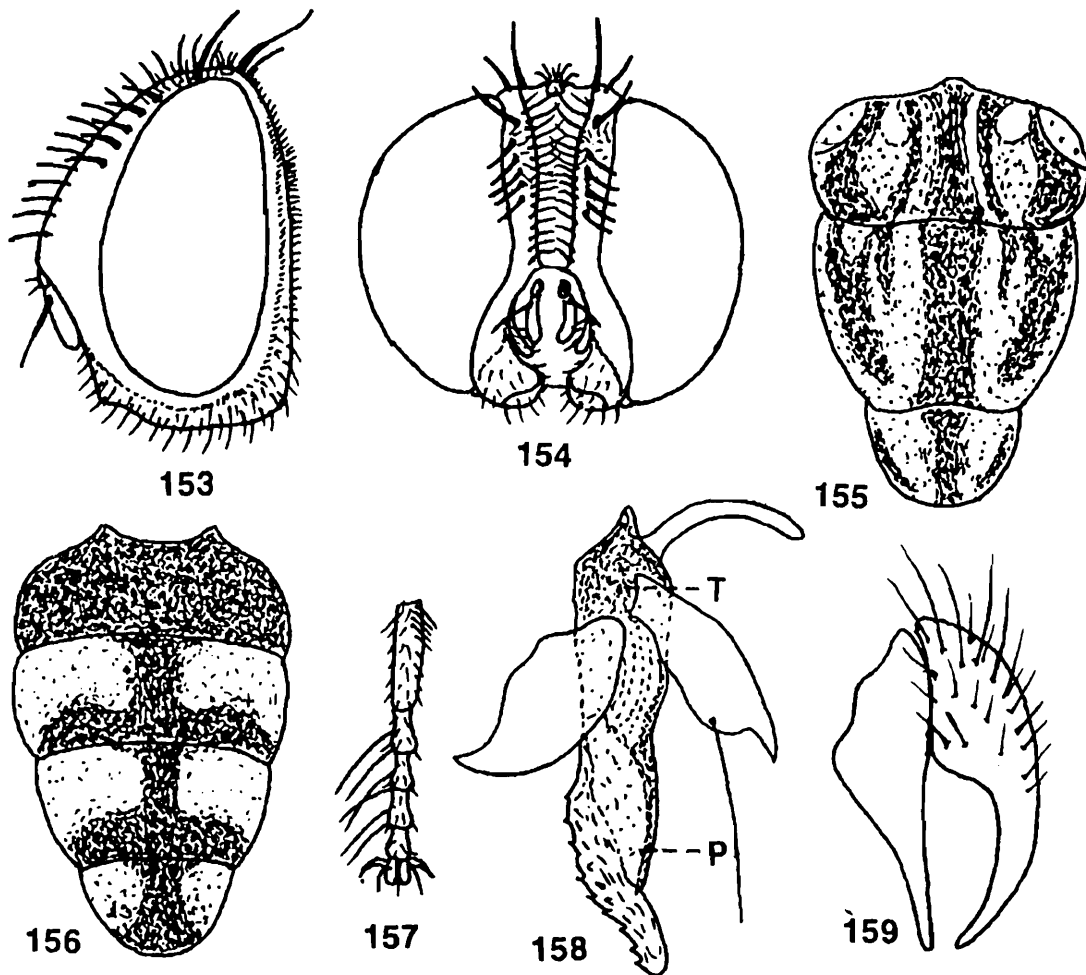
1859. *Miltogramma pilimana* Rondani, *Dipt. ital. prodr.*, 3 : 218.

1986. *Miltogrammidium* (s.str.) *taeniatum* : Verves, *Cat. Palaearct. Dipt.*, 12 : 78.

Male : Body length 8 mm.

Head : Brownish with silvery pollen ; eyes blackish-grey ; width of frons 0.35 that of one eye width and frons slightly projecting forwards ; frontal vitta reddish, slightly widened posteriorly and in front of ocellar triangle about twice that of each parafrontal ; parafrontal and parafacial yellowish with yellow pollen, the former with few short hairs near the orbital region and the latter without hairs ; width of parafacial at face level with base of antennae 0.18 that of one eye width ; antennae short, black and uniform ; third antennal segment about one and half times that of the second, tip of

second segment yellowish ; arista totally black and thickened about basal 0.6 ; facial ridge whitish, bare and with white pollen ; vibrissae not differentiated but with 6–8 supravibrissal bristles ; frontal bristles 16 and not reaching up to the base of antennae, anterior 8–9 proclinate, posterior 4–5 reclinate ; orbital bristles 6, upper 1 reclinate and lower 3 proclinate ; gena narrow, yellowish but without hairs ; post gena white with short greyish hairs ; inner vertical bristle well developed, outer



Figs. 153-159 : *Miltogrammidium (s.str.) taeniatum* (Meigen). 153, Head ♂ (lateral view); 154, Head ♂ (frontal view); 155, Thorax (dorsal view); 156, Abdomen (dorsal view); 157, Fore tarsus (dorsal view); 158, Penis (lateral view); 159, Inner and outer forceps (lateral view).

vertical slightly greater than half of inner vertical, post vertical very short, about one-fourth that of inner vertical and shorter than post ocellar ; ocellar region blackish-grey with 5 pairs of short hairs but without differentiated ocellar bristles ; one row of postocular setae, rest of the area with short greyish hairs ; palpi black and short ; proboscis slightly yellowish.

Thorax : Blackish with shiny median stripe which continues up to scutellum and with two lateral wide stripes, two stripes around median stripe which continue a

little bit beyond suture and with yellowish pollen at the sides ; *ac* 0+1 ; *dc* 4+4 ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 1 ; *np* 3 ; *pa* 2 ; *sa* 2 ; *st* 1+1 ; *mpl* 6 ; *hpl* 8 ; scutellum with yellowish tinge and lateral stripes and with a pair of apicoscutellar, 3 pairs of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with slightly brown veins ; R_1 bare ; R_{4+5} with a row of 3–4 short setae located dorsally and extending up to one-fifth from the basal node to r-m and 2 short setae on ventral surface of basal node of R_{4+5} ; R_{4+5} narrow ; fifth costal segment slightly greater than third, the former with short spines along basal two-thirds of its anterior margin ; costal spines short ; epaulet black ; squama whitish ; halter whitish with brownish tinge at tip ; bend of m 140° ; t_p slightly curved.

Legs : Black ; fore femur with a pair of rows of short bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 1 bristle on posterodorsal surface distally ; mid femur with a row of 4 bristles medially along anterolateral surface, a row of 3–4 short setae and few bristles along posteroventral surface, 3 hair-like bristles basally along anteroventral surface and 2 bristles on posterodorsal surface distally ; mid tibia with a row of long bristles and few short setae along anterodorsal surface, a row of short setae along posterodorsal surface and 1 bristle on anteroventral surface on distal one-third ; hind femur with a row of short bristles each along anterodorsal and anteroventral surfaces ; hind tibia with a row of bristles each along anterodorsal and posterodorsal surfaces and 5–6 long hairs medially along anteroventral surface ; claws and pulvilli short and claw about equal to fifth tarsomere, first tarsomere about equal to total of two to fourth tarsomeres, second to fourth tarsomeres with long hairs along anterodorsal surface.

Abdomen : Black ; second tergite with black band throughout, third to fifth with wide median black stripes and their lateral bands continue up to anterior half of each tergite, second and third without median marginal bristles but third with 3 short lateral marginal bristles, fourth and fifth each with a row of marginal bristles ; fourth and fifth each with a row of marginal bristles ; sternites first to fourth with short hairs basally and long hairs terminally ; inner and outer forceps elongated, the former curved and pointed apically ; anterior paramere wide at middle and gradually pointed at end ; posterior paramere wide but abruptly pointed at end and with 1 long hair ; paraphallus elongated with few setae and posterior apical projection ; epiphallus curved.

Female : Unknown.

Material examined : 1 ♂, Sri Lanka : Anu. Dist. ; Wild life Soc. Bungalow, Hunuwilagama, Wilpattu, 60 m, 10–19. iii. 1970, Davis and Rowe (det. by T. Pape ; dep. in ZMUC).

Discussion on species : This species differs from *M. (s.str.) nepalicum* Rohdendorf, 1966 by the distribution of hairs on male fore tarsus, numbers of frontal and proclinate orbital bristles and by shorter claws, less widened frons and short palpi.

Biology : So far as the literature is concerned nothing is known regarding the biology of this species.

Distribution : India ; D ; SL (Vav. Dist., Anu. Dist.) ; Albania ; Armenia ; Bulgaria ; France ; Germany ; Hungary ; Iran ; Italy ; Kyrgyzstan ; Mongolia ; Poland ; Serbia ; Slovakia ; Spain ; Tajikistan ; Turkmenistan ; Ukraine and Uzbekistan.

Type deposited : *Holotype* ♂, MNHN, not examined.

Subtribe **Apodacrina** Rohdendorf

This subtribe has the parafacial bare or with short hairs and R_{4+5} petiolate ; third antennal segment elongated and three to five times that of the second.

This is a small subtribe and Verves (1989d) divided this subtribe into three genera : *Apodacra* Macquart, 1954, *Xeromyia* Rohdendorf, 1925 and *Xerophilomyia* Rohdendorf, 1925. Only one genus *Apodacra* is present in this area.

Few species are found in the nest of Larridae and Sphecidae, This subtribe is distributed in the Palaearctic, Oriental and Afrotropical regions.

Genus 10. **Apodacra** Macquart, 1854

1854. *Apodacra* Macquart, *Annl. Soc. ent. Fr.*, (3) 2 : 425.

Type species : *Apodacra seriemaculata* Macquart, 1854.

Morphology : Small bright coloured flies with dark design and the abdomen with stripes or spots ; eyes always bare ; facial ridge bare ; frons somewhat narrow ; vibrissal angle situated on the very edge of the mouth and with short bristles and hairs ; frons and frontal vitta wide ; third segment of antennae always three to four times that of the second ; orbital bristles 3–5 pairs and erect ; R_{4+5} stalked and distinctly petiolate.

Discussion : This genus has been divided into two subgenera : *Apodacra* Macquart, 1854 and *Parapodacra* Rohdendorf, 1925 and only subgenus *Parapodacra* is present here. Verves (1986) reported 11 species under this genus from the Palaearctic region.

Biology : A few species were collected from the nests of Sphecidae.

Distribution : This genus is mostly present in the Palaearctic region.

Subgenus **Parapodacra** Rohdendorf, 1925

1925. *Parapodacra* Rohdendorf, *Encycl. ent. (BII), Dipt.*, 2 : 68.

Type species : *Apodacra chrysocephala* Rohdendorf, 1925.

Morphology : Presence of four pairs of strong and long orbital bristles ; facial ridge bare or with short hairs ; frontal vitta wide ; frontal bristles short ; abdomen with distinct spots but without any marked stripes ; claws and pulvilli short and shorter than fifth tarsomere.

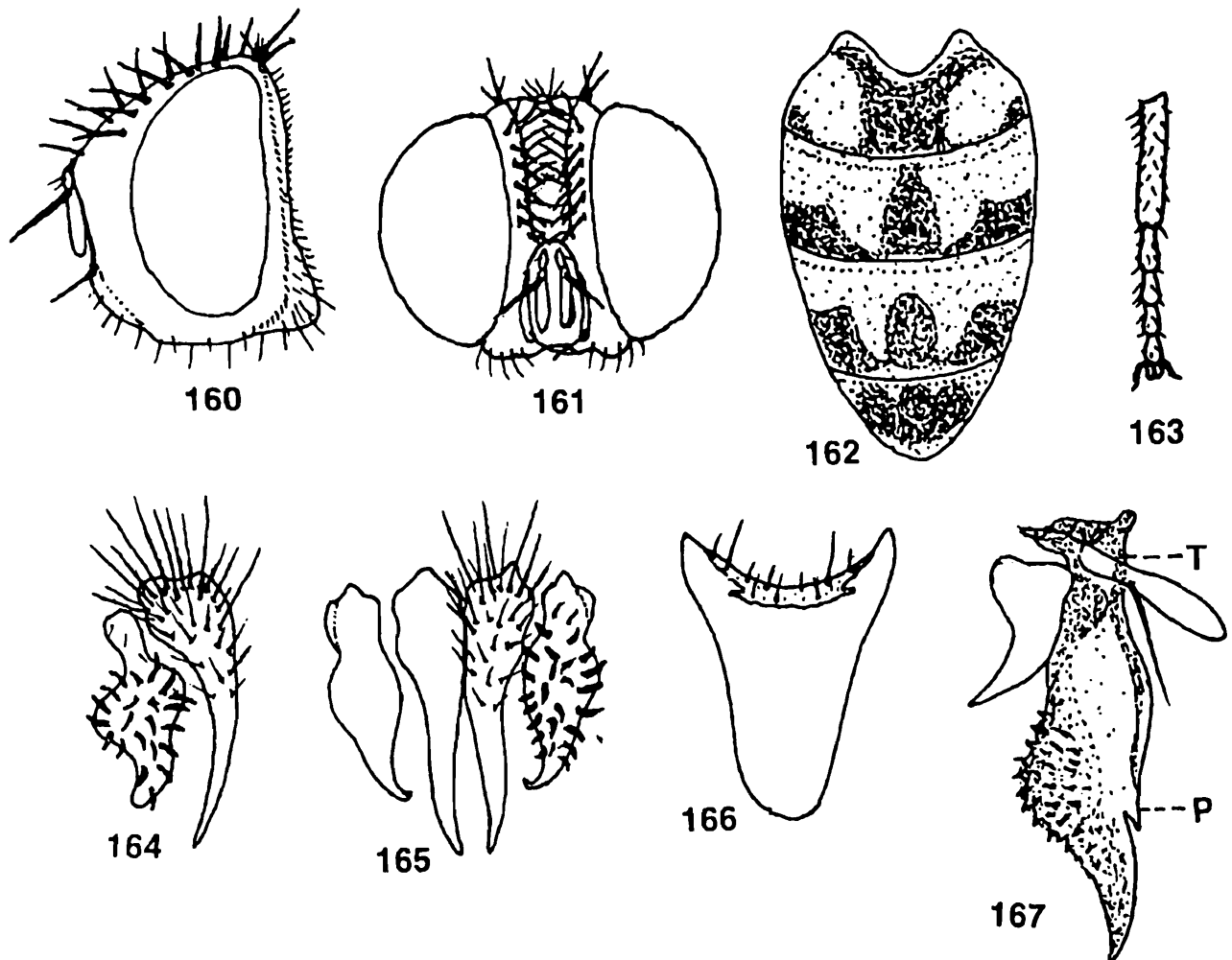
This is a small subgenus and Verves (1986) reported 7 species from the Palaearctic region. Only 1 species has been reported from the Oriental region which is also present in this area.

20. *Apodacra (Parapodacra) ceylonica* Verves
(Figs. 160-167)

1979. *Apodacra (Parapodacra) ceylonica* Verves, *Ent. Rev. Wash.*, 58 (4) : 166.

Male : Body length 5.5 mm.

Head ; Reddish-brown; eyes red and bare ; frons comparatively wide and its width 0.35 that of one eye ; frontal vitta yellow with pollen, gradually widened posteriorly and its width at ocellar region three times that of each parafrontal and 1.5 times in the middle of frons ; parafrontal and parafacial with silvery white pollen but without hairs ; width of parafacial at face level with base of antennae 0.16 times that of one



Figs. 160-167 : *Apodacra (Parapodacra) ceylonica* Verves. 160, Head ♂ (lateral view); 161, Head ♂ (frontal view); 162, Abdomen (dorsal view); 163, Fore tarsus (dorsal view); 164, Inner and outer forceps (lateral view); 165, Inner and outer forceps (posterior view); 166, Fifth sternite; 167, Penis (lateral view).

eye width, sides of frons with golden pollen ; antennae yellow, third segment about three times that of the second ; arista elongated, bare and thickened practically up to distal end ; facial ridge bare, brownish and with silvery pollen ; vibrissae not so developed ; vibrissal angle slightly above mouth margin and with 2-3 short supravibrissal bristles ; frontal bristles 9 and not reaching up to base of antennae, 2-3 proclinate, 6 reclinate ; orbital bristles 5-6, 1 reclinate ; gena silvery pollen with sparsely short hairs ; post gena black with sparse hairs ; inner vertical bristle well developed, outer vertical half that of inner vertical, post vertical and post ocellar bristles not developed ; orbital region black with 3-6 pairs of orbital bristles and few short hairs ; orbital bristles less than vibrissae ; a row of regular postocular setae, rest of the area with greyish hairs ; palpi long, yellowish and abruptly dilated terminally ; proboscis brownish-black.

Thorax : Black and covered with short hairs which are arranged in regular rows ; dorsal surface of thorax and greater part of scutellum covered with yellow-grey pollen ; *ac* 4-5+5-6 ; *dc* 3-4+5-6 ; *ia* 2 ; *ps* 1 ; *h* 2 ; *ph* 2 ; *np* 2 ; *pa* 2 ; *sa* 2 ; *st* 1+1 ; *mpl* 5-6 ; *hpl* 7 ; propleura bare ; scutellum with yellowish pollen on posterior part and with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of strong discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with 2-3 short setae located dorsally and extending up to half from the basal node to r-m and 3 short setae on ventral surface of basal node of R_{4+5} ; R_{r+5} pedunculate ; fifth costal segment three times that of the second, the former with short spines along its entire length on anterior margin ; costal spines short ; epaulet black ; squama whitish ; halter slightly brownish ; bend of m 120° with process ; t_p weakly curved.

Legs : Yellow ; fore femur with a row of short bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia without any differentiated bristles ; mid femur with 1 bristle each on anterodorsal and posterodorsal surfaces on distal one-fifth ; mid tibia with 2 bristles on anterodorsal surface, 1 bristle each on anteroventral and posterodorsal surfaces at about one-third the distance from the distal end ; mid tarsus without hairs ; hind femur with 1 bristle on anteroventral surface at about one-third the distance from the distal end and 2 bristles on posteroventral surface on basal one-third ; hind tibia with 3 short bristles along anterolateral surface ; claws and pulvilli very short, claw about 0.7 of fifth tarsomere.

Abdomen : Orange-red with silvery pollen ; second to fourth abdominal tergites with rounded post marginal median black spots which are not reaching midway along tergites and lateral short stripes are provided with brown yellow pollen, fifth with 3 large rounded black spot occupying 0.8 of its length, second and third without median marginal bristles but second with 2 and third with 3 lateral marginal bristles, fourth and fifth each with a row of marginal bristles ; sternites first to fourth with short

hairs ; fifth sternite v-shaped, slightly elongated and with few short hairs anteriorly ; inner forceps wide basally, curved and elongated at end ; outer forceps wide at middle with many spines ; anterior paramere wide at base, curved and apically pointed, ; posterior paramere dumble-shaped with 1 long hair ; paraphallus wide at middle, apically pointed and with spines medially.

Female : Similar to male but differs from it by the followings : third antennal segment four times that of the second ; arista short, slightly longer than half of third antennal segment ; vibrissal angle without setae and hairs on gena.

Material examined : *Holotype* ♂, Sri Lanka : Trincomalee ; China Bay Ridge Bungalow, 9.x.1977, K.V. Krombein ; 1 ♂, Sri Lanka : Mon. Dist., Kondachchi Ma Villu, 11-12.x. 1981, K.V. Krombein ; 1 ♂, Sri Lanka : Mon. Dist., Ma Villu, 16-19.ix.1980, K. V. Krombein.

Discussion on species : This species is distinguished from other species by its specific character of colour of eye and head, black thorax, yellow leg and orange-red coloured abdomen.

Biology : This species was collected from a nest of *Gastrosericus* sp. (Larridae).

Distribution : SL ; Trincomalee and Ma Villu.

Type deposited : *Holotype* ♂, USNM, examined.

Discussion on type : Type is in good condition except the right wing is slightly damaged.

Subtribe **Craticulinina** Rohdendorf

This subtribe has a short lower margin of head and is characterised by having width of frons greater than 0.35 of head width and facial ridge with a row of strong bristles ; third antennal segment elongated and six times as long as the second.

This subtribe contains only one genus *Craticulina* Bezzi which is distributed in the Palaearctic, Oriental and Afrotropical regions.

The species of this subtribe are kleptoparasitic in the nests of different wasp species.

Genus 11. **Craticulina** Bezzi, 1906

1906. *Craticulina* Bezzi, *Z. syst. Hymenopt. Dipterol.*, **6** : 49. (new name for *Craticula* Pandellé, 1895).

Type species : *Musca tabaniformis* Fabricius, 1805.

Morphology : Arista shorter than third antennal segment, thick and not reaching up to vibrissae ; third antennal segment almost six times that of the second ; eyes bare ; frons wide and gradually narrowed anteriorly ; facial ridge with a row of strong

bristles which are reaching and surpassing the middle ; R_{4+5} open ; last section of fifth longitudinal vein shorter than preceding section ; basicostal scale yellow ; parafacial bare or setose ; presence of 2 long and thick proclinate orbital bristles ; mid tibia with 1 long anterodorsal bristle.

Discussion : This is a small genus. Verves (1986) reported only 4 species and revised the genus in 1993 from the Palaearctic region. Venturi (1958) revised it from Italy. Zumpt (1961) reported 2 species from the Ethiopian region and later on Dear (1980) added 2 more species. Only 1 species is present in this area.

Biology : Zumpt (1961) reported 1 species of *Craticulina* as kleptoparasitic on the sand wasps-*Bembix melanops* and *Bembix fuscipennis* (Sphecidae).

Distribution : This genus is distributed in the Palaearctic, Oriental and Afrotropical regions and most of the species are present in the Palaearctic region.

21. *Craticulina tabaniformis* (Fabricius)

(Figs. 168–174)

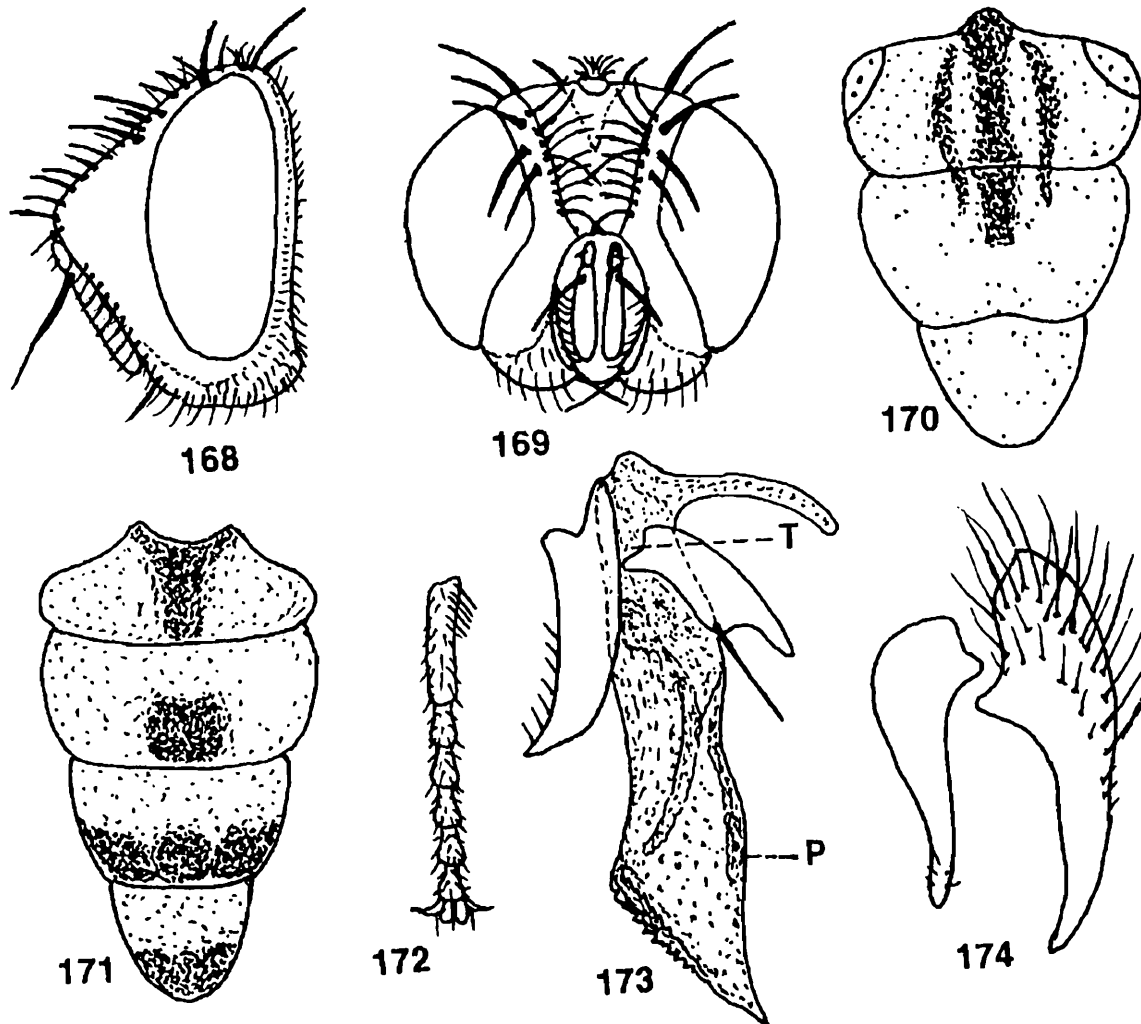
1805. *Musca tabaniformis* Fabricius, *Syst. antl.*, 302.

1979. *Craticulina tabaniformis* : Mihályi, *Fauna Hung. Dipt.*, **15** (16) : 69 ; Verves, 1986, *Cat. Palae. Dipt.*, **12** : 70.

Male : Body length 5.5–9 mm.

Head : Yellowish and slightly blackish ; width of frons 0.62 that of one eye and frons projecting forwards ; frontal vitta yellow, slightly black on the posterior end and gradually narrowed anteriorly, its width in front of ocellar region about four times that of one parafrontal ; parafrontal yellowish with silvery pollen and few short hairs near the orbital region ; parafacial yellow with silvery pollen but without hairs and its width at face level with base of antennae 0.36 that of one eye width ; antennae yellowish-black, elongated and reaching up to about 0.95 distance to vibrissae, third segment slightly black and six times that of the second but tip of the second segment orange ; arista short, about half of antennae and thickened about most of its length, base and tip of arista blackish and median portion yellowish ; facial ridge with a row of 6–7 short bristles ; vibrissae moderately developed, two-thirds that of arista and with 4 short subvibrissal bristles ; frontal bristles 11–13 and not reaching up to antennal base, anterior bristles shorter and 6–7 proclinate and 1 reclinate ; gena yellow with yellowish pollen but without hairs ; post gena with few short yellowish hairs ; inner vertical bristle well developed, outer vertical short about one-third that of inner vertical, post vertical short, post ocellar longer than post vertical ; ocellar region blackish with a pair of long reclinate orbital bristles and 5–6 pairs of normal long hairs ; ocellar bristle almost equal to anterior frontal bristles ; a row of regular postocular setae, rest of the area with blackish hairs ; palpi yellowish ; proboscis brownish-black.

Thorax : Blackish with deep silvery pollen and three black longitudinal stripes which extend up to one-third of mesonotum, the median stripe wider ; *ac* 0+1 ; *dc* 0-3 ; *ia* 0+2 ; *ps* 1 ; *h* 2 ; *ph* indistinct ; *np* 2 ; *pa* 2 ; *sa* 1+1 ; *st* 1+1 ; *mpl* 7 ; *hpl* 10 ; propleura bare ; scutellum blackish at base and with a pair of strong apicoscutellar, 2 pairs of long lateroscutellar and 2 pairs of short discoscutellar bristles.



Figs. 168-174 : *Craticulina tabaniformis* (Fabricius). 168, Head ♂ (lateral view); 169, Head ♂ (frontal view); 170, Thorax (dorsal view); 171, Abdomen (dorsal view); 172, Fore tarsus (dorsal view); 173, Penis (lateral view); 174, Inner and outer forceps (lateral view).

Wings : Transparent with yellowish veins ; R_1 bare ; R_{4+5} with a row of 3 short setae located dorsally and extending up to basal half and 2 short setae on ventral surface of basal node of R_{4+5} ; R_{4+5} open ; fifth costal segment one and half times that of the third, the former with short spines along two-thirds of its length on anterior margin ; costal spines moderately developed ; epaulet yellowish and slightly black ; basicostal scale yellow ; squama white ; halter yellowish ; bend of m 130° with process ; t_p almost straight.

Legs : Blackish with yellow at each joints ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with few bristles medially on ventral surface ; mid femur with many hair-like bristles along anterodorsal surface on basal half, a row of short setae each along anteroventral and posteroventral surfaces and 2 bristles on distal part of posterodorsal surface ; mid tibia with 1 long bristle each on anterodorsal and anteroventral surfaces on distal one-third ; hind femur with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface on distal end and a row of 3 long and few short bristles along posteroventral surface ; hind tibia with a row of short bristles along anterodorsal surface and 5 bristles medially along anteroventral surface ; tarsus short ; claws and pulvilli short, claw about 0.6 that of fifth tarsomere, first tarsomere equal to total of two to fourth tarsomeres, fifth tarsomere 1.2 that of fourth tarsomere.

Abdomen : Elongated, slightly greyish with silvery pollen ; second abdominal tergite with wide median stripe and brownish spots laterally, third to fifth with median stripes reaching up to anterior side of the segments, third and fourth each with lateral spots which reach up to two-thirds of their anterior end, second and third without median marginal bristles but third with very short and many lateral bristles, fourth and fifth each with a row of marginal bristles ; inner and outer forceps elongated at end and wide at base ; anterior paramere almost uniform and pointed at end ; posterior paramere wide at base and abruptly pointed ; epiphallus elongated ; paraphallus uniformly thickened and sharp pointed apically.

Female : Unknown.

Material examined : 1♂, Sri Lanka : Mon. Dist. ; Angunakelapelese, 8–9.x.1980, K.V. Krombein, P.B. Karunaratne, T. Wijesinhe, L. Jayawickrema and V. Gunawardane (det. by Pape ; dep. in ZMUC).

Discussion on species : This species has been recorded for the first time from the Oriental region by Verves (1979b) and it is very characteristics in having a wide frons, long antennae, facial ridge with a row of strong bristles and ill-developed thoracic stripe pattern.

Biology : The larvae of this species have been reported from the nests of wasps of *Bembix oculata*, *Bembix bolivari* (Séguy, 1941) and *Bembix borrei* (Verves, 1979b) (Sphecidae, Sphecoidea). Cuthbertson (1939) studied its first instar larva from Southern Zimbabwe.

Distribution : SL ; (several localities) ; Algeria ; Armenia ; Australia ; Austria ; Egypt ; France ; Hungary ; Indonesia ; Israel ; Italy ; Libya ; Malta ; Morocco ; Romania ; Russia ; Spain ; Thailand ; Turkmenistan ; Ukraine and Western Sahara.

Type deposited : *Holotype* ♂, ZMUC, not examined.

Discussion on type : Pape (1986a) studied the type specimen and reported that the *Holotype* lacks left fore leg and the head is glued on and the condition of the type specimen is otherwise good.

Tribe **Phyllotelini** Rohdendorf

This tribe is characterised by having short third antennal segment, often hairy eyes and normal in size, sixth abdominal tergite in female is divided in the middle of the terminal portion ; frontal vitta parallel and presence of dense hairs on parafrontal and parafacial ; vibrissae absent or medium in size and wings spotted or hyaline ; arista flattened or leaf-like ; abdominal tergite with three dark spots.

Lopes *et al.* (1977) divided this tribe into two subtribes : Phyllotelina and Hoplocephalina and listed all the Oriental species under these two subtribes. Verves (1986) retained only the tribe Phyllotelini and placed all the Palaeartic genera including *Nepalisca* Rohdendorf, 1966 under this tribe. Later on, Verves (1989d) divided Phyllotelini into eight subtribes and most of the Oriental species are placed in the subtribes Phyllotelina, Dolichotachinina and Hoplocephalina.

Most species are present in tropical and sub-tropical deserts and some of the species are known as predators of locust egg-pods. The larvae of some species areinquilines of Sphecidae.

This tribe is distributed in the Oriental, Palaeartic and Afrotropical regions.

Key to subtribes

1. Fore tibia and tarsus very elongated in maleDolichotachinina
Fore tibia and tarsus normal in length in male.....2
2. Arista flattened in male ; abdominal tergites with 3 dark spotsPhyllotelina
Arista not flattened in male ; abdominal tergites with 3 black elongated, round or triangular spots Hoplocephalina

Subtribe **Dolichotachinina** Rohdendorf

This subtribe is characterised by having very elongated tibia and tarsus in the male and it has very characteristic long bristles on tibia and femur. It has only one genus *Dolichotachina* Villeneuve, 1913 which is distributed in tropical and subtropical parts of the Afrotropical and Oriental regions. The species of this subtribe may breed in nests of termites and ants.

Genus 12. ***Dolichotachina*** Villeneuve, 1913

1913. *Dolichotachina* Villeneuve, *Feuille jeun. Nat.*, (5) 43 : 111.

Type species : *Tachina marginella* Wiedemann, 1830.

1934. *Melanometopia* Séguy, *Encycl. ent., B(II), Dipt.*, 7 : 78.

Type species : *Melanometopia albimana* Séguy, 1934.

Morphology : Fore legs very elongated including the coxa which measures half to two-thirds that of fore femur ; legs at least as long as the body ; fore tibia with longer hairs along posteroventral surface ; frons wide ; arista not flattened ; abdomen with wide median stripe and ill-developed lateral spots ; bristles of the tibia and femur have undergone very characteristic modifications in some species ; some of the bristles of thorax and abdomen have completely disappeared whereas others are extremely well developed unusual length and thickenings ; R_{4+5} closed only at the margin or distinctly open ; paraphallus elongated and pointed terminally.

Discussion : This is a very small genus and Rohdendorf (1935) placed it under the subtribe Metopiini. Verves (1986) placed it under the tribe Phyllotelini. Zumpt (1961) described some species from the Ethiopian region. Verves (1986) reported only 1 species from the Palaearctic region which is also present here. Dear (1980) recorded 5 species from the Afrotropical region.

Biology : The species of the genus may breed in the nests of termites and ants but this needs to be confirmed.

Distribution : This subtribe is distributed in the Oriental, Palaearctic and Afrotropical regions.

22. *Dolichotachina melanura* Verves

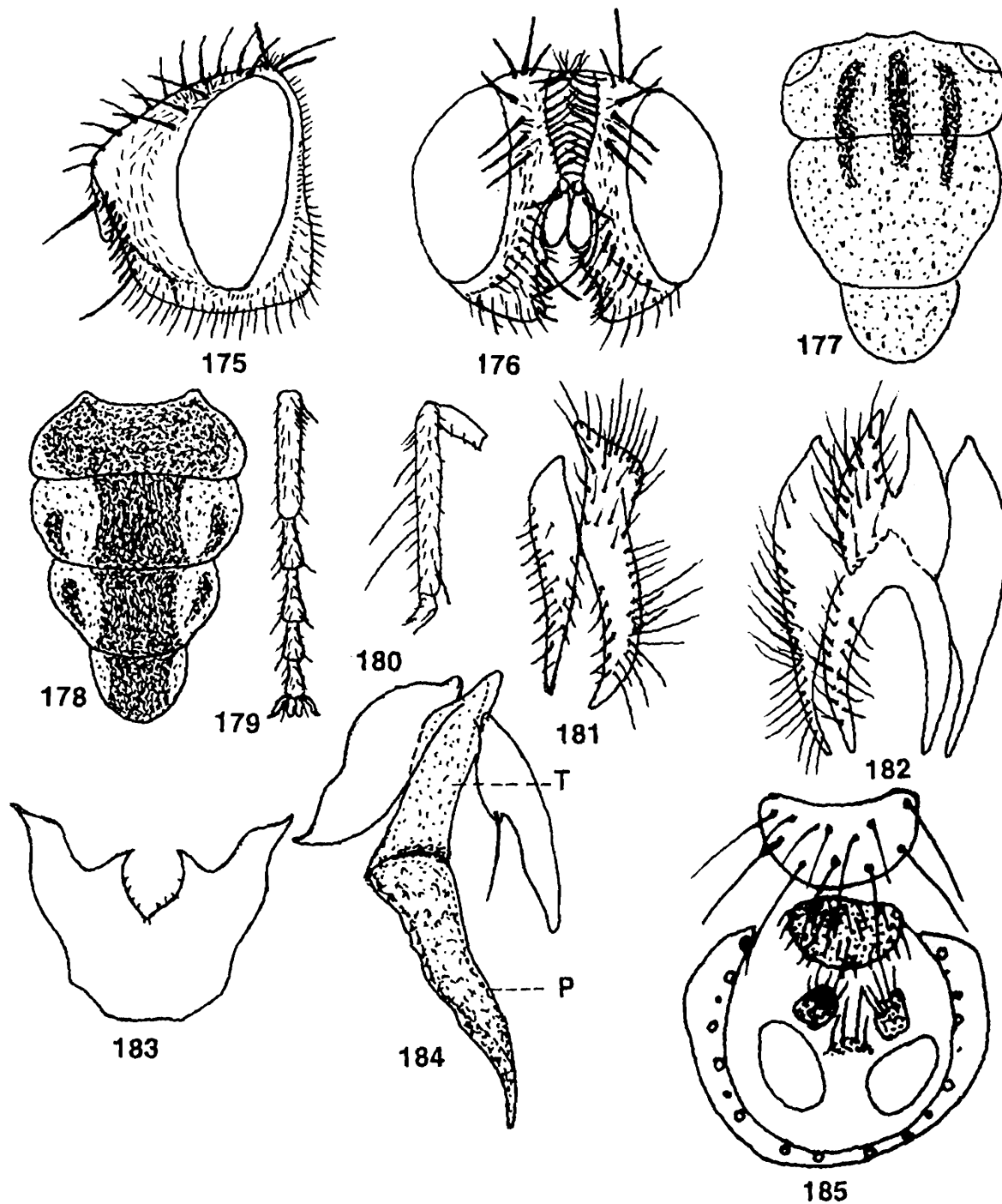
(Figs. 175–185)

1979. *Dolichotachina melanura* Verves, *Ent. Rev. Wash.*, 58 (4) : 170

Male : Body length 5.0–6.5 mm.

Head : Blackish-grey ; eyes brownish or sometimes slightly red ; width of frons 0.36 that of one eye ; frons slightly projecting forwards ; frontal vitta blackish-grey, slightly narrowed anteriorly and twice that of each parafacial ; parafacial and parafrontal black with silvery pollen, the former with short scattered hairs, the latter with short hairs throughout and its width at face level with base of antennae 22.03 that of one eye width ; parafrontal with a row of 8–10 long bristles along its outer margin ; antennae dark black, third segment 1.4–1.6 times that of the second ; arista thickened up to basal 0.5 and with short hairs ; facial ridge black and bare ; vibrissae well differentiated and longer than second segment of antennae ; vibrissal angle appreciably above mouth margin and with 4–5 subvibrissal bristles ; frontal bristles 6–9, reaching up to base of antennae, anterior 4 proclinate, posterior 2 reclinate ; orbital bristles 3–4, 3 proclinate and 1 reclinate ; gena black but without hairs ; post gena black with black hairs ; inner vertical bristle well developed, outer vertical about half of the inner vertical, post vertical and post ocellar short ; ocellar region

black with a pair of long proclinate ocellar bristles and few short hairs; a row of regular postocular setae, rest of the area with short greyish hairs; palpi black and moderately thickened at end; proboscis long and black.



Figs. 175-185 : *Dolichotachina melanura* Verves. 175, Head ♂ (lateral view); 176, Head ♂ (frontal view); 177, Thorax (dorsal view); 178, Abdomen (dorsal view); 179, Fore tarsus (dorsal view); 180, Fore tibia (dorsal view); 181, Inner and outer forceps (lateral view); 182, Inner and outer forceps (posterior view); 183, Fifth sternite; 184, Penis (lateral view); 185, Rear view of genitalia ♀ (after Verves, 1979).

Thorax : Black with slight pollen and three distinct black stripes before suture which slightly extend after suture ; *ac* 0–1+1; *dc* 2–3+3 ; *ia* 1+1–2 ; *ps* 1 ; *h* 2 ; *ph* 1 ; *np* 2 ; *pa* 2 ; *sa* 2 ; *st* 1+1 ; *mpl* 7 ; *hpl* 5–6 ; propleura bare, scutellum greyish with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with 1–2 short setae located dorsally on basal node to r–m or sometimes absent but without setae on ventral surface of basal node of R_{4+5} ; R_{4+5} narrowly open and practically closed ; fifth costal segment twice that of third, the former with short spines along anterior margin of its whole length ; costal spines short ; basicostal scale yellow ; epaulet black ; squama slightly yellowish ; halter yellowish ; bend of m 90° with or without short process ; t_p weakly s-shaped.

Legs : Black ; fore leg elongated which is as long as the body ; fore femur with a row of short bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2–3 long hairs along posteroventral surface, 1 bristle on posterodorsal surface on distal one-third and 1 on dorsal surface on distal end, fore tarsus extremely long ; mid femur with 1–2 bristles medially on anterolateral surface, 2 on posterolateral surface at about one-sixth on distal end and few long hairs along posteroventral surface medially ; mid tibia with 1 bristle each on anterodorsal and anteroventral surfaces at about two-thirds the distance from basal end and 2 long bristles along posterodorsal surface ; hind femur with a row of bristles along anteroventral surface and few long hairs along anterodorsal surface ; hind tibia with a row of bristles along anterodorsal surface and 1 bristle each on posterodorsal and posteroventral surfaces on distal one-third, pulvilli and claws short, claw about half of fifth tarsomere, first tarsomere about total of two to third tarsomeres.

Abdomen : Dark with light silvery pollen ; second abdominal tergite with black band, third to fifth with wide black median stripes but third and fourth each with short lateral spots, second without but third with a pair of median marginal bristles, second with 2–3 and third with 3 lateral marginal bristles, fourth and fifth each with a row of marginal bristles ; sternites first to fourth with short hairs ; fifth sternite v-shaped, the lateral arms pointed with deep grooved at the middle ; genital segment shining black ; inner forceps elongated and curved like a beak ; outer forceps rod-like and almost equal in length to inner forceps ; anterior paramere broad and terminally pointed ; posterior paramere narrow, bearing basal process and 1 long hair ; paraphallus elongated and pointed gradually.

Female : Similar to male but for the following differences : frons broader and face 0.40–0.47 that of head width ; parafacial 0.27–0.30 and gena 0.19–0.21 of eye width ; sides of frons and parafacial with dense greyish-white pollen ; frons dark colour and practically devoid of pollen ; antennae and palpi black ; second antennal segment and

base of third red ; thorax with indistinct longitudinal stripes but with 3 triangular spots on second to fourth tergites ; fifth tergite with traces of spots at base.

Material examined : 3 ♂♂, Sri Lanka : Mannar Dist., Manna Town, 13.iv.1968, Thomas F Halstead ; 2 ♂♂, Sri Lanka : Colombo ; Colpetty, 103 Galle Road, 26.viii.1968, Thomas F. Halstead.

Discussion on species : This species is similar to *D. bechuanae* Zumpt, 1961 but can be distinguished from it by the structures of inner and outer forceps. This species has also its specific characters in the structure of inner forceps, thoracic and abdominal stripes and width of frons. Moreover, this species has 8–10 long bristles along anterior margin of parafacial.

Biology : Nothing is known regarding the biology of the species.

Distribution : SL ; Colpetty, Kala-Oya, Manna Town, Palatupana and Tank.

Type deposited : *Holotype* ♂, USNM, not examined.

Subtribe **Phyllotelina** Rohdendorf

This subtribe is characterised by having third antennal segment twice as long as the second ; lower part of head elongated ; arista flattened in male ; abdominal tergites with 3 dark spots ; vibrissal angle raised over peristome ; fore tibia, tarsus and femur normal in length.

Verves (1989d) divided this subtribe into three genera : *Phylloteles* Loew, 1844, *Chaetophylloteles* Rohdendorf, 1926 and *Trichophylloteles* Baranov, 1934. Pape (1989) synonymized the last genus with *Phylloteles*. Only one genus *Phylloteles* is present in this area.

Not much is known regarding the biology of the species of this genus but some species have been bred from grasshopper eggs.

This tribe is distributed in the Oriental, Palaearctic and Afrotropical regions.

Genus 13: **Phylloteles** Loew, 1844

1844. *Phylloteles* Loew, *Stettin. ent. Ztg.*, **5** : 168.

Type species : *Phylloteles pictipennis* Loew, 1844.

1933. *Thelodiscoprosopa* Townsend, *Jl. N. Y. ent. Soc.*, **40** : 444.

Type species : *Thelodiscoprosopa formosana* Townsend, 1933.

1952. *Paraphylloteles* Zumpt, *Proc. R. ent. Soc. Lond.*, (B), **21** (1–2) : 7.

Type species : *Paraphylloteles hessei* Zumpt, 1952.

1975. *Phyllarista* Rohdendorf, *Die Fliegen Palae Region*, **11** : 199.

Type species : *Phylloteles degener* Zumpt, 1961.

Morphology : Medium sized flies ; head in profile with a more or less projecting forwards ; frons narrow anteriorly ; antennae usually short and twice that of the first segment ; parafacial bare or with fine hairs ; arista often distinctly pubescent in male and a flattened arista which may be short and leaf-like or lanceolated tapered, in female only slightly flattened ; 3–5 strong proclinate orbital bristles ; facial ridge bare ; vibrissae of medium sized (somewhat shorter than antennae) or absent ; gena with often reduced bristles in male and often with short black or hyaline hairs ; wings hyaline, spotted or partly fumose in female ; R_{4+5} open ; bend of m forms a right angle or distinctly obtuse ; paraphallus short and rather compact ; epiphallus broad in lateral view.

Discussion : This is a rather large genus and Zumpt (1973) revised the species of this genus from Africa and Europe and described some new species. Verves (1986) reported 2 species from the Palaearctic region. Pape (1989), while reviewing the Oriental species reported 2 species from India. At present 5 species are reported here.

Biology : The adult species of this genus are mostly often present in sandy places on sea shore and river sides on low fertile soil and luxuriant herbaceous vegetation. Zumpt (1973) reported the breeding of Afrotropical species from egg-pods of an acridid grasshopper (*Schistocerca* sp.).

Distribution : This genus is distributed in the Oriental, Palaearctic and Afrotropical regions.

Key to species

1. Abdominal tergites three to five each with a narrow anterior band of silvery microtomentum which is interrupted at the dorso median line, tergites otherwise shining black ; median marginal bristle on third abdominal tergite well developed *argyrozoster* Pape
 Abdominal tergites three to five with extensive microtomentum, each with 3 more or less well defined dorsal black spots in posterior part ; median marginal bristle on third abdominal tergite ill-developed 2
2. Postcranial setae white except for one or two rows of black setae behind postocular row *hyalipennis* (Baranov)
 Postcranial setae black except for the postgenal setae which may be hyaline 3
3. Ocellar and vertical bristles strong and distinctively flattened
 *olgae* (Rohdendorf)
 Ocellar and vertical bristles of normal size, not flattened 4

4. Dilated part of arista leaf-like and almost as broad as first flagellomere, greatest width distal to middle ; most of parafrontal and all of parafacial with golden microtomentum ; claw shorter than fifth tarsomere*ballucapitatus* Pape
 Dilated part of arista lanceolate, less than half as broad as first flagellomere, greatest width just proximal to middle ; golden microtomentum restricted to upper part of parafrontal and remaining microtomentum silvery grey ; claw at least as long as fifth tarsomere*longiunguis* Pape

23. *Phylloteles argyrozoster* Pape

(Figs. 186-194)

1989. *Phylloteles argyrozoster* Pape, *Steenstrupia*, **15** (8) : 197.

Male : Body length 3.0–5.8 mm.

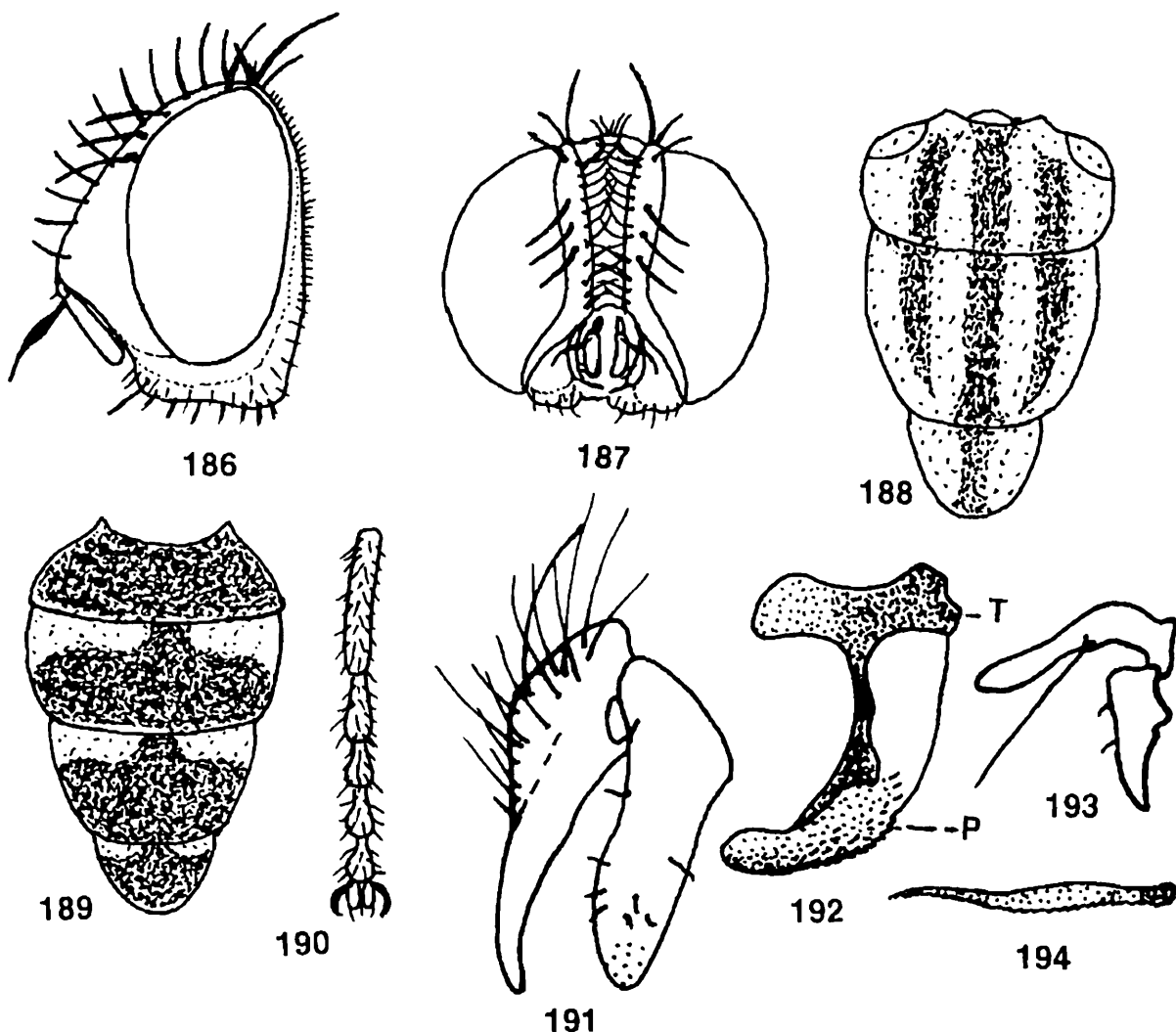
Head : Blackish ; eyes reddish–brown ; width of frons 0.50 that of one eye ; frontal vitta black, slightly widened at ocellar region, greater than that of each parafrontal and frons projecting forwards ; parafrontal black, silvery pollen but without hairs ; parafacial black, bare, with silvery pollen and its width at face level with base of antennae 0.30 that of one eye width ; antennae long and greyish-black, second segment blackish at base and light brown at tip and the third segment three times that of the second ; arista as long as third antennal segment, lanceolate, greatest width at middle and dilated at basal 0.85 ; facial ridge blackish-brown and bare ; vibrissae short about the size that of ocellar bristles and with 1–3 subvibrissal bristles ; usually 5–8 black genal setae in a row along the genal margin below the vibrissae ; frontal bristles 10–11, reaching up to base of antennae, anterior 5 reclinate, posterior 3 proclinate ; orbital bristles 4, 3 proclinate and 1 reclinate ; gena and post gena with silvery grey pollen and hyaline hairs ; inner vertical bristle well developed, outer vertical half of the inner vertical, post vertical and postocellar not traceable ; ocellar region black with moderately developed proclinate ocellar bristles and few short hairs ; ocellar bristle about half of the inner vertical ; a row of regular postocular setae, rest of the area with greyish hairs ; palpi yellow ; proboscis long and black.

Thorax : Blackish-grey with silvery pollen and three long black longitudinal stripes, the median stripe reaches up to scutellum ; *ac* 2+1 ; *dc* 2+3 ; *ia* 1+2 ; *ps* 1 ; *h* 2 ; *ph* 1 ; *np* 2+2 ; *pa* 2 ; *sa* 3 ; *st* 2 ; *mpl* 5 ; *hpl* 7-8 ; propleura bare ; scutellum black, silvery pollen and with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 2 short setae along dorsal surface of basal node to r-m and 1 setae on ventral surface of basal node of R_{4+5} ; fifth costal segment one and half times that of the third, the former with short spines along two-thirds of its anterior margin ; costal spines short ; epaulet black ;

basicostal scale yellow ; squama greyish ; halter slightly yellow ; bend of m 120° but without process ; t_p curved.

Legs : Dark brown ; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 1 bristle on posterodorsal surface on basal two-thirds ; mid femur with 2 bristles medially on anterolateral surface, a row of bristles along anteroventral surface and 2 bristles on posterodorsal surface on distal end ; mid tibia with 1 bristle each on anterodorsal and anteroventral surfaces on distal one-third and a row of 3 short bristles along posterodorsal surface on basal two-thirds ; hind femur with a row of bristles along anterodorsal surface and few sparse bristles along anteroventral surface, 1 bristle



Figs. 186-194 : *Phylloteles argyrozoster* Pape. 186, Head ♂ (lateral view); 187, Head ♂ (frontal view); 188, Thorax (dorsal view); 189, Abdomen (dorsal view); 190, Fore tarsus (dorsal view) ; 191, Inner and outer forceps (lateral view); 192, Penis (lateral view); 193, Anterior and posterior parameres (lateral view); 194, Arista (after Pape, 1989).

each on anteroventral and posterodorsal surfaces on distal one-third ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle each on anteroventral and posteroventral surfaces on distal one-third, claws and pulvilli short ; claw about 0.4 times that of fifth tarsomere, first tarsomere about total of two to fourth tarsomeres, fifth about 1.1 of fourth tarsomere.

Abdomen : Dark shining brown to black with white pollen ; second tergite black, third to fifth each with narrow anterior band of silvery microtomentum which is interrupted in the dorsomedian line and extending about 0.3 of tergal length, second without median and third with well developed median marginal bristles but each with 3 short lateral marginal bristles, fourth and fifth each with a row of marginal bristles ; sternites first to fourth each with long hairs terminally and short hairs basally ; inner forceps wide at base, apically curved and pointed ; outer forceps wide uniformly ; anterior paramere pointed and widened at base ; posterior paramere curved, blunt at end and with 1 long hair ; paraphallus wide at end, deeply curved terminally and with spines anteriorly.

Female : Similar to male in appearance but with the following differences ; profrons slightly less protruded with shorter antennae ; first segment of antennae three times as long as second but distinctly shorter than arista ; arista lanceolate, slightly less flattened than in male and with greatest width just proximal to middle.

Material examined : *Holotype* ♂, Sri Lanka : Tri. Dist., Trincomalee, China Bay Ridge Bungalow, 32m, 13–17.v.1976, K.V Krombein, P.B. Karunaratne, S. Karunaratne and D. W. Balasooriya ; *Paratype* ♂, Sri Lanka : Anu. Dist., Padaviya, Antiquities Site, 20–23. vii. 1978, K.V. Krombein, T. Wijesinhe, L. Jayawickrema and V. Kulasekare.

Discussion on species : This species is distinguished from other species of the genus by the abdominal band pattern and structure of paraphallus, by the colours of body, frontal vitta, parafrontal and parafacial and by the long third antennal segment and strong median marginal bristles on third abdominal tergite.

Biology : Nothing is known.

Distribution : SL ; Tri. Dist. (Trincomalee), Anu. Dist. (Padaviya), Mon. Dist. (Cashew Corp.), Bad. Dist. (Nilgala) and Thailand.

Type deposited : *Holotype* ♂, USNM, examined.

Discussion on type : The condition of the type is good. The genitalia parts are not dissected out from the abdomen.

24. *Phylloteles hyalipennis* (Baranov)

(Figs. 195–204)

1934. *Trichophylloteles hyalipennis* Baranov, *Encycl. ent., B (II), Dipt.*, 7 : 163.

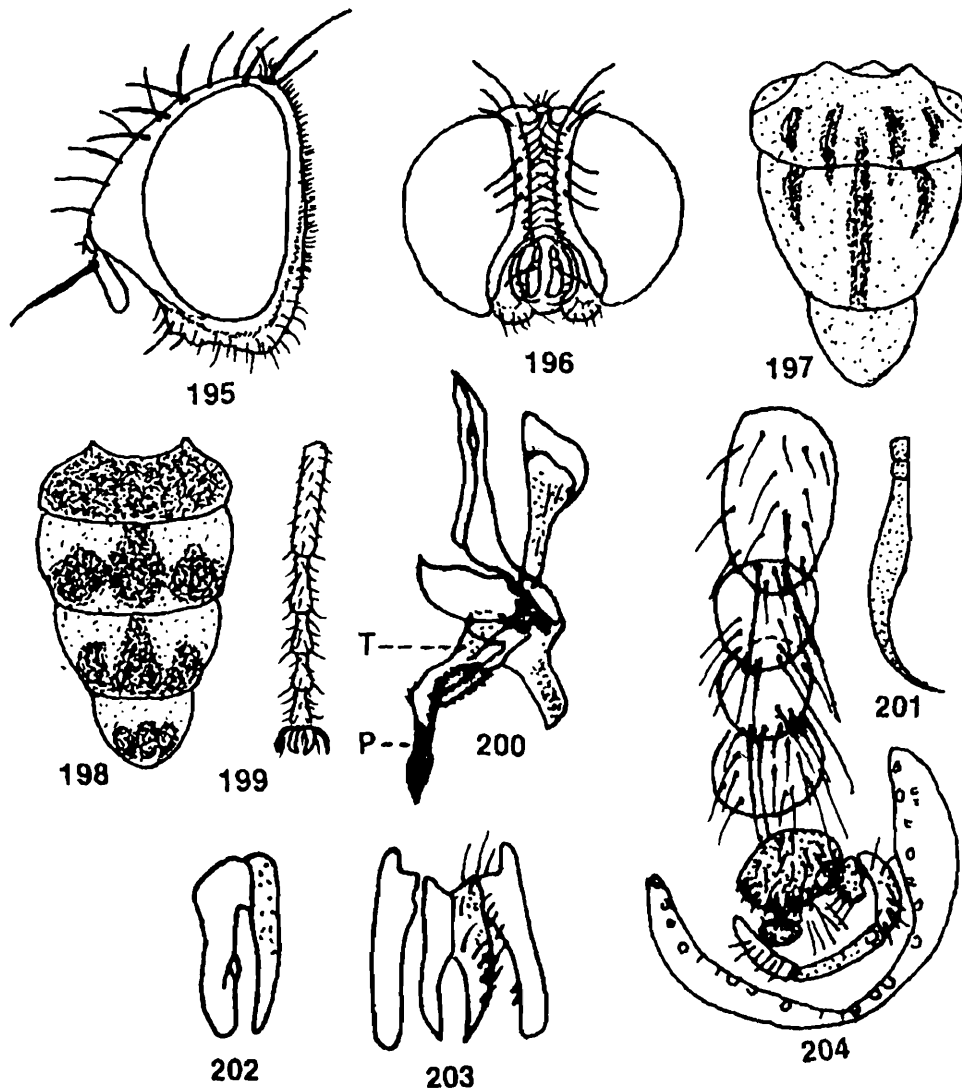
1979. *Phyllarista rohdendorfi* Verves, *Ent. Rev. Wash.*, 58(4) : 169.

1989. *Phylloteles hyalipennis* : Pape, *Steenstrupia*, 15(8) : 199 (as *hyalinipennis*).

1991. *Trichophylloteles rohdendorfi* : Verves, *Proc. Zool. Inst. USSR*, 240 : 129.

Male : Body length 5.0–6.5 mm.

Head : Dark brownish ; eyes blackish ; width of frons 0.30–0.32 that of one eye ; frontal vitta dark, gradually widened on posterior end but frons not projecting forwards and its width at face level with base of antennae 0.18–0.20 that of one eye ; parafrontal



Figs. 195-204 : *Phylloteles hyalipennis* (Baranov). 195, Head ♂ (lateral view); 196, Head ♂ (frontal view); 197, Thorax (dorsal view); 198, Abdomen (dorsal view); 199, Fore tarsus (dorsal view); 200, Penis (lateral view, after Verves, 1979); 201, Arista (after Verves, 1979); 202, Inner and outer forceps (lateral view, after Verves, 1979); 203, Inner and outer forceps (posterior view, after Verves, 1979); 204, Tip of abdomen ♀ (ventral view, after Verves, 1979).

greyish with silvery pollen but without hairs, sides of parafacial with sparse short hairs, silvery pollen and its width at face level with base of antennae 0.24–0.26 that of one eye width ; antennae brownish-black, third segment 2.0–2.2 times that of the

second, first and second and inner surface of third segment brownish-black ; arista brownish-black, longer than third segment of antennae, dilated in basal half and densely covered with prominent hairs ; facial ridge bare, reddish-brown and with silvery pollen ; vibrissae short ; vibrissal angle level is with mouth margin and with 2 supra-and 1 subvibrissal bristles ; frontal bristles 12–16, reaching up to base of antennae, anterior 3 proclinate, posterior 6 reclinate ; gena with short black hairs ; post gena blackish with silvery pollen and hyaline hairs ; orbital bristles 3 and proclinate ; inner vertical bristle well developed and twice that of outer vertical ; post ocellar short and post vertical not distinguishable ; ocellar region black with a pair of latero-proclinate ocellar bristles and 6 pairs of short hairs ; ocellar bristle equal to inner vertical ; a row of regular postocular setae, rest of the area with greyish hairs ; palpi yellow ; proboscis well developed and greyish.

Thorax : Greyish with yellowish pollen and indistinct median and 2 lateral stripes before suture and 1 lateral stripe in mesonotum, the median stripe reaching up to scutellum ; *ac* 3+2 ; *dc* 3+3 ; *ia* 0+2 ; *ps* 1 ; *h* 2 ; *ph* 1 ; *np* 2 ; *pa* 2 ; *sa* 2 ; *st* 1+1 ; *mpl* 6–7 ; *hpl* 8 ; propleura bare ; scutellum greyish with yellowish pollen and with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Transparent ; R_1 bare ; R_{4+5} with a row of 3 short setae located dorsally on basal node to r-m and 1–2 short setae on ventral surface of basal node of R_{4+5} ; fifth costal segment one and half times that of the second, the former with short spines throughout its length on anterior margin ; costal spines short ; epqulet black ; basicostal scale yellow ; squama greyish ; halter slightly yellow ; bend of m obtuse but without process ; t_p straight.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 1 bristle on posterodorsal surface on distal one-third ; mid femur with a row of 3–4 bristles along middle portion of anterodorsal surface, few short bristles with long hairs along anteroventral and posteroventral surfaces and 2 bristles on posterodorsal surface terminally ; mid tibia with 1 bristle each on anteroventral, anterodorsal and posterolateral surfaces on distal one-third and 1 short bristle each on one-third and two-thirds on posterodorsal surface on basal end ; hind femur with a row of bristles each along anterodorsal and anteroventral surfaces and few hair-like bristles along posteroventral surface on basal one-third ; hind tibia with a row of bristles each along anterodorsal and posterodorsal surfaces and 1 short bristle on anteroventral surface on distal two-fifths ; claws and pulvilli short, claw 0.7 that of fifth tarsomere ; first tarsomere slightly less than total of two to fourth tarsomeres, fifth 1.3 of fourth tarsomere.

Abdomen : Dark greyish and at sides red and densely covered with yellowish pollen anteriorly, second tergite black, third to fourth each with 3 indistinct black

spots on posterior two-thirds, fifth with 3 small spots, second tergite without median marginal bristles but third with very short median and second with 2 and third with 3 lateral marginal bristles, fourth and fifth each with a row of marginal bristles; sternites first to fourth with long hairs; inner and outer forceps narrow; outer forceps broader than the inner forceps and terminally blunt; anterior paramere, wide, broad terminally and pointed; posterior paramere narrow terminally, slightly dilated, pointed and with basal bristle-like process; paraphallus with long and broad hook-like spinous projection, apical portion of paraphallus rod-like, sharply recurved dorsally and with spines.

Female : Similar to male but can be distinguished from male by the following structures; arista not dilated; frons broader; parafacial broader; third antennal segment almost entirely orange-red; median spots on fourth abdominal tergite not reaching up to anterior margin of tergite; ninth tergite sclerotised with lateral lobes and membranous median portion; fifth to seventh sternites each with a pair of long bristles on posterior margin.

Material examined : *Holotype* ♂ of *rohdendorfi*, Sri Lanka : Karu. Dist. ; Kurunegala, Badagamuwa Jungle, 26.1.1975, K. V. Krombein; *Paratype* ♂, Sri Lanka : Anu. Dist.; Irrigation Bungalow, Padaviya, 58m, 27.ii.1970, Devis and Rooze.

Discussion on species : This species can be distinguished from *P. olgae* (Rohdendorf) by the structure of paraphallus, colours of eyes, parafacial and parafrontal, elongated arista, very short median marginal bristles on third abdominal tergite and width of frons at ocellar region. Sabrosky and Crosskey (1970) studied the type of *hyalipennis* (Baranov) and found that the genitalia in situ.

Biology : Nothing is known regarding the biology of the species.

Distribution : India ; A (Cachar, Rashed); BD; Ne (Kathmandu); SL; Anu. Dist. (Padaviya), Karu. Dist. (Kurunegala), Kan. Dist. (Laksapana), Rat. Dist. (Panamara), Bad. and Tri. districts.

Type deposited : *Holotype* ♂, BMNH, not examined.

Discussion on type : The author studied the type species of *P. rohdendorfi* and found that the condition of the type is good except the fore right leg is missing. The male genitalia were not dissected out and remain along with the specimen.

25. *Phylloteles olgae* (Rohdendorf)

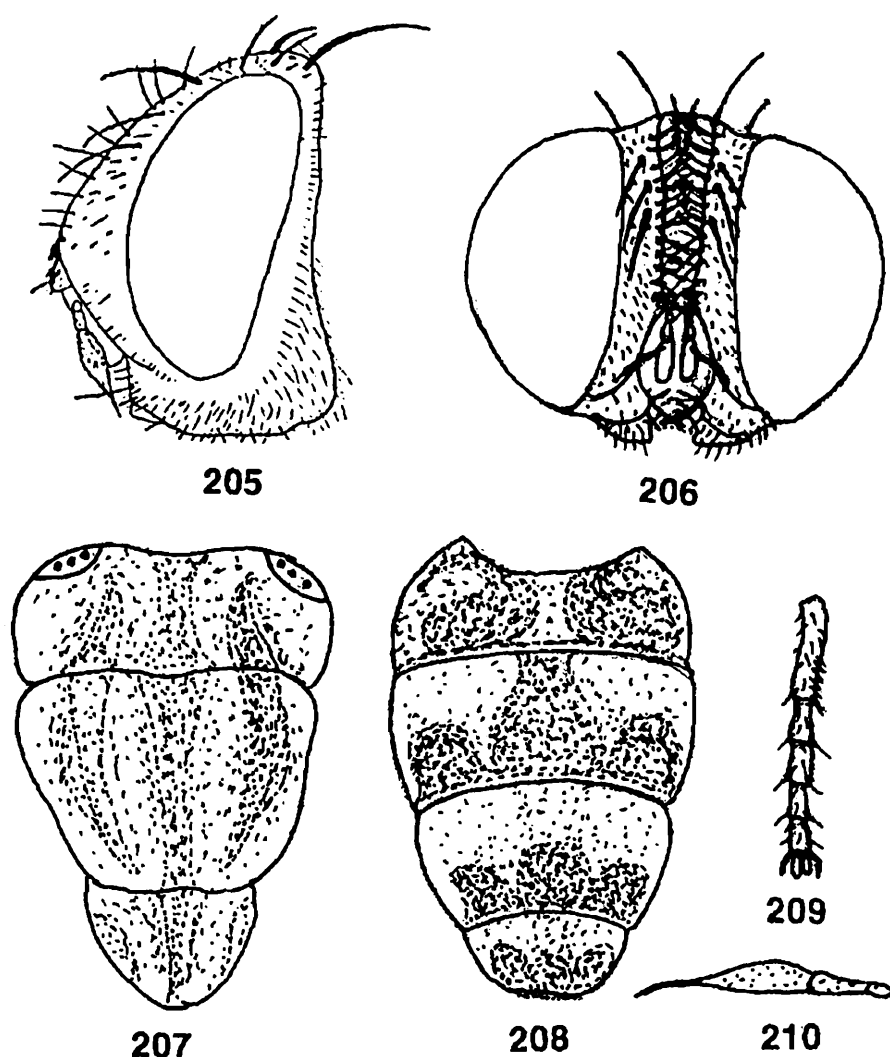
(Figs. 205-210)

1926. *Chaetophylloteles olgae* Rohdendorf, *Ent. Mitt.*, 15(5-6) : 395.

1989. *Phylloteles olgae* : Pape, *Steenstrupia*, 15(8) : 201.

Male : Body length 7.0-7.5 mm.

Head : Black ; eyes slightly reddish ; width of frons about 0.40–0.45 that of one eye ; frontal vitta black, slightly widened at end but frons not projecting forwards and its width at middle half that of each parafrontal ; parafrontal and parafacial without hairs and its width at face level with base of antennae 0.30–0.32 that of one eye width ; antennae brownish–black, second segment orange, third brownish and 2.2 times that of the second ; arista flattened and dilated up to basal 0.8 ; facial ridge bare, brownish and with brown pollen ; vibrissae short with 1 supra- and 1 subvibrissal bristles ; frontal bristles 12, posterior 5 reclinate, anterior 2 proclinate and reaching up to base of antennae ; gena brownish but without hairs ; post gena black with fine whitish hairs ; orbital bristles 2–3 and proclinate ; inner and outer vertical bristles



Figs. 205-210 : *Phylloteles olgae* (Rohdendorf). 205, Head ♂ (lateral view); 206, Head ♂ (frontal view); 207, Thorax (dorsal view); 208, abdomen (dorsal view); 209, Fore tarsus (dorsal view); 210 Arista.

well developed, the latter two-thirds that of the second, post ocellar not traceable ; ocellar region black with 6 pairs of short black hairs ; ocellar bristles strong, distinctly

flattened and half that of inner vertical ; a row of regular postocular setae, rest of the area with greyish hairs ; palpi yellow ; proboscis well developed and brownish.

Thorax : Black with three ill-developed longitudinal stripes ; *ac* 3+2 ; *dc* 3+3 ; *ia* 0+2 ; *ps* 1 ; *h* 2 ; *ph* 1 ; *np* 2 ; *pa* 2 ; *sa* 2 ; *st* 1+1 ; *mpl* 7 ; *hpl* 8 ; propleura bare ; scutellum black and with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Transparent ; R_1 bare ; R_{4+5} without short setae on dorsal surface of basal node to r-m and 2 short setae on ventral surface of basal node to R_{4+5} ; fifth costal segment slightly less than the third, the former with short setae throughout its length on anterior margin ; costal spines very weak ; epaulet black ; basicostal scale yellow ; squama whitish ; halter brown ; bend of 120° but without process ; t_p straight.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface (second row short) and a row of bristles along posterior margin of ventral surface ; fore tibia with 1 bristle on posteroventral surface on distal one-third ; mid femur with a row of 4 bristles medially along anterodorsal surface and 2 bristles on posterodorsal surface on distal end ; mid tibia with 1 bristle each on anterodorsal and anteroventral surfaces on distal one-third, 1 bristle each on one-third and two-thirds of posterolateral surface and 1 short bristle on posterodorsal surface on distal one-third ; hind femur with a row of short bristles along anterodorsal surface and a row of short bristles along anteroventral surface ; hind tibia with a row of short bristles along anterodorsal surface and 1 bristle on distal two-fifths of anteroventral surface ; claws and pulvilli short, claw about 0.6 that of fifth tarsomere ; first tarsomere two and half times that of the fourth and slightly greater than twice of fifth tarsomere.

Abdomen : Dark greyish and densely covered with yellowish pollen, second to fifth abdominal tergites each with 1 median and 2 lateral indistinct spots, the median spot on third tergite wide and bottle-necked and reaching up to the next segment but fourth and fifth extend up to middle, second tergite without median marginal bristles but third and fourth each with weak median but second with 2, third with 4 and fourth with 2 moderately developed lateral marginal bristles, fifth with a row of 16 marginal bristles.

Female : Unknown.

Material examined : 1 ♂, Pakistan : Baluchistan ; Quetta, 4. iv. 1963, G. B. Popov (dep. in BMNH).

Discussion on species : This species is similar to *P. hyalipennis* (Baranov) but differs from it by the stout ocellar and vertical bristles and also by the presence of hairs on gena. Moreover, the frontal bristles are very weak in this species in comparison with *hyalipennis*.

Biology : Nothing is known regarding the biology of the species.

Distribution : Pa (Baluchistan) and Iran.

Type deposited : *Holotype* ♂, ZMMSU, not examined.

26. *Phylloteles ballucapitatus* Pape

(Figs. 211–219)

1989. *Phylloteles ballucapitatus* Pape, *Steenstrupia*, 15(8) : 197.

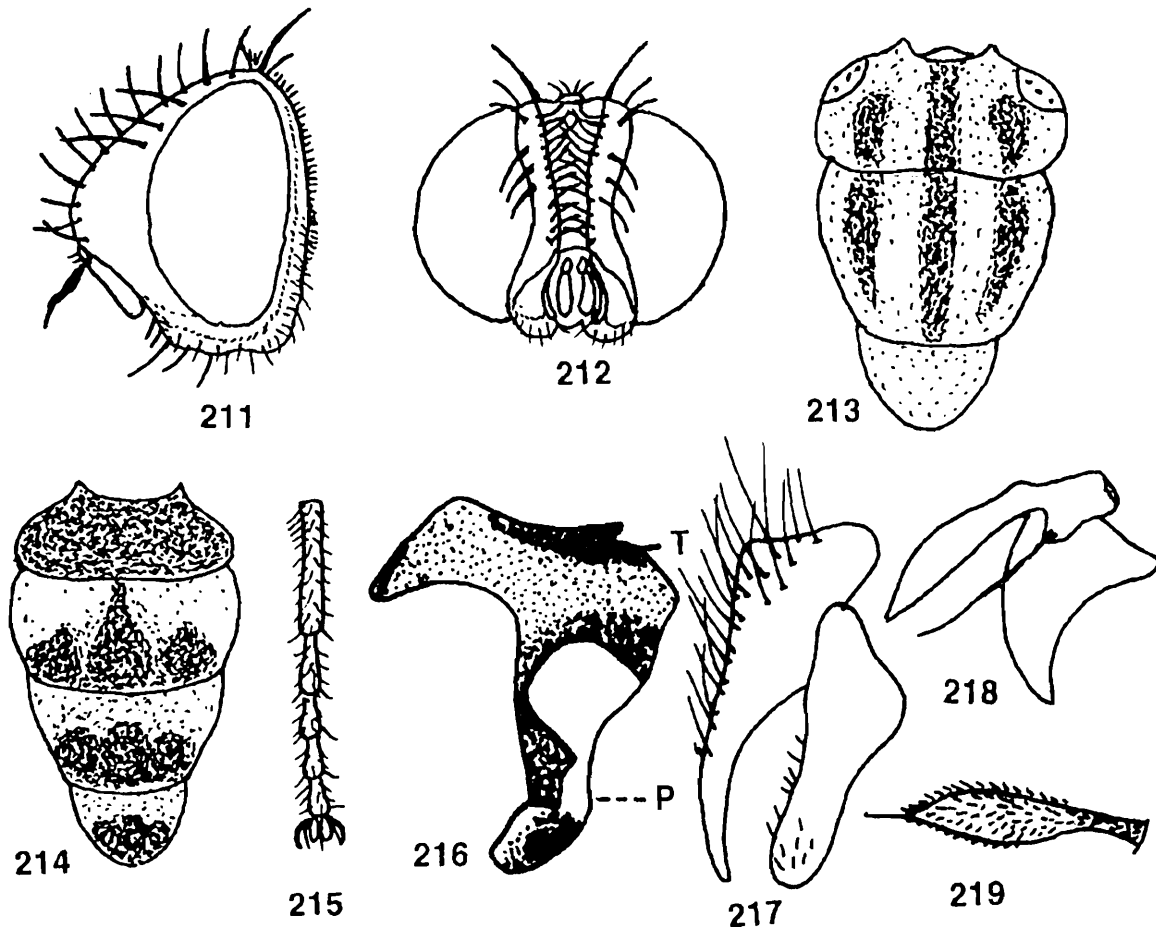
Male : Body length 4.0–5.8 mm.

Head : Greyish with yellow pollen ; eyes blackish ; width of frons 0.40 that of one eye and frons slightly projecting forwards ; frontal vitta yellowish with golden pollen, slightly black in the middle, gradually narrowed anteriorly and at ocellar region more than twice that of each parafrontal ; parafrontal and parafacial with golden pollen but without hairs and width of parafacial at face level with base of antennae 0.25 that of one eye width ; antennae light brown to greyish, second segment brownish and reddish at tip, third greyish and about twice that of the second ; arista brownish-black, widened at middle and dilated part of arista leaf-like and greatest width at distal half ; facial ridge brownish with golden pollen ; vibrissae above mouth margin ; vibrissal bristles short and slightly shorter than ocellar bristles and with 1 supra- and often 1 subvibrissal bristles ; frontal bristles 9–11, reaching below base of antennae, posterior 3 reclinate and anterior 4 proclinate ; gena and post gena blackish with golden pollen, the former with hyaline and the latter with black hairs ; orbital bristles 4, anterior 3 proclinate and posterior 1 reclinate ; inner vertical bristle well developed, outer vertical four-fifths that of inner vertical, post-vertical and postocellar very short ; ocellar region black with a pair of reclinate ocellar bristles and few short hairs ; a row of regular postocular setae, rest of the area with greyish hairs ; proboscis and palpi yellow.

Thorax : Black with silvery pollen and three black longitudinal stripes, the middle one reaches up to scutellum ; *ac* 3+1 ; *dc* 3+3 ; *ia* 2 ; *ps* 1 ; *h* 2 ; *ph* 1 ; *np* 2 ; *pa* 2 ; *sa* 1+2 ; *st* 1+1 ; *mpl* 5 ; *hpl* 6 ; propleura bare ; scutellum greyish-black and with a pair of apicoscutellar, a pair of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 2–3 short setae located dorsally on basal node to r–m and 1 setae on ventral surface of basal node of R_{4+5} ; fifth costal segment slightly less than third, the former with short spines along basal half of its anterior margin ; costal spines short ; epaulet black ; basicostal scale light yellowish ; squama white ; halter brown ; bend of m 120° but without process ; t_p straight.

Legs : Blackish-brown ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 1 bristle on posterodorsal surface on distal one-third ; mid femur with 1 bristle medially on anterodorsal surface and 2 bristles on posterodorsal surface on distal end ; mid tibia with 1 bristle each on posterodorsal and anterodorsal surfaces on distal one-third ; hind femur with a row of bristles along anterodorsal surface and 1 bristle on anteroventral surface on distal one-third ; hind tibia with a row of short bristles along anterodorsal surface, 2 bristles on posterodorsal surface medially and 1 bristle on anteroventral surface on distal two-thirds ; claws and pulvilli shorter than fifth



Figs. 211-219 : *Phylloteles ballucapitatus* Pape. 211, Head ♂ (lateral view); 212, Head ♂ (frontal view); 213, Thorax (dorsal view); 214, Abdomen (dorsal view); 215, Fore tarsus (dorsal view); 216, Penis (lateral view, after Pape, 1989); 217, Inner and outer forceps (lateral view, after Pape, 1989); 218, Anterior and posterior parameres (lateral view, after Pape, 1989); 219, Arista (after Pape, 1989).

tarsomere ; first tarsomere almost equal to total of two to fourth tarsomeres, fifth tarsomere one-third that of fourth tarsomere.

Abdomen : Blackish with yellowish pollen ; second tergite black, third and fourth each with 3 more or less triangular black spots, the spot of second with bottle-necked

and reaching up to the end of second segment, fifth with coalescence spots up to half of anterior end, second without median and third with a pair of median marginal bristles but each with 3–4 short lateral marginal bristles, fourth and fifth each with a row of marginal bristles ; sternites first to fourth with long hairs anteriorly ; inner forceps wide at base and pointed apically ; outer forceps wide at end, uniform but blunt at end ; anterior paramere wide basally, apically curved and pointed ; posterior paramere elongated, basally with process and with 1 long hair ; paraphallus gradually tapering, blunt at end and curved posteriorly.

Female : Almost similar to male but for the following differences : entirely grey coloured ; genal bristles at lower margin short but distinctly differ from other genal bristles ; arista twice as long as first segment, only slightly flattened and with greatest width at proximal half.

Material examined : *Holotype* ♂, Sri Lanka : Mon. Dist.; Ma Villu, 16-9. ix.1980, K. V Krombein, P. B. Karunaratne, T. Wijesinhe, L. Jayawickrema and V Gunawardane ; *Paratype* ♂, Mon. Dist.; Angunakolapelessa, 8–9.x.1980, coll. as *Holotype*.

Discussion on species : This species can be distinguished from other species of the genus, especially from *P. longiunguis* Pape, 1989 by the golden dust on parafrontal, parafacial and frontal vitta, by the structure of arista, paraphallus and by the colour of eye and yellowish pollen on abdomen.

Biology : Nothing is known about the biology of the species.

Distribution : SL ; Kan. Dist. (Kandy), Mon. Dist. (Ma Villu, Angunakolapelessa).

Type deposited : *Holotype* ♂, USNM, examined.

Discussion on type : The type is in good condition and the male genitalia are not dissected out.

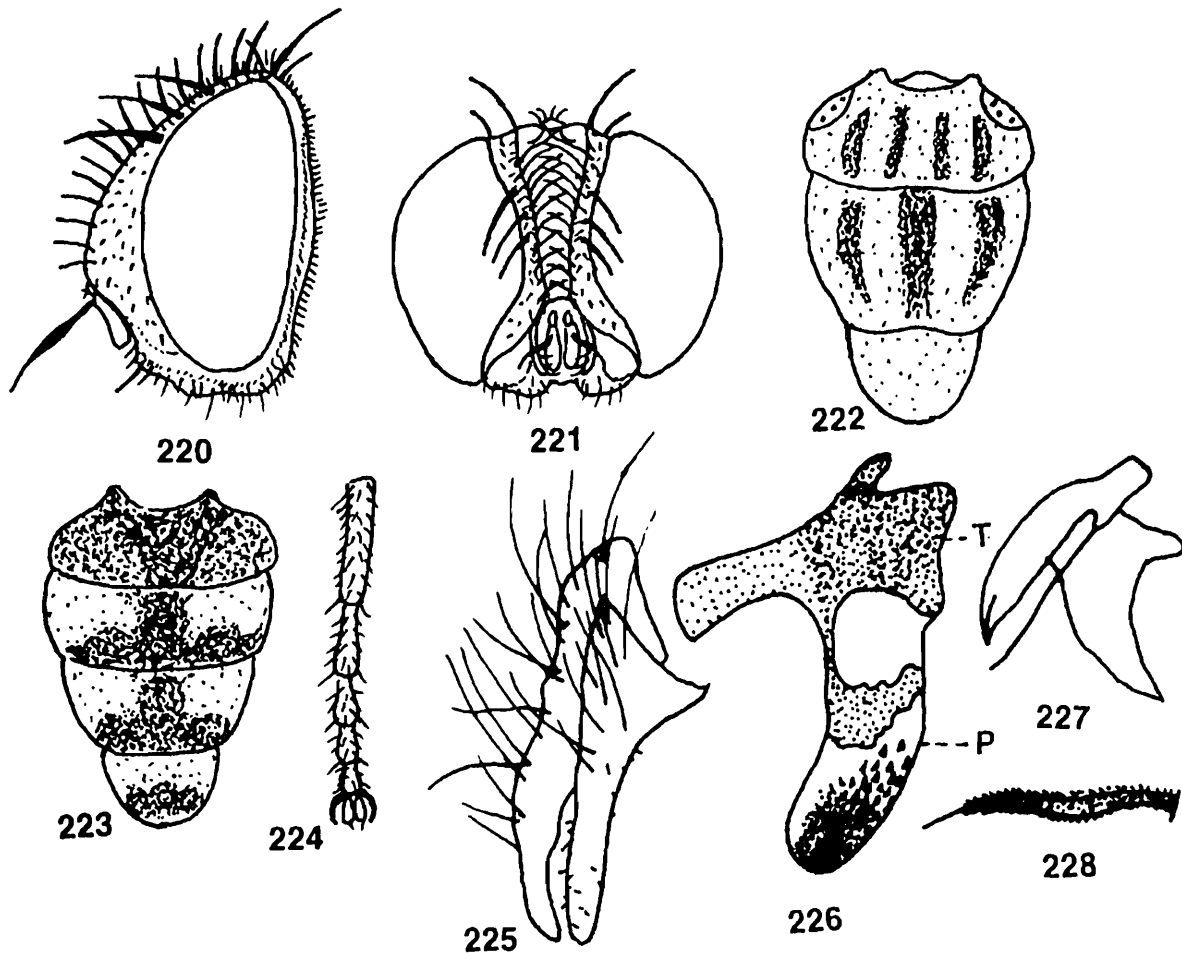
27. *Phylloteles longiunguis* Pape

(Figs. 220–228)

1989. *Phylloteles longiunguis* Pape, *Steenstrupia*, **15** (8) : 200.

Male : Body length 4.6 mm.

Head : Brownish and slightly reddish ; eyes slightly reddish ; width of frons 0.25 that of one eye and frons slightly projecting forwards ; frontal vitta greyish with golden pollen and 0.70 that of each parafrontal, gradually narrowed anteriorly and its width at ocellar region twice that of each parafrontal ; parafrontal and parafacial black with silvery grey pollen but without hairs, the width of parafacial at face level with base of antennae 0.18 times that of one eye width ; antennae greyish, third segment twice that of the second ; arista slightly widened at basal 0.8, gradually tapering at end, dilated part lanceolate and greatest width just proximal to middle ;



Figs. 220-228 : *Phylloteles longiunguis* Pape. 220, Head ♂ (lateral view); 221, Head ♂ (frontal view); 222, Thorax (dorsal view); 223, Abdomen (dorsal view); 224, Fore tarsus (dorsal view); 225, Inner and outer forceps (lateral view, after Pape, 1989); 226, Penis (lateral view, after Pape, 1989); 227, Anterior and posterior parameres (lateral view, after Pape, 1989); 228, Arista (after Pape, 1989).

facial ridge greyish ; vibrissae short, silvery pollen, slightly greater than ocellar bristle and with 2 supra-and 1 subvibrissal bristles ; gena and post gena blackish with silvery pollen and hyaline hairs ; frontal bristles 8, anterior 3 proclinate, posterior 5 reclinate and reaching up to base of antennae ; genal bristles not developed ; orbital bristles 4, anterior 3 proclinate and posterior 1 reclinate ; inner vertical bristle well developed, outer vertical short and shorter than half of inner vertical, post vertical and post ocellar not detectable ; a row of regular postocular setae, rest of the area with greyish hairs ; palpi yellowish ; proboscis long and blackish.

Thorax : Grey with three black longitudinal stripes which reach up to scutellum ; *ac* 3+1 ; *dc* 3+3 ; *ia* 2 ; *ps* 1 ; *h* 2 ; *ph* 1 ; *np* 2 ; *pa* 2 ; *sa* 1+2 ; *st* 1+1 ; *mpl* 6 ; *hpl* 8 ; propleura bare ; scutellum greyish-black at sides and with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} without setae on dorsal surface of basal node to r-m and only 1 short setae on ventral surface of basal node of R_{4+5} ;

fifth costal segment one and half times that of the second, the former with short spines throughout its length; costal spines short; epaulet black; basicostal scale yellow; squama whitish; halter slightly yellowish; bend of m obtuse but without process; t_p straight.

Legs : Brown; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with 1 bristle on posterodorsal surface on distal one-third; mid femur with 1 bristle medially on anterodorsal surface, a row of bristles along anteroventral surface and 1 bristle on posterodorsal surface on distal end; mid tibia with 1 bristle each on posterodorsal, anterodorsal and anteroventral surfaces on distal one-third; hind femur with a row of bristles along anterodorsal surface and 1 bristle on anteroventral surface on distal one-third; hind tibia with a row of bristles along anterodorsal surface and 1 bristle on anteroventral surface on distal one-third; claws and pulvilli long, claw 1.1 that of fifth tarsomere; first tarsomere slightly greater than total of two to third tarsomeres, fifth tarsomere 1.2 of fourth tarsomere.

Abdomen : Grey with silvery pollen; second tergite entirely black, third and fourth each with 3 black spots and the median spot reaching up to the next tergite, fifth black up to half, second and third without median marginal bristles but second with 2 and third with 3 lateral marginal bristles, fourth and fifth each with a row of marginal bristles; sternites first and fourth with long hairs on posterior end; inner and outer forceps narrow and elongated; anterior paramere wide and curved on anterior end; posterior paramere pointed at end with short process basally bearing long hairs; paraphallus wide and oval at end.

Female : Unknown.

Material examined : *Holotype* ♂, Sri Lanka : Ham. Dist.; Bundala Sanctuary Circuit Bungalow, 22–24. viii. 1980, K. V. Krombein, P. B. Karunaratne, T. Wijesinhe, L. Jayawickrema and L. Weeratunge.

Discussion on species : This species is distinguished from other species of the genus and especially from *P. ballucapitatus* Pape, 1989 by the long claws on legs, elongated inner and outer forceps and by the construction of paraphallus. Moreover, the absence of setae on basal node to r-m and bristles on third abdominal tergite, narrow frontal vitta and colour of eyes are also characteristics in this species.

Biology : Nothing in known.

Distribution : SL; Ham. Dist. (Bundala).

Type deposited : *Holotype* ♂, USNM, examined.

Discussion on type : The abdomen is dissected out from the type and the male genitalia are preserved in a tube which is attached on the pin of the specimen. Part

of male abdomen was placed on a triangular board and attached with the pin. The specimen is mouldy and in somewhat bad condition.

Subtribe **Hoplocephalina** Rohdendorf

This subtribe is characterised by having frons wider than 0.35 of head width ; lower part of head elongated ; eyes bare or haired ; epiphallus elongated and widened apically ; arista not flattened.

This subtribe has been revised by Verves (1988) and he (1989d) divided it into 10 genera, of which only 4 genera : *Hoplcephala* Macquart, 1846, *Hoplocephalomima* Verves, 1988, *Krombeinomyia* Verves, 1979 and *Nepalisca* Rohdendorf, 1966 are present in this area.

Some species of this subtribe live in the nests of termites.

This subtribe is distributed in the Palaearctic, Afrotropical and Oriental regions.

Key to genera

1. Sternopleural bristles more than 32
 Sternopleural bristles less than 3.....3
2. Eyes bare ; vibrissae well-developed and abdomen reddish or black
 *Hoplcephala* Macquart
 Eyes haired ; vibrissae not developed and abdomen dull black
 *Nepalisca* Rohdendorf
3. Third antennal segment twice that of the second ; arista bare
 *Hoplocephalomima* Verves
 Third antennal segment one and half times that of the second ; arista with short
 hairs*Krombeinomyia* Verves

Genus 14. ***Hoplcephala*** Macquart, 1846

1846. *Hoplcephala* Macquart, *Mém. Soc. Sci. Agric. Lille* : 283.

 Type species : *Hoplcephala tessellata* Macquart, 1846.

1855. *Dichoetometopia* Macquart, *Mém. Soc. Sci. Agric. Lille* : (2) 1 : 126.

 Type species : *Dichoetometopia rufiventris* Macquart, 1855 (= *Hoplcephala essellata* Macquart, 1846).

1913. *Hoplocephalopsis* Villeneuve, *Rev. zool. afr.*, 3 : 110.

 Type species : *Hoplocephalopsis schistacea* Villeneuve, 1913.

1916. *Hoplocephalina* Villeneuve, *Ann. S. Afr. Mus.*, 15 : 510 (as subgenus).

 Type species : *Hoplocephalina maculosa* Villeneuve, 1916.

1961. *Curranitopia* Zumpt, *Explor. Parc natn. Virunga*, **98** : 25.

Type species : *Hoplcephala irvingi* Curran, 1928.

Morphology : Propleura with several black setae or bare ; parafacial without a row of strong, demarcated bristles near the inner edge but densely beset with normal or bristly hairs ; ocellar bristles weak or indistinct in the male, but well developed in the female ; vibrissae well distinguished and much longer than oral bristles ; parafrontal bristles 4–6 pairs which may be cruciate and of normal or unusual length ; thorax mostly dull black ; abdomen mostly reddish with median stripe and lateral black spots.

Discussion : This is a rather small genus and most of the species are present in the Afrotropical region. Dear (1980) reported a total of 13 species from this region. He used *Hoplcephala* instead of *Hoplocephala* and mentioned that the latter is a variant spelling. Zumpt (1961) separated this genus from *Curranitopia* Zumpt, 1961 due to the presence of setae on the upper part of propleura but Dear (1980) synonymized this genus with *Curranitopia*. Curran (1928) reviewed it and Zumpt (1961) made a good contribution on this genus from Africa. Only 1 species is present here.

Biology : Little is known regarding the biology of the species of this genus but Verves (1991) reported that larvae may be found in termite nests.

Distribution : Mostly distributed in the Afrotropical region and 1 species is available in the Oriental region.

28. *Hoplocephala asiatica* Verves, 1991

1991. *Hoplocephala asiatica* Verves, *Proc. Zool. Inst., USSR*, **240** : 129.

Female : Body length 10 mm.

Head : Head silvery-grey with yellowish fringe ; eyes bare ; frontal vitta dull black and almost without coating ; width of frons 0.38 that of head width and at face level with base of antennae 0.49 that of head width ; frontal vitta parallel, its width at middle about half that of one eye width ; antennae brownish-black, tip of third antennal segment brownish and its length about one and half times that of the second ; arista black, bare, elongated, its base only widened and this part not more than one-third that of its length but more than one and half times that of its breadth ; width of parafacial at base of antennae 0.27 that of one eye width and parafrontal at base of antennae 0.25 of one eye width ; the edge of mouth is slightly projecting forwards but head not projecting forwards ; outer vertical bristle well developed and shorter than twice that of inner vertical ; orbital bristles 1+3, strong and directed forwards and laterally ; frontal bristles 8–9, strong and curved ; vibrissae well developed, strong and with a row of strong bristles along the inner edge ; parafrontal and parafacial

with silvery grey coating and slightly yellowish near the frons, the former with thick small hairs, the latter with a row of strong bristles along vibrissal edge ; a pair of rows of postocular setae, rest of the area with small black hairs ; palpi long and widened slightly at the end ; proboscis short.

Thorax : Black with grey-yellowish coating but with well-developed median and lateral black stripes, the middle stripe is in the form of indistinct dark spot ; *ac* 0+2 ; *dc* 2+3 ; *ia* 1+3 ; *ps* 1 ; *h* 2 ; *ph* 2 ; *np* 2 ; *pa* 2 ; *st* 3+1 ; *mpl* 6 ; *hpl* 7 ; propleura bare ; scutellum with three pairs of apicoscutellar and one pair of discoscutellar bristles.

Wings : Transparent ; R_1 bare ; R_{4+5} with a row of bristles on dorsal surface along basal two-thirds and 2-3 short setae on ventral surface of basal node to R_{4+5} ; R_{4+5} narrowly open and almost closed ; costal segment small but weakly visible ; fifth costal segment slightly longer than the third ; basicosta and epaulet yellow ; squama whitish ; bend of *m* at acute angle and with well developed process ; *m* and *cu* slightly bend.

Legs : Black ; mid tibia with a row of 4 anterodorsal bristles on basal half ; claws short and slightly bent.

Abdomen : Slightly grey with iridescent coating ; second and third abdominal tergites without median marginal bristles, fourth and fifth each with a row of strong marginal bristles, sixth entire with many marginal bristles, third and fourth tergites with iridescent dark lateral stripes on posterior half ; fifth tergite with small stripe at the middle ; sternites with closely set short hairs but with long bristles on posterior margin ; genitalia black.

Male : Unknown.

Material examined : The material was not available for examination and the description provided here is mostly from the original description.

Discussion on species : Verves (1991) distinguished it from all other species of the genus by bare eyes and mentioned that due to absence of male specimen it was not possible to determine the exact relationship with the other species.

Biology : This species was collected from tropical forest.

Distribution : SL ; Kandy.

Type deposited : *Holotype* ♀, ZISP, not examined.

Genus 15. *Nepalisca* Rohdendorf, 1966

1966. *Nepalisca* Rohdendorf, *Bull. Br. Mus. nat. Hist. (Ent.)*, B, 17 (10) : 463; Verves, 1986. *Cat. Palae. Dipt.*, 12 : 105.

Type species : *Nepalisca dasyops* Rohdendorf, 1966.

Morphology : Eyes densely haired; third antennal segment twice that of the second; arista long with long hairs throughout; vibrissal angle place far higher than usual

and epistome and parafacial are very reduced; parafacial plate with numerous dark long hairs ; vibrissae not differentiated and vibrissal ridge with a row of 8 strong bristles below; frons prominent and projecting forwards; proboscis short; *ac* 0+1 and short; *st* 3+1; propleura bare; claws shorter than fifth tarsomere; R_{4+5} open with short setae up to middle; abdomen short, ovate and with long bristles on third, fourth and fifth tergites; frontal bristles well developed.

Discussion : This is a small genus and Rohdendorf (1966) distinguished it from *Hoplcephala* Macquart, 1846 by the densely haired arista and eyes and by the construction of wing veins in the anterior half of wing.

Biology : This genus is mostly present in forest areas.

Distribution : Distributed in the Oriental region.

29. *Nepalisca dasyops* Rohdendorf

(Figs. 229-233)

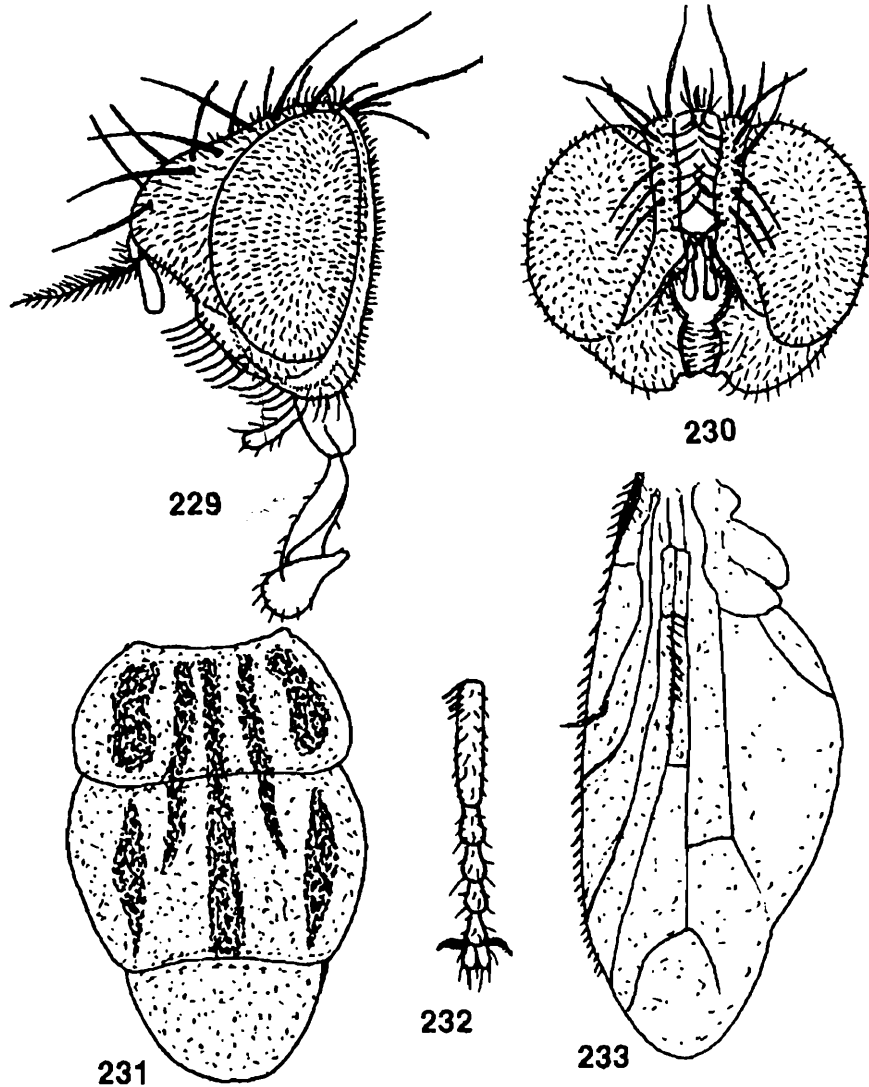
1966. *Nepalisca dasyops* Rohdendorf, *Bull. Br. Mus. nat. Hist. (Ent.)*, B, 17 (10) : 464; Lopes Kano, Shinonaga and Kurahashi, 1977, *Cat. Dipt. Orient. Region*, 3 : 562.

Male : Body length 8.2 mm.

Head : Reddish-grey; eyes red; width of frons 0.38 that of one eye and frons projecting forwards; frontal vitta yellowish, narrow and narrowest in the middle and in front of ocellar triangle about twice that of each parafacial; parafacial black with short hairs; parafacial deep black with more dense short black hairs besides short bristles, its width at face level with base of antennae 0.25 that of one eye width; antennae black, slightly narrowed and rounded apically; third antennal segment twice that of second; arista dilated up to basal 0.3 and with rather dense short hairs throughout its length; facial ridge brownish and bare; vibrissae not differentiated; vibrissal angle and vibrissal ridge anteriorly shining black with a row of 8 subvibrissal bristles; frontal bristles 5-7, proclinate and not reaching up to base of antennae, posterior 2 pairs shorter; orbital bristles 5, anterior 3 strong, proclinate and posterior 2 reclinate; gena black with short black hairs; post gena greyish black with short greyish densely haired ; outer vertical bristle well developed, inner vertical almost one and half times that of outer vertical, post vertical very short, shorter than post ocellar and about two-fifths that of outer vertical, ocellar region brownish with 1 pair of reclinate bristles and few short hairs; ocellar bristle less than frontal bristle; a pair of rows of regular postocular setae, rest of the area with short greyish hairs; palpi black and greyish at tip ; proboscis black.

Thorax : Dark in colour, grey dusted and with five black longitudinal stripes, the median stripe slender, the lateral stripes broader and the former reaching up to scutellum and latter extends up to middle of mesonotum; *ac* 0+1; *dc* 2+3; *ia* 1+2;

ps 1; *h* 2; *ph* 2; *np* 2; *pa* 2; *sa* 2; *st* 3+1; *mpl* 4; *hpl* 7; propleura bare; scutellum black laterally, light black distally and with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of short discoscutellar bristles.



Figs. 229-233 : *Nepalisca dasyops* Rohdendorf. 229, Head ♂ (lateral view); 230, Head ♂ (frontal view); 231, Thorax (dorsal view); 232, Fore tarsus (dorsal view); 233, Wing.

Wings : Subhyaline with brown veins; R_1 bare; R_{4+5} with a row of 6 short setae located dorsally and extending up to half from the basal node to r-m and 2 short setae on ventral surface of basal node of R_{4+5} ; fifth costal segment slightly longer than the third, the former with short spines along entire length on its anterior margin; costal spines short; epaulet black; basicostal acule yellowish; squama white; halter brownish; bend of m 130° with process; t_p almost straight and faintly blackish.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of short bristles along anterodorsal surface and 2 bristles apart medially on posterodorsal surface; mid femur with a row of 4 bristles along middle portion of

anterolateral surface, a row of bristles along anteroventral surface, a row of 3 bristles along posteroventral surface and 3 bristles terminally on posterodorsal surface; mid tibia with 1 bristle each on anteroventral and posteroventral surfaces on distal one-third and a row of 3 bristles (1 short) along basal one-third of anterodorsal surface; hind femur with a row of bristles along anterodorsal surface, a row of 3 long bristles and few short hairs along posterodorsal surface and a row of bristles along anterodorsal surface; hind tibia with a row of bristles along anterodorsal surface, 2 bristles apart along anteroventral surface medially and a row of bristles along long hairs on posterodorsal surface; claws and pulvilli short; first tarsomere of fore leg equal to the rest of three, fifth tarsomere 1.2 times that of the fourth and 2.5 times that of the first tarsomere.

Abdomen : Dark black and densely grey dusted; second tergite black in the middle and at the sides of dorsal surface with small rounded spots, third with poorly defined paired spots in the middle and well defined lateral spots, fourth with similar in colour but the middle spot less defined, fifth with only 1 poorly defined median spot and in addition to many blackish dots at the bases of all bristles, second with extensive marginal bristles, third with a pair of median marginal bristles but second and third each with lateral marginal bristles, fourth and fifth each with a complete row of marginal bristles; genitalia small and black; inner forceps in lateral view acute and slightly curved ventrally; outer forceps long and rounded at apex; parameres dark, strongly toothed and cylindrical; paraphallus simple in structure; ventralia straight and toothed on its margin.

Female : Unknown

Material examined : *Holotype* ♂, East Nepal : Teplejung Dist., Sangu, 1,972 m, 17.x. 1-xi. 1961, R. L. Coe.

Discussion on species : This species is distinguished from other species in having haired eyes, haired arista and specialised structure of vein pattern.

Biology : Nothing is known but the specimen was collected from edge of mixed forests.

Distribution : Ne; Sangu.

Type deposited : *Holotype* ♂, BMNH, examined.

Discussion on type : In type material, the abdomen and right mid leg are missing and right wing is slightly damaged on anterior portion.

Genus 16. *Hoplocephalomima* Verves, 1988

1988. *Hoplocephalomima* Verves, *Vest. Zool.*, **3** : 16.

Type species : *Hoplocephalomima nathani* Verves, 1988.

Morphology : Grey coloured flies of big size; eyes bare; frons about 0.3 of head width and is equal to the width of eye; parafacial with short hairs; base of antennae is placed lower of the half of the eye height; third segment of antennae almost twice that of second; arista bare and basally thickened; vibrissal angle is raised above the mouth margin; vibrissae longer and stronger; post orbital bristles well developed and somewhat shorter than inner vertical; orbital bristles 1+3-4, longer and stronger; frontal bristles many and not so stronger; eyes and facial with scattered short hairs; gena with vertical row of bristles; *ac* 0+1-2; *st* 2+1; propleura bare; claws short and curved; R_{4+5} narrowly open with several basal bristles; R_1 bare; seventh and eighth tergites separated in the middle; sixth sternite prolonged.

Discussion : This is a very small genus known by 1 species from India.

Biology : Nothing is known regarding the biology of the species of this genus.

Distribution : This genus is only distributed in the Oriental region.

30. *Hoplocephalomima nathani* Verves

(Figs. 234-239)

1988. *Hoplocephalomima nathani* Verves, *Vest. Zool.*, **3** : 16.

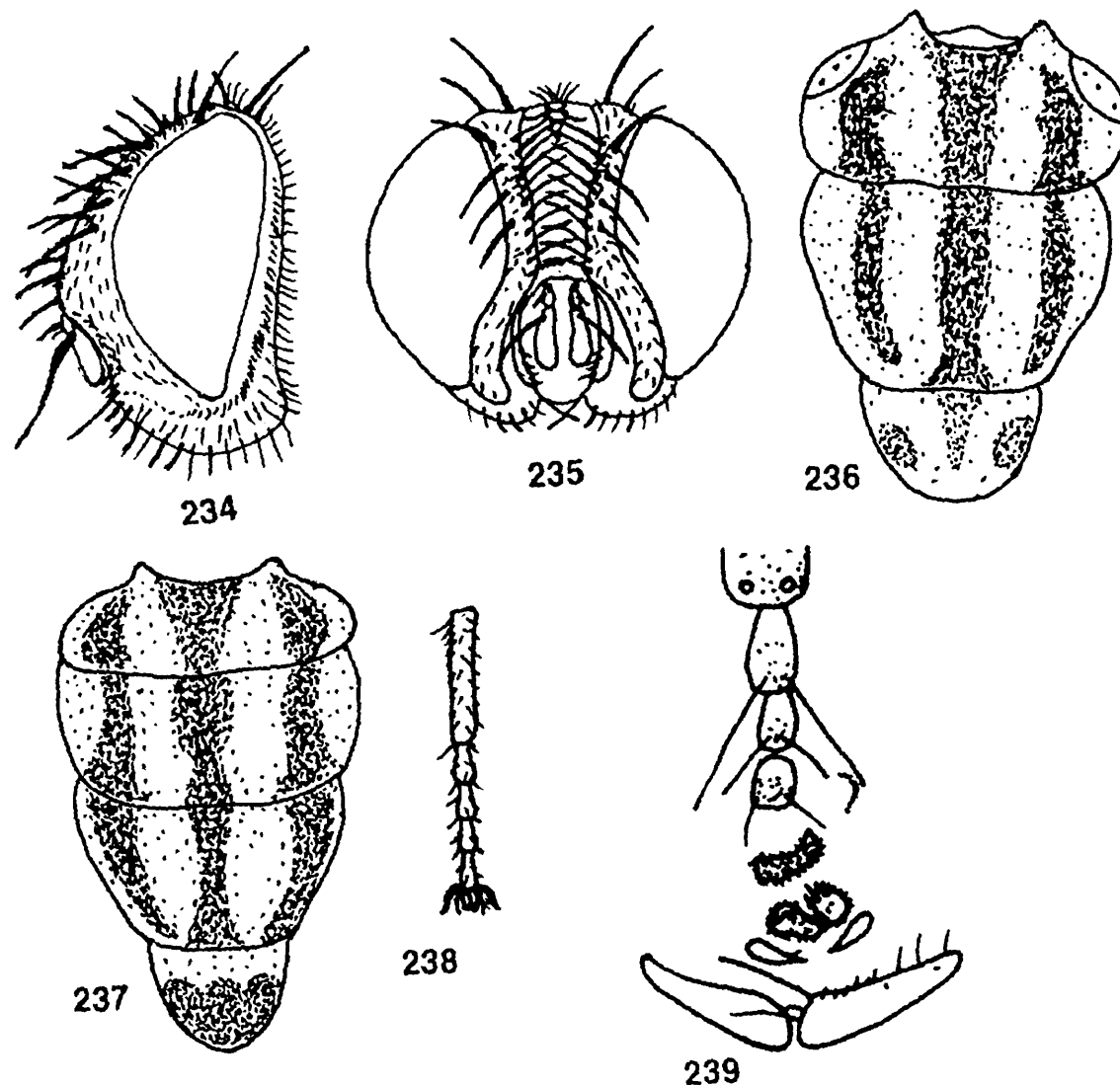
Male : Body length 10.5 mm.

Head : Greyish with silvery pollen; eyes brownish; width of frons 0.54 that of one eye and frons not projecting forwards; frontal vitta black and 0.8 times that of each parafrontal in middle region, gradually narrowed anteriorly and in front of ocellar region about half that of each parafrontal; parafrontal and parafacial black, silvery pollen and with short black hairs and posterior part of frons with dense greyish short hairs; width of parafacial at face level with base of antennae 0.35 that of one eye width; antennae reddish-brown, first and second segments reddish, third brownish and twice that of second; arista brownish black, bare and dilated up to basal 0.35; facial ridge black and bare; vibrissae moderately developed with 8-9 subvibrissal bristles and hairs near vibrissal ridge are more developed; frontal bristles 10-12, anterior 5 proclinate, posterior 2 reclinate and reaching not up to base of antennae; orbital bristles 4, anterior 3 proclinate and posterior 1 reclinate; gena with black hairs; post gena blackish with greyish hairs; inner vertical bristle well developed, outer vertical short and about equal to inner vertical, post vertical very short, post ocellar short and one-third that of inner vertical; ocellar region black with a pair of proclinate bristles and many short hairs; ocellar bristles greater than last posterior frontal bristle; a row of regular postocular setae, rest of the area with short greyish hairs; palpi yellowish and slightly reddish at tip; proboscis short and black.

Thorax : Grey with blackish yellow pollen and three well defined dark longitudinal stripes, yellowish tinge at the lateral sides and with dark spots before suture; *ac* 0+1;

de 2+3; *ia* 1+2-3; *ps* 1; *h* 2; *ph* 2; *np* 1; *pa* 2; *sa* 2; *mpl* 8; *hpl* 6; propleura bare; scutellum with indistinct median and lateral black stripes and a pair of apicoscutellar, 2 pairs of lateroscutellar and 2 pairs of short discoscutellar bristles.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 8 short setae on dorsal surface extending up to two-fifths from the basal node to r-m and 2 short setae on ventral surface of basal node of R_{4+5} ; fifth costal segment slightly greater than



Figs. 234-239 : *Hoplocephalomima nathani* Verves. 234, Head ♂ (lateral view); 235, Head ♂ (dorsal view); 236, Thorax (dorsal view); 237, Abdomen (dorsal view); 238, Fore tarsus (dorsal view); 239, Rear view of genitalia ♀ (after Verves, 1988).

third, the former with short spines along its basal four-fifths; costal spines short; epaulet black; basicostal scale yellowish; squama greyish with yellow stripe; halter yellowish; bend of *m* 140° with short process; *t_p* arcuate.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row

of bristles along anterodorsal surface and 1 bristle on posteroventral surface on distal one-third; mid femur with a row of 5 bristles medially along anterolateral surface, 3 bristles along posterodorsal surface on distal one-fourth and a row of bristles basally with comb-like setae distally along posteroventral surface; mid tibia with 1 bristle on anterodorsal surface medially, 2 bristles apart on posterolateral surface medially, 1 on posterodorsal surface on two-thirds of basal end and 1 on anteroventral surface of distal one-third; hind femur with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface on distal one-fourth and a row of 5 bristles along posteroventral surface on basal half; hind tibia with a row of short and 2 long bristles along posterodorsal surface, 1 bristle on anteroventral surface on distal one-third but without long hairs; claws and pulvilli moderately long, claw 0.7 of fifth tarsomere; first tarsomere slightly greater than total of second to third tarsomeres, fourth 1.3 of the second tarsomere.

Abdomen : Greyish-black; second, third and fourth tergites yellowish-grey with three black longitudinal stripes, fifth with 3 weakly developed spots on two-thirds, second and third abdominal tergites without median marginal bristles but second with 1 and third with 2 short lateral marginal bristles, fifth with a row of marginal bristles; sternites first to fourth with short hairs and hair-like bristles; fifth sternite Y-shaped; genitalia short, black and with weak tomentum; inner and outer forceps slightly elongated but the former with blunt end; anterior and posterior parameres curved; paraphallus with backward process.

Female : Similar to male.

Material examined : *Holotype* ♂, India : Tamil Nadu ; Anamalai Hills (Cinchona), ix.1956, P. S. Nathan.

Discussion on species : This species is peculiar in having long arista, parafacial with short hairs, well developed post orbital and strong orbital bristles.

Biology : Nothing is known regarding the biology of the species.

Distribution : India ; TN, Anamalai Hills (Cinchona).

Type deposited : *Holotype* ♂, ZML, examined.

Discussion on type : In *Holotype* the ♂ genitalia are dissected out, kept inside a tube and the tube has been attached with the pin of the specimen.

Genus 17. *Krombeinomyia* Verves, 1979

1979. *Krombeinomyia* Verves, *Ent. Rev. Wash.*, **58** (4) : 167.

Type species : *Krombeinomyia marabilis* Verves, 1979.

Morphology : Dark coloured and medium sized flies; width of frons at vertex slightly narrower than eye width and its width at face level with base of antennae equal to one eye width; eyes bare; frontal vitta well developed, shorter and practically

narrower than orbit; frons and oral margin scarcely projecting; vibrissal angle above mouth margin; inner vertical bristles stronger and longer than surrounding bristles; antennae of medium length and third segment 1.5 times that of the second; arista with short hairs, basally thickened and second segment elongated; several short hairs above inner vertical; parafacial medium in width, densely covered with short hairs and a row of bristles along median line; gena and post gena narrow and covered with dark hairs; a row of postorbital bristles; *ac* 0+1; other thoracic bristles short with long dense hairs between them; *st* 1+1; propleura bare; mid tibia with 1 anterodorsal bristle; claws short and curved; segment of fore tarsi of male without swelling, bristles and hairs; R_{4+5} close to wing margin; t_p s-shaped; third section of *m* longer than fourth; R_1 bare; R_{4+5} with basal bristles; abdomen oblong or oval; male genitalia small.

Discussion : This is rather small genus and represented by 2 species from India. According to Verves (1979b) this genus is similar to *Synorbitomyia* Townsend, 1933 but can be distinguished from it by having practically bare eyes, R_{4+5} close on wing margin, 3 proclinate orbital bristles and absence of *ac* before suture.

Biology : Nothing is known regarding the biology of the species of this genus.

Distribution : This genus is only distributed in the Oriental region.

Key to species

1. Antennae black; frontal bristles less than 8 pairs; apical part of paraphallus elongated; third abdominal tergite with a pair of median marginal bristles.....
.....*indica* Verves
- Antennae red-yellowish; frontal bristles more than 8 pairs; apical part of paraphallus short; third abdominal tergite without median marginal bristles ..
.....*mirabilis* Verves

31. *Krombeinomyia indica* Verves

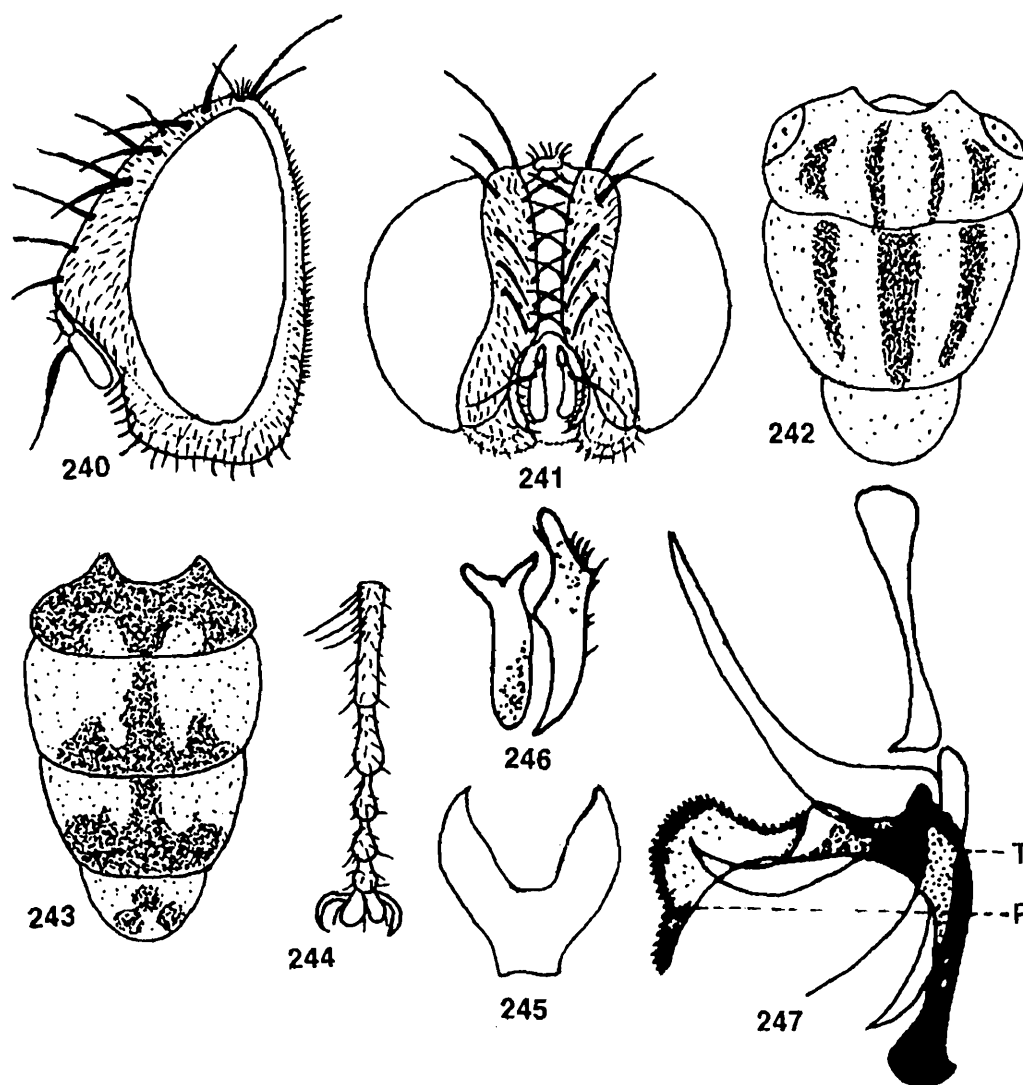
(Figs. 240-247)

1988. *Krombeinomyia indica* Verves, *Vest. Zool.*, 3 : 15.

Male : Body length 8.5 mm.

Head : Blackish with grey dusted; eyes black, practically bare and sometimes with short hairs; width of frons about 0.55 that of one eye and frons slightly projecting forwards; frontal vitta slightly blackish, gradually broadened on both sides and with silvery pollen, its width at middle of frons less than half and in front of ocellar 0.35 that of each parafrontal; parafrontal slightly yellowish with scattered hairs; parafacial yellowish with white pollen and few scattered hairs, its width at face level with base of antennae 0.37 that of one eye width; antennae black, uniformly thickened and

third antennal segment 1.5 times that of the second ; arista long and dilated up to basal 0.5 ; facial ridge bare ; vibrissal angle less prominent and slightly anterior to mouth margin; vibrissae moderately developed with 6-7 short supravibrissal bristles ; frontal bristles 6-8, strong, reaching up to base of antennae, posterior 1 reclinate,



Figs. 240-247 : *Krombeinomyia indica* Verves. 240, Head ♂ (lateral view); 241, Head ♂ (frontal view); 242, Thorax (dorsal view); 243, Abdomen (dorsal view); 244, Fore tarsus (dorsal view); 245, Fifth sternite; 246, Inner and outer forceps (lateral view); 247, Penis (lateral view, after Verves, 1988).

anterior 2 proclinate ; orbital bristles 1+3-4, stronger, anterior 2-3 proclinate and posterior 1 reclinate; gena brownish, short and covered with short hairs and pollen ; post gena yellowish with grey pollen and short hairs ; inner vertical bristle well developed, outer vertical short and half of the inner vertical, post vertical and post ocellar not differentiated; ocellar triangle black with a pair of long proclinate and many long hairs ; a pair of rows of regular postocular setae, rest of the area with greyish hairs; palpi yellowish-orange; proboscis long and black.

Thorax : Blackish, silvery pollen and with four narrow dark black longitudinal stripes before suture and three more wider stripes in mesonotum; *ac* 0+1; *dc* 2+3; *ia* 1+3; *ps* 1; *h* 2; *ph* 2-3; *np* 2; *pa* 2; *sa* 2; *st* 1+1; *mpl* 7-8; *hpl* 6; propleura bare; scutellum with greyish pollen and with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of very short discoscutellar bristles.

Wings : Transparent with brown veins; R_1 bare; R_{4+5} with a row of very short setae located dorsally along more than basal half and 2 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment slightly greater than third, the former with short spines along whole length of its anterior margin; costal spines very short; epaulet black; basicostal scale slightly yellowish; epaulet black; squama greyish-yellow with yellow spines along the edges; halter slightly brownish; bend of *m* less than 120°; t_p straight with process.

Legs : Black; fore femur with a row of bristles along posterodorsal surface and a row of 4 short bristles along posterior margin of ventral surface on basal one-third; fore tibia with a row of short bristles along posterodorsal surface; mid femur with a row of bristles each along anteroventral and posterodorsal surfaces, 3 bristles along middle portion of anterolateral surface, 4 bristles on distal end of posterodorsal surface and a row of few long and short setae along posteroventral surface; mid tibia with 1 bristle each on anteroventral and posterodorsal surfaces on distal one-third; hind femur with a row of bristles each along anterodorsal, anteroventral and posteroventral surfaces; hind tibia with a row of short bristles along posterodorsal surface and 1 bristle on anteroventral surface on distal one-third; claws and pulvilli short, claw 0.7 of fifth tarsomere ; first tarsomere equal to total of two to fifth tarsomeres and tarsus without erect bristles.

Abdomen : Blackish with shiny pollen; second abdominal tergite with bright iridescent design and black spots, third and fourth each with a pair of long median and two triangular lateral spots on distal half, fifth with 3 small spots, second without median marginal bristles, but third with a pair of median and 2 lateral marginal bristles, fourth and fifth each with a row of complete hair-like marginal bristles; sternites first to fourth with short hairs basally and long hairs distally; fifth sternite Y-shaped with slightly pointed lateral arms; genital segments black with weak pollen; inner forceps long, curved and with subapical slight projection; outer forceps almost straight and bifurcated at basal end; anterior paramere wide, gradually pointed and curved apically; posterior paramere straight, pointed at end, with slight projection at subbasal end and bearing 1 long bristle; paraphallus long, pointed at end with numerous spines and widened subapically.

Female : Unknown.

Material examined : *Holotype* ♂, India : Tamil Nadu; Shevaroy Hills (Yercaud), 1,372 m, O.i. 1955, P. S. Nathan; 1 ♂, Sri Lanka : Manna Dist.; Manna town, 13. iv. 1968, Thomas F. Halstead.

Discussion on species : This species is similar to *K. mirabilis* Verves, 1979 but can be distinguished from it by the structures of apical plate of paraphallus and anterior paramere. Moreover, frontal bristles are more developed, frons wider and also the abdominal spot patterns are quite distinguishable here from other species.

Biology : Nothing is known regarding the biology of this species.

Distribution : India ; TN, Shevaroy Hills (Yercaud); SL; Manna Dist. (Manna town).

Type deposited : *Holotype* ♂, ZML, examined.

Discussion on type : In *Holotype* the right fore leg and all the tarsi except left tarsus are missing. Genitalia are dissected out, kept inside a tube and the tube has been attached with the pin of the specimen.

32. *Krombeinomyia mirabilis* Verves

(Figs. 248-255)

1979. *Krombeinomyia mirabilis* Verves, *Ent. Rev. Wash.*, 58 (4) : 167

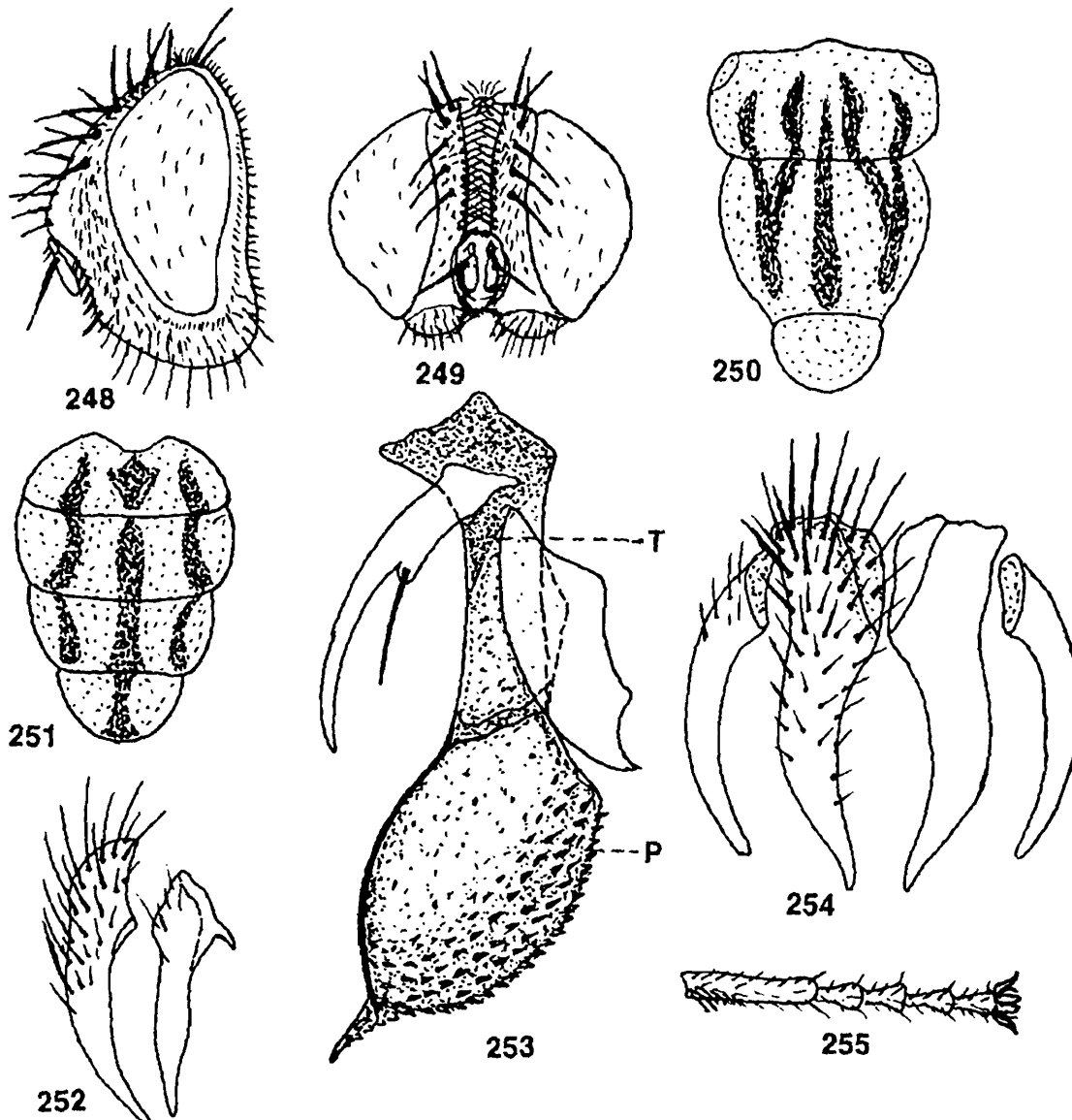
Male : Body length 5.5 mm.

Head : Blackish; eyes black; width of frons about 0.15 that of one eye; frons narrow and slightly projecting forwards; frontal vitta not broadened anteriorly; parafrontal slightly yellowish with silvery pollen; width of parafacial at face level with base of antennae 0.17 to 0.19 that of one eye width; parafacial slightly yellowish, silvery pollen but without hairs; antennae red yellowish, slightly thickened up to proximal 0.5 to 0.6 and third antennal segment about 1.5 times that of the second; arista flattened up to less than basal half, slightly yellowish, with silvery pollen and a row of 5-6 bristles; vibrissae well developed; vibrissal angle less developed and slightly above mouth margin; frontal bristles 14, anterior 8-9 reclinate, posterior 5-6 proclinate; orbital bristles 3, anterior 2 proclinate and posterior 2-3 reclinate; gena very narrow with brown hairs and pollen; post gena with short white hairs; ocellar triangle black with short hairs; post ocellar not distinguishable; inner vertical bristle well developed, outer vertical shorter and about two-thirds that of inner vertical, post vertical very short; a row of regular postocular setae, rest of the area with blackish hairs; palpi red yellow and not so long; proboscis black.

Thorax : Blackish, densely covered, with yellow grey pollen and with four narrow dark longitudinal stripes which are clearly distinguishable only in front of suture and less marked after suture; *ac* 0+1; *dc* 3+1; *ia* 1+2-3; *ps* 1; *h* 1; *ph* 1; *np* 3; *pa* 2; *sa* 2; *st* 1+1; *mpl* 4; *npl* 7-8; propleura bare; scutellum silvery pollen with a pair of apico scutellar, 2 pairs of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Transparent; R_1 bare; R_{4+5} with a row of 3-5 short setae located dorsally and extending up to about one-fifth from the basal node to r-m and several short

setae along ventral surface of basal node of R_{4+5} ; fifth costal segment slightly shorter than third, the former with short setae along less than basal half of its anterior margin; costal spines short; epaulet slightly black; basicostal scale yellowish; squama milky white; halter slightly brownish; bend of m 90° ; t_p arcuate.



Figs. 248-255 : *Krombeinomyia mirabilis* Verves. 248, Head ♂ (lateral view); 249, Head ♂ (frontal view); 250, Thorax (dorsal view); 251, Abdomen (dorsal view); 252, Inner and outer forceps (lateral view); 253, Penis (lateral view); 254, Inner and outer forceps (posterior view); 255, Fore tarsus (dorsal view).

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of bristles along basal half of anterodorsal surface, 1 bristle on posterodorsal surface on distal end, tarsus of usual length but without bristles ; mid femur with 2 bristles along distal one-third of posterodorsal surface ; mid tibia with a row of bristles along

basal half of anterodorsal surface and 1 bristle on anteroventral surface at about one-third on distal end; hind femur with a row of long bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-fourth on distal end; hind tibia with a row of bristles along anterodorsal surface and few short hairs along posterodorsal surface, hind coxa without hairs; pulvilli short and claw shorter than fifth tarsomere.

Abdomen : Blackish, silvery to yellow pollen and with three small rounded spots on second to fifth tergites, fifth tergite with 1 long median stripe, third without median marginal bristles, fourth and fifth each with a row of marginal bristles; sternites first to fourth with short hairs; genital segments reddish but without marginal bristles; inner forceps wedge-shaped inside view, uniformly curved and with few hairs; outer forceps narrow, slightly shorter than inner forceps, the former with basal process; anterior paramere wide, separating as basal broad hook; posterior paramere narrow, long, slightly curved and with long bristle and basal process; theca longer than paraphallus, fairly stout with clavate spines; apical part of paraphallus slender with spines and short process.

Female : Unknown.

Material examined : 1 ♂, India : Kashmir; Dal Lake, o.v. 1964, R. Senior-White.

Discussion on species : This species is similar to *K. indica* Verves, 1988 but differs from it by the structures of anterior paramere, apical portion of paraphallus and colour of antennae. Moreover, the frontal bristles in this species are more developed than in *K. indica* and third abdominal tergite is without median marginal bristles here.

Biology : This species was collected at ultraviolet-light trap.

Distribution : India ; Kt (Bannerghatta, personal communication from Pape), JK (Dal lake) and SL; Rat. Dist. (Uda-Walawe).

Type deposited : *Holotype* ♂, USNM, not examined.

Tribe **Metopiini** Rohdendorf

This tribe is characterised by having small or medium sized body; eyes very large with very wide frons; parafacial and frons wider than 0.35 of head width; proboscis medium in size or short; third antennal segment as a rule more than three times that of second; orbital bristles in one or two rows, sometimes may be in one row; head conical; subvibrissal bristles present; R_{4+5} may be closed or open; parafacial may be bare or with short hairs or with regular rows of long bristles; claws and pulvilli elongated in male; presence of wide hypopharyngeal sclerites in first instar larvae.

Verves (1989d) divided this tribe into six subtribes, of which only four subtribes : Taxigrammatina Rohdendorf, Phrosinellina Verves, Metopiina Rohdendorf and Sphenometopiina Verves are present in this area. Venturi (1953) studied the species

of Metopiini from Italy. Lopes (1989) placed all the species of Australasian and Oceanian Metopiini under one available genus *Metopia* Meigen, 1803. Verves (1986) divided this tribe into twelve genera and placed all the Palaearctic species under those genera.

Key to subtribes

1. R_{4+5} closed or petiolate; arista thickened on largest part.....Taxigrammatina
 R_{4+5} open; arista rod-like2
2. Parafacial with regular rows of long and strong bristles3
 Parafacial bare or with numerous short hairsPhrosinellina
3. Orbital bristles in two rows and not strong.....Metopiina
 Orbital bristles in one row and strongSphenometopiina

Subtribe **Taxigrammatina** Rohdendorf

This subtribe is the most plesiomorphic and is characterised by small size; R_{4+5} closed or petiolate; arista thickened on basal third and with well developed light dusting on the body.

Verves (1989d) lumped this subtribe with Hilarellina Rohdendorf. This subtribe has three genera : *Taxigramma* Perris, 1852, *Paragusia* Schiner, 1861 and *Hilarella* Rondani, 1856 and only genus *Taxigramma* is present in this area.

This subtribe has been reported from the nests of Sphecidae and psammophilic Sphecid wasps and few species were reared from grasshoppers. It is widely distributed in most regions.

Genus 18. **Taxigramma** Perris, 1852

1852. *Taxigramma* Perris, *Annl's Soc. Linn. Lyon.*, 209.

Type species : *Taxigramma pipiens* Perris, 1852 (= *Miltogramma heteroneura* Meigen, 1830).

1854. *Heteropterina* Macquart, *Annl's Soc. ent. Fr.*, (3) 2 : 426.

Type species : *Miltogramma heteroneura* Meigen, 1830.

1863. *Elpigia* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, 2 : 149.

Type species : *Elpigia pellucida* Robineau-Desvoidy, 1863 (= *Miltogramma heteroneura* Meigen, 1830).

1893. *Epolia* Brauer and Bergenstamm, *Denkschr. Akd. Wiss. Wien. Kl. math.-naturw.*, 60 : 113.

Type species : *Epolia velox* Brauer and Bergenstamm, 1893.

1916. *Nasonimyia* Townsend, *Proc. U. S. natn. Mus.*, **49** : 619.

Type species : *Heteropterina nasoni* Coquillett, 1895 (= *Miltogramma heteroneura* Meigen, 1830).

1933. *Pamirella* Enderlein, *Dt. ent. Z.*, 133.

Type species : *Pamirella karakulensis* Enderlein, 1933.

Morphology : Small sized flies ; head with frons more or less protruded; antennae of medium length or long ; arista short, bare or micropubescent and thickened; R₁ bare; R₄₊₅ closed at wing margin or with short petiolate; costal spines strong; abdomen conical and abdominal tergites with 3 small dorsal spots; fifth costal segment more than twice that of second; proclinate ocellar bristles strong; fore tarsus often with elongated sensory hairs; claws and pulvilli long in male.

Discussion : This is a small genus and Verves (1986) placed this genus under the tribe Senotainiini but later on he (1989d) shifted it under the tribe Metopiini. Pape (1988) synonymized the genus *Taxigramma* with *Paragusia* Schiner, 1861. Only 2 species have been reported from the Palaearctic region and 1 species is present here.

Biology : This genus has been reported as a kleptoparasite in the nests of Sphecidae. Allen (1926) recorded the rearing of a species from a grasshopper.

Distribution : This genus has been recorded from all Zoogeographical regions except Neotropical and Australasian and Oceanian regions. About 20 species have so far been reported from the world of which 1 species is present in India.

33. *Taxigramma heteroneura* (Meigen)

(Figs. 256-264)

1830. *Taxigramma heteroneura* Meigen, *Syst. Besch.*, **6** : 367; Verves, 1986, *Cat. Palae. Dipt.*, **12** : 66.

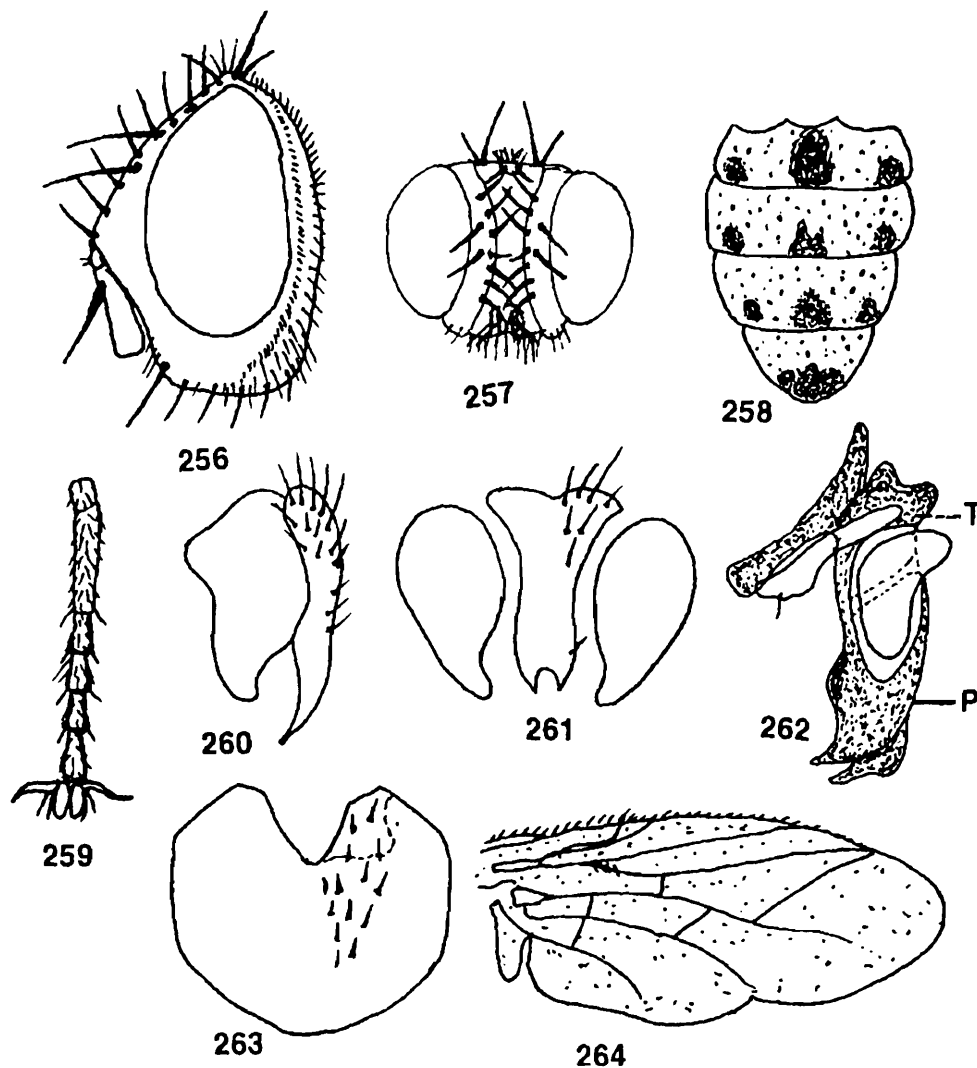
1852. *Taxigramma pipiens* Perris, *Annl. Soc. Linn. Lyon.*, 209.

Male : Body Length 3.5–6.0 mm.

Head : Blackish-brown; eyes reddish or sometimes brownish; width of frons 0.45 to 0.60 that of one eye and frons slightly projecting forwards; frontal vitta brownish-grey, at level of lowest orbital half to one-third and ocellar region 1.4 to 1.8 that of each parafrenal; parafrenal blackish with silvery pollen but without hairs; parafacial blackish with silvery grey pollen, bare or with a row of very fine hairs on lower part and its width at face level with base of antennae 0.30 that of one eye width; antennae reddish-grey, first and second segments reddish, third greyish-black but more or less reddish at base and about twice that of second; arista thickened up to 0.65, bare or with microchaetae and longer than third antennal segment; facial ridge greyish with silvery pollen and bare; vibrissae well developed with few short supra- and 3-4 subvibrissal bristles and its length more than each parafrenal bristle; frontal bristles

7-8 and almost reaching up to base of antennae, anterior 3 proclinate and posterior 4-5 reclinate; orbital bristles 2, proclinate; gena and post gena blackish, silvery pollen and the latter with blackish hairs; inner vertical bristle well developed, outer vertical more than half of inner vertical, post vertical very short, post ocellar not traceable; ocellar region black with a pair of strong proclinate ocellar bristles and few short hairs which are less than frontal bristles and equal to outer vertical; a row of regular postocular setae, rest of the area with greyish hairs; palpi yellow; proboscis medium in length and greyish.

Thorax : Grey with grey pollen but without black stripes; *ac* 3+1; *dc* 3+3; *ia* 2; *ps* 1; *h* 2; *ph* 2; *np* 2; *pa* 2; *sa* 3; *st* 1+1 (strong); *mpl* 3; *hpl* 3-4; propleura bare; scutellum greyish with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of short discoscutellar bristles.



Figs. 256-264 : *Taxigramma heteroneura* (Meigen). 256, Head ♂ (lateral view); 257, Head ♂ (frontal view); 258, Abdomen (dorsal view); 259, Fore tarsus (dorsal view); 260, Inner and outer forceps (lateral view); 261, Inner and outer forceps (posterior view); 262, Penis (lateral view); 263, Fifth sternite; 264, Wing.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} closed with 3-4 short setae located dorsally and extending up to basal half from the basal node to r-m but without setae on ventral surface of basal of R_{4+5} ; fifth costal segment one and half times that of the third, the former with short spines along entire length on its anterior margin ; costal spines strong; epaulet black; squama whitish ; halter slightly yellowish; bend of m 150° ; t_p almost straight.

Legs : Dark brown to blackish-brown; fore femur with a row of few short bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 1 short bristle on posterodorsal surface on distal one-third ; mid femur with 2 bristles medially on anterodorsal surface, 2 bristles on posterodorsal surface distally and few bristles on posteroventral surface on basal half ; mid tibia with 1 bristle each on anteroventral and posterodorsal surfaces at about one-third from the distal end ; hind femur with few bristles along anteroventral surface and 1 bristle on posteroventral surface on basal two-thirds ; hind tibia with a row of 3-4 short bristles along posterodorsal surface on basal half, few short hairs along anteroventral surface medially and a row of bristles along anterodorsal surface ; claws and pulvilli long, claw about 0.8 of fifth tarsomere ; first tarsomere about the total of two to fourth tarsomeres.

Abdomen : Brownish to black with white pollen; second to fifth tergites with 3 small black spots which may be coalesce on fifth tergite, second without median but third with 1 median marginal bristle, fourth and fifth each with a row of marginal bristles; sternites first to fourth with long hairs distally ; fifth sternite v-shaped, grooved at the middle and with few short setae; inner forceps fused basally, elongated and pointed apically; outer forceps broad and wide ; anterior paramere wide ; posterior paramere elongated; paraphallus wide at end with long process apically.

Female : Lighter than male; wings more greyish ; antennae reddish except for arista but sometimes third segment darkened apically ; eyes totally reddish ; anterior part of frons slightly reddish ; parafrontal and parafacial yellowish ; thorax brownish with grey pollen ; legs orange ; tarsus black ; claws and pulvilli short.

Material examined : 1 ♂, Yugoslavia ; E. Beograd Deliblata National Park, 22. viii. 1983, Copenhagen Zoological Museum Expedition (det. by T. Pape); 1 ♀, Hillas Peloponises, 5 kms. S. of Monemvasia, 28. vi. 89, George Christensen; 1 ♂, same date as female (det. by T. Pape; dep. in ZMUC,).

Discussion on species : This species is distinctive in having blackish to brown body, abdominal tergites with 3 short spots, male claws and pulvilli moderately long, last section of costa half that of previous section and hind femur with few hairs along anteroventral surface.

Biology : This species has been recorded from nests of *Ammophila* sp. and *Tachysphex* sp. (Sphecidae). Walton (1915) mentioned the breeding of 2 specimens from a grasshopper.

Distribution : India ; TN, Anamalai Hills (Cinchona) ; Afghanistan; Albania; Algeria; Armenia ; Austria ; Azerbaijan ; Bulgaria; California; Canada ; Canary Islands; China; Colorado ; Czech Republic ; Denmark ; Egypt ; Finland ; France; Germany; Greece; Gruzia ; Hungary ; Illinois ; Iran ; Italy; Kazakhstan ; Kyrgyzstan ; Mongolia; Moldova; Morocco ; New Mexico ; Ontario ; Poland ; Romania ; Russia ; Serbia; Slovakia; Spain; Sweden ; Tajikistan ; Texas ; Turkey ; Turkmenistan ; Ukraine ; Uzbekistan and West Siberia.

Type deposited : *Holotype* ♀, MNHN, not examined.

Subtribe **Phrosinellina** Verves

This subtribe is characterised by having arista rod-like and widened in the basal 0.6–0.8; frons very wide; third antennal segment elongated; parafacial bare or with numerous short hairs; R_{4+5} open; presutural acrostichal bristles reduced; abdominal spots partly united or abdomen with checkered pattern; fore tarsus of male often with bristles or brush of spines.

This subtribe consists of two genera : *Gymnoprosope* Townsend, 1892 and *Phrosinella* Robineau-Desvoidy, 1863. Only one genus *Phrosinella* is available in this area.

The species of this subtribe are psammophilous and the larvae are inquilines of the nests of wasps.

This tribe is distributed in the Nearctic, Oriental and Palaearctic regions.

Genus 19. **Phrosinella** Robineau-Desvoidy, 1863

1863. *Phrosinella* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, **2** : 82.

Type species : *Tachina nasuta* Meigen, 1824.

1863. *Phrosina* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, **2** : 101 (as junior homonym of *Phrosina* Risso, 1936, Crustacea).

Type species : *Phrosina argyrina* Robineau-Desvoidy, 1863 (= *Tachina nasuta* Meigen, 1924).

1925. *Pedimyia* Rohdendorf, *Zool. Anz.*, **62** (3) : 81.

Type species : *Pedimyia fedtshenkoi* Rohdendorf, 1925.

Morphology : Vibrissal angle placed at peristome ; female brownish-grey and male more blackish ; claws and pulvilli of male short; male fore tarsus modified ; head with profrons protruding somewhat anteriorly ; frontal vitta broad and only slightly narrowing anteriorly ; parafacial with some hyaline hairs which may be restricted to the peristomal ridge or extend to post gena and gena ; parafrontal plate with scattered moderately long hairs only on inner margin; palpi yellow; thorax with ill-defined stripes and abdomen with sparsely defined spots ; arista widened at greater part.

Discussion : This is a medium-sized genus and Verves (1989d) divided it into four subgenara : *Phrosinella* Robineau-Desvoidy, 1863, *Asiometopia* Rohdendorf, 1935, *Caspiomyia* Rohdendorf, 1935 and *Euhilarella* Townsend 1915. Only one subgenus *Phrosinella* Rohdendorf has been reported from this area. Verves (1989d) reported 11 species under this genus from the Palaearctic region. Pape (1987) recorded the distribution of 17 species in the Nearctic and Palaearctic regions. Rohdendorf (1971) studied the Palaearctic species of *Phrosinella* and Pape (1987) reported only 2 species from Fennoscandia and Denmark.

Biology : This genus is parasitic in the nests of Sphecidae. Larvae of the species have been described and drawn by Thompson (1921) and Draber-Mónko (1973).

Distribution : This genus is distributed in the Nearctic, Oriental and Palaearctic regions.

Subgenus *Phrosinella* Robineau-Desvoidy, 1863

1863. *Phrosinella* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, **2** : 82.

Type species : *Tachina nasuta* Meigen, 1824.

Morphology : Antennae longer and third segment about four times that of the second ; frons very wide, narrow and projecting anteriorly ; parafacial sometimes with short hairs ; proclinate orbital bristles well developed ; orbital region with long hairs ; vibrissal bristles well developed ; thorax with light design ; arista thickened in most part ; parafacialia with well developed numerous black setae : fore tarsus of male without long hairs.

This is a small subgenus with most species in the Palaearctic region. Only 1 species has been reported from the Oriental region which is also present in India.

34. *Phrosinella* (*s. str.*) *fedtshenkoi* (Rohdendorf)

(Figs. 265-269)

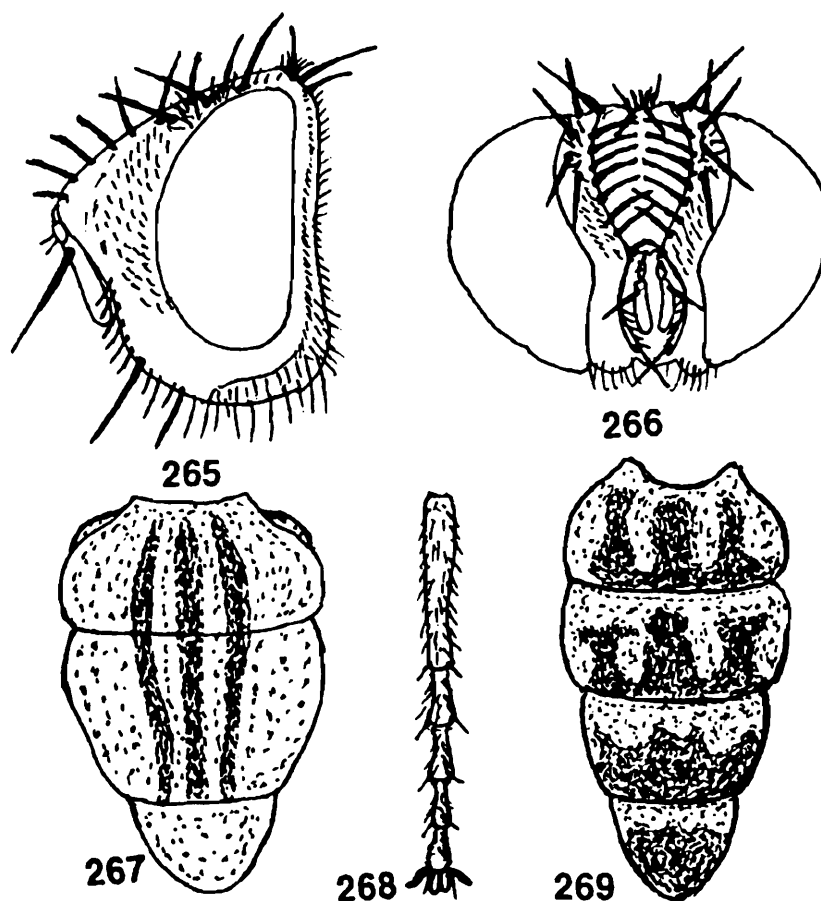
1925. *Pedimyia fedtshenkoi* Rohdendorf, *Zool. Anz.*, **62**(3) : 82.

1986. *Phrosinella* (*s. str.*) *fedtshenkoi* : Verves, *Cat. Palae. Dipt.*, **12** : 102.

Male : Body length 6 mm.

Head : Brownish-grey with silvery pollen ; eyes reddish ; width of frons 0.60–0.65 that of one eye and frons slightly projecting forwards ; frontal vitta slightly blackish, very wide, narrowed anteriorly and with silvery pollen and its width at ocellar region three times that of each parafacial ; parafacial grey, silvery pollen and with many scattered long hairs near the orbital region ; parafacial greyish, silvery pollen and with numerous short hairs along outer margin and its width at face level with base

of antennae 0.30–0.32 that of one eye width ; antennae long and slightly brownish, third antennal segment elongated and about 4.5 that of second ; arista long, black and slightly less than third segment, thickened most of its proximal part but without hairs ; facial ridge brownish, silvery pollen and with greyish hairs at the base ; vibrissae well developed ; vibrissal angle slightly above mouth margin with 3–4 supra- and 2 subvibrissal bristles ; frontal bristles 6–7, some of them short and reaching up to base



Figs. 265-269 : *Phrosinella (s. str.) fedtshenkoi* (Rohdendorf). 265, Head ♂ (lateral view); 266, Head ♂ (frontal view); 267, Thorax (dorsal view); 268, Fore tarsus (dorsal view); 269, Abdomen (dorsal view).

of antennae, anterior 2 proclinate and posterior 3 reclinate ; orbital bristles 3, strong, anterior 1 reclinate and posterior 2 proclinate ; gena brownish with silvery pollen ; post gena blackish with white pollen and short black hairs ; inner vertical bristle well developed, outer vertical moderately developed but slightly shorter than inner vertical, post vertical and post ocellar not developed ; ocellar region brownish with a pair of strong ocellar bristles and few short hairs ; ocellar bristle longer than shortest frontal bristles ; a row of regular postocular setae, rest of the area with black hairs ; palpi yellowish ; proboscis long and black.

Thorax : Greyish with bright dusting and indistinct 1 median and 2 lateral stripes before suture which extend after suture very faintly ; *ac* 0+1 ; *dc* 3+3 (anterior 1

short); *ia* 0+1; *ps* 1; *h* 3; *ph* 2; *np* 2; *pa* 2; *sa* 3; *st* 1+1; *mpl* 4; *hpl* 4; propleura bare; scutellum grey, slightly yellowish pollen and with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 4–5 short setae located dorsally and extending up to basal half from basal node to r-m and 2–3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment longer than third, the former with short spines along entire length of its anterior margin; costal spines moderately developed; epaulet black; basicostal scale yellowish; squama milky white; halter brown; bend of m 120° with process; t_p almost straight.

Legs : Black; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with 1 bristle on posterodorsal surface on distal end; mid femur with a row of 3 bristles along middle portion of anterolateral surface and 1–2 bristles on posterodorsal surface on distal end; mid tibia with 1 bristle each on anterodorsal and anteroventral surfaces and 2 short bristles on posterodorsal surface on about distal half; hind femur with a row of bristles along anteroventral surface and 2 bristles on posterodorsal surface on distal end; hind tibia with a row of bristles along anterodorsal surface and 1 bristle on posterodorsal surface on distal one-third, fore tarsus moderately developed; claws and pulvilli short, claw 0.5 of fifth tarsomere; first tarsomere slightly longer than total of two to fourth tarsomeres.

Abdomen : Greyish, silvery pollen and with three distinct black spots; second tergite entirely black with silvery spot in between, third with a long median and 2 smaller lateral spots, fourth almost black three-fourths of its posterior margin and fifth with black stripe along posterior half; second tergite with a pair of short median and 2–3 lateral marginal bristles, third with a pair of median 2 lateral marginal bristles, fourth and fifth each with a row of marginal bristles; sternites first to fourth with long hairs posteriorly.

Female : Unknown.

Material examined : 1 ♂, India : Kashmir Valley; Tangmarg, 671m, 17. viii.–7. ix. 1978, Copenhagen Zoological Museum Expedition (det. by T. Pape; dep., in ZMUC).

Discussion on species : This species is distinctive in having third antennal segment elongated, posterior part of frons wider, orbital region with long hairs, abdomen elongated with distinct black spots, thorax with indistinct 1 median and 2 lateral stripes and second abdominal tergite with a pair of strong median marginal bristles.

Biology : Nothing is known regarding the biology of the species.

Distribution : India; JK (Tangmarg); Turkmenistan and Uzbekistan.

Type deposited : Holotype ♂, ZMMSU, not examined.

Subtribe **Metopiina** Rohdendorf

This subtribe is characterised by having vertical rows of long and strong bristles on outer margin of parafacial ; presence of two rows of orbital bristles and widened hypopharyngeal sclerite of the first instar larva. Rohdendorf (1967b) included the majority of the genera of the tribe Metopiini into subtribe Metopiina. Verves (1989d) placed only the genus *Metopia* Meigen, 1803 under this subtribe which includes about 35 species. Only two genera : *Metopia* Meigen and *Chaetancia* Townsend are present here.

Most of the species are kleptoparasites in the nests of Pompilidae, Vespidae, Sphecidae, Apidae and Helictidae.

This subtribe is widely distributed.

Key to genera

1. Frons broader and projecting forwards ; abdomen without triangular spots*Metopia* Meigen
- Frons shorter and not projecting forwards ; abdomen with triangular spot.....*Chaetancia* Townsend

Genus 20. **Metopia** Meigen, 1803

1803. *Metopia* Meigen, *Mag. Insektenk.*, **2** : 280.
Type species : *Musca leucocephala* Rossi, 1790, not Villers, 1789 (= *Tachina argyrocephala* Meigen, 1824).
1830. *Araba* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. Sci. Inst. Fr.*, **2** (2) : 127.
Type species : *Argyrella dissimilis* Robineau-Desvoidy, 1863 (= *Tachina argyrocephala* Meigen, 1824).
1916. *Parametopia* Townsend, *Proc. U. S. natn. Mus.*, **49** : 619.
Type species : *Parametopia morrisoni* Townsend, 1916 (= *Metopia lateralis* Macquart, 1846).
1934. *Udamomitra* Enderlein, *Sber. Ges. natruf. Freunde Berl.*, **4** : 188.
Type species : *Tachina campestris* Fallén, 1810.
1935. *Allenancia* Townsend, *Revta Ent.*, **5** : 68.
Type species : *Metopia sinipalpis* Allen, 1926.
1953. *Fanestria* Venturi, *Boll. Ist. Ent. Univ. Bologna*, **19** : 166.
Type species : *Metopia grandii* Venturi, 1953.
1955. *Opheliella* Rohdendorf, *Ént. Obozr.*, **34**, (2) : 363.
Type species : *Tachina campestris* Fallén, 1810.

Morphology : Medium sized flies with triangular head ; frons broad ; antennae long ; third antennal segment very long and about 4–5 that of the second ; parafacial with a row of bristles or macrochaetae anteriorly which extend not more than one-fourth the distance from vibrissae to the base of antennae ; arista long, thin and practically bare ; orbital bristles 2–3, anterior 2 proclinate and posterior 1 reclinate ; apical cell open at margin of wing ; frontal vitta narrowed anteriorly ; proboscis short ; males more hairy with specialized tarsal setae ; hypopharyngeal sclerite of the first instar larva wide.

Discussion : This is a well defined and rather large genus and most of the authors (Verves, 1979b ; Lopes, 1989) have preferred the subgeneric status of the genus *Metopia* species group, but Pape (1986b) admitted that this subgeneric status is not sufficiently grounded. Townsend (1942) published an illuminating work on the larvae of the genus *Metopia*. Venturi (1953) revised the species of *Metopia* from Italy. Zumpt (1961) reported 2 species from the Ethiopian region and later on Dear (1980) included 4 species in the Afrotropical region. Pape (1986 b,c ; 1987c) revised the Oriental, Eastern Palaearctic, Afrotropical and Neotropical species of *Metopia* and reported some species from India. Verves (1986) recorded 10 species from the Palaearctic region. Only 4 species have been reported from this area which are placed under the subgenera : *Metopia* Meigen, 1803, *Australoancia* Verves, 1979 and *Anicia* Robineau-Desvoidy, 1863. Lopes (1989) divided this genus into two subgenera : *Metopia* and *Australoancia*.

Biology : Most of the species have been reported from the nests of Pompilidae, Vespidae, Sphecidae, Apidae and Halictidae (Hymenoptera). First instar larvae of few species have been described by Thompson (1921).

Distribution : This genus is worldwide in distribution.

Key to subgenera

1. Frontal vitta abruptly narrowed anteriorly ; ocellar bristles hair-like and weaker than reclinate orbital bristles ; frontal rows of bristles strongly divergent anteriorly *Metopia* Meigen
 Frontal vitta sparsely or comparatively narrowed anteriorly ; ocellar bristles as strong as reclinate orbital bristles ; frontal rows of bristles not or little divergent and not extending beyond pedicel 2
2. Mid tibia with incomplete row of short posterodorsal bristles ; basicosta brownish-black ; fore tarsi of male without long hairs on posterodorsal surface..... *Australoancia* Verves
 Mid tibia with 1 strong anteroventral bristle ; basicosta yellowish-orange ; fore tarsi of male with long hairs on posterodorsal surface
 *Anicia* Robineau- Desvoidy

Subgenus *Metopia* Meigen, 1803

1803. *Metopia* Meigen, *Mag. Insektenk.*, 2 : 280.

Type species : *Musca leucocephala* Rossi, 1790 (preoccupied) = *Tachina argyrocephala* Meigen, 1824.

Morphology : Ocellar bristles hair-like and weaker than reclinate orbital bristles ; frontal rows of bristles strongly divergent anteriorly and with a cluster of upcurved hairs extending beyond base of first antennae ; parafacial with a row of short bristles along anterior margin ; palpi black ; male profrons very large and projecting forwards ; anterior part of frontal vitta more or less obliterated by the contiguous fronto-orbital plates ; frontal vitta abruptly narrowed anteriorly.

This is a large subgenus and Lopes (1989) synonymized it with the genera *Chaetanicia* Townsend, 1932 and *Argyria* Robineau-Desvidy, 1863. Verves (1986) placed most of the species under this subgenus and reported a total of 7 species from the Palaearctic region. Only 2 species are reported from this area.

Few species of the subgenus have been recorded as kleptoparasites in Halictidae, Apidae, Vespidae, Sphecidae (Downes, 1965 ; Pape, 1987b).

This subgenus is widely distributed.

Key to species

1. Second abdominal tergite with a row of strong median marginal bristles ; ocellar bristles weaker than reclinate orbital bristles ; supra vibrissal bristles 3 ; row of frontal bristles distinctly interrupted along contiguous margins of fronto-orbital plates*argyrocephala* (Meigen)
 Second abdominal tergite without median marginal bristles ; ocellar bristles stronger than reclinate orbital bristles ; supra vibrissal bristle 1 ; row of frontal bristles almost uninterrupted but weakly developed along contiguous margins of fronto-orbital plates*roserii* Rondani

35. *Metopia* (s. str.) *argyrocephala* (Meigen)

(Figs. 270–278)

1824. *Tachina argyrocephala* Meigen, *Syst. Besch.*, 4 : 372.

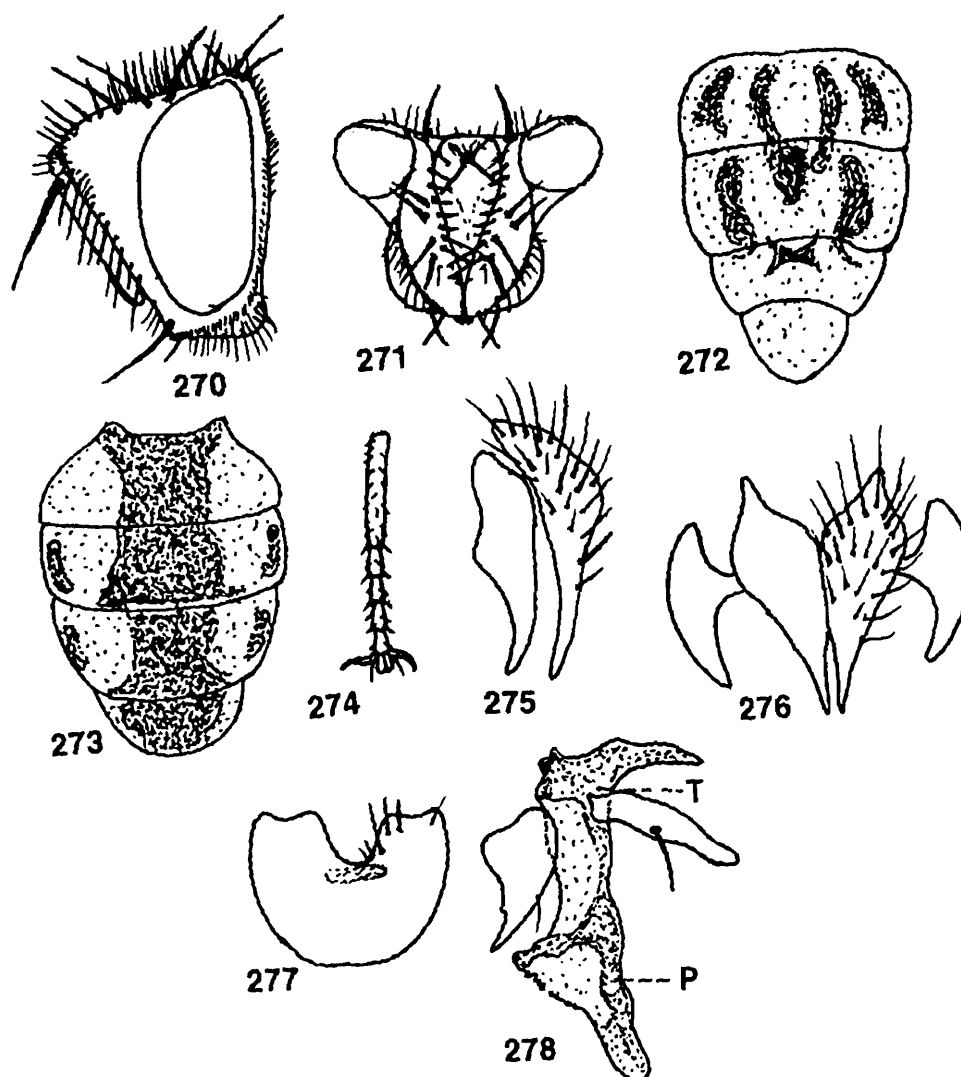
1790. *Musca leucocephala* Rossi, *Fauna Etrusca*, 2 : 306 (preoccupied by Villers, 1789).

1970. *Metopia argyrocephala* : Kurahashi, *Kontyû*, 38(2) : 111.

1986. *Metopia* (s. str.) *argyrocephala* : Verves, *Cat. Palae. Dipt.*, 12 : 97.

Male : Body length 6.0–7.5 mm.

Head : Blackish ; eye reddish ; width of frons about 0.55 that of one eye and frons concealed anteriorly ; frontal vitta black, narrowed abruptly towards profrons where the parafrontal plates are contiguous and obliterated anterior 0.3 of frontal vitta ; profrons conically protruding with silvery pollen which abruptly demarcated from the greyish pollen posterior 0.5–0.6 of parafrontal ; parafrontal with short hairs near orbital region ; antennae black, third segment of antennae 5–6 that of the second ;



Figs. 270-278 : *Metopia (s.str.) argyrocephala* (Meigen). 270, Head ♂ (lateral view); 271, Head ♂ (frontal view); 272, Thorax (dorsal view); 273, Abdomen (dorsal view); 274, Fore tarsus (dorsal view); 275, Inner and outer forceps (lateral view); 276, Inner and outer forceps (posterior view); 277, Fifth sternite; 278, Penis (lateral view).

arista long and dilated up to basal 0.5 ; facial ridge black ; parafacial with a row of 6–7 bristles along outer margin close to facial ridge and with 4 black hairs on upper margin ; vibrissae long, twice that of reclinate ocellar bristles and with 3 subvibrissal bristles ; frontal bristles 5–6 and present on contiguous margin of fronto-orbital plate ;

orbital bristles 4, anterior 2 proclinate and posterior 2 reclinate ; gena and post gena not distinguishable ; inner vertical bristle well developed, outer vertical two-thirds of inner vertical, post vertical not differentiated ; ocellar region black with a pair of proclinate ocellar bristles and few short hairs ; ocellar bristles weaker than reclinate orbital bristles ; one row of regular postocular setae, rest of the area with brownish hairs ; palpi yellowish ; proboscis short and black.

Thorax : Grey with silvery pollen and two median and two lateral marginal stripes before suture, 1 median spot and two wide lateral stripes in mesonotum and also median square spot at the terminal end of mesonotum ; *ac* 0+1 ; *dc* 2+3 ; *ia* 0+2 ; *ps* 1 ; *h* 2 ; *ph* 2 ; *np* 2 ; *pa* 2 ; *sa* 3 ; *st* 1+1 ; *mpl* 5 ; *hpl* 3 ; propleura bare ; scutellum greyish with a pair of apicoscutellar, 2 pairs of lateroscutellar and a pair of discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of setae located dorsally and extending up to half from the basal node to r-m and 2 short setae on ventral surface of basal node of R_{4+5} ; fifth costal segment greater than third, the former with short spines along basal two-thirds of its anterior margin ; costal spines short ; epaulet black ; basicostal scale black ; halter yellowish ; squama whitish ; bend of m 130° but with short process ; t_p slightly curved.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia without differentiated bristles ; mid femur with 2 bristles distally on posterodorsal surface ; mid tibia with a row of bristles along posterodorsal surface and 1 strong bristle on anterodorsal surface on distal one-fourth ; hind femur with a row of bristles each along anterodorsal and anteroventral surfaces and 1 strong bristle on posteroventral surface on distal one-fourth ; hind tibia with a row of bristles each along posterodorsal and anterodorsal surfaces ; claws and pulvilli short ; first tarsomere slightly shorter than total of two to fifth tarsomeres and the tarsomeres without hairs.

Abdomen : Blackish with grey dusted ; second tergite with wide median stripe, third and fourth each with median and indistinct lateral stripes, fifth silvery pollen with 3 black spots which coalesce at posterior margin, the lateral spots irregular with brownish margin and the median spots almost rectangular, second and third each with a pair of median and 3 lateral marginal bristles, fourth and fifth each with a row of marginal bristles ; sternites first to fourth each with 2 strong hairs ; fifth sternite v-shaped with short window and the lateral arms blunt ; genitalia with elongated apical portion ; inner and outer forceps pointed at end ; anterior paramere wide at base and pointed terminally ; posterior paramere elongated, blunt at end and with 1 long hair ; epiphallus short ; paraphallus straight, wide at middle and gradually narrowed anteriorly.

Female : Profrons conical but much less than in male and without distinct spot ; frontal vitta distinct to lunula and not obliterated by parafrontal plate ; fore tarsus with slightly broader tarsomere but without specialised hairs ; abdomen less changeable in colour with the incidence of light ; marginal bristles on second abdominal tergite occasionally rather weak or totally absent.

Material examined : 1 ♂, Sri Lanka : Mon. Dist. ; Anguna Kolapelessa, 100m, 21–23. i. 1979, K. V. Krombein, P. B. Karunaratne, T. Wijesinha, S. Siriwardne and T. Gunawardane.

Discussion on species : Pape (1986b) while revising the Oriental and Palaearctic species of *Metopia* Meigen, 1803 placed it under the genus *Metopia* and distinguished it from other species of *Metopia* by its specific character of silvery part of fronto-orbital plate covering anterior 0.4–0.5 and with an abrupt boundary to the grey posterior part.

Biology : This species is kleptoparasite and Pape (1986b) reported it from nests of *Stenodynerus* sp. (Vespidae), *Ammophila* sp., *Bembix* sp., *Cerceris* sp., *Chlorion* sp., *Crossocerus* sp., *Encopognathus* sp., *Mellinus* sp., *Oxybelus* sp., *Philantus* sp., *Sphecius* sp. and *Sphex* sp. (Sphecidae), *Halictus* sp., *Lasioglossum* sp. (Apidae). Kurahashi (1970) recorded the rearing of this species from the above mentioned Hymenopteran hosts. Downes (1965) recorded the rearing of this species from the nests of *Lasioglossum* and *Sphex* and also from other nests of other wasps in Europe. Verves (1979b) reported the larvae inhabit a wide range of nests of Sphecoidea. First instar larva of this species has been drawn and described by Thompson (1921).

Distribution : Ne ; SL (several localities) ; BD; Afghanistan ; Alaska; Armenia ; Austria ; Azerbaijan ; Belgium ; Bulgaria ; Byelorussia ; Canada; China ; Cuba ; Cyprus ; Czech Republic ; Denmark ; Ecuador ; Estonia; Finland ; France ; Germany ; Guatemala ; Great Britain ; Greece ; Gruzia ; Hungary ; Iran ; Ireland ; Israel ; Italy ; Jamaica ; Japan (including Ryukyu Islands) ; Kazakhstan ; Korea ; Kyrgyzstan ; Laos; Latvia; Lithuania; Mexico ; Moldova; Mongolia ; North Korea; Norway ; Peru ; Poland ; Romania ; Russia ; Serbia; Slovakia ; Spain ; Sweden ; Switzerland ; Taiwan ; Tajikistan ; Turkey ; Turkmenistan ; Ukraine ; USA ; Uzbekistan and Yugoslavia (former).

Type deposited : Holotype ♂, MNHN, not examined, probably lost.

36. *Metopia (s. str.) roserii* Rondani

(Figs. 279–287)

1859. *Metopia roserii* Rondani, *Dipt. ital. prodr.*, 3 : 210 ; Pape, 1987, *Fauna ent. scand.*, 17 : 77.

1859. *Metopia instruens* Walker, *J. Proc. Linn. Soc. Lond., Zool.*, 4 : 129.

1859. *Metopia inspectans* Walker, *J. Proc. Linn. Soc. Lond., Zool.*, 4 : 128.

1955. *Metopia* (*s. str.*) *stachelbergi* Rohdendorf, *Ént. Obozr.*, 34 (2) : 369.

1970. *Metopia zenigoi* Kurahashi, *Kontyû*, 38 (2) : 111.

Male : Body length 6 mm.

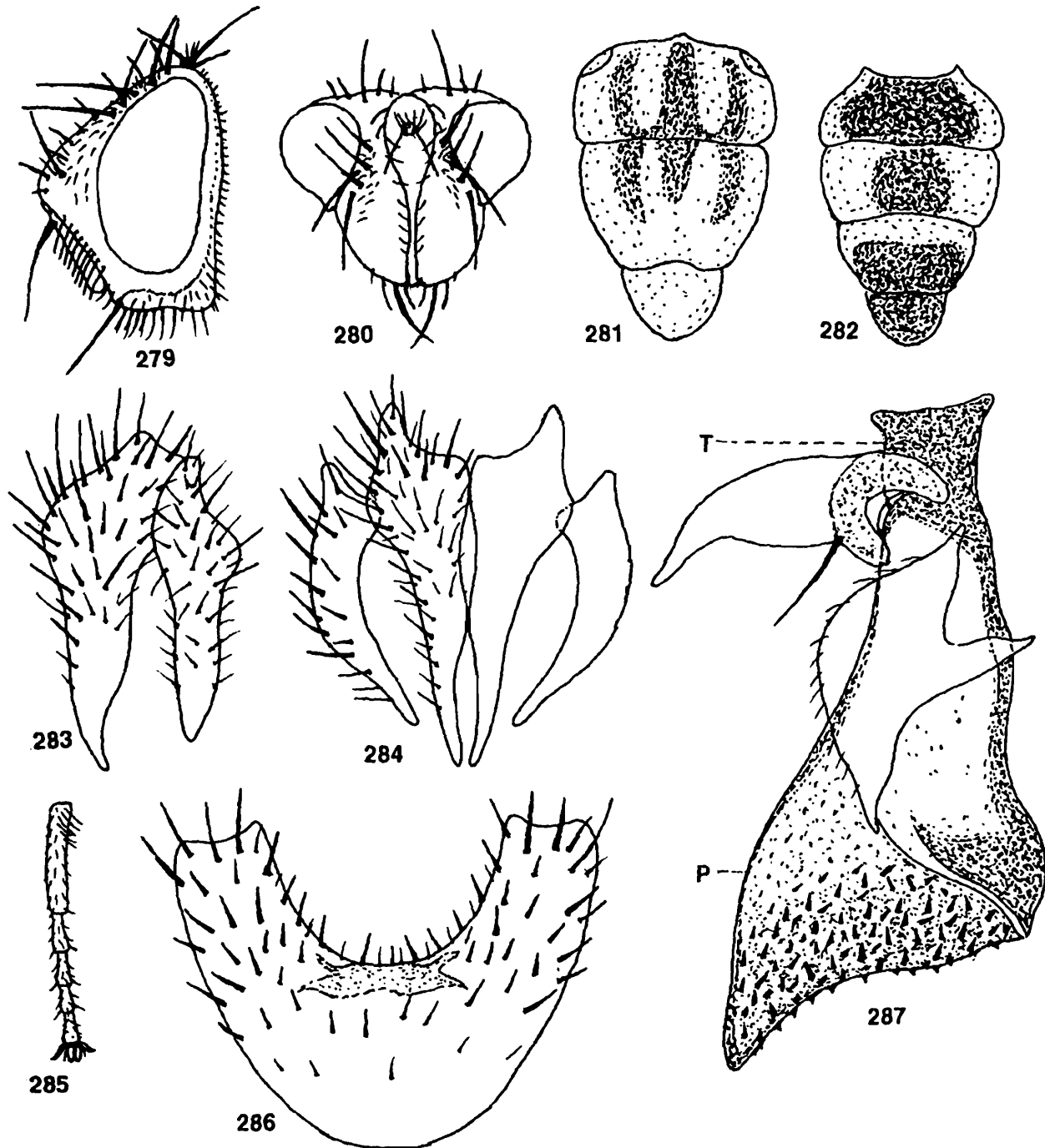
Head : Brownish-grey with silvery pollen ; eyes brownish ; width of frons 0.62–0.68 that of one eye and frons somewhat projecting forwards ; frontal vitta with silvery pollen and narrowed anteriorly towards lunula ; profrons protruded with silvery pollen at sides and blackish-brown at middle ; parafrons protruded with silvery pollen and with short scattered hairs ; parafacial greyish, slightly silvery pollen and with a row of strong bristles close to facial ridge ; upper edge of facial ridge with 1 strong and 3–4 short bristles and its width at face level with base of antennae 0.32–0.34 that of one eye width ; antennae long, third antennal segment about six times that of the second ; arista without hairs but widened only on less than basal half ; facial ridge brownish with silvery pollen ; vibrissae well developed with 1 supravibrissal bristle ; vibrissal angle less developed and slightly above mouth margin ; frontal bristles 6, less developed, anterior 2 proclinate and posterior 2 reclinate ; orbital bristles 5, strong, anterior 2 proclinate and posterior 3 reclinate ; gena brownish, silvery pollen and with short white hairs ; post gena blackish with white pollen and black hairs ; ocellar region black with 1 strong proclinate bristle which is as strong as but longer than reclinate frontal bristle and with few short hairs ; postocellar not distinguishable ; inner vertical bristle well developed, outer vertical short and less than inner vertical, post vertical not developed ; a row of regular postocular setae, rest of the area with greyish hairs ; proboscis long and black ; palpi short and yellowish.

Thorax : Greyish with bright dusting and indistinct 1 median and 2 lateral stripes which extend up to half of mesonotum ; *ac* 0+1 ; *dc* 3+3 ; *ia* 0+1 ; *ps* 1 ; *h* 1 ; *ph* 3 ; *np* 2 ; *pa* 2 ; *sa* 3 ; *st* 1+1 ; *mpl* 5 ; *hpl* 5-6 ; propleura bare ; scutellum grey, yellowish pollen and with a pair of long apicoscutellar, 2 lateroscutellar and a pair of weak discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of short setae extending up to whole length from basal node to r-m and 2 short setae on ventral surface of basal node to R_{4+5} ; fifth costal segment slightly longer than the third, the former with short setae along entire length of its anterior margin ; costal spines moderately developed ; epaulet black ; basicostal scale slightly yellowish ; squama milky white ; halter brown ; bend of m 120° ; t_p straight.

Legs : Black ; fore femur with a row of bristles along anterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 1 bristle on dorsal surface on distal end ; mid femur with a row of 3 long bristles along middle

portion of anterolateral surface, a row of bristles along anteroventral surface and 3 bristles along posterodorsal surface on distal end ; mid tibia with 1 bristle each on anterodorsal and anteroventral surfaces on about distal one-third ; hind femur with



Figs. 279-287 : *Metopia (s.str.) roserii* Rondani. 279, Head ♂ (lateral view); 280, Head ♂ (frontal view); 281, Thorax (dorsal view); 282, Abdomen (dorsal view); 283, Inner and outer forceps (lateral view); 284, Inner and outer forceps (posterior view); 285, Fore tarsus (dorsal view); 286, Fifth sternite; 287, Penis (lateral view).

a row of bristles along anteroventral surface and 2 bristles on dorsal surface on distal end ; hind tibia with a row of bristles along anterodorsal surface and a row of short bristles along posterodorsal surface, tarsus moderately long ; claws and pulvilli short, the former longer than the latter ; second tarsomere without hairs ; first tarsomere equal to total of second to fifth tarsomeres.

Abdomen : Greyish with black spot and silvery pollen ; second tergite black with patches of silvery pollen in between but without median marginal bristles, third with wide median spot and 3 pairs of lateral marginal bristles, fourth almost black at three-fourths of its posterior margin and with a row of lateral marginal bristles, fifth entirely black with a row of lateral marginal bristles ; sternites first to fourth with short hairs ; fifth sternite v-shaped with short window and many spines ; genitalia segments black ; inner forceps long, slightly curved at end and with many basal hairs ; outer forceps shorter than the inner one and almost blunt at end ; anterior paramere wide, apically narrowed and basally bifurcated ; posterior paramere beak-shaped apically, basally wide with an inward groove and 1 long hair ; theca shorter than paraphallus ; median process of paraphallus not detectable ; apical plate of paraphallus wide with many spines most of its anterior border.

Female : Unknown.

Material examined : 1 ♂, India : Kashmir ; Gulmarg, 2,590m, F. W. Thompson (dep. in BMNH).

Discussion on species : This species is similar to *M. (s. str.) argyrocephala* (Meigen) but may be distinguished from it by the longer third antennal segment, more prominent parafacial hairs, wideness of arista at basal portion and spots pattern of the abdomen. Verves (1986) listed this species under *M. (s. str.) argyrocephala* (Meigen) but Pape (1987b) gave it separate species status and synonymized it with *M. stackelbergi* Rohdendorf, 1955. Verves (1986) also kept it as separate species and synonymized it with *M. zenigoi* Kurahashi, 1970. The author agrees with Pape and keeps it as distinct species.

Biology : Pape (1987b) recorded it as breed from Pompilidae (Hymenoptera).

Distribution : India ; JK (Gulmarg) ; Austria ; China ; Czech Republic ; Finland ; Germany ; Hungary ; Indonesia (Sulawesi) ; Italy ; Japan ; Moldova ; Mongolia ; North Korea ; Poland ; Romania ; Russia ; Slovakia ; Switzerland ; Taiwan ; Ukraine and Yugoslavia (former).

Type deposited : *Lectotype* ♂, MZLS, not examined.

Discussion on type : Pape (1986b, 1988) studied the type material and designated it as *Lectotype* which is in good condition except the right hind leg is missing. 1 *Paralectotype* ♂ is also in the same Museum.

Subgenus *Australoancia* Verves, 1979

1979. *Australoancia* Verves, *Ent. Rev. Wash.*, **58** (4) : 166.

Type species : *Opsidiopsis nudibasis* Malloch, 1930.

Morphology : Body dark with dense light pollen ; frons wide ; frontal vitta of male sparsely narrowed anteriorly ; parafacial without prominent developed silvery spots anteriorly ; ocellar bristles as strong as reclinate orbital bristles, 1 pair and directed forwards and little outwards ; some of the frontal bristles little developed ; basicosta of both sexes brown-black ; R_1 comparatively covered with setae ; R_{4+5} with setae up to level of t_p ; fore tarsus of male without hairs along posterodorsal surface ; mid tibia of male with incomplete row of short bristles on posterodorsal surface ; sternites first to fourth with strong bristles on posterior margin ; parafacial with complete row of bristles anteriorly near facial ridge ; 4 orbital bristles, 2 proclinate and 2 reclinate.

This is a rather small subgenus and larvae of this subgenus are found in the nests of Sphecidae, Crabronidae and Pompilidae (Hymenoptera).

This subgenus is distributed in the Palaearctic, Oriental, Afrotropical and Australasian and Oceanian regions. Only 1 species has been reported from this area.

37. *Metopia (Australoancia) nudibasis* (Malloch)

(Figs. 288–296)

1930. *Opsidiopsis nudibasis* Malloch, *Proc. Linn. Soc. N.S.W.*, **55** (4) : 439.

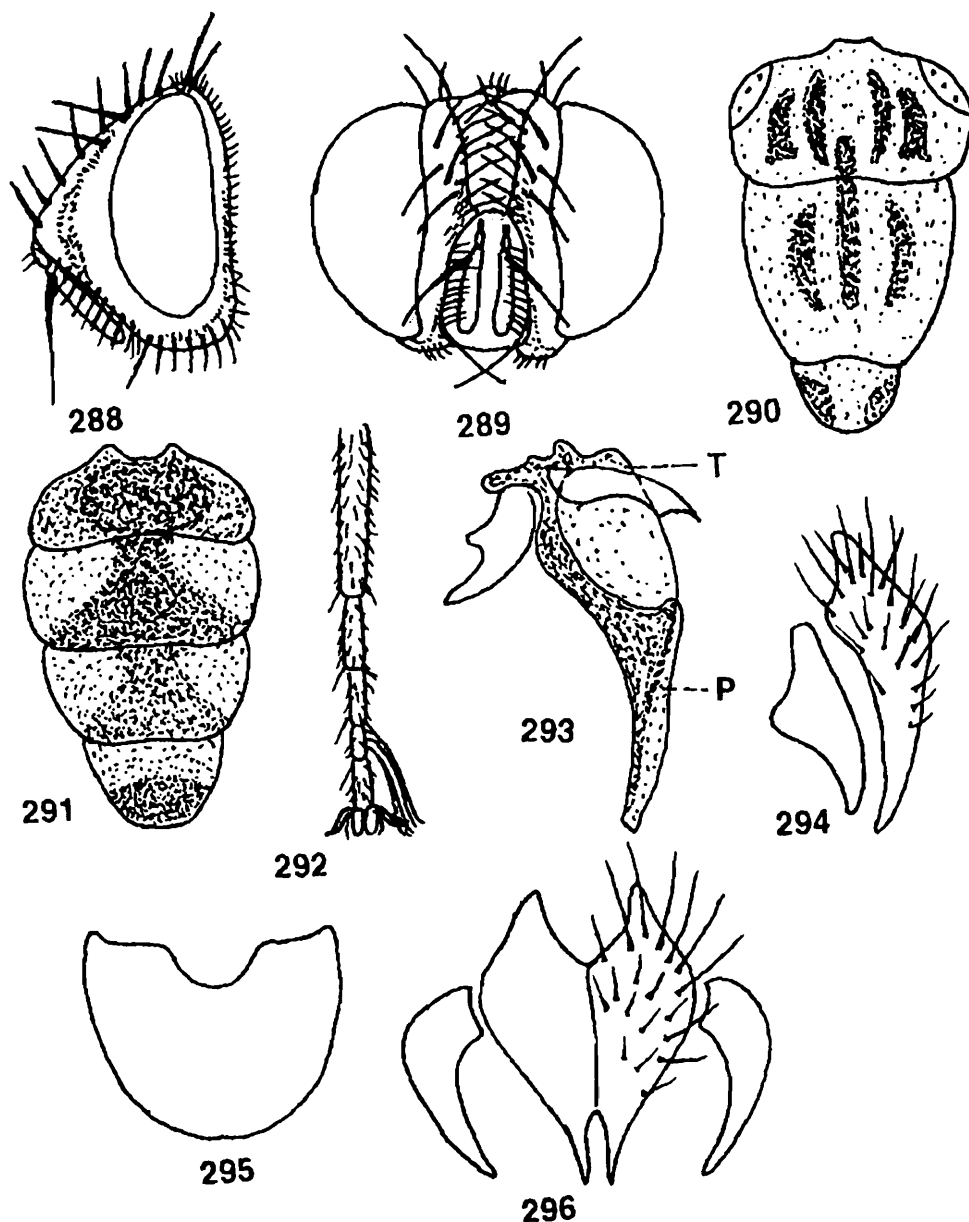
1970. *Metopia nudibasis* : Kurahashi, *Kontyû*, **38** (2) : 106.

1986. *Metopia (Australoancia) nudibasis* : Verves, *Cat. Palae. Dipt.*, **12** : 97.

Male : Body length 5.0–6.5 mm.

Head : Blackish-brown with silvery pollen ; eyes bare, large and black ; width of frons about 0.63 that of one eye and almost uniform ; frontal vitta broad, black, slightly narrowed towards antennal groove and at ocellar region about two and half times that of each parafrontal ; parafrontal silvery dusted, dark at vertex and sparsely with hairs at the level of antennal base and near the vertex ; parafacial bare, silvery dusted and with a complete row of 10 strong black bristles along anterior end just above vibrissae and the bristles reaching up to about base of antennae, its width at face level with base of antennae about 0.30 that of one eye width ; antennae black and reddish on second segment, third antennal segment about four times that of the second ; arista blackish-brown, dilated on basal 0.35 and longer than third antennal segment ; facial ridge black with silvery pollen ; vibrissae long, slightly less than third antennal segment and orbital bristle and with 3 sub- and 1 supravibrissal bristles ; frontal bristles 8, anterior 3 proclinate, posterior 2 reclinate and reaching up to about

base of second antennal segment ; orbital bristles 4, anterior 2 proclinate and posterior 2 reclinate ; ocellar region black with a pair of proclinate divergent bristles which are almost equal to post frontal bristles and as strong as reclinate orbital bristle and with few short hairs ; gena very narrow, grey with silvery pollen and fine black hairs ; post gena black with greysih hairs ; inner vertical bristle well developed and longer than frontal bristle, outer vertical short and about one-third of inner vertical, post vertical short ; a row of regular postocular setae, rest of the area with greyish hairs ; palpi short and blackish ; proboscis short and brownish.



Figs. 288-296 : *Metopia (Australoancia) nudibasis* (Malloch). 288, Head ♂ (lateral view); 289, Head ♂ (frontal view); 290, Thorax (dorsal view); 291, Abdomen (dorsal view); 292, Fore tarsus (dorsal view); 293, Penis (lateral view); 294, Inner and outer forceps (lateral view); 295, Fifth sternite; 296, Inner and outer forceps (posterior view).

Thorax : Slightly dark in colour, densely grey with brownish grey pollen and four narrow median longitudinal dark stripes before suture, the stripes sometimes indistinct due to brownish grey pollen ; mesonotum with 3 distinct stripes, median one strong ; *ac* 0+0 ; *dc* 2+3 ; *ia* 1+3 (anterior 1 short) ; *ps* 1 ; *h* 2 ; *ph* 3 ; *np* 2 ; *pa* 2 ; *sa* 3 ; *st* 1+1 ; *mpl* 4 ; *hpl* 2 ; propleura bare ; scutellum darker on sides and with 2 pairs of lateroscutellar, a pair of short apicoscutellar but with indistinct discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 with short setae along its entire length on dorsal surface ; R_{4+5} with a row of setae located dorsally and extending up to its entire length beyond r-m and with 3 short setae along ventral surface of basal node of R_{4+5} ; R_{4+5} open ; fifth costal segment slightly less than one and half times that of the second, the former with short setae throughout its length on anterior margin ; costal spines short ; epaulet and basicostal scale black ; squama whitish ; halter brown ; bend of m at right angle and with process ; t_p straight.

Legs : Black ; fore femur with a row of 3 short bristles along distal half of posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of short bristles along anterodorsal surface, 1 bristle each on distal two-fifths of posterolateral and posterodorsal surfaces, fore tarsus of male long but without hairs on posterodorsal surface ; mid femur with 1 bristle on anterodorsal surface and few bristles on basal part of posteroventral surface ; mid tibia with incomplete row of bristles along anterodorsal surface and a row of short bristles along ventral surface on basal half ; hind femur with a row of bristles along anterodorsal surface on basal half ; hind tibia with a row of bristles each along anterodorsal and posterodorsal surfaces and 4 bristles along middle portion of anteroventral surface, claws and pulvilli short ; first tarsomere about one and half times that of the fourth, fourth with long hairs anteriorly.

Abdomen : Dark, shining black with silvery pollen and tapering to apex ; second tergite blackish-brown with 1 median marginal bristle, third and fourth each with a large triangular shining broad metallick-black band on most of its posterior end, third with 1 median and fourth with a row of marginal bristles, fifth blackish on posterior half and with a row of marginal bristles ; sternites first to fourth with marginal band and a pair of strong posterior bristles ; fifth sternite u-shaped with slight groove ; genital segments black but rather small ; inner forceps pointed apically ; outer forceps wide at middle and shorter than inner forceps ; anterior paramere wide with slight median projection ; posterior paramere pointed apically ; paraphallus gradually narrowed apically.

Female : Closely similar to male except genitalia characters and unmodified fore tarsus and also mid tibia with 1 bristle on anterodorsal surface.

Material examined : *Holotype* ♂, Australia : Queensland; Eidsvoid, 23.i, no other data.

Discussion on species : This species may be easily distinguished from other species by its specific character of basicosta black, R_1 with short setae along its entire length and R_{4+5} with short setae along its entire length beyond r-m. Pape (1986 b, c) while reviewing the Oriental, Palaearctic and Afrotropical species of *Metopia* Meigen, 1803, placed it under the genus *Metopia* and distinguished it from other species of *Metopia* by its colour of basicosta, bare post-alar wall and third to fourth tarsomeres of male fore tarsus with elongated hairs. He further noted that Indian species might represent a distinct species.

Biology : Larvae of this species are found in the nests of *Anoplius reflexus*, *Batozonellus annulatus*, *Episyron arrogans* (Pompilidae), *Sphex flammitrichus*, (Kurahashi, 1973) *Sphex subtruncatus* (Sphecidae) and *Encopognathus* sp. (Crabronidae) and (Verves, 1979b).

Distribution : India ; Kt (Bannerghatta) ; SL (several localities) ; Australia ; China ; Gambia ; Gilimale ; Japan ; Kenya ; Laos; Malaysia ; New Britain ; Papua New Guinea ; Philippines ; Solomon Islands ; South Africa; Tanzania and Vietnam.

Type deposited : *Holotype* ♂, ANIC, examined.

Discussion on type : In *Holotype* the mid and hind pairs of legs are mounted on a paper board except one hind leg is lost and the genitalia are not dissected out. Otherwise, the condition of the type is good.

Subgenus *Anicia* Robineau-Desvoidy, 1863

1863. *Anicia* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, 2 : 99.

Type species : *Anicia sabulosa* Robineau-Desvoidy, 1863 (= *Tachina campestris* Fallén, 1810)

Morphology : Fore tarsus of male with very long hairs on posterodorsal surface ; frontal rows of bristles not or little divergent and not extending beyond pedicel ; ocellar bristles as strong as reclinate orbital bristles ; second abdominal tergite with a pair of median marginal bristles ; mid tibia with 1 strong bristle on anteroventral surface ; second segment of antennae very long ; inner vertical bristle longest of all bristles.

This is a small subgenus and Verves (1985) reported only 3 valid species from the Palaearctic region. Shewell (1987) recoded 4 species from the Nearctic region. Pape (1986c, 1987c) synonymized this subgenus with *Chaetanicia* Townsend, 1933, but Lopes (1989) treated the latter as a separate genus. Only 1 species has been reported from India.

The species of this subgenus have been reported from the nests of Pompilidae, Vespidae and Sphecidae. Larvae of a species have been described by Townsend (1942).

38. *Metopia (Anicia) campestris* (Fallén)

(Figs. 297–304)

1810. *Tachina campestris* Fallén, *K. svenska Vetensk. Akad. Handl.*, (2) **31** : 266.
 1849. *Tachina sosicles* Walker, *List. Dipt. Br. Mus.*, **4** : 772.
 1961. *Metopia campestris* : Kurahashi, *Kontyû*, **29** : 131 ; Pape, 1987, *Fauna ent. scand.*, **19** : 73.
 1986. *Metopia (Anicia) campestris* : Verves, *Cat. Palae. Dipt.*, **12** : 96.

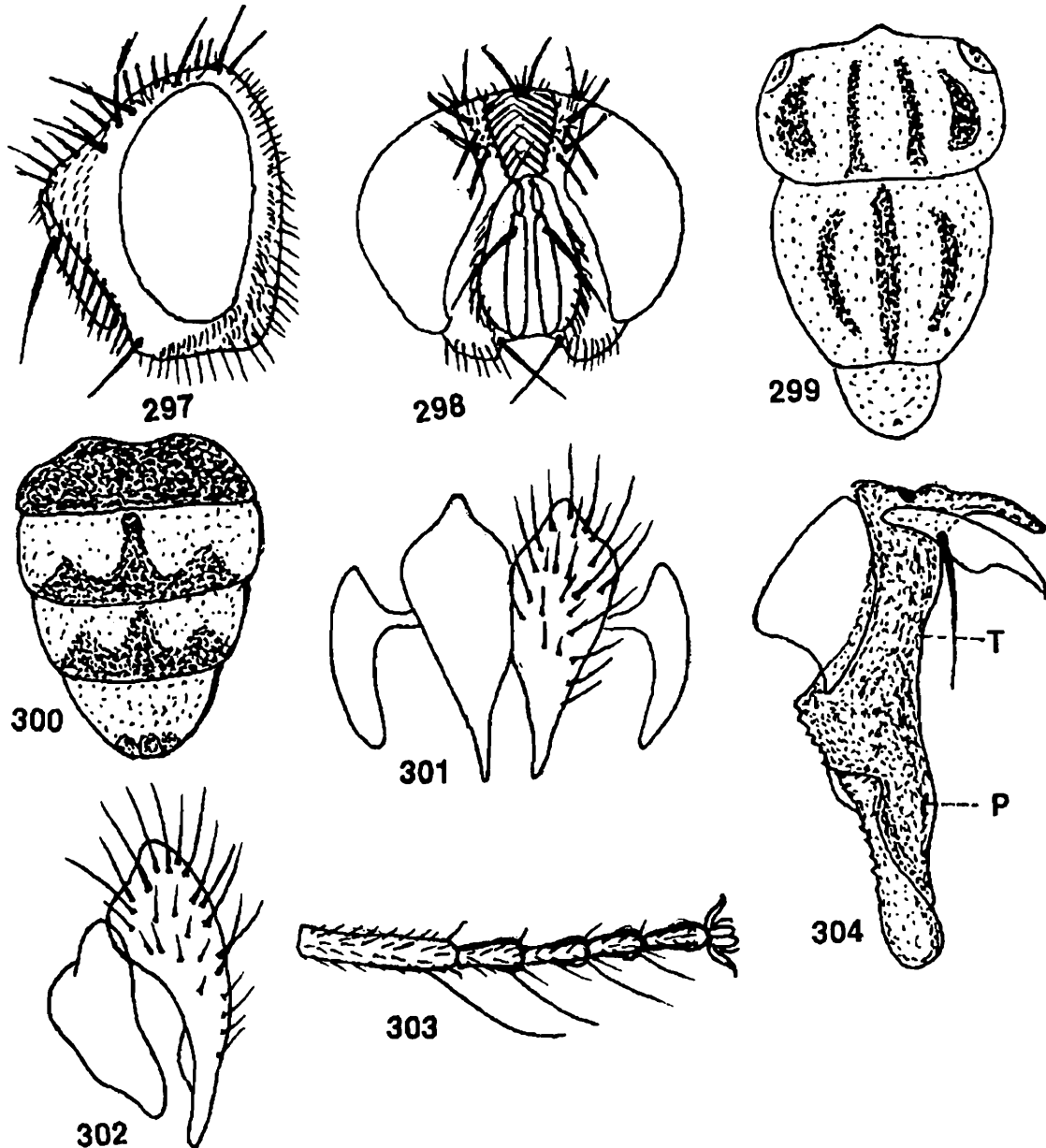
Male : Body length 4.5–0.0 mm.

Head : Black ; eyes blackish-brown ; frons broad and its width at ocellar region 0.55 times that of one eye and frons slightly projecting forwards ; frontal vitta black, gradually narrowed anteriorly and its width at ocellar region about 3.3 that of each parafrontal ; frontal vitta with slightly grey to brownish pollen ; parafacial and lower portion of parafrontal blackish with silvery pollen, the former with short hairs in anterior portion and the latter with numerous long scattered hairs near orbital region ; parafacial at face level with base of antennae 0.30 that of one eye width ; antennae long and greyish-black, third antennal segment greyish and about 4.5 to 5.5 that of the second ; arista about as long as third antennal segment and dilated up to basal 0.4 ; facial ridge greyish with silvery pollen ; parafacial with a row of 8–9 strong bristles on inner margin close to facial ridge and on upper part with some black hairs which are continued on to the antennal base ; vibrissae strong with 2-4 supravibrissal bristles ; frontal bristles 11–13, anterior 5–6 proclinate and posterior 2–3 reclinate and reaching up to below base of antennae ; orbital bristles 4, anterior 2 proclinate and posterior 2–3 reclinate ; ocellar region black with a pair of proclinate bristles and few moderately long hairs and proclinate ocellar bristles as strong as reclinate orbital bristles ; gena black with silvery pollen ; post gena black with greyish hairs ; inner vertical bristle well developed, outer vertical about four-fifths that of inner vertical, post-vertical and post ocellar not differentiated ; a row of postocular setae with few moderately long hairs, rest of the area with black hairs ; palpi black ; proboscis short and greyish-black.

Thorax : Grey with silvery pollen and 2 median and 2 lateral stripes in mesonotum ; *ac* 3+3 ; *dc* 3+3 ; *ia* 3 ; *ps* 1 ; *h* 2 ; *ph* 1 ; *np* 2 ; *pa* 2 ; *sa* 2 ; *st* 1+1 ; *mpl* 5–7 ; *hpl* 5–7 ; propleura bare ; scutellum black, silvery pollen and with a pair of apicoscutellar, 2 pairs of lateroscutellar. and a pair of moderately developed discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 2–5 short setae located dorsally and extending up to more than basal half from the basal node to

r-m and 2 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment almost same or slightly longer than the third, the former with short setae along



Figs. 297-304 : *Metopia (Anicia) campestris* (Fallén). 297, Head ♂ (lateral view); 298, Head ♂ (frontal view); 299, Thorax (dorsal view); 300, Abdomen (dorsal view); 301, Inner and outer forceps (posterior view); 302, Inner and outer forceps (lateral view); 303, Fore tarsus (dorsal view); 304, Penis (lateral view).

entire length on its anterior margin; costal spines short; epaulet black; basicostal scale yellowish-orange; squama white; halter yellow; bend of m 130° with slight process; t_p almost straight.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of short bristles along anterodorsal surface and 1 bristle on posterodorsal surface on distal two-thirds, fore tarsus with very long hairs on posterodorsal surface; mid

femur with a row of 2–3 long bristles along anteroventral surface on basal half, few long and few hair-like bristles along posteroventral surface and 2 bristles on posterodorsal surface on distal end ; mid tibia with 1 strong bristle each on anterodorsal and anteroventral surfaces on distal one-third and a row of 3 short bristles on posterodorsal surface ; hind femur with a pair of rows of bristles along anterodorsal surface and a row of bristles along anteroventral surface ; hind tibia with a row of 2 long and few short bristles along anterodorsal surface, 2 bristles apart medially on posterodorsal surface and 1 bristle on anteroventral surface on distal one-third ; claws and pulvilli short ; claw slightly longer than pulvilli and about 0.5 of fifth tarsomere ; apical part of first to fourth tarsomeres with long hairs along posterodorsal surface ; first tarsomere equal to total of two to fourth tarsomeres.

Abdomen : Dark black with silvery pollen ; second tergite entirely black, third and fourth with 3 black spots which coalesce at hind margin and the median spot elongated, fifth with silvery-grey pollen and black spots on hind margin of 0.3, second tergite with a pair and third with 2 pairs of median marginal bristles but second with 1 and third with 2 lateral marginal bristles, fourth and fifth each with a row of marginal bristles ; sternites first to fourth with long hairs posteriorly ; inner forceps wide ; outer forceps gradually pointed terminally with 1 hair ; anterior paramere rather short, wide and slightly curved ; posterior paramere wide at middle, curved, pointed at end and with 1 hair ; paraphallus wide, blunt at end and with well developed ventral plates and spines apically.

Female : Almost similar to male but with shorter and sparser hairs ; parafacial broader and almost as broad as frons at vertex ; fore tarsus without specialised hairs and second abdominal tergite with only a pair of median marginal bristles.

Material examined : 1♂, Spain : Gerona ; Caralps, 1,200–1,300 m, 13–17. vi. 1982, Anderson, Lyneborg and Michelsen ; 1♂, N. W. Russia : Vie Luga ; Tolmatshevo, 4. vii. 1937, Stackelberg (det. Stackelberg ; dep. in USNM).

Discussion on species : This species may be distinguished from other species by having numerous bristles with almost triangular head, black body colour, peculiar abdominal pattern and also with hairs on male fore tarsus. Verves (1986) synonymized this species with a large number of the Palaearctic species.

Biology : Pape (1986b) recorded it as kleptoparasite from nests of *Pompilus* sp. (Pompilidae) and *Arachnospila* sp. (Vespididae). He further reported in 1987b that this species was bred from nests of *Ammophila campestris* (Sphecidae); *Arachnospila trivialis* and *Pompilus* sp. (Lundbeck, 1927 ; Nielsen, 1932). The first instar larva of this species has been drawn and described by Thompson (1921) and Townsend (1942).

Distribution : India ; JK (Gulmarg) ; Alaska ; Albania ; Armenia ; Austria ; Azerbaijan ; Belgium ; Bulgaria ; Byelorussia ; California ; Canada ; China ; Czech Republic ; Denmark ; Estonia ; Finland ; France ; Germany ; Great Britain ; Gruzia ;

Hungary ; Ireland ; Italy ; Japan ; Kazakhstan ; Korea ; Latvia ; Moldova ; Mongolia ; Netherlands ; Norway ; Poland ; Romania ; Russia ; Servia ; Slovakia ; Sweden ; Switzerland ; Tajikistan ; Ukraine ; United Kingdom ; USA and Uzbekistan.

Type deposited : *Lectotype* ♂, NRM, not studied.

Discussion on type : Pape (1986b) studied the type material of *campestris* Fallén and reported that the *Lectotype* lacks both hind legs and the condition of the type is otherwise good. He identified it as *Metopia campestris* (Fallén) and labelled 2 ♂♂ specimens collected by Fallén as *Paralectotype*. Fallén (1810) described this species from both sexes and in 1820 he redescribed the species from female only. He (1820) redescribed *Metopia campestris* from remaining *Syntype* which he described in 1810 and mentioned it as mis-sexed female.

Genus 21. *Chaetania* Townsend, 1932

1933. *Chaetania* Townsend, *Jl. N. Y. ent. Soc.*, **40** : 445.

Type species : *Chaetania sauteri* Townsend, 1933.

1966. *Nepalometopia* Rohdendorf, *Bull. Br. Mus. nat. Hist. (Ent.)*, **B**, **117** (10) : 462.

Type species : *Nepalometopia brunneipennis* Rohdendorf, 1966 (= *Chaetania sauteri* Townsend, 1933).

Morphology : Hind cross vein (t_p) situated almost midway between the angle of m and the cross vein ; frons shorter and not projecting forwards ; R_1 bare ; R_{4+5} open ; presutal *ac* absent ; parafacial with pollen and a row of short hairs along anterior margin ; frontal vitta wide and gradually narrowed anteriorly ; vibrissae well developed ; arista long, longer than anterior paired ocellar bristles which is also longer than vibrissae ; t_p straight.

Discussion : This is a small genus and Pape (1986b) synonymized it with *Metopia* but Verves (1986) treated it as separate genus and synonymized with *Nepalometopia* Rohdendorf, 1966. Only 1 species has so far been reported from this area.

Biology : Adult flies have been bred from the nests of Sphecidae and Pompilidae.

Distribution : This genus is distributed in the Palaearctic and Oriental regions.

39. *Chaetania sauteri* (Townsend)

(Figs. 305–312).

1933. *Chaetania sauteri* Townsend, *Jl. N. Y. ent. Soc.*, **30** : 445, Verves, 1986, *Cat. Palae. Dipt.*, **12** : 89.

1935. *Metopia zosea* Séguy, *Notes Ent. Chin.*, **2** (9) : 182.

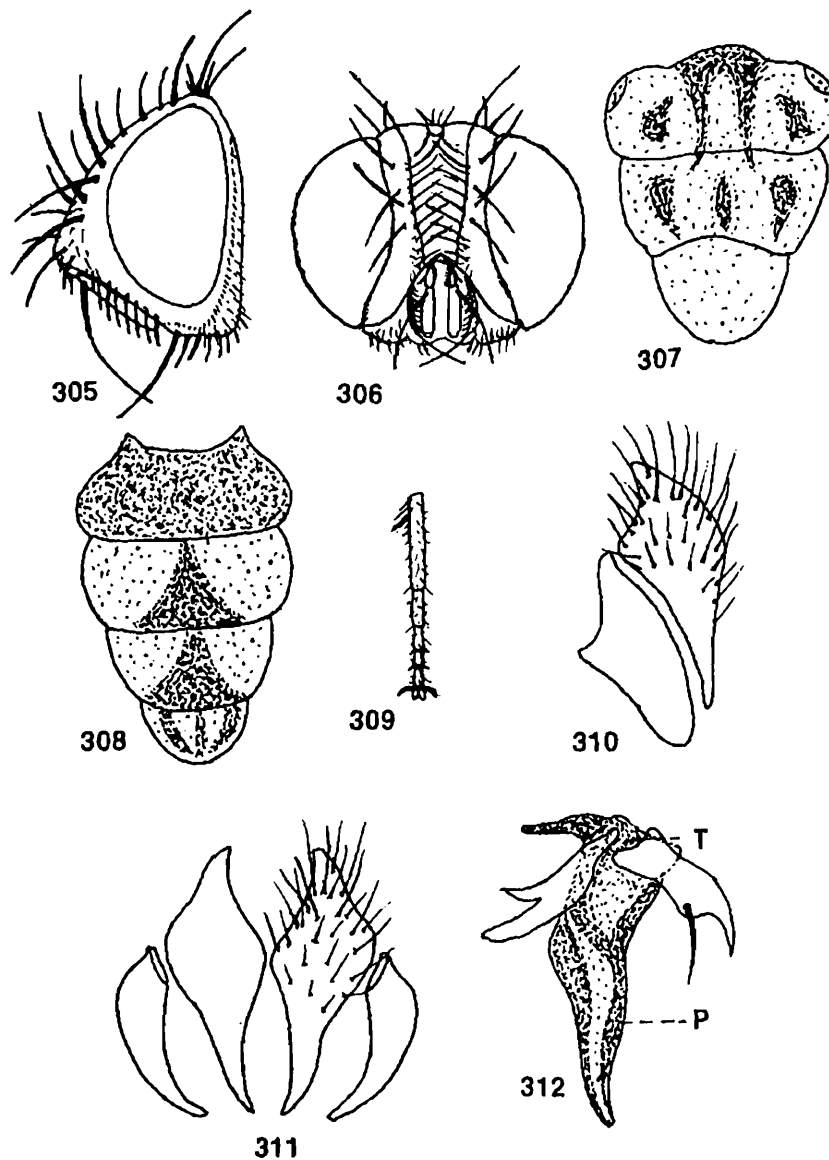
1965. *Metopia (Opheliella) amamiensis* Fan, *Synn. flies China*, **15** : 301.

1966. *Nepalometopia brunneipennis* Rohdendorf, *Bull. Br. Mus. nat. Hist. (Ent.)*, B, 17 (10) : 463.

1970. *Metopia sauteri* : Kurahashi, *Kontyû*, 38 (2) : 108.

Male : Body length 4.0–7.0 mm.

Head : Dark black colour with shiny silvery pollen ; eyes bare and reddish ; width of frons at ocellar region about 0.50 that of one eye and frons not projecting forwards ; frontal vitta reddish-black and in middle more than twice that of each parafrontal and gradually narrowd anteriorly ; width of frons just above level of antennae about 0.60 that of one eye width ; parafrontal with silvery pollen, brownish tinge towards



Figs. 305-312 : *Chaetanicia sauteri* (Townsend). 305, Head ♂ (lateral view); 306, Head ♂ (frontal view); 307, Thorax (dorsal view); 308, Abdomen (dorsal view); 309, Fore tarsus (dorsal view); 310, Inner and outer forceps (lateral view); 311, Inner and outer forceps (posterior view); 312, Penis (lateral view).

vertex but without hairs ; parafacial black, silvery pollen and with few short scattered hairs near posterior end and 2 frontal and a row of bristles on anterior margin ; antennae black but reddish on apical parts of second segment, third antennal segment about four times that of the second ; arista longer than ocellar bristles ; antennae bare and dilated on basal 0.35 ; vibrissae well developed above mouth margin and slightly shorter than arista ; facial ridge blackish with a row of 3 strong supra- and 2-5 subvibrissal bristles ; frontal bristles 8, anterior 2-4 strong, proclinate and rest short ; gena narrow, yellowish but without hairs ; post gena black with black hairs ; inner and outer vertical bristles well developed, outer slightly longer than two-thirds of inner vertical, post vertical one-fourth that of inner vertical ; orbital bristles 4-5, moderately developed, posterior 2-3 reclinate and anterior 2 proclinate ; postocellar bristles short ; ocellar region brownish with a pair of moderately developed proclinate bristles and few hairs ; a row of regular postocular setae besides postocular cilia, rest of the area with short greyish hairs ; palpi reddish ; proboscis brownish and dark at tip.

Thorax : Dark brownish with grey pollen and 2 median narrow stripes which cross the presutural suture and 2 lateral spot shaped stripes on pronotum ; mesonotum with 1 median and 2 lateral spots ; *ac* 0+1 ; *dc* 2+3 ; *ia* 1+3 (presutural 1 fine) ; *ps* 1 ; *h* 3 (one short) ; *ph* 1-2 ; *np* 2 ; *pa* 2 ; *sa* 3 ; *st* 1+1 ; *mpl* 5 ; *hpl* 4 ; propleura bare ; scutellum silvery dusted and with a pair of short apicoscutellar, 2 pairs of discoscutellar and a pair of short lateroscutellar bristles.

Wings : Hyaline with dark brown veins ; R_1 bare ; R_{4+5} with a row of 7 short setae located dorsally and extending up to whole of basal node to r-m and 2-3 short setae along ventral surface of basal node of R_{4+5} ; R_{4+5} open ; fifth costal segment slightly longer than the third, the former with short setae along entire length on its anterior margin ; costal spines stout ; epaulet and basicostal scale black ; squama yellowish-white ; halter yellow ; bend of m at right angle ; t_p straight and almost midway in between the angle of m and the cross vein.

Legs : Black, long with silvery pollen ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 1 bristle on posterodorsal surface along distal one-third ; mid femur with a row of 3 bristles along basal half of anterodorsal surface, 2 long hair-like bristles along basal one-third on posteroventral surface and few comb-like setae along anterior and posterior margins on distal half ; mid tibia with 1 bristle on anterodorsal surface on distal one-third and a row of short bristles along posterodorsal surface ; hind femur with a row of bristles along anterodorsal surface and 3 long hairs along anteroventral surface on basal one-third ; hind tibia with a row of short bristles each along anterodorsal and posterodorsal surfaces on distal two-thirds but without long hairs along ventral surface ; claws and pulvilli small ; claw less than

fifth tarsomere ; fifth tarsomere short and about one-fifth that of first tarsomere and 0.9 times that of second tarsomere.

Abdomen : Dark with densely yellow brown pollen ; second tergite entire with dark black band, third and fourth with a large triangular metallic-black band and also with erect median marginal bristles, fifth with indistinct dark lateral marginal band, fourth and fifth tergites with lateral marginal bristles, second and fourth with a pair of fine maginal bristles on hind margin ; ventral side of abdomen sometimes reddish ; inner and outer foreceps wide and the former with pointed end ; anterior paramere bifurcated ; posterior paramere wide at base, abruptly pointed at end and with 1 hair ; paraphallus wide at base and gradually pointed at end ; genitalia not so much prominent.

Female : Closely similar to male except genitalia structures.

Material examined : *Holotype* ♂ of *Nepalometopia brunneipennis* studied and the description agrees with the earlier description of *sauteri* and few characters are also added here.

Discussion on species : Lopes (1989) placed this species under the subgenus *Metopia* of the genus *Metopia* and also as synonyme of the genus *Chaetania*. Verves (1986) placed it under the genus *Chaetania* Townsend. The author studied the type species of *Nepalometopia brunneipennis* Rohdendorf, 1966 and agreed to place it under the genus *Chaetania*. This species is distinctive in having peculiar abdominal band pattern, wideness of inner and outer forceps and peculiar structure of paraphallus. *C. sauteri* is practically identical with *Metopia (Australoancia) nudibasis* (Malloch) in the female sex. The only difference is setae of wing R_1 . A generic separation is difficult to defined.

Biology : This species is frequently found around the nest of *Sphex* sp. (Sphecidae) on low fertile soil surrounding by luxuriant herbaceous vegetation (Kurahashi, 1970). It is also recorded as kleptoparasite in the nest of *Episyron arrogans* (Pompilidae) (Pape, 1986b).

Distribution : Ne (Sangu) ; China ; Japan ; Laos ; New Britain ; Papua New Guinea and Taiwan.

Type deposited : *Holotype* ♂ of *sauteri*, IPEF, not examined ; but *Holotype* ♂ *brunneipennis*, BMNH, examined.

Discussion on type : The author studied the type of *brunneipennis* Rohdendorf and found that the abdomen, right fore and left hind legs are missing. Pape (1986b) while revising the Oriental and Palaeartic species of the genus *Metopia* Meigen, 1803 placed this species under the genus *Metopia* and distinguished it from other species of *Metopia* by its specific characters of wing, vein R_1 bare and setal row of wing vein R_{4+5} extending beyond cross vein r-m.

Subtribe **Sphenometopiina** Verves

This subtribe is characterised by having long supra vibrissal bristles and specific sexual dimorphism ; the facial ridge with regular rows of long and strong bristles ; frons of male usually silvery or gold dusted ; orbital bristles in one row and strong ; fore tarsus of male usually with many long hairs ; abdomen of male partly with black spotted but abdominal tergites of female with 3 black spots dorsally ; tenth tergite of female abdomen is reduced and seventh tergite is often divided.

This subtribe consists of two genera *Sahararaba* Rohdendorf, 1971 and *Sphenometopa* Townsend, 1908 including about 50 species in the world. Only the genus *Sphenometopa* is present in India. Pape (1990) has previously synonymized *Sahararaba* with *Sphenometopa*.

Most of the flies are frequent in stone-banks of mountain streams. One species of these flies has been reared in the nest of a Sphecoid wasp-*Podalonia occidentalis* (Sphecidae) (Verves, 1989d).

This subtribe is mostly distributed in the Holarctic and Palaearctic regions.

Genus 22. ***Sphenometopa*** Townsend, 1908

1908. *Sphenometopa* Townsend, *Smithson. misc. Collect.*, **51**(2) : 64.

Type species : *Araba nebulosa* Coquillett, 1902.

1889. *Eumetopia* Brauer and Bergenstamm, *Denkschr. Akad. Wiss. Wien. Kl. math.-naturw.*, **56** : 114 (preoccupied Macquart, 1846 and Westwood, 1840).

Type species : *Tachina fastuosa* Meigen, 1824.

1915. *Euaraba* Townsend, *Proc. biol. Soc. Wash.*, **28** : 20.

Type species : *Araba tergata* Coquillett, 1895.

1915. *Arabiopsis* Townsend, *Can. Ent.*, **47** : 285.

Type species : *Arabiopsis cocklei* Townsend, 1915 (= *Eumetopia stelviana* Brauer and Bergenstamm, 1891).

1933. *Eumetopiops* Townsend, *Jl. N. Y. ent. Soc.*, **40** : 445.

Type species : *Tachina fastuosa* Meigen, 1824.

1936. *Pariosticha* Enderlein, *Sber. Ges. naturf. Freunde. Berl.*, **4** : 188.

Type species : *Pariosticha stelviana* Brauer and Bergenstamm, 1891.

1936. *Eremoparia* Enderlein, *Sber. Ges. naturf. Freunde. Berl.*; **4** : 189.

Type species : *Baumhaueria leucocephala* Jaennicke, 1867 (identification doubtful).

1967. *Asiaraba* Rohdendorf, *Ént. Obozr.*, **46**(2) : 456. (as subgenus of *Sphenometopa*)

Type species : *Sphenometopa (Asiaraba) stackelbergi* Rohdendorf, 1967.

1967. *Tarsaraba* Rohdendorf. *Ént. Obozr.*, **46** (2) : 460 (as subgenus of *Sphenometopa*)

Type species : *Sphenometopa (Tarsaraba) przewalskii* Rohdendorf, 1967.

1967. *Xantharaba* Rohdendorf, *Ént. Obozr.*, **46** (2) : 463 (as subgenus of *Sphenometopa*)
Type species : *Metopia steinii* Schiner, 1862.
1971. *Sahararaba* Rohdendorf, *Die Fliegen Palae. Region*, **11** : 149.
Type species : *Sahararaba elegans* Rohdendorf, 1971.
1897. *Araba* Coquillett, *U.S. Dept. Agric., Div. Ent. Tech. Ser.*, **7** : 127. and subsequent authors, not *Araba* Robineau-Desvoidy, 1830.
1981. 1982, *Styloneuria* : Verves, *Folia ent. hung.*, **34** (1) : 197. and *Insects of Mongolia*, **8** : 551. (misidentification, not Brauer and Bergenstamm, 1891).
1984. *Eumetopiella* : Verves, *Insects of Mongolia*, **9** : 539. (misidentification, not Hendel, 1907).
Type species : *Tachina fastuosa* Meigen, 1824.

Morphology : Body black, partially covered with pollen ; antennae long, third antennal segment 3–6 times that of the second ; arista rod-like and thickened on basal half ; a row of fine long bristles along vibrissal ridges at least upper third or fourth ; frons moderately protruding ; frontal vitta narrowed anteriorly ; parafacial almost bare ; second abdominal tergite without median marginal bristles ; claws short in both sexes ; R_1 bare ; t_p situated near the bend of m ; vibrissae distinct and differentiated ; orbital region with bristly hairs ; supravibrissal bristles present ; face not protruded ; apical part of cerci of male straight.

Discussion : This is a comparatively species rich genus. Rohdendorf (1967a) revised this genus from the Palaearctic region and described many new species. Shewell (1987) reported only 3 species from the Nearctic region. Pape (1990) revised the nomenclature of this genus and discussed its phylogenetic affinities. Only 2 species have been reported from this area.

Biology : Rohdendorf (1967a) reported that most of the species inhabit rocky or mountain terrain and can be collected from cliffs and boulders near streams and also from the dry beds of mountain rivulets. Larvae of a few species have been drawn and described by Thompson (1921)

Distribution : This genus is distributed in all Zoogeographical regions except the Australasian and Oceanian regions but Neotropical records are from Mexico and the genus does not occur in South America.

Key to species

1. R_{2+3} and R_{4+5} with brown patch and band ; fifth abdominal tergite with a broader black band covering along about half of posterior margin*fastuosa* (Meigen)
 R_{2+3} and R_{4+5} without brown patch and band ; fifth abdominal tergite with very shiny small narrow black band along posterior margin
.....*jacobsoni* (Rohdendorf)

40. *Sphenometopa fastuosa* (Meigen)

(Figs. 313–319)

1824. *Tachina fastuosa* Meigen, *Syst. Besch.*, **4** : 370.
 1830. *Ophelia agilis* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. Sci. Inst. Fr.*, (2) **2** : 120.
 1967. *Sphenometopa (Euaraba) fastuosa* : Rohdendorf, *Ént. Obozr.*, **46** (2) : 454.
 1980. *Araba fastuosa* : Dear, *Cat. Dipt. Afrotrop. Region*, **821** : 802.
 1986. *Eumetopiella (s. str.) fastuosa* : Verves, *Cat. Palae. Dipt.*, **12** : 92. (erroneous, author not Hendel, 1907).
 1990. *Sphenometopa fastuosa* : Pape, *Nouv., Rev. Ent. (N. S.)*, **7** (4) : 439.

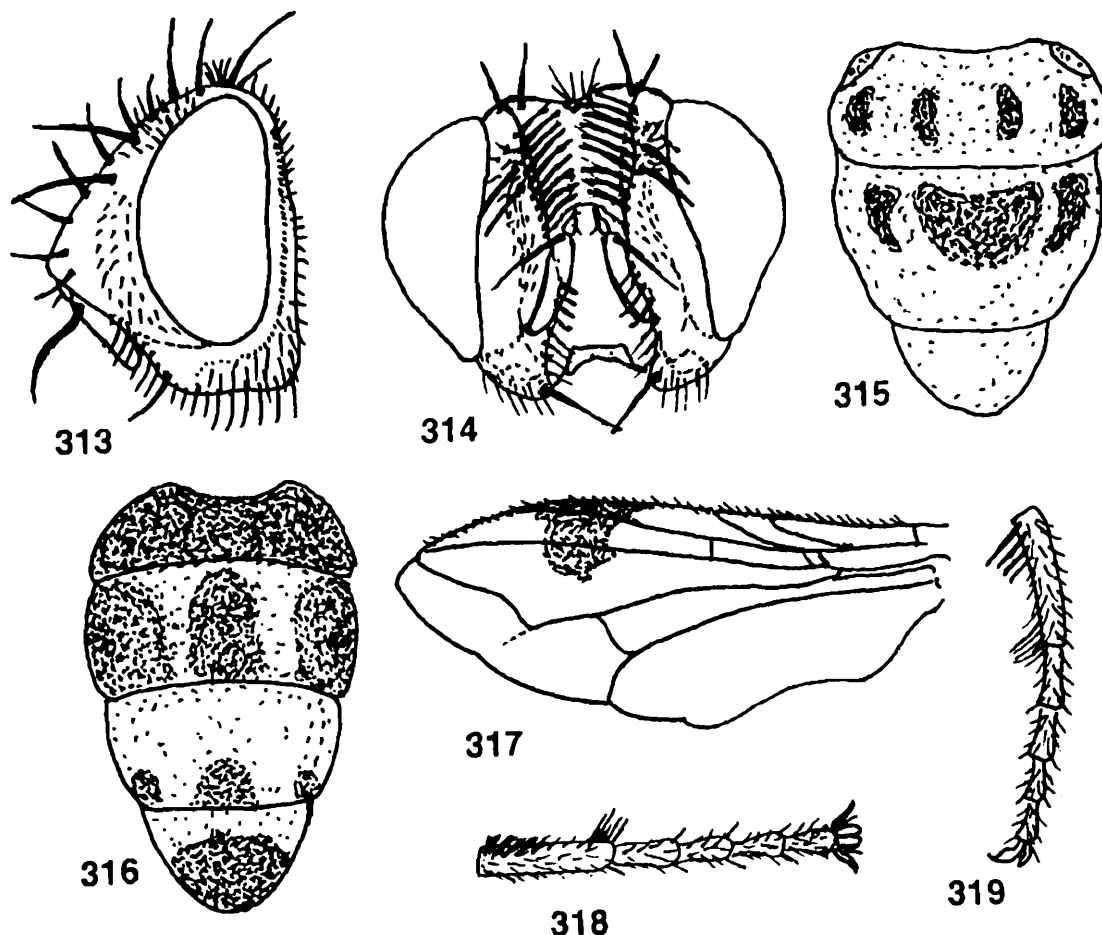
Male : Body length 4.0–5.5 mm.

Head : Dark black and covered with silvery pollen ; eyes greyish ; width of frons about 0.55–0.60 that of one eye and frons moderately projecting forwards ; frontal vitta silvery white with silvery pollen, slightly narrowed anteriorly and its width near ocellar region four times that of each parafrontal ; parafrontal silvery white, very narrow and with moderately long hairs ; parafacial slightly blackish, silvery pollen and with short hairs near inner margin and its width at face level with base of antennae about 0.31 to 0.35 that of one eye width ; antennae blackish, long and thickened uniformly, third antennal segment 3.0–4.5 times that of the second ; arista rod-like, black, thickened up to basal 0.7 and with very short hairs at basal end and slightly shorter than that of third segment ; facial ridge slightly blackish with a row of long bristles ; vibrissae not so developed ; vibrissal angle less prominent, slightly above mouth margin and with 4–5 sub- and 5 supravibrissal bristles ; frontal bristles 9–10, anterior 3 proclinate, posterior 2 reclinate and reaching up to below base of antennae ; orbital bristles 2, proclinate ; gena somewhat short with silvery pollen ; post gena blackish with short blackish hairs ; inner vertical bristle well developed, outer vertical one-fifth that of inner vertical, post vertical and post ocellar very short ; ocellar region dark black with six pairs of short hairs but without proclinate ocellar bristles ; a row of regular postocular setae, rest of the area with greyish hairs ; palpi blackish ; proboscis short and black.

Thorax : Dark black and covered in places with grey pollen forming small some what four indistinct longitudinal stripes before suture and with 1 wide median and 2 short lateral stripes on mesonotum ; *ac* 3+3 (short) ; *dc* 2+3 ; *ia* 1+2 ; *ps* 1 ; *h* 2 ; *ph* 1 ; *np* 3 ; *pa* 2 ; *sa* 4 ; *st* 1+1 ; *mpl* 4–5 ; *hpl* 5 ; propleura bare ; scutellum black with white pollen and with a pair of apicoscutellar , 2 pairs of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of short setae located dorsally and extending up to basal one-third of basal node to r-m and 2 short setae

along ventral surface of basal node of R_{4+5} ; fifth costal segment twice that of the second, the former with short setae along more than basal half of its anterior margin;



Figs. 313-319 : *Sphenometopa fastuosa* (Meigen). 313, Head ♂ (lateral view); 314, Head ♂ (frontal view); 315, Thorax (dorsal view); 316, Abdomen (dorsal view); 317, Wing; 318, Fore tarsus (dorsal view); 319, Fore tarsus (lateral view).

R_{4+5} with an anterior brownish big spot and a posterior broader stripe above the bend of m and with wide patch on posterior border of R_{2+3} ; costal spines short; epaulet brownish; basicostal scale slightly yellowish; squama milky white; halter brownish-yellow; bend of m 120° with short process; t_p slightly arcuate and situated near the bend of m .

Legs : Black; fore femur with a row of bristles along posterodorsal surface and a row of long bristles along posterior margin of ventral surface; fore tibia with 1 bristle on posterodorsal surface on distal one-third; mid femur with a row of 5-6 bristles medially along anterodorsal surface, few short bristle-like hairs along anteroventral and posteroventral surfaces and 2 bristles on posterodorsal surface on distal end; mid tibia with 2 bristles apart on middle portion of posterodorsal surface, 1 bristle each on anteroventral and anterodorsal surfaces at about two-thirds from the basal end; hind femur with a row of bristles along anterodorsal surface and few long and

short hairs along anteroventral surface; hind tibia with a row of bristles along anterodorsal surface and few short hairs along middle portion of anteroventral surface; claws short, slightly longer than pulvilli, claw 0.5 of fifth tarsomere; first and second tarsomeres of fore tarsus without hairs on posterior end, first tarsomere short and equal to total of first to second tarsomeres.

Abdomen : Black and covered with grey pollen; second tergite entirely black with black median and 2 lateral stripes, third wholly light blackish with 1 median and 2 lateral stripes, fourth with 1 short median and 2 lateral spots on its posterior one-third, fifth with broader black band at its posterior half; second tergite without median but with few short lateral marginal bristles, third with a pair of short median and 3 lateral marginal bristles, fourth with a pair of median and 2–3 lateral marginal bristles, fifth with a row of marginal bristles; sternites first to fourth with short hairs; genitalia black.

Female : Almost similar to male but the following differences: third abdominal tergite with median spots and the lateral spots separated from the lateral bands on the posterior margin, fourth with a distinct median and iridescent lateral spots, band on posterior margin of fifth tergite covers half to three-fifths of the tergite.

Material examined : 1♂, India: Kashmir Valley; Tangmarg, 671 m, 17.viii.–ix. 1978, Copenhagen Zoological Expedition, (det. by T. Pape; dep. in ZMUC).

Discussion on species : This species can be distinguished from *S. jacobsoni* (Rohdendorf, 1967) by the thickening of arista which is more than half of its length, well developed band on posterior margin of fifth tergite and without hairs on first and second tarsomeres of anterior tarsus but with few hairs along middle portion of anteroventral surface of hind tibia. Moreover, wing band of this species is very characteristic. Thomas Pape (personal communication) reported that the wing band of Indian specimens slightly different from the Palearctic specimens.

Biology : So far as the literature is concerned nothing is known regarding the biology of this species.

Distribution : India; JK (Tangmarg); Armenia; Austria; Czech Republic; Egypt; Europe; France; Greece; Hungary; Italy; Kenya; Poland; Russia; Slovakia; Spain; Switzerland; Turkmenistan; Ukraine; Yemen; Yugoslavia (former) and Zimbabwe.

Type deposited : Holotype ♂, NMW, not examined.

41. *Sphenometopa jacobsoni* (Rohdendorf)

(Figs. 320–325)

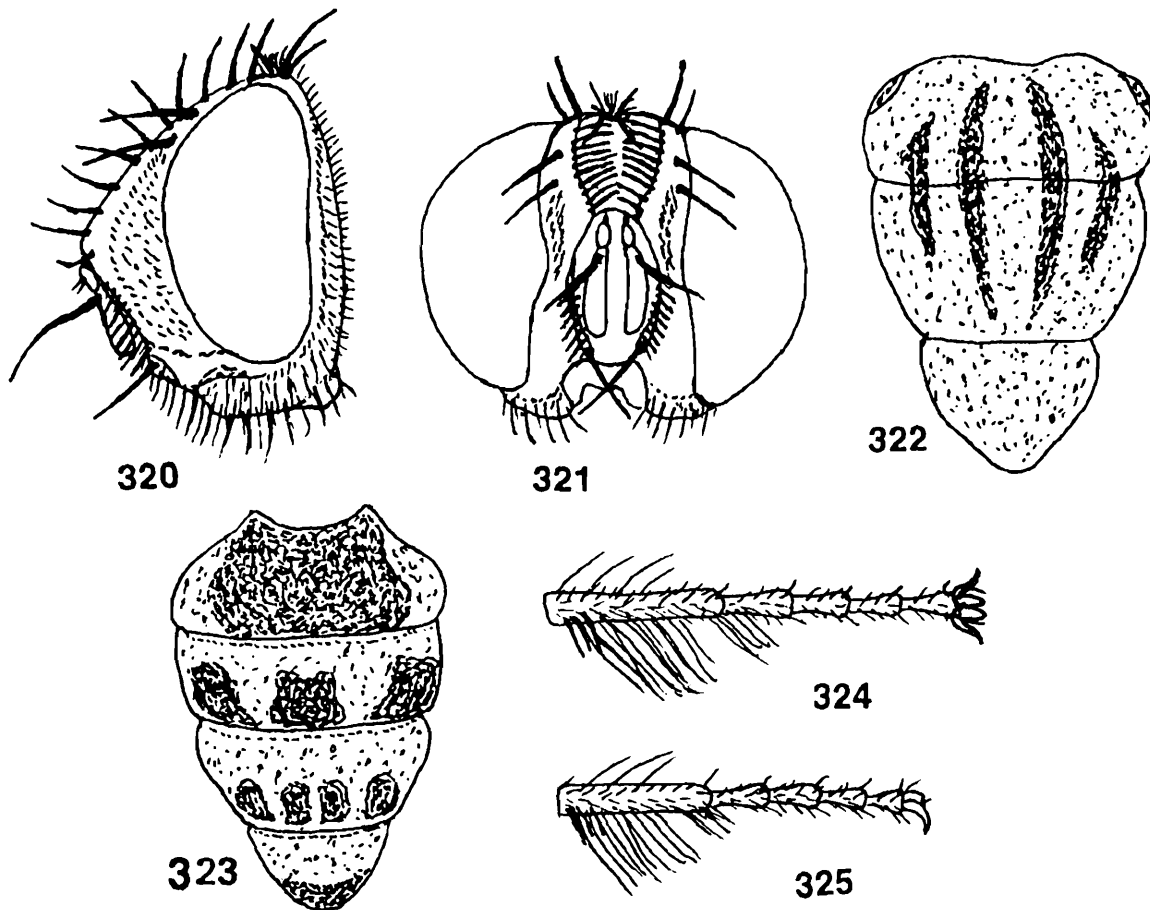
1967. *Sphenometopa (Asiaraba) jacobsoni* Rohdendorf, *Ént Obozr.*, **46**(2) : 457.

1986. *Eumetopiella (Asiaraba) jacobsoni* : Verves, *Cat. Palae. Dipt.*, **12** : 91.

1990. *Sphenometopa jacobsoni* : Pape, *Nouv. Rev. Ent.*, (N.S.), 7(4) : 440.

Male : Body length 4.7–6.1 mm.

Head : Dark and covered with dense pollen ; eyes slightly reddish ; width of frons about 0.55–0.60 that of one eye and frons slightly projecting forwards ; frontal vitta with silvery white pollen, slightly narrowed anteriorly and its width at ocellar region five times that of each parafrontal ; parafrontal silvery white, narrow and almost bare ; parafacial silvery-blackish with silvery pollen and short hairs near eye margin and its width at face level with base of antennae 0.25–0.30 that of one eye width ; antennae blackish, long and thickened uniformly, third antennal segment 3–4.7 times that of the second ; arista reddish-black, thickened up to basal 0.5 and with



Figs. 320-325 : *Sphenometopa jacobsoni* (Rohdendorf). 320, Head ♂ (lateral view); 321, Head ♂ (frontal view); 322, Thorax (dorsal view); 323, Abdomen (dorsal view); 324, Fore tarsus (dorsal view); 325, Fore tarsus (lateral view).

very short hairs at basal end and longer than third antennal segment ; facial ridge slightly blackish with a row of 8–9 short bristles ; vibrissae moderately developed ; vibrissal angle less prominent and slightly above mouth margin ; frontal bristles 10–11, reaching up to base of antennae, anterior 4 proclinate and posterior 4 reclinate ; orbital bristles 2 and reclinate ; gena somewhat short with silvery pollen ; post gena

blackish with short hairs; inner vertical bristle well developed, outer vertical two-thirds that of inner vertical, post vertical and post ocellar very short; ocellar region dark grey with 2 proclinate and few short hairs; a row of regular postocular setae, rest of the area with greyish hairs; proboscis short and black; palpi blackish.

Thorax : Dark and covered in places with grey pollen forming somewhat indistinct four longitudinal stripes before suture which also continue half way to mesonotum; *ac* 3+3; *dc* 2+3; *ia* 1+2; *ps* 1; *h* 2; *ph* 1; *np* 3; *pa* 2; *sa* 4; *st* 1+1; *mpl* 4; *hpl* 4; propleura bare; scutellum black with white pollen and a pair of apicoscutellar, 2 pairs of lateroscutellar and 2 pairs of short discoscutellar bristles.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} without setae on dorsal surface of basal node to r-m but with 2 short setae on ventral surface of basal node of R_{4+5} ; fifth costal segment twice that of the second, the former with short spines along more than basal half of its anterior margin; costal spines short; epaulet brownish; basicostal scale slightly yellowish; squama milky white; halter brownish-yellow; bend of m 120° ; t_p slightly curved and situated near the bend of m; R_{2+3} and R_{4+5} without brush patch and band.

Legs : Black; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with 1 bristle on posterodorsal surface on distal one-third; mid femur with a row of 5–6 bristles medially on anterodorsal surface, few short bristles along posteroventral surface and 2 bristles on posterodorsal surface on distal end; mid tibia with a row of bristles along basal half of anterodorsal surface, a row of short bristles along posterodorsal surface and 1 bristle on anteroventral surface on distal one-third; hind femur with a row of bristles along anterodorsal surface and a row of bristles along anteroventral surface; hind tibia with a row of bristles along anterodorsal surface and 1 bristle each on anteroventral and posterodorsal surfaces on distal one-third; claws and pulvilli very short, claw short, about 0.4 of fifth tarsomere; first and second tarsomeres of fore tarsus with long bristle-like hairs along posterodorsal surface, few hairs on anterodorsal surface and second in addition with few hairs on basal end on posterodorsal surface; first tarsomere equal to total of two to third tarsomeres.

Abdomen : Black and covered with grey pollen; second tergite with black wide band at the middle and grey pollen only on the sides and below, third with three black longitudinal stripes up to half of its posterior end and light grey at sides, fourth with 2 short median and 2 lateral stripes, fifth with narrow small black band on posterior end, second without but third with a pair of median marginal bristles and each with a lateral marginal bristle, fourth and fifth each with a row of marginal bristles; sternites first to fourth with short hairs; genital tergites black with less pollen; inner forceps curved and pointed apically.

Female : Female is almost similar to male but for the following differences : median spots on third and fourth abdominal tergites larger and circular, lateral spot larger than the spaces between them and the median spot.

Material examined : 1♂, India : Kashmir Valley ; Tangmarg, 671 m, 17. viii. –ix. 1978, Copenhagen Zoological Expedition, (det. T. Pape ; dep. in ZMUC).

Discussion on species : Verves (1989d) erroneously reported this species under the genus *Eumetopiella*. This species can be distinguished from *S. fastuosa* (Meigen, 1924) by the thickening of long haired arista which is half of its length in this species and by the presence of long bristle-like hairs on posterodorsal surface on first and second tarsomeres. Moreover, the wing spots and abdominal bands of *S. fastuosa* are quite distinguishable.

Biology : So far as the literature is concerned nothing is known regarding the biology of this species.

Distribution : India ; JK (Tangmarg) ; China ; Kyrgyzstan and Tajikistan.

Type deposited : *Holotype* ♂ and *Allotype*, ZISP, not examined.

Subfamily 2. PARAMACRONYCHIINAE Brauer and Bergenstamm, 1889

A group of medium to large sized flies with female frons broad and with proclinate orbital bristles but male frons usually narrow and without proclinate bristles.

Head : Frons of male narrow; female frons broad with proclinate orbital bristles ; male frons without proclinate bristles except in *Sarcophila* Rondani, 1856 where the frons is equibroad in both sexes ; lower frontal bristles ending before middle of second antennal segment and not abruptly divergent ; parafacial hairs short, usually with one or two rows but not bristly below ; lower occipital and gena with black hairs, first antennal segment slightly protruding, third segment broad and about twice that of the second ; arista bare or haired on basal half ; parafacial with numerous rather long hairs and continuous with those of parafacial ; frontal bristles varying in numbers ; palpi black or brownish-grey.

Thorax : Presutural acrostichal bristles present ; 3 postsutural dorsocentral bristles ; prosternum, propleural depression and postalar wall bare ; hypopleuron with both hairs and setae ; vibrissae near oral margin ; eyes bare ; 2 short notopleural bristles and often with additional pairs.

Wings : Fourth vein sharply angled at bend and ending before apex of wing ; no costal setae.

Legs : Long, bristly with well developed claws ; mid femur of male with setae on posterodorsal surface ; mid tibia with 2 strong anterodorsal bristles ; hind coxa bare on posterior surface ; hind tibia without villosity ; preapical posterodorsal bistles on hind tibia weak.

Abdomen : Postabdomen without discal bristles but with strongly recurved row of bristles before middle ; hind margin of male fifth sternite with shallow concave ; outer forceps curved, rigid and as long as inner forceps ; paraphallus short and one segmented ; female genitalia short with two segmented ; sixth tergite of male fused with seventh and eighth and distinctly angular in profile ; a row of strong bristles marks the segmental origin of the sclerite.

Very little is known regarding this subfamily from this area and it is too meagre to complete the study. Verves (1986) divided this subfamily into three tribes ; Sarcotachinini, Goniophytonini and Paramacronychiini. Only Paramacronychiini is available here and 2 species under one genus are reported from the region under study.

Biology : Biology of the species is diverse and some species are necrophagous and predators of snails or parasites of mammals and various insects. Some species are highly host-specific and prey upon larvae and pupae of Lepidoptera. Few are predators on larvae of *Bombus* sp. and *Vespa* sp. (Hymenoptera). Few species are myiasis producers and are obligate parasites of vertebrates. Some attack reptiles but most of them are mammal parasites causing serious damage to their hosts (Zumpt, 1965). Females of the genus *Wohlfahrtia* can deposit larvae in the ear, eye and nose, causing extensive facial tissue destruction (Dear, 1980). First instar larvae have a functional median hook and a pair of more or less developed maxillae (Lopes, 1982). Some larvae live in dead fish, birds and mammals.

Distributed in all Zoogeographical regions except the Australasian region.

Tribe **Paramacronychiini** Brauer and Bergenstamm

This tribe is characterised by having postabdomen on male with two free segments only ; sixth segment is separated from seventh and eighth by a suture ; first genital segment large and fused with well developed tergite which is separated from seventh and eighth tergites by a suture or a row of strong bristles ; arista mostly with long hairs or rarely bare ; hypopleuron with both hairs and setae ; mid femur of male with apical posteroventral comb-like setae.

Lopes *et al.* (1976) placed all the Oriental species of Paramacronychiinae under the subfamily Agriinae and divided it into two tribes : Goniophytonini Lopes, 1976, Agriini Townsend, 1937 and placed the genus *Wohlfahrtia* under the tribe Agriini. Lopes (1982) synonymized the tribes Agriini and Wohlfahrtiina Séguy, 1941 with Paramacronychiini Brauer and Bergenstamm, 1889 after studying the characters of first instar larva.

This is a rather large tribe and Verves (1986) divided it into several genera. *Wohlfahrtia* Brauer and Bergenstamm, 1889 is present in this area.

Adults are mechanical carriers of different germs of enteric diseases. The larvae of some members of this tribe feed on bumble bee larvae and other species parasitise the larvae and pupae of many Lepidoptera. Some species are also parasitic on mammals and various insects. Shewell (1987) recorded the rearing of these flies from different insect orders. Larvae of a few species have been described by Tolg (1913), Thompson (1921), Townsend (1937), James and Grassner (1947) and Lopes (1982).

This tribe is mostly distributed in the Palaearctic, Afrotropical, Oriental and Nearctic regions.

Genus 23. *Wohlfahrtia* Brauer and Bergenstamm, 1889

1889. *Wohlfahrtia* Brauer and Bergenstamm, *Denkschr. Akad. Wiss. Wien. Kl. math.-naturw.*, **56** : 123.

Type species : *Sarcophila magnifica* Schiner, 1862.

1894. *Disjunctio* Pandellé, *Revue Ent.*, **13** : 56.

Type species : *Sarcophaga tertripunctata* Dufour, 1850 (= *Agria bella* Macquart, 1839a).

1895. *Paraphyto* Coquillett, *Jl. N. Y. ent. Soc.*, **3** : 105.

Type species : *Paraphyto chittendeni* Coquillett, 1895 (= *Sarcophaga vigil* Walker, 1849).

1919. *Afrowohlfahrtia* Townsend, *Ins. Ins. menstr.*, **6** : 159.

Type species : *Afrowohlfahrtia pachytyli* Townsend, 1919.

1934. *Eubracia* Enderlein, *Sber. Ges. naturf. Freunde Berl.*, **4** : 189.

Type species : *Agria argentea* Macquart, in Webb and Berthelot, 1839a (= *Agria bella* Macquart, in Webb and Berthelot, 1839a).

1934. *Pandellea* Enderlein, *Sber. Ges. naturf. Freunde Berl.*, **4** : 189.

Type species : *Agria hungarica* Brauer and Bergenstamm, 1889 (= *Sarcophila meigenii* Schiner, 1862).

1934. *Bracia* Enderlein, *Sber. Ges. naturf. Freunde Berl.*, **4** : 189.

Type species : *Tachina nuba* Wiedemann, 1830.

Morphology : First and second genital segments completely fused ; penis simple but heavily sclerotised ; anterior and posterior parameres present ; presutural *ac* absent ; paraphallus and theca can not be separated ; abdomen with more or less variable pattern of black and well defined spots ; arista bare or with very short hairs ; notopleural and sternopleural bristles 2 ; hind coxa without posterior hairs ; frons wide in both sexes ; parafacial with a few small scattered hairs ; palpi yellow or brownish-orange ; ocellar and lateral vertical bristles present in both sexes ; *ac* generally 0+1 in male ; *dc* 2+2+3 ; *h* 3 ; *ph* 2 ; *np* 2 ; *pa* 2 ; *sa* 2 ; *st* 2+1 ; abdomen with

fixed markings ; wings with bristles ; third section of costa longer than total of fifth and sixth.

Discussion : This is rather a large genus. Rohdendorf (1956) revised this genus from the Palaearctic region and reported a lot of species. Zumpt (1972) described 7 species from Africa and Salem (1938) published a monograph on this group. So far the literature is concerned only 2 species have been reported from India which are also known from this area.

Biology : Most of the species produce benign and malign traumatic myiasis and other develop in decaying matter or locust (Van Schalkwijk, 1939). Larvae of some species develop in pustules in the skin of many young mammals, occasionally including man (Downes, 1965) and few larvae live in dead insects and develop therein (Rohdendorf and Verves, 1978). The larvae of some species are necrophagous, coprophagous and schizophagous and are not notorious vertebrate parasites which may cause some damage to the hosts (Pape, 1987b).

First instar larvae of some species have been described by Walker (1949), Séguy (1940), James and Grassner (1947), Draber Mónico (1973) and Lopes (1982).

Distribution : This genus occurs in the Nearctic, Afrotropical, Palaearctic and Oriental regions.

Key to species

1. Penis anteriorly with long terminal hook-shaped process; fourth abdominal tergite with a rounded median spots; mid and hind tibia of male with long dense hairs ventrally *trina* (Wiedemann)
- Penis without hook-shaped process but slightly concave in posterior margin; fourth abdominal tergite with a bottle-neck prolongation which reaches up to the anterior margin; mid and hind tibia of male without long hairs ventrally
..... *nuba* (Wiedemann)

42. *Wohlfahrtia trina* (Wiedemann)

(Figs. 326-327)

1830. *Tachina trina* Wiedemann, *Aussereurop. zweifl. Insekt.*, **2** : 313.

1909. *Disjunctio guyoti* Villeneuve in Hermann, *Verh. naturw. Ver. Karlsruhe*, **21** : 155.

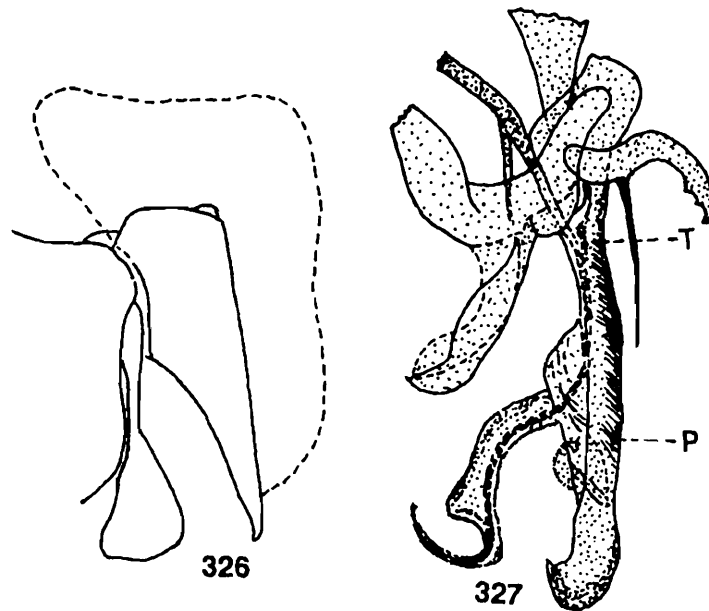
1956. *Wohlfahrtia trina* : Rohdendorf, *Ént. Obozr.*, **35** (1) : 225; Zumpt, 1972, *Explor. Parc natn. Virunga*, **101** : 121; Verves, 1986, *Cat. Palae. Dipt.*, **12** : 121.

Male : Body length 8–15 mm.

Head : Width of frons equal to head width; frons yellowish with silvery pollen; frontal bristles 6 - 7; parafrontal and sides of frons with short scattered numerous

black hairs; outer vertical bristle not well developed; gena narrow and upper part of gena with short black hairs; third segment of antennae with white pollen and two and half times that of the second; bending part of arista somewhat shorter and with fine, short but well developed hairs; maxilla and palpi long, yellowish and slightly bent at end.

Thorax : Grey with yellow pollen; *ac* 0+1; *dc* 2+2 (anterior bristles short); pleura blackish; R_{4+5} curved up to basal half.



Figs. 326-327 : *Wohlfahrtia trina* (Wiedemann). 326, Inner and outer forceps (lateral view, after Rohdendorf, 1956); 327, Penis (lateral view, after Rohdendorf, 1956).

Wings : Hyaline with brown veins; second and third costal segments unequal; squama white.

Legs : Black; mid and hind tibia with long dense hairs ventrally; claws and pulvilli without hairs.

Abdomen : Light colour with white silvery coating; median spot on fourth abdominal tergite rounded and as long as half the segment; genital tergite with 4-6 strong median marginal bristles and a pair of rows of bristles along its hind margin; anal tergite red or orange, hardly brown and shorter than its height; inner forceps straight, tapering and pointed apically; outer forceps oval at end; anterior paramere pointed and folded at end; posterior paramere recurved at end and with a short hook and long hairs; paraphallus straight anteriorly with a long terminal hook-shaped process.

Female : Unknown.

Material examined : The material was not available for study and the description provided here is based on Rohdendorf, 1956.

Discussion on species : This is a very light coloured species and may be distinguished from other species by the presence of a pair of rows of bristles along posterior margin of genital tergite and also by the structure of paraphallus. Moreover, the hind tibia of male in this species is with dense long hairs ventrally.

Biology : Lopes *et al.* (1977) reported it as parasite on *Schistocerca gregaria* (Acrididae).

Distribution : India ? ; Rajasthan; Afghanistan; Algeria; Canary Islands; Cape Verde Islands; Egypt; Iran; Israel; Libya; Mongolia; Morocco; Socotra Island; Sudan; Turkmenistan and Uzbekistan.

Type deposited : Holotype ♂, VM, not examined.

43. *Wohlfahrtia nuba* (Wiedemann)

(Figs. 328-330)

1830. *Tachina nuba* Wiedemann, *Aussereurop. zweifl. Insekt.*, **2** ; 296

1956. *Wohlfahrtia nuba* : Rohdendorf, *Ént. Obozr.*, **35** (1) : 220; Zumpt, 1972, *Explor. Parc natn. Virunga*, **101** : 121; Verves, 1986, *Cat. Palae. Dipt.*, **12** : 121.

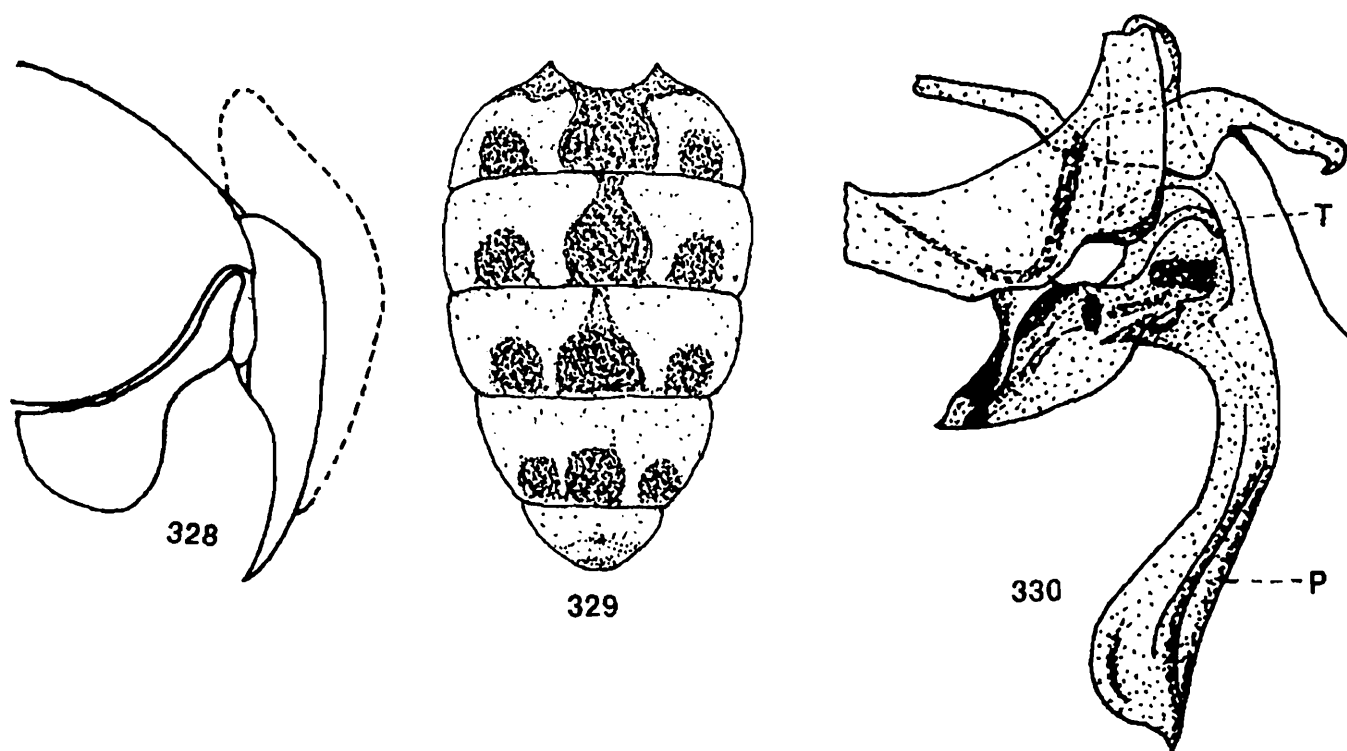
Male : Body length 5–12 mm.

Head : Greyish with deep silvery pollen; eyes large and slightly reddish; width of frons about 0.40 that of one eye and gradually narrowed; frontal vitta yellow, narrowed anteriorly, silvery yellowish pollen and about one-fourth that of each parafrontal near the antennal groove; parafrontal and parafacial silvery-brownish with silvery pollen, both are with few short scattered black hairs; parafacial at face level with base of antennae about less than 0.30 of one eye width; gena narrow, brownish and with shiny black hairs; post gena blackish with many black hairs; antennae brownish-red, reaching up to about 0.80 distance to vibrissae, first and second segments red, third slightly blackish, silvery pollen and about two and half times that of the second; arista long, longer than antennae, widened up to basal half and covered with short black hairs; facial ridge slightly blackish, silvery pollen and with 4 supra- and 7-8 subvibrissal bristles; vibrissae well developed, distance between vibrissae slightly greater than half of each parafacial width; frontal bristles 6-7, short, lower 2 below base of antennae and reaching up to half of second antennal segment; ocellar region black with few short black hairs; ocellar bristles strong and divergent laterally; inner vertical bristle well developed, outer vertical half that of inner vertical, post vertical and post ocellar very short; a row of regular postocular setae, rest of the area with black hairs; palpi short, brownish and its tip dark grey; proboscis short and black.

Thorax : Slightly yellowish, silvery pollen and with three black longitudinal stripes, the median stripe extends up to subbasal end of scutellum; *ac* 0+1; *dc* 3+4 (posterior 2 *dc* strong); *ia* 1+3; *ps* 2; *h* 3; *ph* 2 (very small); *np* 2; *pa* 2; *sa* 2; *st* 2+1 (anterior

1 short); *mpl* 5; *hpl* 7-8; propleura slightly black with shiny pollen; scutellum with a pair of strong apicoscutellar, 2 pairs of lateroscutellar and a pair of short discoscutellar bristles.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of short setae located dorsally and extending up to about two-thirds from the basal node to r-m and 3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment almost equal to third, the former with short setae along basal half of its anterior margin; costal spines short; epaulet black; basicostal scale yellow; squama whitish; halter slightly yellowish; bend of m 120° with process; t_p curved.



Figs. 328-330 : *Wohlfahrtia nuba* (Wiedemann). 328, Inner and outer forceps (lateral view, after Rohdendorf, 1956); 329, Abdomen (dorsal view); 330, Penis (lateral view, after Rohdendorf, 1956).

Legs : Black; fore femur with a row of short bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal half of anterodorsal surface, 1 bristle each on posterodorsal and posteroventral surfaces on distal one-third; mid femur with 1 bristle on middle portion of anterolateral surface, few short bristles along anteroventral surface on basal half and 2 bristles along posterodorsal surface on distal end; mid tibia with a row of 3 bristles along anterodorsal surface at about basal two-thirds, 1 bristle each on anteroventral and posteroventral surfaces on distal one-third but without long hairs anteriorly; hind femur with a row of bristles along anterodorsal surface and a

row of 3-4 short bristles along basal half of anteroventral surface; hind tibia with a row of 3-5 bristles along anteroventral surface, 2 bristles on posterodorsal surface but without long hairs along anterior and posterior margins of ventral surface; hind coxa without bristles.

Abdomen : Ash-grey with 3 deep spots on each segment and the spots not changing with light incidence, second and third segments without median larger isolated spots, third and fourth with bottle-neck median prolonged spots which reach up to the anterior margin, second with 3 weak and third with 1 lateral and 2 short median marginal bristles, fourth and fifth each with a pair of median, but the former with 2 and the latter with 3-4 lateral marginal bristles; first and second genital segments completely fused; second genital segment ash-grey with 4 long and 2 short median and 1 lateral bristles on hind margin ; inner forceps uniformly and strongly bent in the form of wide spade; outer forceps elongated with groove medially; anterior paramere straight, small and curved ventrally; posterior paramere usually bent, terminally hook-shaped and with 1 long hair; paraphallus slightly concave on posterior margin; penis without hook-shaped process but with slightly concave in posterior region.

Female : Unknown.

Material examined : 1 ♂, India : Rajasthan; Bikaner, 2. xi. 1971, C.I.E.A. (dep. in BMNH).

Discussion on species : This species is light-coloured in appearance and may be distinguished from *W. trina* (Wiedemann) by the structures of paraphallus and inner forceps. Moreover, the hind tibia in males of this species is without hairs.

Biology : James (1947) reported the larvae of this species feeding on diseased tissues and the species has been used in maggot wound therapy. Zumpt (1965) reported it as facultative benign myiasis producer in man and animals and the species may be bred in decaying organic matters. Lopes *et al.* (1977) reported it as parasite on *Schistocerca gregaria* (Acrididae).

Distribution : India ; R (Bikaner); Pa (Karachi); Africa; Afghanistan; Armenia; Azerbaijan; Egypt; Iran; Morocco; Nigeria; Saudi Arabia; Somalia; South Yemen; Sudan; Tajikistan; Tunisia; Turkmenistan and Uzbekistan.

Type deposited : *Holotype* ♂, VM, not examined.

Subfamily 3. SARCOPHAGINAE Macquart, 1843

These flies are small to large in size and usually greyish to black in colour with three dark longitudinal stripes on thorax and checkered pattern on abdominal tergites.

Head : Eyes are separated in both sexes and the female frons are broader than the male; third antennal segment 2 to 4 times that of the second; arista usually long,

plumose along basal two-thirds to four-fifths and rarely pubescent; eyes without hairs; vibrissal ridges bare; parafrontal with short scattered hairs; parafacial with a row of short black hairs; gena usually with short black hairs; proclinate fronto-orbital bristles absent in male; 1 to 3 rows of postocular setae besides postocular cilia.

Thorax : Usually with hairs on post sternum; propleura usually bare but sometimes with hairs or setae; pre acrostichal bristles usually absent; posterodorsal bristles 2 to 5; post-humeral bristles 2 to 4; sternopleural bristles 1+1+1 or 1+1; mesopleuron bristles usually present in male but absent in female.

Wings : Costal spines often stout or absent; R₁ usually bare but often with short setae; R₄₊₅ with short setae; fifth costal segment equal or greater than the third and with short setae along its anterior margin; proportion of third costal segment to fifth costal segment variable.

Legs : Fore femur with bristles along posterodorsal and posterior margin of ventral surfaces; fore tibia with 2-4 bristles along anterodorsal surface; mid femur with comb-like setae along about distal half; hind femur with or without fringe or hairs; hind tibia often with long hairs.

Abdomen : Third abdominal tergite with or without a pair of median marginal bristles; sternites first to fourth with closely set hairs or short spines; fifth sternite of male deeply cleft, v, U or Y-shaped, usually with brush of strong spines laterally and short or long hairs terminally on arms; male genital segments usually large; first genital segment with or without row of marginal bristles; inner forceps may be slender to stout or long to short; outer forceps usually short and subtriangular but sometimes more or less elongated; phallic tube may be present or absent; female genital segments without ovipositor; sixth tergite of female always large, seventh poorly developed, eighth vestigial or absent; sixth sternite always well developed; larvae cylindrical and tapering anteriorly; spine bands generally present on anterior and posterior borders; posterior spiracle situated in a deep depression; peretreme open; clypeal arch generally present; mandible may be present or absent; tubercles on the last segment well developed; dorsal cornu longer than ventral cornu.

Senior-white (1924) revised these flies from the Oriental region as a subfamily of Calliphoridae and placed all the species under the genus *Sarcophaga*. Zumpt (1972) also followed this classification. Lopes *et al.* (1977) distributed all the Oriental species under different tribes and genera and only three tribes are present here. Sugiyama and Kano (1984) revised the Oriental species of Sarcophaginae based on comparative morphology of male genitalia and divided this subfamily into four genera : *Ravinia*, *Blaesoxipha*, *Harpagophalla* and *Sarcophaga* of three tribes, namely Raviniini, Tephromyiini and Sarcophagini. Verves (1986) used the generic delimitation of Lopes *et al.* (1977) and distributed all the Palaearctic species under one hundred and fifteen genera. 126 species under twenty seven genera are reported here.

Biology : Some are synanthropic flies of medically, veterinary, forensic and sanitary importances and they often carry the germs of enteric diseases of man and animals in their guts and also act as mechanical carriers of such germs. They are larviparous and generally breed in dead animal carcasses, meat, animal dung, human excrement and also in melons. Some of them breed in living animals such as insects, spiders, reptiles and mammals. Genera *Bercaea*, *Helicophagella* (in part) *Parasarcophaga* and *Ravinia* develop in faeces. Few *Parasarcophaga* and *Robineauella* live in butterfly pupae. The larvae of genus *Helicophagella* (in part) and *Pierretia* develop in living or dead terrestrial Gastropods. The species of *Blaesoxipha* and *Boettcherisca* are true parasites of Acrididea, Coleoptera and Lumbricidae respectively and the latter breed in carrion and dung. Genus *Lioproctia* has been bred from dead rabbits and bats. The larvae of some species of the genera *Boettcherisca*, *Parasarcophaga*, *Ravinia* and *Thomsonia* cause myiasis in different parts of man and also in toads, bulls and leopards.

Distributed in all Zoogeographical regions.

Key to tribes

1. Phallic tube present; styli of glans absent; division of theca and paraphallus in penis not distinct Raviniini
 Phallic tube absent; styli of glans generally present or may be absent; division of theca and paraphallus in penis distinct 2
2. Lateral plate of paraphallus absent or feebly developed; inner forceps bent posteriorly Protodexiini
 Lateral plate of paraphallus present and well developed; inner forceps straight or bent anteriorly Sarcophagini

Tribe **Raviniini** Rohdendorf

This tribe is characterised by the absence of an apical plate of paraphallus but presence of a phallic tube; lateral plate of paraphallus elongated and well sclerotised; ventralia well developed; theca and paraphallus fused; this tribe may be separated from other tribes by the presence of frontal bristles which are not divergent anteriorly.

This is a small tribe and Roback (1954) gave its status as separate subtribe of the tribe Sarcophagini and listed 31 species under this subtribe. Lopes (1969b) reported nine genera from the Neotropical region under this tribe. Later on, Lopes *et al.* (1977) and Lopes (1982) divided this tribe into two subtribes : Raviniina Rohdendorf, 1937 and Oxysarcodexiina Lopes, 1975, of which only one subtribe Raviniina is reported from the Oriental and Palaeartic regions which is also present in this area. Genus *Ravinia* is present here.

The larvae of this tribe have been studied and described by different authors (Ishijima, 1967; Lopes, 1982). Larvae feed mostly on human faeces and dead animals. The larvae have been reported as predator and intestinal myiasis producer. The clypeal arch of the species is situated far behind the clypeal phragma and the labium is absent, rarely present as membranous vestige.

This tribe is cosmopolitan in distribution.

Genus 24. *Ravinia* Robineau-Desvoidy, 1863

1863. *Ravinia* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, 2 : 434; Rohdendorf, 1937, *Fauna USSR, Dipt.*, 19 (1) : 391.

Type species : *Sarcophaga haematodes* Meigen, 1826 (= *Musca pernix* Harris, 1780).

Morphology : Third antennal segment about twice that of the second and reaching up to about lower margin of eye; parafacial broad and about two-fifths that of one eye; oral margin somewhat protruding forwards; acrostichal bristles 2+1; postsutural dorsocentral bristles 3 and strong; discoscutellar bristles 1 pair; lateroscutellar bristles 2 pairs; costal spines short; R₁ usually bare, rarely setose; mid tibia without bristles on ventral surface; third abdominal segment without median marginal bristles; fifth sternite without window, deeply incised but with short spines along inner margin; first genital segment with several strong marginal bristles; second genital segment reddish-orange; theca very short and fused with paraphallus; ventralia very large, paired and petiolate; lateral plate of paraphallus short.

Discussion : Lopes *et al.* (1977) and Verves (1986) placed this genus under the tribe Raviniini but later on Lopes (1982) placed it under the subtribe Raviniina on the basis of study of the cephalopharyngeal sclerite of the first instar larva of the species. Downes (1955) divided this genus into two subgenera *Chaetoravinia* Townsend, 1917 and *Ravinia* Robineau-Desvoidy, 1863. Only 1 species is represented in the Oriental and Palaearctic regions.

Biology : The larvae of the members of this genus normally occur in dung and breed in human faeces and dead bodies of different animals. Knipling (1936) reared some of the species on meat in the laboratory. The larval stages of a species have been studied by Kano, Sato and Tange (1951) and Ishijima (1967).

Distribution : This genus is represented in all Zoogeographical regions except the Australasian and Oceanian regions.

44. *Ravinia pernix* (Harris)

(Figs. 331-336)

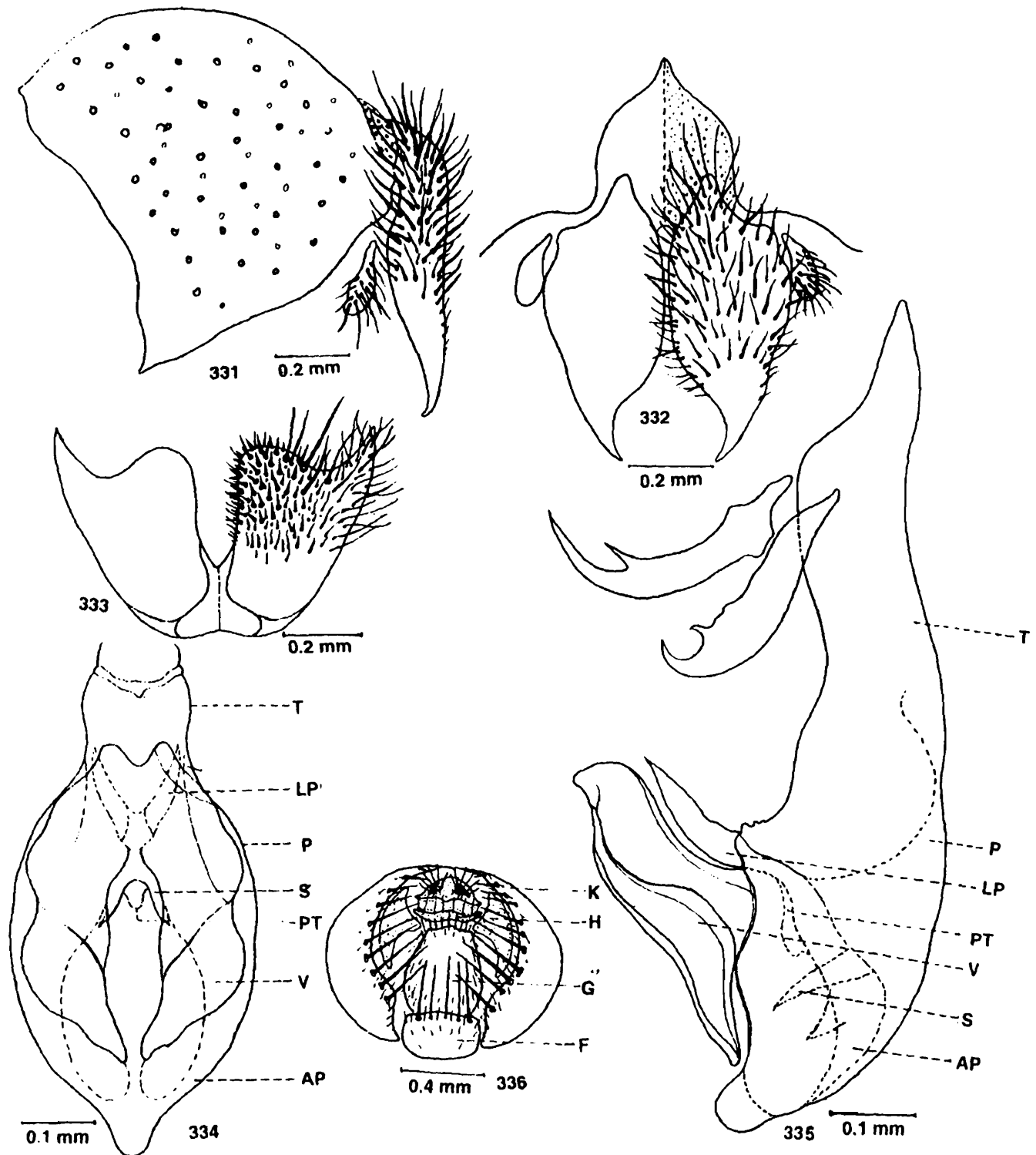
1780. *Musca pernix* Harris, *Exp. Engl. Ins.*, 84.

1794. *Musca striata* Fabricius, *Ent. Syst.*, 4 : 315. (preoccupied by Gmelin, 1790).

1817. *Musca haemorrhoidalis* Fallén, *K. svenska Vetensk. Akad. Handl.*, **3** : 237 (preoccupied by Villers, 1789).
1826. *Sarcophaga haematodes* Meigen, *Syst. Besch. europ. zweifl. Insekt.*, **5** : 29.
1830. *Myophora haemisphaerica* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. Sci. Inst. Fr.*, (2) **2** : 346.
1830. *Myophora limpidipennis* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. Sci. Inst. Fr.*, **2** (2) : 346.
1830. *Myophora horticola* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. Sci. Inst. Fr.*, **2** (2) : 346.
1830. *Myophora campestris* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. Sci. Inst. Fr.*, **2** (2) : 346.
1863. *Pierretia parva* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, **2** : 427.
1863. *Ravinia sulcata* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, **2** : 437.
1863. *Ravinia hebes* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, **2** : 436.
1928. *Thyrsocnema striata* : Enderlein, *Arch. klassif. phylogen. Ent.*, **1** (1) : 42.
1935. *Sarcophaga aozia* Séguéy, *Mém. Acad. Sci. Inst. Fr.*, **62** (2) : 5.
1937. *Ravinia striata* : Rohdendorf, *Fauna USSR, Dipt.*, **19** (1) : 391; Kano, Field and Shinonaga, 1967, *Fauna Japonica, Sarcophagidae* : 130 ; Nandi, 1990, *J. Beng. nat. Hist. Soc.*, **9** (2) : 9 ; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, **45** : 271.
1938. *Gesneriodes disjuncta* Séguéy, *Encycl. ent.*, (BII), *Dipt.*, **9** : 43.
1987. *Ravinia pernix* : Pape, *Fauna ent. scand.*, **19** : 42.

Male : Body length 6–9 mm.

Head : Width of frons about four-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of 4-5 short hairs near the eye margin and about two-fifths that of one eye; antennae dark brown and reaching up to about 0.80 distance to vibrissae, first and second segments brownish, third brownish with silvery pollen and slightly greater than twice that of the second; arista long, plumose along basal three-fifths; facial ridge brownish with silvery pollen; vibrissae long crossed, distance between vibrissae is greater than one parafacial width; frontal bristles 7-9, posterior 1 reclinate, anterior 2 below base of antennae and reaching up to about more than three-fifths of second antennal segment, rest cruciate and directed forwards; gena black, silvery pollen and with long hairs; post gena black; ocellar triangle black with long hairs; outer vertical bristle very short, inner vertical well developed, post-vertical less than half of inner vertical; ocellar bristles short, postocellar less than half of inner vertical;



Figs. 331-336 : *Ravinia pernix* (Harris). 331, Inner and outer forceps (lateral view); 332, Inner and outer forceps (posterior view); 333, Fifth sternite; 334, Penis (ventral view); 335, Genitalia ♀ (ventral view); 336, Penis (lateral view).

a row of regular postocular setae besides postocular cilia, rest of the area with irregular silvery hairs; palpi long and brownish to black; proboscis short and black.

Thorax : Blackish to brown with three black longitudinal stripes; *ac* 2+1; *dc* 3+3; *ia* 0+3; *ps* 1; *h* 3; *ph* 2; *np* 3; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 7; *hpl* 8; upper part of propleura well developed and accompanied with short hairs; pro-and mesothoracic spiracles dense brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of about 9-11 short setae located dorsally and extending up to more than half from the basal node to *r-m* and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than the third, the former with short spines along basal half of its anterior margin; costal spines short; epaulet black; basicostal scale light brown; squama white; halter brown.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of long bristles along posterior margin of ventral surface; fore tibia with 3-4 bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the basal end; mid femur with 2-3 short bristles along middle portion of anterolateral surface, a row of short setae along distal one-third and several short bristles along basal two-thirds of anteroventral surface, several short comb-like setae along distal half and few bristles along basal half of posteroventral surface and 1 bristle each on distal one-third of posterolateral and posterodorsal surfaces; mid tibia with 2 bristles along middle portion of anterodorsal surface, 1 bristle each on posterolateral surface at about one-third and two-thirds the distances from the distal end, 1 bristle each on posteroventral surface at about one-third and two-thirds the distances from the basal end; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, several bristles along basal half and a row of bristles along distal half of posteroventral surface; hind tibia with 2 long and several short bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end and 1 long bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end.

Abdomen : Black with golden checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of 12-14 marginal bristles; sternites first to fourth with short black hairs; fifth sternite v-shaped, without window but with 4-5 bristles terminally and numerous short spines laterally on arms; first genital segment reddish or brown with 6 marginal bristles, second reddish-orange but without marginal bristles; inner forceps elongated and slightly curved at end; outer forceps slightly elongated with long hairs terminally;

anterior paramere elongated and bifurcated at end; posterior paramere elongated, strongly curved at end and with short subapical process; theca short and fused with paraphallus, both are sclerotised; apical portion of paraphallus blunt at end; lateral plate of paraphallus short and pointed terminally; styli of glans absent; ventralia well developed, paired and petiolate.

Female : Body length 6–8 mm.

Head : Frons a little broader than one eye; 2 proclinate fronto-orbital bristles present; outer vertical bristle well developed; other characters as that of male.

Thorax : Same as male.

Wings : Same as that of male.

Legs : Mid femur with a row of short bristles along distal half of posteroventral surface but in male with comb-like setae and 1 bristle on anteroventral surface at about one-third the distance from the distal end; hind femur with a row of bristles along anterodorsal surface.

Abdomen : Similar to that of male but the sixth tergite reddish-brown with greyish pollen; sixth sternite almost oval in shape with 5 bristles, seventh elongated, medially wide and with few bristles, eighth membranous and narrow; genital tergite orange; seventh tergite with many bristles.

Material examined : India : several male specimens collected from different localities of Himachal Pradesh and West Bengal, in Oct., 1988; Oct. 1986; June, 1977; B. C. Nandi.

Discussion on species : This species may be distinguished from other species by the presence of presutural acrostichal bristles, reddish or brownish genital segments, short costal setae and the structure of male genitalia.

Biology : This is a relatively common species which was collected from bushes in hilly areas. The larvae generally breed in human and animal excrement, dead animals and meat and can be reared from such media in the laboratory. The larvae are coprophagous, occasionally necrophagous and parasitic on gastropod snails and grasshoppers. In some cases, they produce wound and intestinal myiasis in man (Roback, 1954; Rohdendorf and Verves, 1978). Pape (1987b) reported that the larvae probably live as predator. The larval stages of this species (as *striata*) have been studied by Kano, Sato and Tange (1951) and Ishijima (1967). The adult fly is also associated with *Shigella flexneri* (Eubacteriales) (Greenberg, 1971).

Distribution : India ; ArP (Dunn Bridge), B (Postoita), HP (Chamba, Dalhousie, Kufri, Manali, Manikaran, Shimla), JK (Jhelum Valley, Kogyar, Tangmarg), UP (Bardinath, Mussoorie, Naini Tal, Sahastradhara, Tehri) and WB (Darjeeling, Jalapahar, Takvar Tea Estate); BD (Dacca); Bh (several localities); Ne (several localities); Pa (several localities); Afghanistan; Albania; Algeria; Arabia; Armenia;

Austria; Azerbaijan; Azores; Belgium; Bulgaria; Byelorussia; Canary Islands; China; Cyprus; Czech Republic; Denmark; Egypt; Estonia; Finland; France; Germany; Great Britain; Greece; Gruzia; Hungary; Iran; Iraq; Ireland; Israel. Italy; Japan (including Ryukyu Islands); Kazakhstan; Korea; Kyrgyzstan; Latvia; Lebanon; Libya; Lithuania; Malta; Moldova; Mongolia; Morocco; Norway; Poland; Portugal; Rumania; Russia; Saudi Arabia; Serbia; Slovakia; South China; Southern Spain; Sweden; Switzerland; Syria; Tajikistan; Tunisia; Turkmenistan; Ukraine; United Kingdom; Uzbekistan and Yemen.

Type deposited : *Lectotype* ♂, ZMUC, not examined.

Discussion on type : According to Pape (1986a) the *Lectotype* lacks the left and mid tarsus and the condition is otherwise good. There is one specimen (sex) in the ZMUC, collected by Fabricius which labelled as '*striata*' by Fabricius of which only the wings, scutellum and fragments of notum remain. Pape (1986a) labelled this specimen as *Paralectotype*.

Tribe **Protodexiini** Townsend

This tribe is characterised by the presence of a single terminal opening but absence of phallic tube; ventralia small and inner forceps bent posteriorly; lateral plate of paraphallus absent or feebly developed; frontal bristles sharply curved; penis distinctly bent between theca and paraphallus and usually with 3 post dorsocentral bristles on thorax.

Lopes (1955) placed all the species of *Blaesoxipha* Loew under the subtribe *Blaesoxiphina* of the tribe *Sarcophagini*. Lopes *et al.* (1977) and Sugiyama and Kano (1984) placed all the Oriental species of *Blaesoxipha* under the tribe *Tephromyiini*. Lopes (1971) made a review of the generic construction of this tribe and divided it into two subtribes : *Acanthodothecina* Lopes, 1982 and *Protodexiina* Townsend, 1912. Lopes (1982) synonymized *Blaesoxiphina* with the tribe *Tephromyiini* and Sugiyama and Kano (1984) placed the genus *Blaesoxipha* under the tribe *Tephromyiini*. Four genera have been reported from the Palaearctic region (Verves, 1986) and only one genus *Blaesoxipha* is reported from the Oriental region which is also present in India. Pape (1987b) placed all the species of *Blaesoxipha* from Denmark under this tribe. Shewell (1987) placed all North American *Blaesoxipha* under the tribe *Protodexiini*. Lopes (1990) described few new species from the Oriental, Australasian and Oceanian regions under this tribe.

Larvae of this tribe which have been studied by Lopes (1982) are characterised by absence of a complete clypeal arch in first instar larvae. The larvae live as obligatory parasites in Coleoptera, Orthoptera and Lepidoptera and sometimes in other dead insects and breed in them.

This tribe is widely distributed with most of the species been reported from the Palaearctic region.

Genus 25. *Blaesoxipha* Loew, 1861

1861. *Blaesoxipha* Loew, *Wien. ent. Mschr.*, **5** : 384.
Type species : *Blaesoxipha grylloctona* Loew, 1861.
1863. *Servaisia* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, **2** : 429.
Type species : *Sarcophaga erythrura* Meigen, 1826.
1863. *Listeria* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, **2** : 600.
Type species : *Listeria campestris* Robineau-Desvoidy, 1863.
1907. *Sphaerogaster* Bezzi and Stein, *Kat. Palae. Dipt.*, **3** : 469.
Type species : *Sarcophaga laticornis* Meigen, 1826.
1891. *Parasarcophila* Brauer and Bergenstamm, *Denkschr. Akad. Wiss. Wien, Kl. math.-naturw.*, **58** : 366.
Type species : *Agria rufipes* Macquart, in Webb and Berthelot, 1839.
1909. *Gesneriodes* Villeneuve, *Wien. ent. Ztg.*, **28** : 47.
Type species : *Musca lineata* Fallén, 1817 (= *Listeria agrestis* Robineau-Desvoidy, 1863).
1912. *Gesneriella* Villeneuve, *Annl. hist.-nat. Mus. natn. hung.*, **10** : 614.
Type species : *Gesneriella unicolor* Villeneuve, 1912.
1922. *Locustivora* Johnston and Tiegs, *Rec. Austr. Mus.*, **13** : 187.
Type species : *Masicera pachytyli* Skuse, 1891.
1928. *Proballia* Enderlein, *Arch. klassif. phylogen. Ent.*; (1) **1** : 28.
Type species : *Proballia camerunensis* Enderlein, 1928.

Morphology : Antennae is inserted at the middle of the eye ; numerous pre-and postsutural acrostichal bristles well developed ; 3 postsutural dorsocentral bristles present ; third antennal segment about twice that of the second ; arista short, plumose ; hind femur and tibia without setae but with long hairs ; a pair of median marginal bristles present on third abdominal tergite but in some species absent ; marginal bristles on fourth and fifth abdominal tergites well developed ; fifth sternite deeply cleft but without spine-like bristles ; inner forceps bent angularly and mostly beset with short spines dorsally ; lateral plate of paraphallus absent or poorly developed in few species ; styli of glans absent in most cases ; penis small and simple in structure ; palpi and genital tergites black ; genitalia characters are very variable.

Discussion : This genus is represented by 29 species in the Palaearctic, 6 species in the Oriental, 7 species in the Afrotropical and 5 species in the Australasian and

Oceanian regions. Rohdendorf (1928, 1937) and Zumpt (1972) revised this genus from USSR and Africa respectively and the Australian species have been reviewed by Lopes (1955). Sugiyama and Kano (1984) listed 7 species under this genus from the Oriental region. Only 8 species have been reported up to date from the Oriental region, of which 9 species under the subgenus *Blaesoxipha* Loew are present in this area. Downes (1965) distributed the Nearctic species into different subgenera. Verves (1986) described and keyed the Palaearctic species. Pape (1987b) reviewed the 6 species of Fennoscandia and Denmark. He (1994) also divided this genus into seven subgenera and only one subgenus *Blaesoxipha* Loew, 1861 is present here.

Biology : The larvae of this genus live parasitically in *Locusta* sp., *Anacridium* sp., *Pyrgomorpha* sp., *Aiolopus* sp., *Acrotyla* sp., *Valanga* sp., *Acridia* sp., *Chorthippus* sp., *Oedaleus* sp., *Schistocerca* sp., *Podisma pedestris* (Acrididae ; Orthoptera). Few members of the larvae are parasite on Pyrgomorphidae and Proscopidae (Orthoptera) (Zumpt, 1972). Some members of the genus have been recorded as parasites of adult Scarabaeidae and Tenebrionidae : *Canthon* sp., *Copris* sp., *Phyllophaga* sp., *Ligyris* sp., *Thyce* sp. (Coleoptera) and the Cockroach—*Arenivaga bolliana*. (Dictyoptera). Some Nearctic members live in the water of pitcher plant leaves *Sarracenia* sp. (Sarraceniaceae) and feed on other insects drowned therein (Downes, 1965). He also mentioned that some species have been reared from *Amblycorypha* sp. (Tettigoniidae), *Melanoplus* sp. (Acrididae) and *Stagmomantis* sp. (Mantidae) and millipeds of the genus *Spirobolus*. The larvae mainly feed on the fat body and haemolymph of the host. Death of the host is due to excessive dehydration through the wound (Wood, 1933 ; Clausen, 1940 ; Leonide and Leonide, 1973). Pape (1987b) reported the breeding of some species from Acrididae (*Chorthippus* sp., *Chrysochraon* sp., *Gomphocerus* sp., *Euchorthippus* sp., *Omoestus* sp.). Life history of different species have been studied by Wood (1933) and Greathead (1963). Draber-Mónko (1978) described the larval stages of few species.

Distribution : This genus is predominantly present in the Palaearctic, Oriental, Afrotropical, Nearctic and Australasian and Oceanian regions.

Subgenus *Blaesoxipha* Loew, 1861

1861. *Blaesoxipha* Loew, *Wien. ent. Mschr.*, 5 : 384.

1936. *Blaesoxipha* distinct : Verves, *Cat. Palae. Dipt.*, 12 : 124 ; Pape, 1994, *Ent. scand. suppl.*, 45 : 56 (as subgenus).

This is a quite large subgenus and Verves (1986) reported 27 species from the Palaearctic region. Pape (1994) revised the World *Blaesoxipha* Loew and reported 72 species under this subgenus.

Morphology : Hind femur and tibia with long hairs ; third abdominal tergite generally with median marginal bristles ; fifth sternite deeply cleft ; inner forceps bent abruptly and medially beset with short spines on dorsal end ; lateral plate of paraphallus mostly absent ; styli of glans generally absent ; penis small and simply constructed.

Pape (1994) reported a quite large number of Orthopteran, Hymenopteran and Lepidopteran hosts of the species of this subgenus.

Key to male species

1. Inner forceps without spines on terminal end2
 Inner forceps with numerous spines on terminal end3
2. Fifth sternite Y-shaped ; inner forceps curved throughout its whole length.....
 *aldrichi* Nandi
 Fifth sternite v-shaped ; inner forceps almost straight and only curved apically
 *pygmaea* (Zetterstedt)
3. Angle between base and terminal end of inner forceps is 170°4
 Angle between base and terminal end of inner forceps is 150°6
4. Inner forceps with numerous scattered spines on two-thirds of its apical
 end*valangae* (Aldrich)
 Inner forceps with cluster of spines of subapical end5
5. Ventralia ill-developed ; apical part of paraphallus straight.....*rishikeshi* Nandi
 Ventralia well developed ; apical part of paraphallus strongly curved
 *bhutanensis* Nandi
6. Apical part of paraphallus without bifurcation at end
 *agrestis* (Robineau-Desvoidy)
 Apical part of paraphallus bifurcated at end7
7. Antennae brownish and abdomen grey ; arrangement of spines on the inner
 forceps are fewer*karnataka* Pape
 Antennae reddish-grey and abdomen black ; arrangement of spines on the inner
 forceps are more8
8. Ventralia long with spines*nathani* Lopes
 Ventralia small, slender but without spines*rufipes* (Macquart)

45. *Blaesoxipha* (s. str.) *aldrichi* Nandi

(Figs. 337–341)

1992. *Blaesoxipha* (s. str.) *aldrichi* Nandi, *Hexapoda*, 4 (1) : 65.

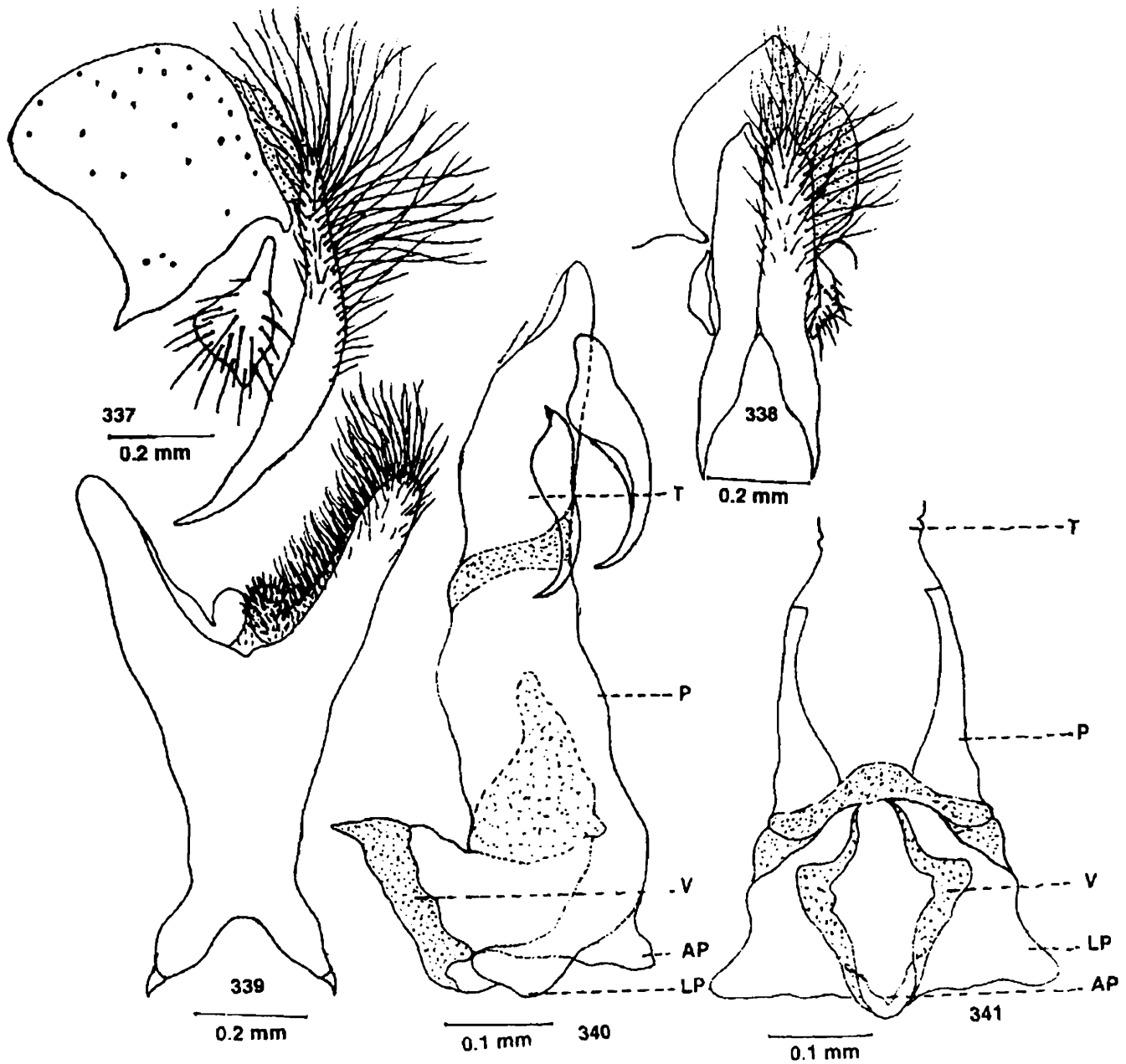
Male : Body length 7 mm.

Head : Width of frons about two-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about more than twice that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of about 5 short hairs near the eye margin ; antennae blackish and reaching up to about 0.85 distance to vibrissae, first and second segments black, third brownish-black, silvery pollen and about more than half that of the second ; arista long, plumose along basal two-thirds ; facial ridge brownish, silvery pollen and with short black hairs on lower half ; vibrissae long, crossed, distance between vibrissae greater than one parafacial width ; frontal bristles 11, posterior 3 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; gena black, silvery pollen and with black hairs ; post gena black ; ocellar triangle black with short black hairs ; outer vertical bristle short, inner vertical well developed, post vertical equal to ocellar and about one-third the inner vertical ; a row of regular postocular setae besides postocular cilia, rest of the area with short irregular brownish hairs ; palpi slender and black ; proboscis brownish.

Thorax : Black with three black longitudinal stripes ; *ac* 2+3 ; *dc* 4+3 ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 3 ; *np* 4 ; *pa* 2 ; *sa* 2 ; *st* 1+1+1 ; *mpl* 8 ; *hpl* 8 ; upper part of propleura bare, black and with silvery pollen ; prostigmatic and propleural bristles well developed and accompanied with short black hairs ; pro- and mesothoracic spiracles blackish-brown ; apicoscutellar and discoscutellar bristles well developed, 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 1-8 short setae located dorsally and extending up to about fifth-sixths from basal node to r-m and 4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to the third, the former with short spines along basal two-thirds of its anterior margin ; costal spines not stout ; epaulet black with short spines ; basicostal scale and squama whitish ; halter brown.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row of bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of comb-like setae along distal half of anteroventral surface, a row of long hairs along basal half and comb-like short setae along distal half of posteroventral surface, 2 bristles on posterolateral surface at about one-fifth the distance from the distal end and 1 bristle on posteroventral surface at about two-thirds the distance from the basal end ; mid tibia with 2 bristles on middle portion of anterodorsal surface,



Figs. 337-341 : *Blaesoxipha (s. str.) aldrichi* Nandi. 337, Inner and outer forceps (lateral view); 338, Inner and outer forceps (posterior view); 339, Fifth sternite; 340, Penis (lateral view); 341, Penis (ventral view).

1 bristle each on posterodorsal and posteroventral surfaces at about one-third the distance from basal end; hind femur with a row of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 1 bristle on posterodorsal surface at about one-fourth the distance from the distal end and with long hairs along ventral surface; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about two-fifths the distance from the basal end, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end and a row of long hairs each along anteroventral and posteroventral surfaces at about two-thirds the distance from the distal end.

Abdomen : Black with silvery checkered pattern; median marginal bristle on second abdominal tergite absent but third with a pair of median, second with 2 and third with 3 lateral marginal bristles, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of 14 marginal bristles; sternites first to fourth with short black hairs; fifth sternite Y-shaped, with long hairs terminally and two knob-like structures bearing spines basally and short hairs laterally on arms; first genital segment brownish-black but without marginal bristles, second black with short hairs; inner forceps elongated, curved gradually and pointed but without terminal spines; outer forceps oval with few hairs; anterior paramere elongated and slightly curved at end; posterior paramere elongated, curved strongly but without hairs; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus short and blunt at end; lateral plate of paraphallus wide and blunt at end; ventralia large, pointed terminally and membranous at outer end.

Female : Unknown.

Material examined : *Holotype*, ♂, India : Karnataka; Kaimara, 1, 480 m, 26. vi. 1990, B. C. Nandi; *Paratype* 2 ♂♂, same data as *Holotype*.

Discussion on species : This species is similar to *B. (s. str.) valange* (Aldrich, 1932) but differs from it by the inner forceps which is without spines here. This species also may be distinguished from *B. (s. str.) pygmaea* (Zetterstedt, 1844) by the structures of ventralia and fifth sternite.

Biology : This is a rare species which was collected from bush sweepng. It might be parasitic on insects.

Distribution : India; Kt (Kaimara) and Mr (Nagpur).

Type deposited : *Holotype* ♂, ZSIC, examined.

46. *Blaesoxipha (s. str.) pygmaea* (Zetterstedt)

(Figs. 342-347)

1844. *Sarcophaga pygmaea* Zetterstedt, *Dipt. scand.*, 3 : 1302.

1868. *Sarcophila impunctata* Rondani, *Atti Soc. ital. Sci. nat.*, 11 : 49.

1912. *Blaesoxipha berolinensis* Villeneuve, *Annls hist. -nat. Mus. natn. hung.*, **10** : 612.
 1924. *Sarcophaga aspinata* Senior-White, *Rec. Indian Mus.*, **26** (3) : 230; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 266.
 1928. *Blaesoxipha monticola* Rohdendorf, *Publ. Uzb. Expl. Sta. Plant. Prot.*, **14** : 44.
 1930. *Blaesoxipha schistocerae* Telenka, *Izv. Khorezm. sel.-Khoz. Osvit. Stants.*, **6** : 11.
 1966. *Blaesoxipha schirakiensis* Gudjabidze, *Soobshch. Akad. Nauk. gruz.*, **43** (3) : 747.
 1988. *Blaesoxipha* (s. str.) *aspinata* Verves, *Vest. Zool.*, **3** : 17; Nandi, 1992, *J. Beng. nat. Hist. Soc.*, **11**(2) : 33.
 1994. *Blaesoxipha* (s. str.) *pygmaea* : Pape, *Ent. scand. suppl.*, **45** : 63.

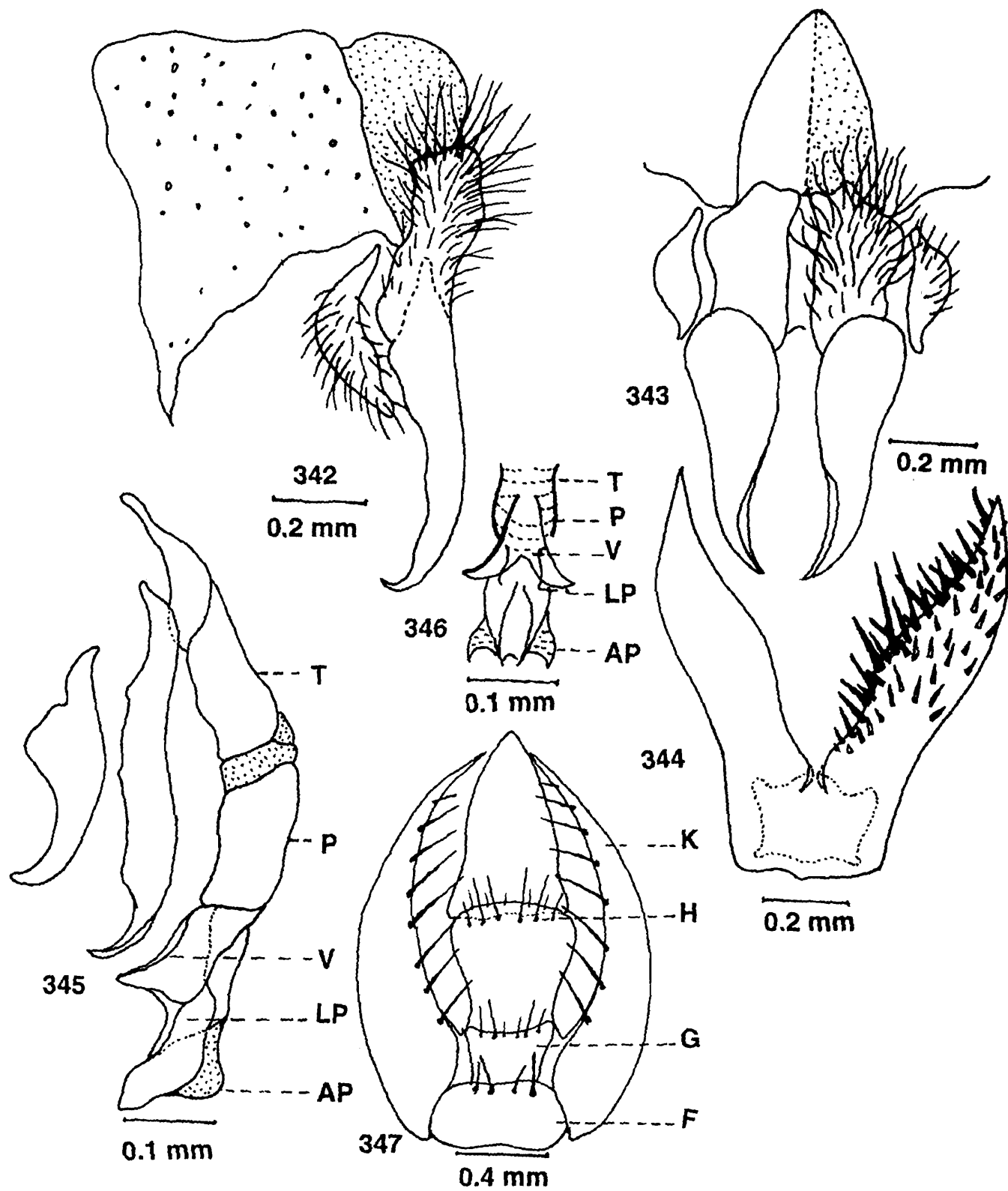
Male : Body length 9–10 mm.

Head : Width of frons about two-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about less than twice that of each parafrontal; parafrontal and parafacial black with a row of 6-7 black hairs near the eye margin; antennae brownish-black, reaching up to about 0.75 distance to vibrissae, first and second segments black with short black hairs, third brownish with silvery pollen and about two and half times that of the second; arista long, plumose along basal three-fifths; facial ridge brownish with silvery pollen; vibrissae long, distance between vibrissae greater than one parafacial width; frontal bristles 11, posterior 3 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena black with silvery pollen and black hairs; outer vertical bristle not differentiated, inner vertical well developed, post vertical one-third the inner vertical; ocellar bristle short, post ocellar equal to ocellar and about one-third the inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with brownish hairs; palpi long, slender and brownish.

Thorax : Black with three black longitudinal stripes; *ac* 2+3; *dc* 4+3; *ia* 1+2; *ps* 1; *h* 3; *ph* 3; *np* 4; *pa* 2; *sa* 2; *st* 1+1+1; *mpl* 6; *hpl* 5; upper part of propleura black with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short black hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 3 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of about 7-8 short setae located dorsally and extending up to about half from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment about equal to third, the former with short spines along whole length of its anterior margin; costal spines not stout; epaulet blackish with short spines; basicostal scale and squama whitish; halter brown.

Legs : Blackish; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of



Figs. 342-347 : *Blaesoxipha (s. str.) pygmaea* (Zetterstedt). 342, Inner and outer forceps (lateral view); 343, Inner and outer forceps (posterior view); 344, Fifth sternite; 345, Penis (lateral view); 346, Penis (ventral view); 347, Genitalia ♀ (ventral view).

2-3 short bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the basal end; mid femur with a row of 3 short bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posteroventral surfaces terminally; mid tibia with a pair of rows of bristles along middle portion of anterodorsal surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end and 1 bristle on posteroventral surface at about one-third the distance from the distal end; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface and 1 bristle on posterodorsal surface at about one-fifth the distance from the distal end; hind tibia with a pair of rows of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end; 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end but without long hairs along posterior margin of ventral surface.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 4 and third with 2 lateral marginal bristles, fifth with a row of 14 marginal bristles; sternites first to fourth with long hairs but undifferentiated bristles; fifth sternite v-shaped, deeply cleft and with few spine-like bristles laterally on arms; first and second genital segments black but without marginal bristles; inner forceps almost straight, elongated, curved only apically but without spines on terminal end; outer forceps not so elongated but with hairs; anterior paramere short and slightly curved at end; posterior paramere long, almost straight, curved, pointed at end but without hair; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus almost straight, blunt at end and membranous apically; lateral plate of paraphallus wide, chitinous and blunt at end; ventralia short and pointed at end.

Female : Forns equal to three-fifths that of one eye; third antennal segment one and half times that of the second; sixth sternite wide and with few bristles, seventh slightly elongated with few short bristles, eighth more elongated with few long and short hairs; seventh tergite pointed posteriorly with many bristles.

Material examined : *Holotype* ♂ of *aspinata*, India : Tamil Nadu; Coimbatore, 8. vii. 1912, Fletcher; 1 ♂, Mizoram; Lunglei Circuit House Campus, 16. vi. 1989, B. C. Nandi.

Discussion on species : This species is somewhat similar to *B. (s. str.) aldrichi* Nandi, 1992 but differs from it by the structures of fifth sternite, inner forceps and posterior paramere. Moreover, the median marginal bristles on second and third abdominal tergites absent in this species. Pape (1994) synonymized this species with *B. (s.str.) aspinata* (Senior-White).

Biology : This is relatively rare species which was collected from bushes in hill areas. It has been bred from stagnant water in a manure pit (This record relates to one of the *Paratypes* which most probably is a different genus). It is parasitic on *Acrotyla* sp. and *Acrida tomulus* (Acrididae) (Lopes *et al.*, 1977). Pape (1994) reported the following Orthopteran hosts of the species : *Acrotylus insubricus*, *Aiolopus strepens*, *A. thalassinus*, *A. tomulus*, *Chorthippus biguttulus*, *C. brunneus*, *C. mollis*, *Locusta migratoria*, *Oedalus decorus* and *Schistocerca gregaria*.

Distribution : India ; Mz (Lunglei), TN (Coimbatore, Anamalai Hills and Cinchona); Pa; Azerbaijan; China; Croatia; Denmark; Ethiopia; France; Germany; Gruzia; Italy; Kazakhstan; Kyrgyzstan; Mongolia Morocco; Poland; Russia; Switzerland; Tajikistan; Turkey and Uzbekistan.

Type deposited : *Holotype* ♂ , ZML, examined.

47. *Blaesoxipha* (*s. str.*) *valangae* (Aldrich)

(Figs. 348-352)

1932. *Sarcophaga valangae* Aldrich, *Proc. U. S. natn. Mus.*, **81** (9) : 15.

1932. *Sarcophaga kaestneri* Baranov, *Misc. Zool. Sumatra*, **66** : 3; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 229.

1977. *Blaesoxipha kaestneri* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 564.

1978. *Blaesoxipha similis* Cantrell. *J. Austr. ent. Soc.*, **17**(4) : 363.

1990. *Blaesoxipha microspinosa* Lopes, *Revta bras. Ent.*, **34** : 438.

1994. *Blaesoxipha* (*s.str.*) *valangae* : Pape, *Ent. scand. suppl.*, **45** : 65.

Male : Body length 7 mm.

Head : Width of frons half that of one eye; parafrontal half the width of frons; parafacial twice the width of third antennal segment; third antennal segment twice that of the second; palpi black; gena covered with black hairs; three rows of postocular setae, first row regular, others row irregular.

Thorax : *Ac* 3+2; *dc* 4+3; propleura bare; scutellum with weak lateroscutellar bristles.

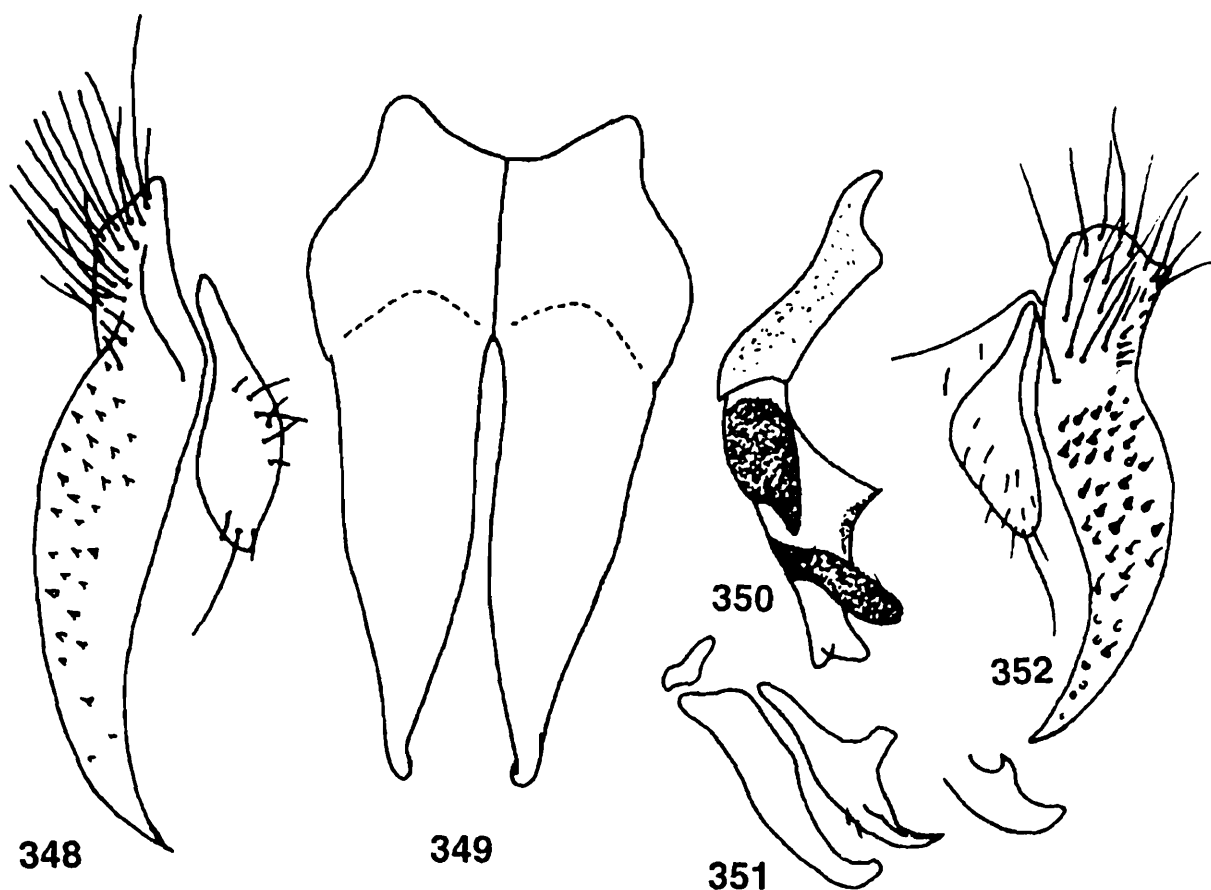
Wings : Nothing mentioned.

Legs : Mid femur with a row of 3 bristles.

Abdomen : Third tergite with median marginal bristles; inner forceps slightly curved at end with short spines on two-thirds of its apical end; outer forceps almost elongated with short hairs; first and second genital segments black.

Female : Unknown.

Material examined : No material was available for examination during the present study and the description provided here is mostly based on Senior-White *et al.* (1940).



Figs. 348-352 : *Blaesoxipha (s. str.) valangae* (Aldrich). 348, Inner and outer forceps (lateral view); 349, Inner forceps (ventral view); 350, Penis (lateral view); 351, Anterior and posterior parameres (lateral view); (after, Pape, 1994); 352, Inner and outer forceps (lateral view; after Baranov, 1932 as *kaestneri*).

Discussion on species : This species is very close to *B. (s.str.) pygmaea* (Zetterstedt, 1844) but may be distinguished from it by the possession of numerous distinct spines on inner forceps and also from *B. rishikeshi* Nandi, 1990 by the curvature of inner forceps. The material was not available for comparing the male genitalia parts with other species of the genus. Pape (1994) synonymized this species with *B. (s. str.) kaestneri* (Baranov).

Biology : Pandian and Delvi (1973) reported this species as parasite on the grasshopper- *Poecilocerus pictus* (Fab.) (Pyrgomorphidae) and also recorded the mortality of this grasshopper by this parasite. They illustrated the larval stages, mentioned the duration of the pupal stage and suggested that this species can be used as a biological control of this grasshopper. Senior-White *et al.* (1940) reported the breeding of this species from *Valanga nigricornis*. Pape (1994) recorded the following Orthopteran hosts of the species : *Austracris guttulosa*, *Cyrtacanthacris succincta*, *Poecilocerus pictus* and *Valanga nigricornis*.

Distribution : India : Kt (Bangalore); Pa; Australia; Indonesia; Malaysia; Papua New Guinea; Solomon Islands and Thailand.

In spite of extensive survey from different parts of India, this species has not been recorded again since its collection in 1973. The species reared by Pandian and Delvi was identified as *B. kaestneri* by R.G. Fennah and R.W. Crosskey, London.

Type deposited : *Holotype* ♂ , USNM, not examined.

48. *Blaesoxipha* (*s. str.*) *rishikeshi* Nandi

(Figs. 353-357)

1990. *Blaesoxipha* (*s.str.*) *rishikeshi* Nandi, *J. Beng. nat. Hist. Soc.*, 9(1) : 16.

Male : Body length 7 mm.

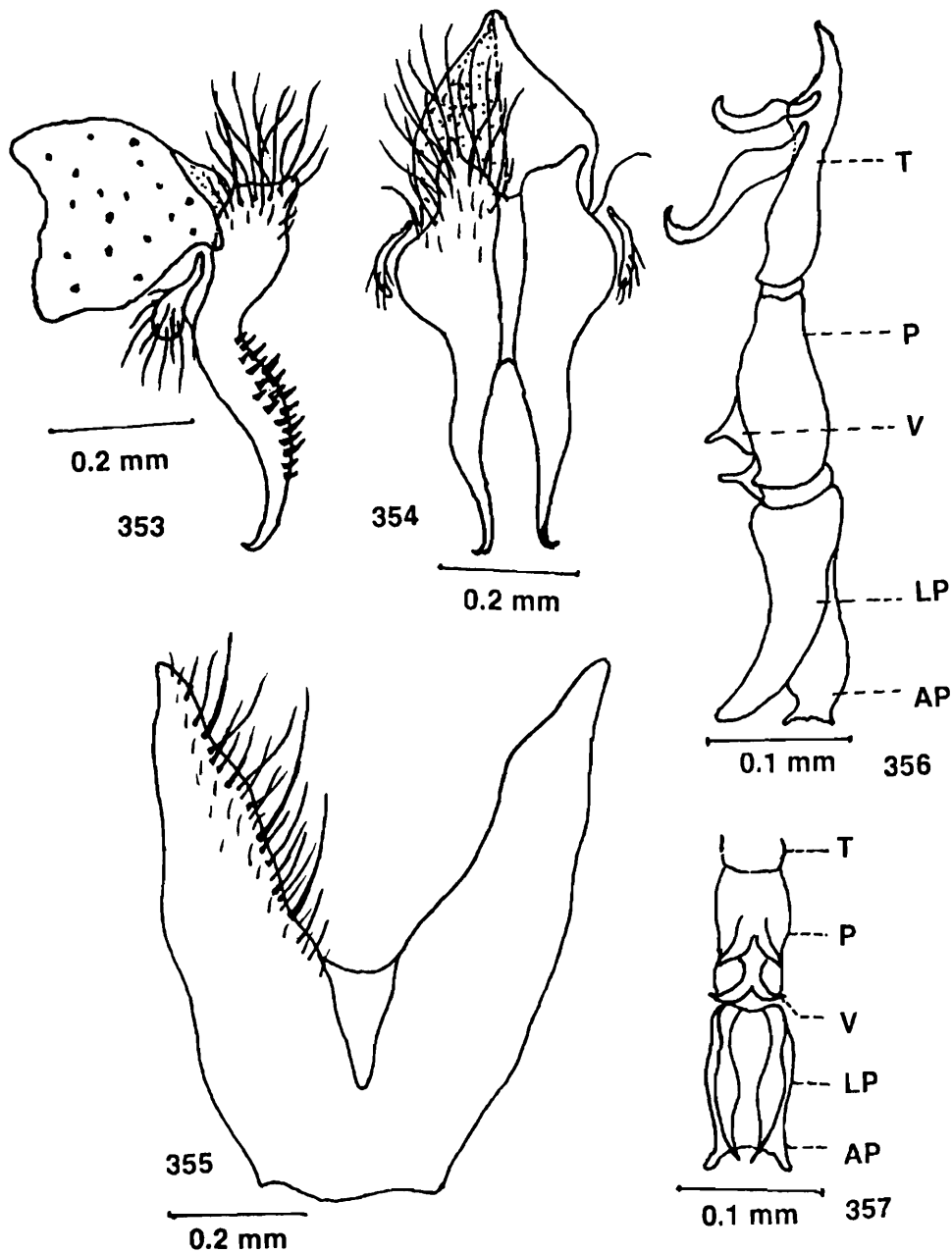
Head : Width of frons about two-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of 6 black hairs near the eye margin; antennae brownish, reaching up to about 0.75 distance to vibrissae, first and second segments brownish-black with short black hairs, third brownish with silvery pollen and about two and half times that of the second; arista long, plumose along basal three-fifths; facial ridge brownish with silvery pollen and about two and half times that of the second; arista long, plumose along basal three-fifths; facial ridge brownish with silvery pollen; vibrissae long, crossed, distance between vibrissae greater than one parafacial width; frontal bristles 11, posterior 3 reclinate, anterior 2 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena black with short black hairs; post gena blackish with grey hairs; outer vertical bristle not differentiated, inner vertical well developed, post vertical one-third the inner vertical; ocellar bristles short, post ocellar about one-third the inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with irregular brownish hairs; palpi slender; proboscis brownish.

Thorax : Black with three black longitudinal stripes; *ac* 2+3; *dc* 4+3; *ia* 1+2; *ps* 1; *h* 3; *ph* 3; *np* 3; *pa* 2; *sa* 2; *st* 1+1+1; *mpl* 7; *hpl* 7; upper part of propleura bare, black with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short black hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles well developed, 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of short setae located dorsally and extending up to about two-thirds from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to

the third, the former with short spines along basal half of its anterior margin; costal spines not stout; epaulet brownish with short spines; basicostal scale and squama white; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 short bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of



Figs. 353-357 : *Blaesoxipha (s. str.) rishikeshi* Nandi. 353, Inner and outer forceps (lateral view); 354, Inner and outer forceps (posterior view); 355, Fifth sternite; 356, Penis (lateral view); 357, Penis (ventral view).

bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of setae along distal half of anteroventral surface, a row of bristles along basal half of posteroventral surface, 1 bristle on posterolateral surface at about one-third the distance from the distal end and a row of bristles along basal half of posteroventral surface; mid tibia with 2 bristles along middle portion of anterolateral surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end and 1 bristle on posterolateral surface at about half the distance from the distal end; hind femur with a row of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 1 bristle on posterodorsal surface at about one-fourth the distance from the basal end and with tuft of long hairs along ventral surface; hind tibia with 2 bristles along posterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end and a row of long hairs along posterior margin of ventral surface at about three-fifths the distance from the distal end.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second abdominal tergite absent but third with a pair of median and each with 4 lateral marginal bristles, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of 14 marginal bristles; sternites first to fourth with long hairs; fifth sternite v-shaped, deeply cleft and with few bristles and hairs laterally on arms; first genital segment brownish-black but without marginal bristles, second black with short hairs; inner forceps elongated, curved at end and with numerous marginal spines on subterminal end and strongly convex at the middle; outer forceps elongated with few hairs; anterior paramere elongated and slightly curved; posterior paramere elongated and strongly curved at end; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus almost straight and blunt at end; lateral plate of paraphallus well differentiated; ventralia ill-developed.

Female : Unkonwn.

Material examined : *Holotype* ♂, India : Uttar Pradesh; Rishikesh, Panichar, 335 m, 19.X. 1986, B.C. Nandi.

Discussion on species : This species comes close to *B.(s.str.) bhutanensis* Nandi, 1992 but differs from it by the structures of fifth sternite and paraphallus. This species is also distinguished from *B. (s.str.) rufipes* (Macquart, 1839) by the structures of apical plate of paraphallus, anterior paramere and fifth sternite.

Biology : This rare species was collected from bush-sweeping under *Eucalyptus* sp. (Murtaceae).

Distribution : India ; UP (Panichar).

Type deposited : *Holotype* ♂, ZSIC, examined.

49. *Blaesoxipha* (s. str.) *bhutanensis* Nandi

(Figs. 358-362)

1992. *Blaesoxipha* (s.str.) *bhutanensis* Nandi, *Rec. zool. Surv. India*, **90** (1-4) : 39.*Male* : Body length 6.5 mm.

Head : Width of frons about two-fifths that of one eye; frontal vitta brownish, its width at narrowest point of frons about twice that of each parafrenal; parafrenal and parafacial brownish-black with white pollen, the former with short scattered hairs, the latter with a row of 4-5 short black hairs near the eye margin; antennae brownish-black and reaching up to about 0.85 distance to vibrissae, first and second segments brownish black with black hairs, third brownish with numerous white pollen and about four and half times that of the second; arista long, plumose along basal three-fifths; facial ridge brownish, silvery pollen and with black hairs at the lower half; vibrissae long, crossed, distance between vibrissae greater than one parafacial width; frontal bristles 13, posterior 4 reclinate, anterior 3 below base of antennae and reaching up to about more than half of second antennal segment, rest cruciate and directed forwards; gena black with long black hairs; post gena black; ocellar triangle black with short black hairs; outer vertical bristle not differentiated, inner vertical well developed, post vertical half of inner vertical; ocellar bristles short, postocellar half of inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with irregular brownish hairs; palpi long, slender and brownish; proboscis brownish.

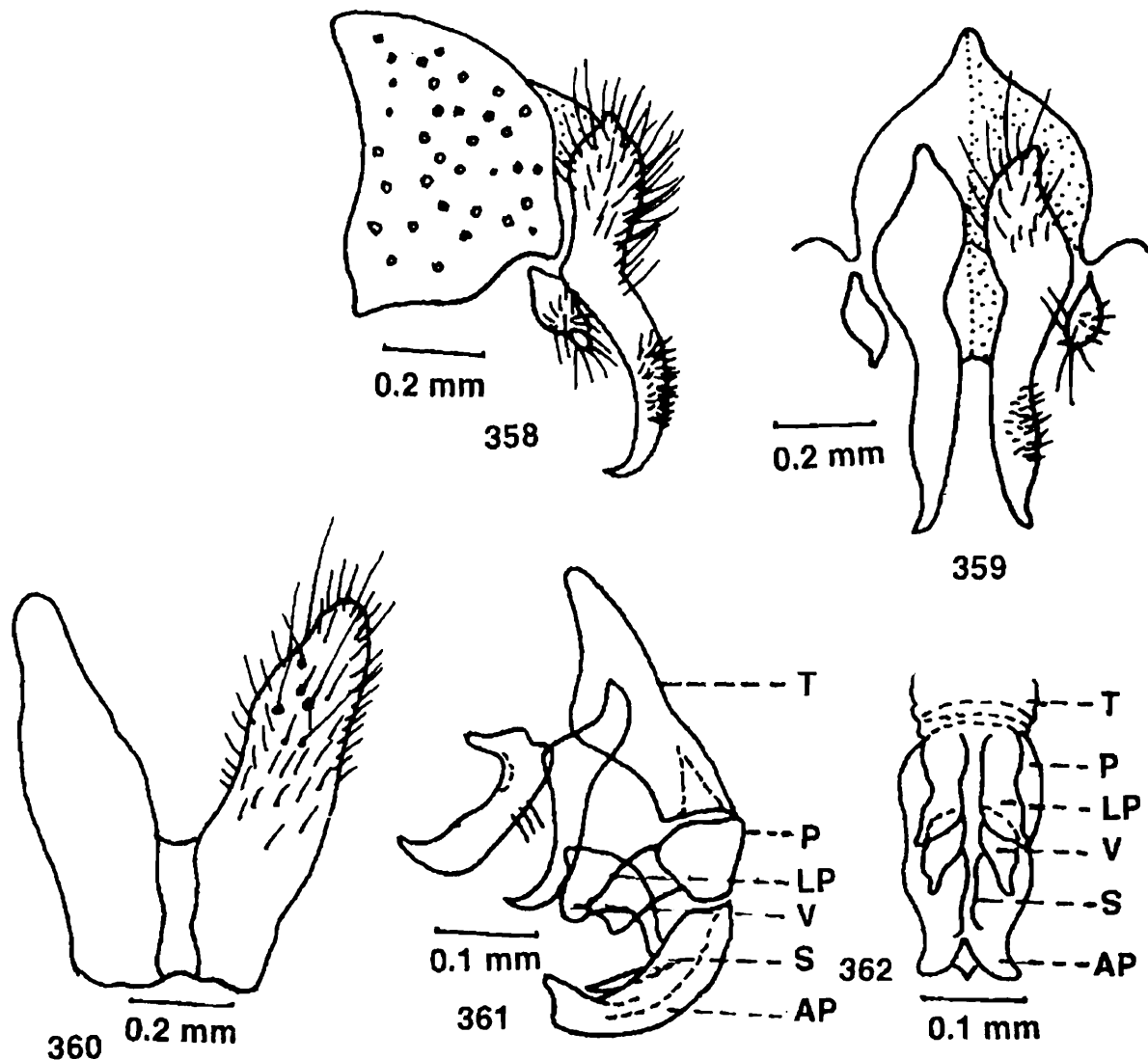
Thorax : Black with three black longitudinal stripes; *ac* 2+3; *dc* 3+3; *ia* 1+2; *ps* 1; *h* 3; *ph* 3; *np* 4; *pa* 2; *sa* 2; *st* 1+1+1; *mpl* 9; *hpl* 8; upper part of propleura black with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short black hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles well developed, 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of short setae located dorsally and extending up to about half from the basal node to r-m and 3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to third, the former with short spines along basal one-third of its anterior margin; costal spines not stout; epaulet black with short spines; basicostal scale and squama whitish; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of short bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with 1 bristle on middle portion of anterolateral surface, a row of 5 bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of bristles along basal half and a row of short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end; mid tibia with

1 bristle on middle portion of anterodorsal surface, a row of bristles along posterodorsal surface and 1 bristle each on anteroventral and posteroventral surfaces at about one-third the distance from the distal end; hind femur with a row of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 1 bristle on posterodorsal surface at about one-fifth the distance from the distal end and a row of hairs along posterior margin of ventral surface; hind tibia with a row of bristle each along anteroventral and posterodorsal surfaces at about one-third the distance from the distal end and 1 bristle each on posteroventral surface at about one-third and two-thirds the distances from the distal end.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal



Figs. 358-362 : *Blaesoxipha* (*s. str.*) *bhutanensis* Nandi. 358, Inner and outer forceps (lateral view); 359, Inner and outer forceps (posterior view); 360, Fifth sternite; 361, Penis (lateral view); 362, Penis (ventral view).

bristles, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of 14 marginal bristles; sternites first to fourth with short hairs; fifth sternite v-shaped, deeply cleft and with 2-4 strong bristles laterally on arms; first genital segment blackish with 4 marginal bristles, second black but without marginal bristles; inner forceps elongated, strongly curved and bent posteriorly but with tuft of spines on sub terminal end; outer forceps slightly elongated with few hairs; anterior paramere elongated, slightly curved at end with basal process and few hairs posteriorly in middle; posterior paramere elongated and curved strongly at end; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus strongly curved, long and almost blunt at end; lateral plate of paraphallus curved, wide and almost blunt at end; styli of glans feebly developed, without serration but reaching up to about subterminal end of paraphallus; ventralia well developed, narrow but without serration at end.

Female : Unknown.

Material examined : *Holotype* ♂, Bhutan ; Thimpu, 2, 450 m, 21. x. 1978, B.C. Nandi; 1 ♂, India : Sikkim; Gangtok Hospital Campus, 1, 677 m, 27. x 1977, B.C. Nandi.

Discussion on species : This species is similar to *B. (s.str.) rishikeshi* Nandi but differs from it by the structures of apical and lateral plates of paraphallus and anterior paramere. Moreover, the structure of ventralia is also quite distinguishable here from *rishikeshi*. *B. (s.str.) bhutanensis* Nandi can be distinguished from *B. (s.str.) agrestis* (R.D., 1863) by the structure of genitalia and absence of median marginal bristles on third abdominal tergite.

Biology : This rare species was collected from hill bushes.

Distribution : India; S (Gangtok) and Bh (Thimpu).

Type deposited : *Holotype* ♂, ZSIC, examined.

50. *Blaesoxipha (s. str.) agrestis* (Robineau-Desvoidy)

(Figs. 363-366)

1863. *Listeria agrestis* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, **2** : 600.

1817. *Blaesoxipha lineata* Fallén, *K. svenska Vetensk. Akad. Handl.*, **3** : 238 (a junior primary homonym of *Musca lineata* Harris, 1776 and Fabricius, 1781).

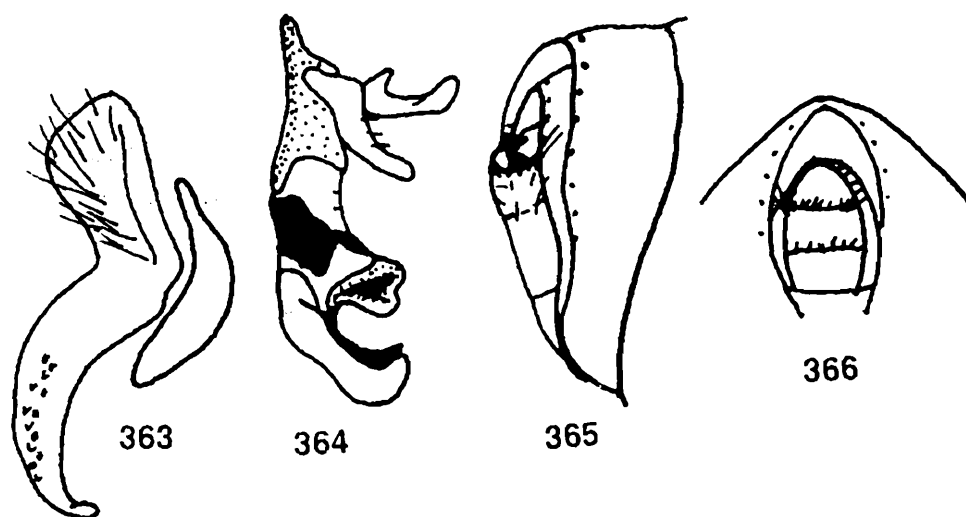
1987. *Blaesoxipha agrestis* : Pape, *Fauna ent. scand.*, **19** : 102.

Male : Body length 5.0–8.5 mm.

Head : Width of frons about two-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and

parafacial brownish-black with white pollen, the former with short scattered hairs near the eye margin; antennae totally black and reaching up to about 0.85 distance to vibrissae, first and second segments with black hairs, third with brownish pollen and about four and half times that of the second; arista long, plumose along a little more than basal half; facial ridge blackish, silvery pollen and with short black hairs along lower half; vibrissae long crossed, distance between vibrissae greater than one parafacial width; frontal bristles 12, anterior 3 reclinate, posterior 3 below base of antennae and reaching up to tip of second antennal segment, rest cruciate and directed forwards; gena black with long black hairs; post gena black with greyish hairs; ocellar triangle black with few short black hairs; outer vertical bristle not differentiated, inner vertical well developed, post vertical half the inner vertical; ocellar bristles short; post ocellar half the inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with blackish hairs; palpi long and slender; proboscis brownish.

Thorax : Black with three black longitudinal stripes; *ac* 2+3; *dc* 3+3; *ia* 1+2; *ps* 1; *h* 3; *ph* 3; *np* 4; *pa* 2; *sa* 2; *st* 1+1+1; *mpl* 7; *hpl* 8-9; upper part of propleura black with silvery pollen and short black hairs; pro-and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each, discoscutellar bristle well developed and one-third the apicoscutellar bristle; lateroscutellar bristles 2 pairs.



Figs. 363-366 : *Blaesoxipha (s. str.) agrestis* (Robineau-Desvoidy). 363, Inner and outer forceps (lateral view); 364, Penis (lateral view); 365, Genitalia ♀ (lateral view); 366, Genitalia ♀ (ventral view); (after Pape, 1987).

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 6 setae located dorsally and extending up to less than half from the basal node to r-m and 1-2 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment slightly greater than third, the former with short spines along basal half of its anterior margin; costal spines not stout; epaulet black with short spines; basicostal scale and squama whitish; halter brown.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 short bristles along basal half of anterodorsal surface at about one-third the distance from the distal end; mid femur with 1 bristle on middle portion of anterolateral surface, a row of 4-5 bristles along basal half of anterodorsal surface, a row of short bristles each along basal half of anteroventral and posteroventral surfaces and a row of short setae each along distal half of anteroventral and posteroventral surfaces; mid tibia with 1 bristle on middle portion of anterodorsal surface, a row of bristles along posterodorsal surface and 1 bristle each on posteroventral and anteroventral surfaces at about one-third the distance from the distal end; hind femur with a row of bristles along anterodorsal surface, 2 bristles on posterodorsal surface at about one-fourth the distance from the distal end and a row of long hairs along posterior margin of ventral surface; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end and 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end.

Abdomen : Black with grey pollen and median black stripes, the lateral black spots on second to fifth tergites coalesce with lateral stripes; median marginal bristles on second abdominal tergite absent but third with a pair of median and second with 2 and third with 3 lateral marginal bristles, fourth with a pair of median and 6 lateral marginal bristles; fifth with a row of 14 marginal bristles; sternites first to fourth with moderately long hairs; fifth sternite v-shaped, deeply cleft and with a row of few bristles laterally on arms; first genital segment black with 4 marginal bristles, second black but without marginal bristles; inner forceps grooved at the middle and hook-shaped apically; outer forceps elongated; anterior paramere with a basal projection; posterior paramere elongated, slightly curved but without hairs on anterior margin; theca shorter than paraphallus; apical plate of paraphallus wide, without bifurcation but blunt at end; lateral plate of paraphallus short, wide and blunt at end; ventralia well developed.

Female : Almost similar to male but for the following differences; female genitalia very short, broad and almost shovel-shaped; sixth sternite wide posteriorly; seventh and eighth sternites almost same in width, without groove but each with strong bristles on posterolateral side.

Material examined : 1 ♂, collected from Russia; locality not interpreted, determined by Yu. G. Verves and T. Pape (dep. in ZMUC).

Discussion on species : This species may be distinguished from *B. (s.str.) bhutanensis* Nandi by the absence of spots on lateral sides of second, third and fourth abdominal

tergites and from *B. (s.str.) rufipes* (Macquart) by the detailed structure of paraphallus. Moreover, the antennae are totally black and inner forcep is slightly curved in this species.

Biology : This species is not common and it has been reared from acridid grasshoppers. The females larviposit at random on the hosts and the larvae seek and penetrate an intersegmental or arthrodiol membrane. Larviposition may even take place on flying hosts (Pape, 1987b). This species was introduced to Sand Island, Honolulu, for biological control of the locust-*Schistocerca nitens* (Acrididae) but not established (Chong, 1968 and Hardy, 1981).

Distribution : India; JK (Gulmarg); Afghanistan; Algeria; Arabia; Canary Islands; China; Denmark; Egypt; France; Germany; Iran; Israel; Libya; Mongolia; Miorocco; North Africa; Norway; Saudi Arabia; Somalia; Sudan; Sweden; Syria; Tunisia; Turkey and Yemen.

Type deposited : *Holotype* ♂, MNHN, probably lost.

51. *Blaesoxipha (s. str.) karnataka* Pape

(Figs. 367-370)

1994. *Blaesoxipha (s. str.) karnataka* Pape, *Ent. scand. suppl.*, 45 : 36.

Male : Body length 7.1 mm.

Head : Narrowest part of frons 0.13 that of head width; outer vertical bristle not differentiated from adjacent postocular setae; genal setae black; setae of post gena and lower 0.7 of post cranium white except for a few black setae along the anteroventral part of post gena close to genal sulcus; palpi black.

Thorax : Proepisternum bare; *ac* 3+2; *dc* 3+2; *ia* 2+3; *sa* 2+3; *pa* 2; scutellum with 2 marginal, 1 distal and 1 somewhat weak apical bristles.

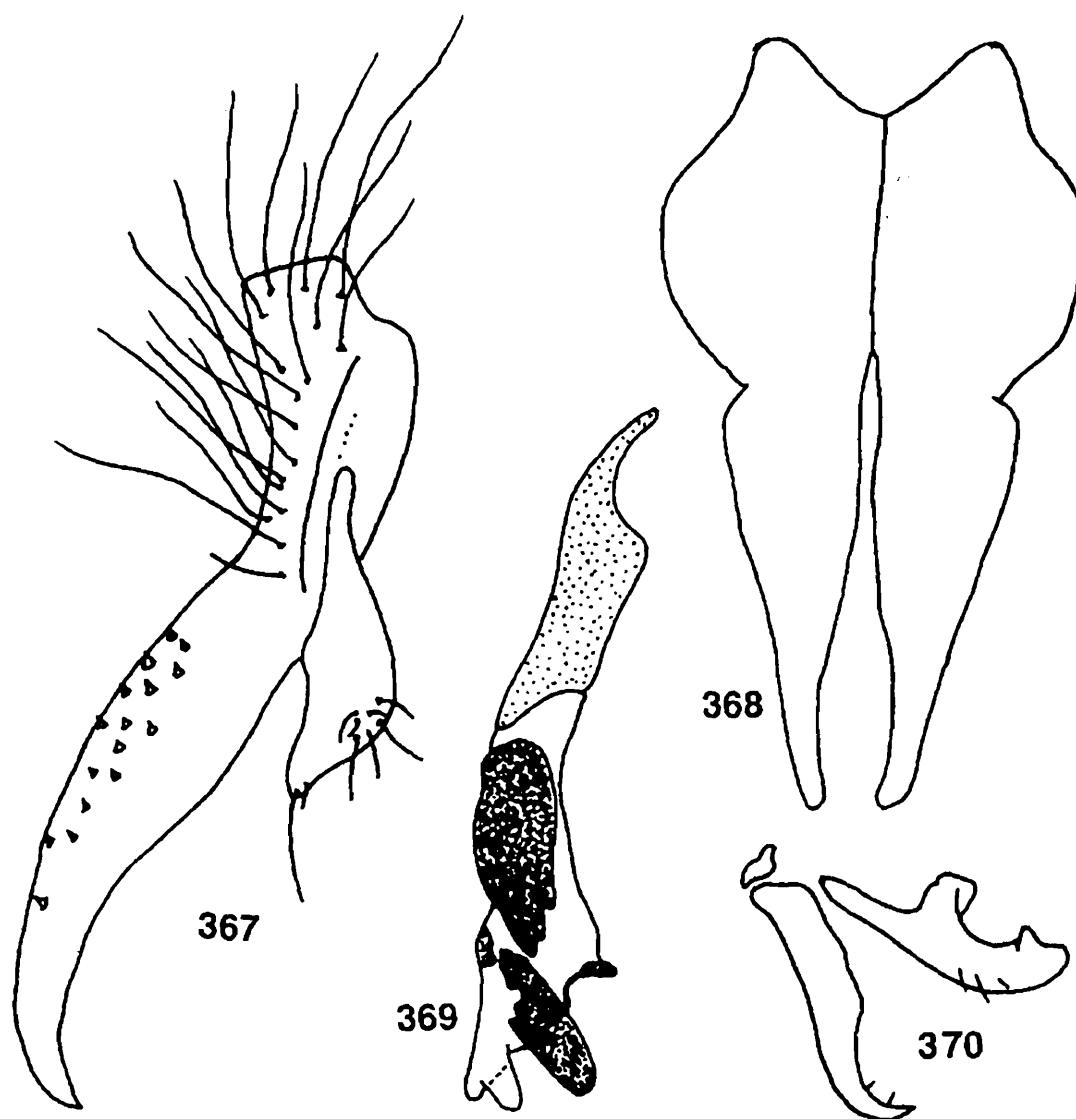
Wings : Costal spines well developed; tegula blackish-brown; basicosta yellow; lower calypteres brownish with whitish margin; long hairs at base between upper and lower calypteres brownish or yellowish.

Legs : Apical posteroventral comb of mid femur with 2-3 bristles only; hind trochanter without posteromedian spines; hind tibia with no elongated posteroventral or posterior setae.

Abdomen : Oval, slender but without a distinct brownish tinge; tergites 1+2-3 without median marginal bristles; tergites 4-5 with a complete row of bristles; genital segments brown.

Female : Unknown.

Material examined : Material was not available for study and the description provided here is from Pape (1994).



Figs. 367-370 : *Blaesoxipha (s. str.) karnataka* Pape. 367, Inner and outer forceps (lateral view); 368, Inner and outer forceps (posterior view); 369, Penis (lateral view); 370, Anterior and posterior parameres (lateral view); (after Pape, 1994).

Discussion on species : Pape (1994) have mentioned that this species is similar to *B. formosana* Baranov, 1931 and *B. valangae* (Aldrich) but the cercus is narrower here on posterior end. This species also can be separated from *B. rufipes* (Macquart) by the structure of apical part of paraphallus and number of spines on inner forceps.

Biology : Nothing is known.

Distribution : India ; Kt (Kemangundi).

Type deposited : Holotype ♂, ZMUC, not studied.

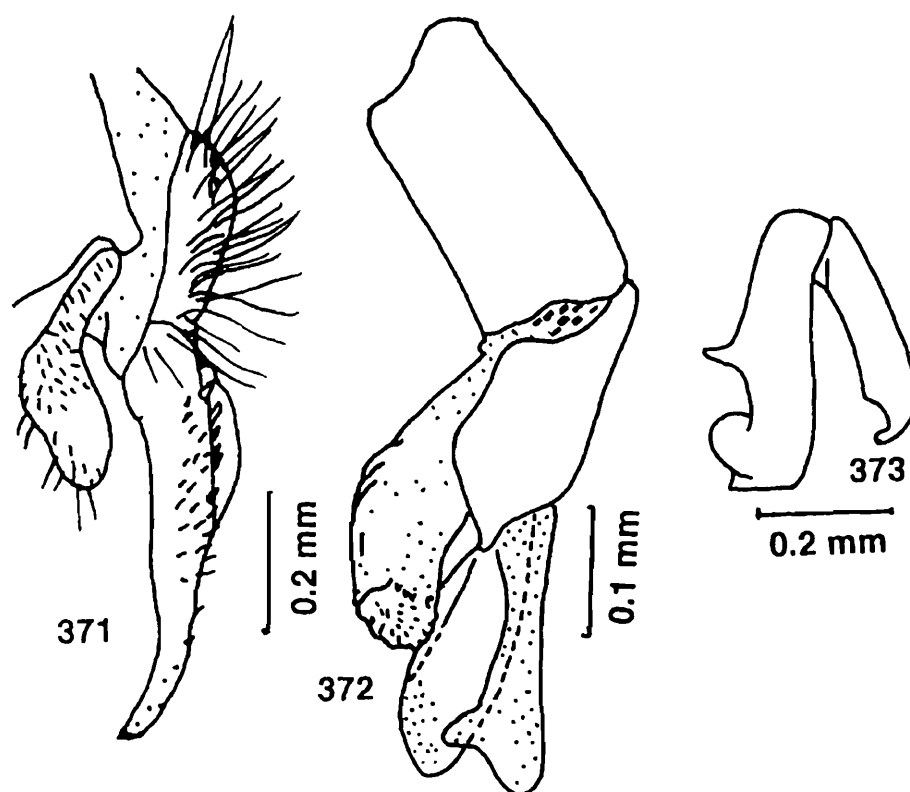
52. *Blaesoxipha (s. str.) nathani* Lopes

(Figs. 371-373)

1990. *Blaesoxipha (s. str.) nathani* Lopes, *Revta bras. Ent.*, **34** : 439.

Male : Body length 8.5 mm.

Head : Width of frons about 0.16 of head; head with silvery pollen and yellowish; frontal vitta dark grey; antennae yellow, third segment except on base greyish and reaching about 0.33 distance to vibrissae, second segment about the same as that of the third; arista long, plumose along basal half; genal groove reddish-brown and covered with grey pollen; gena grey with black hairs; frontal bristles 9-11, posterior 1 directed backwards; ocellar bristle very short; outer vertical bristle not differentiated; parafacial with about 6 small hairs; facial ridge with 5-6 short hairs; back of head with two irregular rows of black hairs; palpi yellow.



Figs. 371-373 : *Blaesoxipha (s. str.) nathani* Lopes. 371, Inner and outer forceps (lateral view); 372, Penis (lateral view); 373, Anterior and posterior parameres (lateral view); (after Lopes, 1990).

Thorax : Grey with slightly yellowish pollen; *ac* 3-4+3; *dc* 3+3; *ia* 2+2; *sa* 1-2+3; scutellum with 2 strong marginal bristles; some small bristles present near posterior marginal scutellar; preapical shorter than apical bristles; meron with 8 bristles.

Legs : Reddish-brown; mid femur with a series of conspicuous stout bristles not forming ctenidium on posterior margin; mid tibia with ventral bristles; hind tibia with bristles on anterior side.

Abdomen : Grey; second abdominal tergite blackish, third and fourth with broad longitudinal black stripes, fifth with wide stripes on sides; median marginal bristles

on third and fourth abdominal tergites present but the third tergite bristles small; second to fourth sternites with scattered hairs; inner forceps slightly curved with median flat region and the spines not reaching up to apical part; outer forceps elongated with broad apex; apical part of paraphallus with conspicuous lateral lobes; ventralia large with spines.

Female : Unknown.

Material examined : The material was not available for examination and the description provided here is mostly based on Lopes (1990).

Discussion on species : This species is similar to *B. (s.str.) rufipes* (Macquart) but differs from it by the structures of apical plate of paraphallus and ventralia. Moreover, this species is quite distinguishable from *rufipes* by the colour of head and bristles on mid femur and tibia.

Biology : Nothing is known.

Distribution : India ; K (Malabar coast).

Type deposited : *Holotype* ♂, MNRJ, not studied.

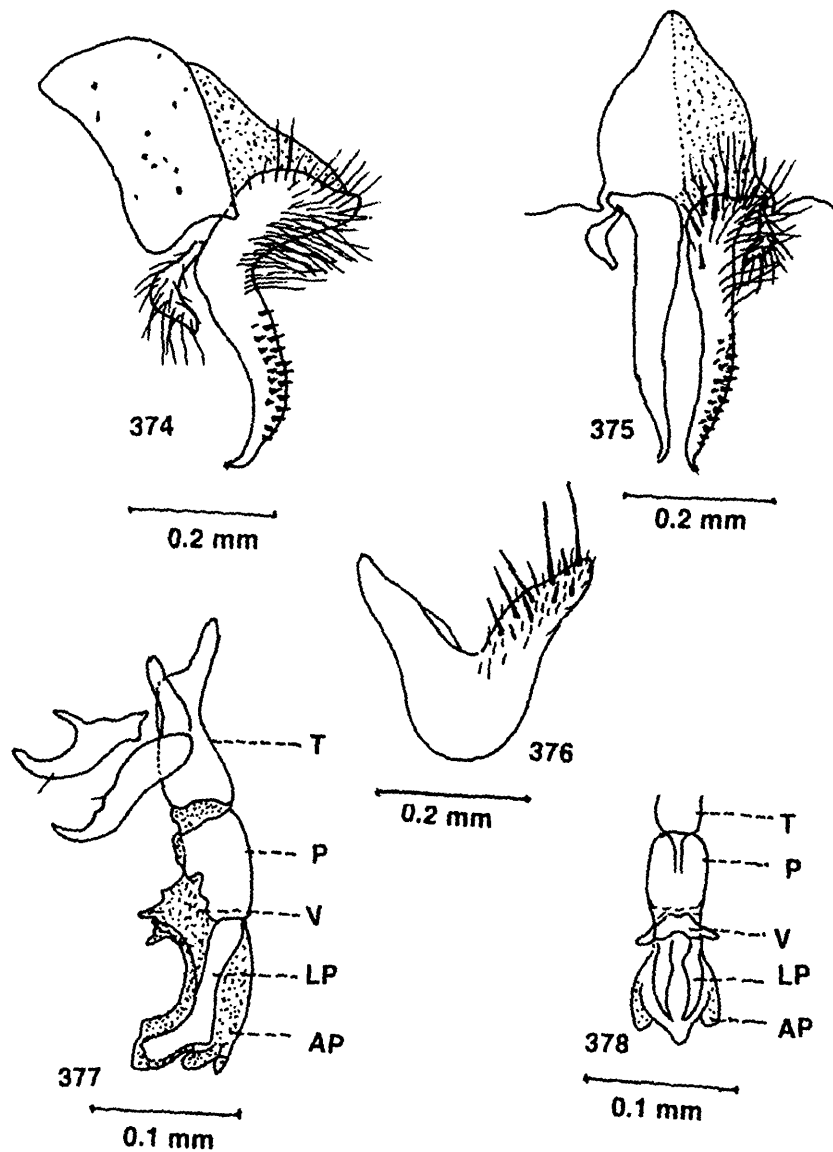
53. *Blaesoxipha (s. str.) rufipes* (Macquart)

(Figs. 374-378)

1839. *Agria rufipes* Macquart, *Hist. nat. Canaries. Ent.*, 2(2) : 113.
1869. *Sarcophaga boops* Thomson, *K. svenska Vetensk. Akad. fragatten Eugenie resa omkring Jordan*, 2(1) : 538.
1891. *Masicera pachytyli* Skuse, *Agric. Gaz. N.S.W.*, 1 : 256.
1924. *Agria hutsoni* Senior-White, *Rec. Indian Mus.*, 26(3) : 258.
1928. *Blaesoxipha filipjevi* Rohdendorf, *Zool. Anz.*, 77(1-2) : 26.
1928. *Blaesoxipha tertia* Rohdendorf, *Publ. Uzb. Expl. Sta. Plant. Prot.*, 14 : 50.
1930. *Blaesoxipha filipjevi aequatorialis* Rohdendorf, *Bull. ent. Res.*, 21(3) : 318.
1932. *Blaesoxipha aegyptiaca* Villeneuve, *Bull. Soc. ent. Fr.*, 37 : 34.
1939. *Blaesoxipha paolii* Villeneuve, *Bull. Soc. ent. ital.*, 71 (6-7) : 114.
1941. *Gesneriodes filipjevi* : Séguy, *Encycl. ent.*, (A), 21 : 180.
1958. *Blaesoxipha palauensis* Lopes, *Ins. Micro.*, 13(2) : 20.
1975. *Blaesoxipha povolnyi* Rohdendorf, *Streenstrupia*, 3 (19) : 197.
1986. *Blaesoxipha rufipes* : Verves, *Cat. Palae. Dipt.*, 12 : 128; Pape, 1994, *Ent. scand. suppl.*, 45 : 63.
1990. *Blaesoxipha filipina* Lopes, *Revta bras. Ent.*, 34 : 434.

Male : Body length 5–6 mm.

Head : Width of frons about two-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of about 10 hairs near the eye margin, lower 2 strong; antennae reddish-grey reaching up to about 0.8 distance to vibrissae, first and second segments reddish



Figs. 374-378 : *Blaesoxipha* (*s. str.*) *rufipes* (Macquart). 374, Inner and outer forceps (lateral view); 375, Inner and outer forceps (posterior view); 376, Fifth sternite; 377, Penis (lateral view); 378, Penis (ventral view).

with short black hairs, third grey with silvery pollen and about two and half times that of the second; arista short, plumose along basal third; facial ridge brownish-black with silvery pollen; vibrissae long, distance between vibrissae greater than one parafacial width; frontal bristles 11-12, posterior 3 reclinate, anterior 2 below base of antennae and reaching up to about half of second antennal segment, rest cruciate

and directed forwards; gena black, silvery pollen and with black hairs; post gena black with black hairs; outer vertical bristle not differentiated; inner vertical well developed, post vertical less than half of inner vertical; ocellar bristle short but distinct, post ocellar equal to ocellar and about one-third of inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with black hairs; palpi long, slender and brownish; proboscis brownish.

Thorax : Black with grey pollen and three black longitudinal stripes; *ac* 3+3; *dc* 3+4 (anterior one small); *ia* 1+2 ; *ps* 1; *h* 3; *ph* 4; *np* 4; *pa* 2; *sa* 2; *st* 1+1+1; *mpl* 6; *hpl* 5; upper part of propleura black with greyish pollen; prostigmatic and propleural bristles well developed and accompanied with short black hairs; pro-and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles strong, 1 pair each; lateroscutellar bristles 3 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 7-8 short setae located dorsally and extending up to about half from the basal node to r-m and 4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment greater than the third, the former with short spines along its whole length of anterior margin; costal spines well developed; epaulet black with short spines; basicostal scale and squama whitish; halter brownish.

Legs : Black; fore femur with a row of bristles along anterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 2-3 bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with 3-4 bristles along middle portion of anterolateral surface, a row of strong bristles along basal half of anteroventral surface, without true setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end; mid tibia with a pair of rows of bristles along middle portion of anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end and 1 bristle on middle portion of posteroventral surface; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface and 1 bristle on posterodorsal surface at about two-fifths the distance from the distal end; hind tibia with a pair of rows of bristles along anterodorsal surface, 1-2 bristles on anteroventral surface at about one-third the distance from the distal end but without long hairs along posterior margin of ventral surface.

Abdomen : Black with yellowish silvery checkered pattern; median marginal bristles on second abdominal tergite absent but third with a pair of median and each with 2 lateral marginal bristles, fourth and fifth each with a complete row of median marginal bristles; sternites second to fourth with sparse black hairs but second with few black bristles in addition to black hairs; fifth sternite v-shaped, slightly cleft and

with few long and delicate hairs laterally on arms; first genital segment with 4 and second with 8 median marginal bristles; inner forceps strong, bent posteriorly and with numerous short spines on distal half; outer forceps elongated with terminal digitiform apophysis and long bristles at the end; anterior paramere curved with strong basal projection; posterior paramere elongated and slightly curved at end; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus membranous with slight bifurcation at end; lateral plate of paraphallus with a spinal sclerotised plate; ventralia small, slender but without spines.

Female : Unknown.

Material examined : 1 ♂, India : Thekkedi; Periyar Dam, Trivancore 6-10. vi. 1937, M.C.M. expedition.

Discussion on species : This species is similar to *B. (s.str.) agrestis* (Robineau-Desvoidy, 1863) but may be distinguished from it by the shape of inner forceps, extraordinary large fifth sternite, by the structure of apical plate of paraphallus and distribution of spines on inner forceps. Pape (1994) synonymized this species with *B. (s.str.) palauensis* Lopes.

Biology : Zumpt (1972) and Rohdendorf and Verves (1978) reported the larvae as parasites of different species of Acridoidea belonging to the families Pyrgomorphidae and Acrididae. Pape (1994) listed the following Orthopteran hosts : *Acanthacris ruficornis lineata*, *Acridaoxycephala* sp., *Aiolopus thalassinus*, *Anacridium aegypticum*, *A. moestum*, *Calliptamus coelesytiens*, *C. italicus*, *Chortoicetes* sp., *Chortoiceta terminifera*, *Dociostaurus kraussi*, *D. maroccanus*, *D. nigrogeniculatus*, *Epacromius coerulipes*, *Kosciuscola cognatus*, *Locusta migratoria*, *Locustene pardaline*, *Mesasippus kozhevnikovi*, *Monistria discrepans*, *Oedaleus* sp., *Oedipoda miniata*, *Phymateus morbillosus*, *Poecilocerus pictus*, *Qualetta maculata*, *Schistocerca gregaria*, *Sphingoderus carinatus*, *Stauronotus* sp., *Tmethis* sp., *Zonocerus variegatus* and Lepidopteran Noctuidae and Hymenoptern hosts (*Exoristobia philippiensis*) (Encyrtidae).

Distribution : India ; TN (Thekkedi), Me (Shilong); Pa; SL (Matale); Afghanistan; Algeria; Angola; Australia; Botswana; Cameroon; Canary Islands; Cape Verde Islands; China; Comores; Croatia; Cyprus; Egypt; Ethiopia; Fiji; France; Gambia; Indonesia (Java); Iran; Israel; Italy; Japan; Jordan; Kazakhstan; Kenya; Kyrgyzstan; Laos; Lebanon; Madagascar; Mali; Malaysia; Mongolia; New Caledonia; Nigeria; Palau Islands; Papua New Guinea; Philippines; Russia; Saudi Arabia; Senegal; Sierra Leone; Solomon Islands; South Africa; South Korea; South Yemen; Spain; Syria; Tanzania; Thailand; Togo; Turkmenistan; Uganda; USA; Uzbekistan; Vanuatu; Zaire and Zambia.

Type deposited : *Holotype* ♂, not recovered, probably lost.

Tribe **Sarcophagini** Macquart

This tribe is characterized by having straight or anteriorly bent inner forceps and well developed lateral plate of paraphallus; phallic tube absent; 3 or 4 postsutural dorsocentral bristle. It is the largest tribe of Sarcophagidae in the world and was divided into several subtribes by Rohdendorf (1965), Lopes *et al.* (1977) and Verves (1986). Lopes (1982) divided it into eight subtribes on the basis of structure of labrum and clypeal arch of first instar larvae. Later on, Sugiyama and Kano (1984) divided it into two genera and included all the available Oriental species. Pape (1987b) provided descriptions and keys to all species of Fennoscandia and Denmark. Zumpt (1952) characterised this tribe as sixth tergite very reduced, apical plate of paraphallus very complicated, fifth sternite deeply emarginated and as a rule provided with dense rows of short hairs or spines forming comb—like structures. The Oriental species of this tribe is essentially similar in characters to that of the Palaearctic species and is mostly comprised of genera that are shared with to other areas. Six subtribes are present here.

The larvae of this tribe utilise wide variety of foods including dead Lepidoptera, Hymenopteran larvae, Orthoptera (Acrididae), dead crabs, spider egg-sacs, dead snails and slugs and dead bodies and excrement of animals. Some species also cause myiasis in different parts of animals. Some of the larvae have been studied from the Oriental and Australasian regions and the larvae bear well sclerotised labrum and complete clypeal arch. Some species are associated with different microorganisms and cause hazards to human beings.

This cosmopolitan tribe is richly represented in the Oriental and Palaearctic regions and on especially large number of species are available in the genus *Parasarcophaga* Johnston and Tiegs.

Key to subtribes

1. Usually 4 postsutural *dc* (rarely 6, 5 or 3) which are equal in length and the largest at the rear3
 Usually 3 stout postsutural *dc* bristles which are uniform in length and are equidistant2
2. Apical part of paraphallus always ill-defined, usually not separated from basal part; lateral plate of paraphallus usually ill-developd or absent; postabdomen always black; sometimes only 2 postsutural *dc*, rarely 4Helicophagellina
 Apical part of paraphallus clearly defined, usually distinctly separated from basal part; lateral plate of paraphallus usually well developed, occasionally present as slender processes; postabdomen often with red anal tergite; postsutural *dc* very rarely 4Heteronychiina

3. Arista basally plumose, parafacial and gena often with black hairs; lateral plate of paraphallus ill-developed, short and slightly projecting; apical part of paraphallus separate; frons of male narrow.....4
 Arista almost bare, except for short fine hairs; parafacial and gena without black hairs; lateral plate of paraphallus paired, large, well sclerotised, elongated and overlapping; apical part of paraphallus not separate; frons of male very broadLeucomyiina
4. Penis very large, slightly sclerotised and vesiculate; lateral plate of paraphallus ill-developedSeniorwhiteina
 Penis short, heavily sclerotised; lateral plate of paraphallus well developed ...5
5. Apical part of paraphallus always large, clearly demarcated, sclerotised and often bearing many processes or protuberances; propleura sometimes setiferous; postabdomen sometimes light coloured; lateral plate of paraphallus usually well developed, often intricately constructed and erect; basal part of styli coiledParasarcophagina
 Apical part of paraphallus with long, slender, more or less cylindrical processes which are more delicate than basal part; propleura bare; postabdomen always black; lateral plate of paraphallus in the form of short hamate processes; basal part of styli straight.....Harpagophallina

Subtribe **Parasarcophagina** Rohdendorf

This subtribe is characterised by having styli of glans elongated and narrow and occasionally covered by apical plate of paraphallus. Shewell (1987) gave it tribal status due to the presence of 5 or 6 postsutural bristles. It is best represented in the Oriental region by the nearly cosmopolitan genus *Parasarcophaga* and numerous genera are known from different parts of the world. A total of fourteen genera under this subtribe have been reported by Lopes *et al.* (1977) from the Oriental region and only *Bercaea*, *Boettcherisca*, *Fengia*, *Lioproctia*, *Parasarcophaga*, *Phallosphaera*, *Robineauella*, *Rosellea*, *Sarcorohdendorfia*, *Rohdendorfisca*, *Sarcosolomonina*, *Sinonipponia*, *Stackelbergeola*, *Horiisca* are available in this area. Verves (1986) reported nineteen genera from the Palaearctic region.

The species of this subtribe are cosmopolitan in distribution.

The larvae are found in carcasses, faeces, garbages and are also recorded as parasites in different insect larvae and pupae. They also produce myiasis in different animals.

Key to genera

1. Upper part of propleura covered with black hairs, often rather densely so2
 Upper part of propleura bare3

2. Presutural *ac* bristles distinct ; fourth abdominal sternite of male with a dark spots and short black bristles8
 Presutural *ac* bristles wanting ; fourth abdominal sternite of male without dark spots 4
3. Paraphallus very large and longer than theca ; lateral plate of paraphallus with a pair of very large sharp forward protruding processes ; apical part of paraphallus small, but clearly demarcated, extending forward but without lateral process.*Bercaea* Robineau-Desvoidy
 Paraphallus rarely longer than theca ; lateral plate of paraphallus varied in structure and not clearly demarcated but with long lateral process ; apical part of paraphallus well demarcated with slender process..... 5
4. Paraphallus medially transparent, without a clearly separated short pointed apical part bearing slender processes, plates or teeth ; styli of glans stout, erect and with spines ; fifth sternite without a tubercle ; ventralia lamellate, not hook-shaped but covered with fine spines*Boettcherisca* Rohdendorf
 Paraphallus chitinous, with projecting long curved apical part bearing recurved distinct process ; styli of glans short, thick but without spines ; fifth sternite with a sharply projecting median tubercle ; ventralia not lamellate, hook-shaped and not covered with spines*Rosellea* Rohdendorf
5. Third abdominal tergite normally without long bristles in the middle of posterior margin ; apical part of paraphallus always small11
 Third abdominal tergite with long erect bristles in the middle of posterior margin ; apical part of paraphallus very large 6
6. Apical part of paraphallus generally with a median process sometimes absent and always divided into two lateral processes ; ventralia ill-developed or slightly developed12
 Apical part of paraphallus always without median process and not divided into lateral process ; ventralia well developed 7
7. Preacrostichal and predorsocentral bristles well differentiated ; lateral plate of paraphallus small but strongly constructed ; apical part of paraphallus with a large median section and lateral process.....*Lioproctia* Enderlein
 Preacrostichal and predorsocentral bristles not so differentiated ; lateral plate of paraphallus very large and intricately constructed ; apical part of paraphallus with slender lateral process 13
8. Anterior paramere apically bidentate ; inner forceps in profile slender and geniculate*Sarcorohdendorfia* Baranov
 Anterior paramere slender and apically blunt ; inner forceps not slender or curved9

9. Paraphallus long, its apical part well differentiated and without lateral process *Phallosphaera* Rohdendorf
 Paraphallus short, its apical part blunt and with or without lateral process ...
 10
10. Paraphallus very massive and not claw-shaped ; lateral plate of paraphallus blunt ; styli of glans slender and long *Fengia* Rohdendorf
 Paraphallus very slender and claw-shaped ; lateral plate of paraphallus short and extending towards each other ; styli of glans short
 *Sarcosolomon* Baranov
11. Lateral plate of paraphallus single, long and without process but pedunculate; styli of glans very slender, never closely adjacent to apical plate of paraphallus; theca long *Parasarcophaga* Johnston and Tiegs
 Lateral plate of paraphallus wide and double ; styli of glans short, rather slender and closely adjacent to the apical plate of paraphallus ; theca very short.....
 *Stackelbergeola* Rohdendorf
12. Ventralia ill-developed ; lateral process of apical plate of paraphallus generally with two pairs of short sharp hooks *Robineauella* Enderlein
 Ventralia moderately developed ; lateral process of apical plate of paraphallus in the form of a paired erect sclerotised straight process
 *Rohdendorffisca* Grunin
13. Apical part of paraphallus with notches ; inner forceps sharply bent forward, almost at right angle and very sharp at ends ; anterior paramere wide and bifurcated at end *Horiisca* Rohdendorf
 Apical part of paraphallus without notches ; inner forceps not bent forward, almost straight and sharply notched at ends ; anterior paramere pointed at end
 *Sinonipponia* Rohdendorf

Genus 26. *Bercaea* Robineau-Dsvoidy, 1863

1863. *Bercaea* Robineau-Dsvoidy, *Hist. nat. Dipt. Paris*, 2 : 549.

Type species : *Musca haemorrhoidalis* Fallén, 1817 (preoccupied) (= *Sarcophaga cruentata* Meigen, 1826).

1928. *Mesothyrasia* Enderlein, *Arch. klassif. phylogen. Ent.*, 1(1) : 37.

Type species : *Mesothyrasia madagascariensis* Enderlein, 1928 (= *Sarcophaga cruentata* Meigen, 1826).

1928. *Thyrsoetradiscus* Enderlein, *Arch. klassif. phylogen. Ent.*, 1(1) : 20.

Type species : *Thyrsoetradiscus friederichsianus* Enderlein, 1928 (= *Sarcophaga cruentata* Meigen, 1826).

1937. *Coprosarcophaga* Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 293.

Type species : *Musca haemorrhoidalis* Fallén, 1817 (preoccupied) (= *Sarcophaga cruentata* Meigen, 1826).

Morphology : Third antennal segment about twice that of the second ; arista long, plumose ; R₁ bare ; upper part of propleura bare ; acrostichal bristles absent ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs ; mid tibia with tuft of long hairs ; third abdominal tergite without median marginal bristles ; first genital segment with marginal bristles ; inner forceps divided at the basal one-third, both arms elongated and widely divergent ; claw-like ventralia which are large and heavily pigmented ; styli of glans slender and bent forwards.

Discussion : Zumpt (1972) placed it under the genus *Sarcophaga* and reported a total of 5 species from the Ethiopian region. Dear (1980) placed all the Ethiopian species under the subgenus *Bercaea* of the genus *Sarcophaga*.

Biology : The larvae of this genus are usually scavengers and breed in various kinds of decomposing materials including human faeces and animal dung. They may become facultative parasites either in birds or in the digestive tracts of mammals (James, 1947). Adults are associated with different types of microorganisms (Greenberg, 1971).

Distribution : This genus is nearly cosmopolitan and only 1 species under this genus has been reported from the Oriental and Palaearctic regions which is also present in India.

54. *Bercaea cruentata* (Meigen)

(Figs. 379-384)

1826. *Sarcophaga cruentata* Meigen, *Syst. Besch. europ. zweifl. Insekt.*, **5** : 28 ; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, **45** : 270.
1817. *Musca haemorrhoidalis* Fallén, *K. svenska Vetensk. Akad. Handl.*, **3** : 237 (junior primary homonym, preoccupied *haemorrhoidalis* Villers, 1789 = junior synonym of *Ravinia pernix*).
1830. *Myophora squalida* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. Sci. Inst. Fr.*, (2) **2** : 342.
1830. *Myophora blondeli* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. Sci. Inst. Fr.*, (2) **2** : 344.
1830. *Myophora villica* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. Sci. Inst. Fr.*, (2) **2** : 340.
1830. *Sarcophaga georgina* Wiedemann, *Aussereurop. zweifl. Insekt.*, **2** : 357.
1849. *Sarcophaga aegra* Walker, *List. dipt. Br. Mus.*, **4** : 821.
1860. *Sarcophaga consobrina* Rondani, *Atti Soc. ital. Sci. nat.*, **3** : 391.

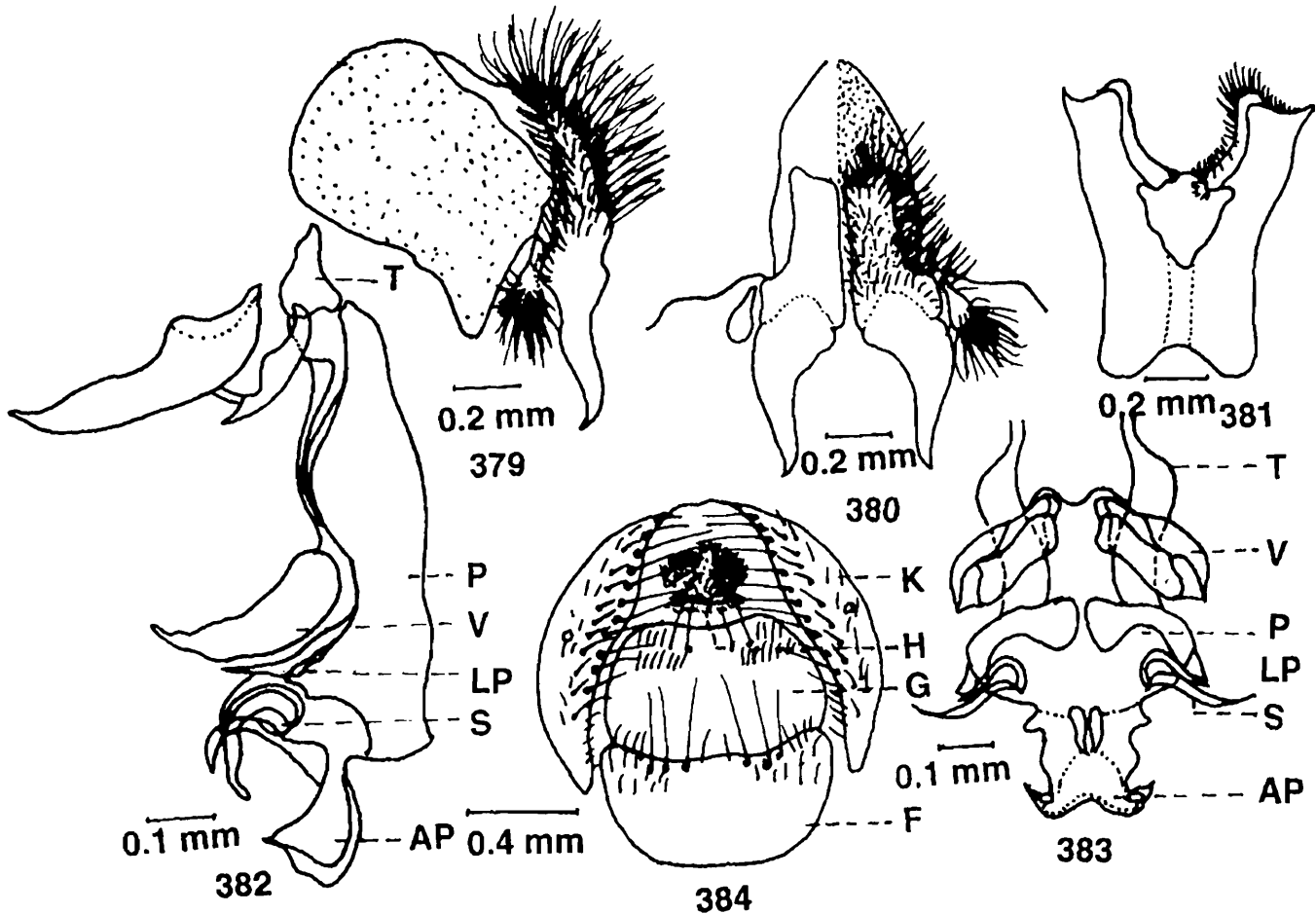
1860. *Sarcophaga nurus* Rondani, *Atti Soc. ital. Sci. nat.*, **3** : 392.
 1863. *Sarcophaga praeceps* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, **2** : 480.
 1863. *Bercaea fulvipalpis* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, **2** : 551.
 1863. *Bercaea haemathura* Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, **2** : 551.
 1928. *Bellieria haemorrhoidalis* : Enderlein, *Arch. klassif. phylogen. Ent.*, **1**(1) : 36.
 1928. *Thyrsotetradiscus friederichsianus* Enderlein, *Arch. klassif. phylogen. Ent.*, **1**(1) : 20.
 1928. *Mesothyrsia madagascariensis* Enderlein, *Arch. klassif. phylogen. Ent.*, **1**(1) : 37.
 1937. *Coprosarcophaga haemorrhoidalis* : Rohdendorf, *Fauna USSR, Dipt.*, **19** (1) : 295.
 1986. *Bercaea cruentata* : Verves, *Cat. Palae. Dipt.*, **12** : 159 ; Pape, 1991, *Jap. J. Ent.*, **59**(1) : 213, Nandi, 1992. *J. Beng. nat. Hist. Soc.*, **11** (2) : 35.

Male : Body length 9–13 mm.

Head : Width of frons about three-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial black with golden pollen, the former with short scattered black hairs, the latter with a row of 4-5 short black hairs near the eye margin ; antennae dark brown and reaching up to about 0.8 distance to vibrissae, first segment black, second blackish, third dark brown, silvery pollen and about two and half times that of the second ; arista long, plumose along more than basal half ; facial ridge black with golden pollen ; vibrissae long, distance between vibrissae about one and half times that of one parafacial width ; frontal bristles 12-15, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about two-thirds of second antennal segment, rest cruciate and directed forwards ; gena black with silvery pollen and black hairs ; post gena black ; ocellar triangle black with long hairs : outer vertical bristle short, inner vertical well developed, post vertical moderately developed and about half of inner vertical ; ocellar and post ocellar bristles moderately developed, the latter less than half of inner vertical ; a row of irregular postocular setae besides postocular cilia, rest of the area with irregular black and white hairs ; palpi slender and black ; proboscis black ;

Thorax : Grey with yellowish pollen and three black longitudinal stripes ; *ac* 0+0 ; *dc* 6+6 (anterior four post *dc* stout) ; *ia* 1+3 ; *ps* 1 ; *h* 2 ; *ph* 3 ; *np* 4 ; *pa* 2 ; *sa* 4 ; *st* 1+1+1 ; *mpl* 7 ; *hpl* 11 ; upper part of propleura black, bare and with white pollen ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of about 9-10 short setae located dorsally and extending up to half the distance from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment one and half times that of the third, the former with short spines along basal



Figs. 379-384 : *Bercaea cruentata* (Meigen). 379, Inner and outer forceps (lateral view); 380, Inner and outer forceps (posterior view); 381, Fifth sternite; 382, Penis (lateral view); 383, Penis (ventral view); 384, Genitalia ♀ (ventral view).

one-third of its anterior margin ; costal spines stout ; epaulet black with short spines; basicostal scale light brown ; squama creamy white ; halter brown.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 bristles along basal half of anterodorsal surface, a row of short bristles along posterodorsal surface and 1 bristle on posterolateral surface at about one-third the distance from the distal end ; mid femur with a row of 3-4 bristles along middle portion of anterolateral surface, a row of bristles along basal two-thirds and a row of short setae along distal one-third of anteroventral surface, a row of long hairs along basal half and a row of short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with 1 long and 2 short bristles along basal one-third of anterodorsal surface, a row

of short bristles along posterodorsal surface, 1 bristle each on anteroventral and posterolateral surfaces at about one-third the distance from the distal end and tuft of long hairs along distal one-third of ventral surface ; hind femur with a pair of rows of long bristles along anterodorsal surface, a row of short bristles along anteroventral surface, 1 bristle on posterodorsal surface at about one-fifth the distance from the distal end, a row of 5-6 bristles along posteroventral surface and numerous long hairs along ventral surface ; hind tibia with a row of long bristles along anterodorsal surface, 1 long bristle on anteroventral surface at about one-fifth the distance from the distal end, 1 long bristle each on one-third and two-thirds the distances from the distal end on posterodorsal surface and numerous long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of median and 3 pairs of lateral marginal bristles, fifth with a row of 18 marginal bristles ; sternites first and second with long hairs, third and fourth with short scattered hairs ; fifth sternite Y-shaped with wide window and short spines laterally and short hairs terminally on arms ; first genital segment light brown with 2-3 pairs of marginal bristles and long hairs ; inner forceps long, curved, pointed at apex, slightly grooved posteriorly and with tuft of long hairs along basal half ; outer forceps short and its apex rounded and hairy ; anterior paramere wide, long and pointed at apex but without short hairs on outer side ; posterior paramere short, pointed at apex and with 2 short subapical hairs ; theca very short ; paraphallus very long, heavily sclerotised but blunt at end, its lateral process short, curved and pointed ; lateral plate of paraphallus forms a single pair of forwarding processes ; styli of glans long and curved ; ventralia large and pointed at apex.

Female : Body length 8–12 mm.

Head : Width of frons about the same as that of one eye ; frontal bristles 10-12; fronto-orbital bristles 2 and proclinate ; outer vertical bristle well developed and about three-fifths the inner vertical.

Thorax : Similar to that of male but for the absence of apicoscutellar bristles.

Wings : Same as in male.

Legs : Chaetotaxy same as in male but differs for the followings : mid femur without long hairs along basal half of posteroventral surface ; hind femur with a row of bristles along anteroventral surface ; hind tibia with 2 bristles on anteroventral surface but without tuft of long hairs along anterior and posterior margins of ventral surface.

Abdomen : Sternites second with 5-7, third with 6 and fourth with 4 short bristles, fifth with 4 stout bristles, sixth broader with a row of about 6 bristles proximally, seventh broader than the sixth but with 4 bristles distally, eighth short and

membranous ; anal sternite with long hairs ; seventh tergite composed of 2 plates with hairs and stout marginal bristles :

Material examined : Several male specimens from different localities of Arunachal Pradesh, Himachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Uttar Pradesh and West Bengal collected by B.C. Nandi.

Discussion on species : This species is very characteristic in having a peculiar type of penis. Inner forcep is dorsally hollowed and shows a sharp angle on the inner edge and paraphallus with well developed apical plate of paraphallus and ventralia. Theca is very short and the paraphallus is very elongated and much sclerotised.

Biology : This is a relatively common species and it was collected from bushes near human excrement, animal carcasses, mixed vegetations and flowering plants. Specimens are also attracted to fruit. The larvae of this species are found in decaying organic matters, such as, decaying meat and different kinds of rotten food-stuffs and breed in human excrement, animal carcasses including various kinds of decomposing organic matters. The larvae of this species cause human myiasis. Aldrich (1916) reported a case of human intestinal myiasis and stated that the larvae have the ability to develop in the alimentary tract of man. Judd (1956) and Ali-Khan (1974 *et al.*) reported cases of intestinal myiasis caused by the larvae of this species (as *haemorrhoidalis*). Zumpt (1965) reported a few cases of insect parasitisms and myiasis in vertebrates caused by this species. Regnier (1931) gave an account of rearing of this fly from adult *Schistocerca gregaria* (Acrididae) and Roback (1954) recorded it from dung. Moutia (1930), Knipling (1936) and Sanjean (1957) described the larval stages of this species (as *haemorrhoidalis*). Good figures of larval stages have also been presented by Smith (1986). This species is associated with *Ascaris lumbricoides*, *Aerobacter aerogenes*, *Bacillus megaterium*, *Diplococcus pneumoniae*, Poliovirus; *Proteus morgani*, *Proteus rettgeri*, *Proteus vulgaris*, *Escherichia coli*, *Escherichia intermedia*, *Salmonella typhi*, *Salmonella paratyphi*, *Salmonella enteritidis*, *Shigella dysenteriae*, etc. (Greenberg, 1971). It is also being parasitised by *Nasonia brevicornis* (Pteromalidae, Hymenoptera).

Distribution : India ; Several localities of ArP, A, HP, MnP, Me, Mz, N, P, S, UP and WB ; Bh (several localities) ; Ne (Panchdhara) ; Pa (several localities) ; Afghanistan ; Albania ; Algeria ; Angola ; Argentina ; Armenia ; Australia ; Austria ; Azerbaijan ; Azores ; Belgium ; Brazil ; Botswana ; Bulgaria ; Byelorussia ; California ; Cameroon ; Canada ; Canary Islands ; China ; Costa Rica ; Cuba ; Cyprus ; Czech Republic ; Denmark ; Easter Islands ; Egypt ; Ethiopia ; France ; Georgia ; Germany ; Great Britain ; Greece ; Gruzia ; Hawaiian Islands ; Hungary ; Illinois ; Iran ; Iraq ; Ireland ; Israel ; Italy ; Japan ; Kazakhstan ; Korea ; Kyrgyzstan ; Latvia ; Lebanon ; Libya ; Lithuania ; Luxembourg ; Madagascar ; Madeira Islands ; Malta ; Mauritania ; Mauritius ; Mexico ; Moldova ; Mongolia ; Morocco ; Mozambique ; Netherlands ; Norway ;

Paraguay; Poland ; Portugal ; Reunion Island ; Romania ; Russia ; Saudi Arabia ; Serbia; Seychelles ; Slovakia ; Spain; St. Helena ; Sweden; Switzerland ; Syria ; Tajikistan; Texas; Tunisia ; Turkey ; Turkmenistan ; Ukraine ; United Kingdom; Uzbekistan and Yemen.

Type deposited : Holotype ♂, MNHN, not examined.

Genus 27. *Boettcherisca* Rohdendorf, 1937

1937. *Boettcherisca* Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 270.

Type species : *Myophora peregrina* Robineau-Desvoidy, 1830.

1937. *Notochaetomima* Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 273.

Type species : *Boettcherisca septentrionalis* Rohdendorf, 1937.

1938. *Athyrsiola* Baranov, *Zagreb. Vet. Arch.*, **8**(4) 174.

Type species : *Athyrsiola atypica* Baranov, 1934 (= *Sarcophaga invaria* Walker, 1858).

Morphology : Frons very narrow, its width at narrowest point of frons about one-third that of one eye ; antennae slender, third segment about two and half times that of the second ; propleura hairy in the middle ; presutural dosocentral bristles present; presutural acrostichal bristles absent ; postsutural dorsocentral bristles 4-5 (only posterior 2 well developed) ; R₁ bare ; hind tibia of male without tuft of long hairs; fourth abdominal sternite without dark spots ; first genital segment without marginal bristles ; theca shorter than paraphallus ; inner forceps not slender but curved ; penis medially transparent ; apical plate of paraphallus distinct ; lateral plate of paraphallus elongated with process and bifurcated distally ; styli of glans with short and very stout lateral process bearing spines ; ventralia well developed, lamellate, membranous, bilobed and covered with short spines.

Discussion : Verves (1989b) raised this genus to subtribal rank Boettcheriscina and included 13 genera, of which only *Phallosphaera* Rohdendorf, *Boettcherisca* Rohdendorf, *Rosellea* Rohdendorf and *Lioproctia* Enderlein are available here. Lopes (1961) revised this genus and reported a total of 7 species from the Oriental and Palaearctic regions. Kano *et al.* (1967) revised the Japanese species. Lopes *et al.* (1977) included 5 species under this genus from the Oriental region, of which only 4 species have been reported from this area. 2 more species are included which have been reported from Nepal and Pakistan. Verves (1986) reported 3 species from the Palaearctic region.

Biology : Members of this genus breed in a wide variety of decaying substances including meat and human excrement and the larvae cause intestinal myiasis. Some species are also associated with different microorganisms (Greenberg, 1971) and cause intestinal disorder of humans.

Distribution : This genus is widely distributed in the Oriental, Palaearctic and Australasian and Oceanian regions.

Key to male species

1. Anterior margin of ventralia rounded ; apical plate of paraphallus with pointed apex2
 Anterior margin of ventralia straight, apical plate of paraphallus with blunt apex5
2. Spines at the apex of inner forceps extending up to dorsal side ; styli of glans with apical incision*nathani* Lopes
 Spines at the apex of inner forceps not extending up to dorsal side ; styli of glans without apical incision3
3. Anterior paramere without apical flaps ; lateral process of apical plate of paraphallus with long and wide anterior process.....4
 Anterior paramere with apical flaps ; lateral process of apical plate of paraphallus with short anterior process*karnyi* (Hardy)
4. Inner forceps blunt at apex and with spines*peregrina* (Robineau-Desvoidy)
 Inner forceps pointed at apex but without spines.....*septentrionalis* Rohdendorf
5. Process of apical part of paraphallus bilobed ; lateral plate of paraphallus square-shaped ; apical part of inner forceps sharply pointed at end but without incision*nepalensis* Kano and Sugiyama
 Process of apical part of paraphallus trilobed ; lateral plate of paraphallus hook-shaped ; apical part of inner forceps blunt with slight incision
*bengalensis* Nandi

55. *Boettcherisca nathani* Lopes

(Figs. 385-389)

1961. *Boettcherisca nathani* Lopes, *Mems Inst. Oswaldo Cruz.*, **59**(1) : 79 ; Nandi, 1992, *Proc. zool. Soc., Calcutta*, **45**(2) : 87.

1984. *Sarcophaga nathani* : Sugiyama and Kano, *Jap. J. sanit. Zool.*, **35**(4) : 351.

Male : Body length 10–11 mm.

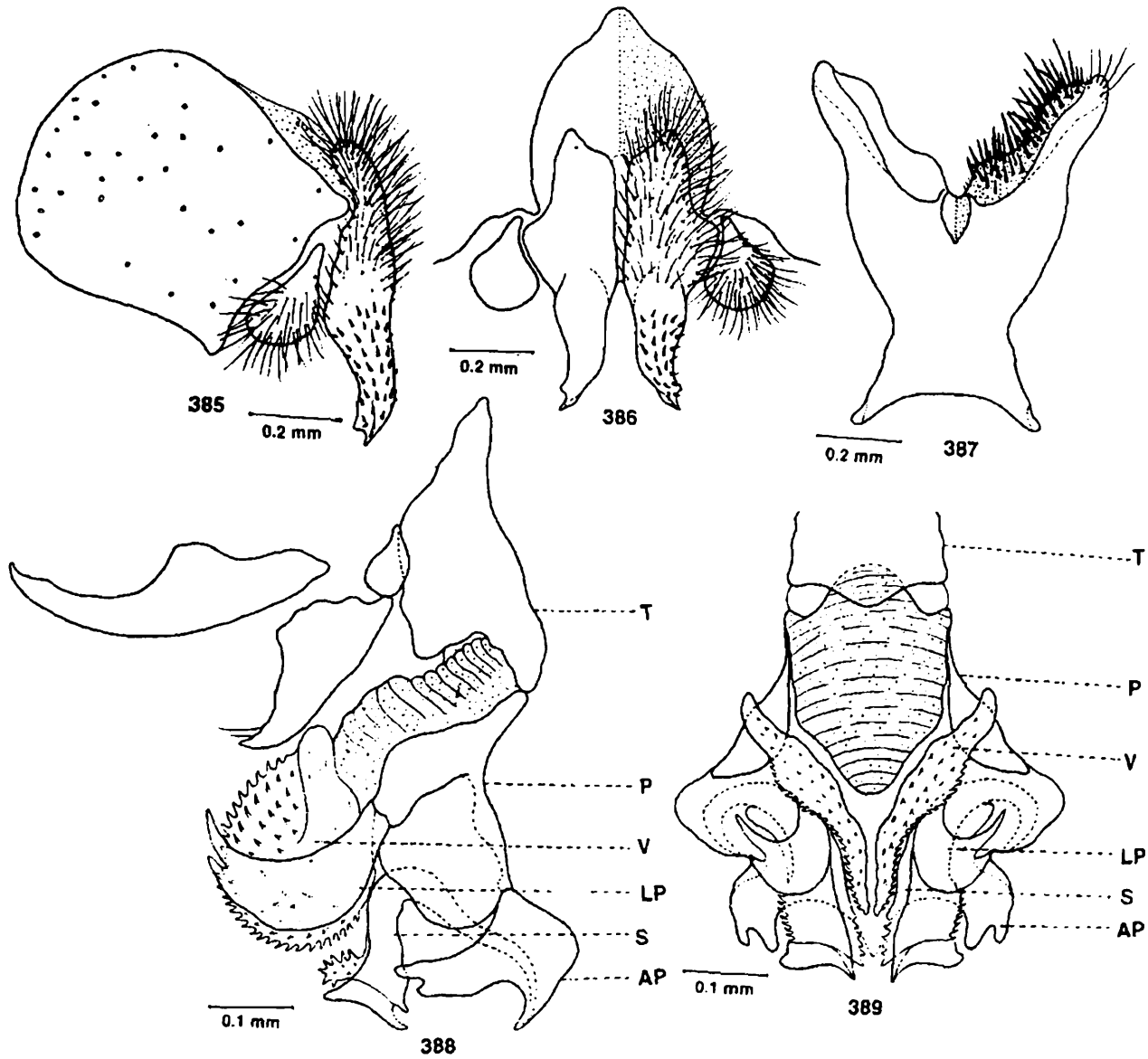
Head : Width of frons about three-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about more than twice that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of black hairs near the eye margin ; antennae blackish-brown and reaching up to about 0.85 distance to vibrissae, first and second segments black with numerous short black hairs, third brown with silvery pollen and about two

and half times that of the second ; arista long, plumose along basal three-fifths ; facial ridge black with golden pollen and few short black spines ; vibrissae long, crossed, distance between vibrissae more than one parafacial width ; frontal bristles 12, posterior 2 reclinate, anterior 4 below base of antennae and reaching up to about the apical end of second antennal segment, rest cruciate and directed forwards ; gena black with numerous black hairs ; post gena black with numerous long brownish hairs ; ocellar triangle black with short hairs ; outer vertical bristle short, inner vertical well developed, post vertical short about one-third the inner vertical ; ocellar and postocellar bristles 1 pair each, the latter less than half of the inner vertical ; a pair of rows of postocular setae besides postocular cilia, rest of the area with brownish hairs ; palpi long, slender and black ; proboscis black.

Thorax : Blackish-brown with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 (posterior 2 *dc* stout) ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 8 ; upper part of propleura black with short hairs ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of about 10 short setae located dorsally and extending up to about two-thirds from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment a little shorter than the third, the former with short spines along basal half of its anterior margin ; costal spines not stout ; epaulet black with short spines ; basicostal scale light brown ; squama white ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2 bristles on basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row of bristles along middle portion of anterolateral surface, a row of about 4 bristles along basal half and a row of short setae along distal half and numerous long hairs along basal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal one-third ; mid tibia with 1 bristle on anterodorsal surface at about one-third the distance from the distal end, a row of 3 long and several short bristles along posterodorsal surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface and 1 bristle each on posterodorsal and posteroventral surfaces at about one-third the distance from the distal end ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end, 1 bristle on anteroventral surface at about half the distance from the distal end but without tuft of long hairs along ventral surface.



Figs. 385-389 : *Boettcherisca nathani* Lopes. 385, Inner and outer forceps (lateral view); 386, Inner and outer forceps (posterior view); 387, Fifth sternite; 388, Penis (lateral view); 389, Penis (ventral view).

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent, but each with 2 pairs of lateral marginal bristles, fourth with a pair of median and 3 pairs of lateral marginal bristles, fifth with a row of 16 marginal bristles ; sternites first to fourth with short black hairs but without marginal bristles ; fifth sternite Y-shaped with closely set bristles laterally and short hairs terminally on arms ; first and second genital segments black with hairs but without marginal bristles ; inner forceps dorsally with numerous spines along one-third of its length apically ; outer forceps almost triangular with hairs on its broad distal end ; anterior paramere wide medially, tapering gradually with two subapical hairs ; posterior paramere terminally hook-shaped; theca shorter than paraphallus, both are heavily sclerotised ; apical plate of paraphallus membranous, curved, pointed at apex and with a pair of long lateral processes each of which is slightly notched at the middle ; lateral plate of paraphallus sclerotised with two unequal pointed processes ; styli of glans with apical incision and comb-like processes anteriorly ; ventralia large with short digitiform processes and its anterior margin rounded.

Female : Unknown.

Material examined : 1 ♂, India : Gujarat ; Dwarka, 11.x.1990, B.C. Nandi ; 7♂♂, Gir Wild Life Sanctuary, 680 m, 12.x.1990, B.C. Nandi ; 1 ♂, Sasan Gir, 680 m, 12.x.1990, B.C. Nandi ; 1 ♂, Maharashtra ; Khandala, 960 m, 21.vi.1990, B.C. Nandi ; 9 ♂♂, West Bengal ; Darjeeling (Gooke), 12.v.1975, B.C. Nandi

Discussion on Species : This species is similar to *B. peregrina* (R. D., 1830) but differs from it by the structures of apical plate of paraphallus and ventralia. Moreover, the styli of glans is also quite different here from *peregrina*.

Biology : This species is not so abundant which was collected from bushes.

Distribution : India ; Gu (Ahmedabad, Dwarká, Gir Wild Life Sanctuary, Girnar Hills, Sasan Gir), Mr (Khandala), TN (Karikal, Korumbagram) and WB (Gooke) ; Ne (several localities) ; Pa (several localities) ; Indonesia ; Malayasia ; Thailand and Philippines.

Type deposited : *Holotype* ♂, IOC, not studied.

56. *Boettcherisca karnyi* (Hardy)

(Figs. 390-395)

1927. *Sarcophaga karnyi* Hardy, *Proc. Linn. Soc. N.S.W.*, **52** : 454.

1958. *Boettcherisca karnyi* : Lopes, *Ins. Micro.*, **13**(2) : 32 ; Lopes, Kano, Shinonaga and Kurahashi, 1977, *Cat. Dipt. Orient. Region*, **3** : 565 ; Nandi, 1989, *J. Andaman Sci. Assoc.*, **5**(2) : 117.

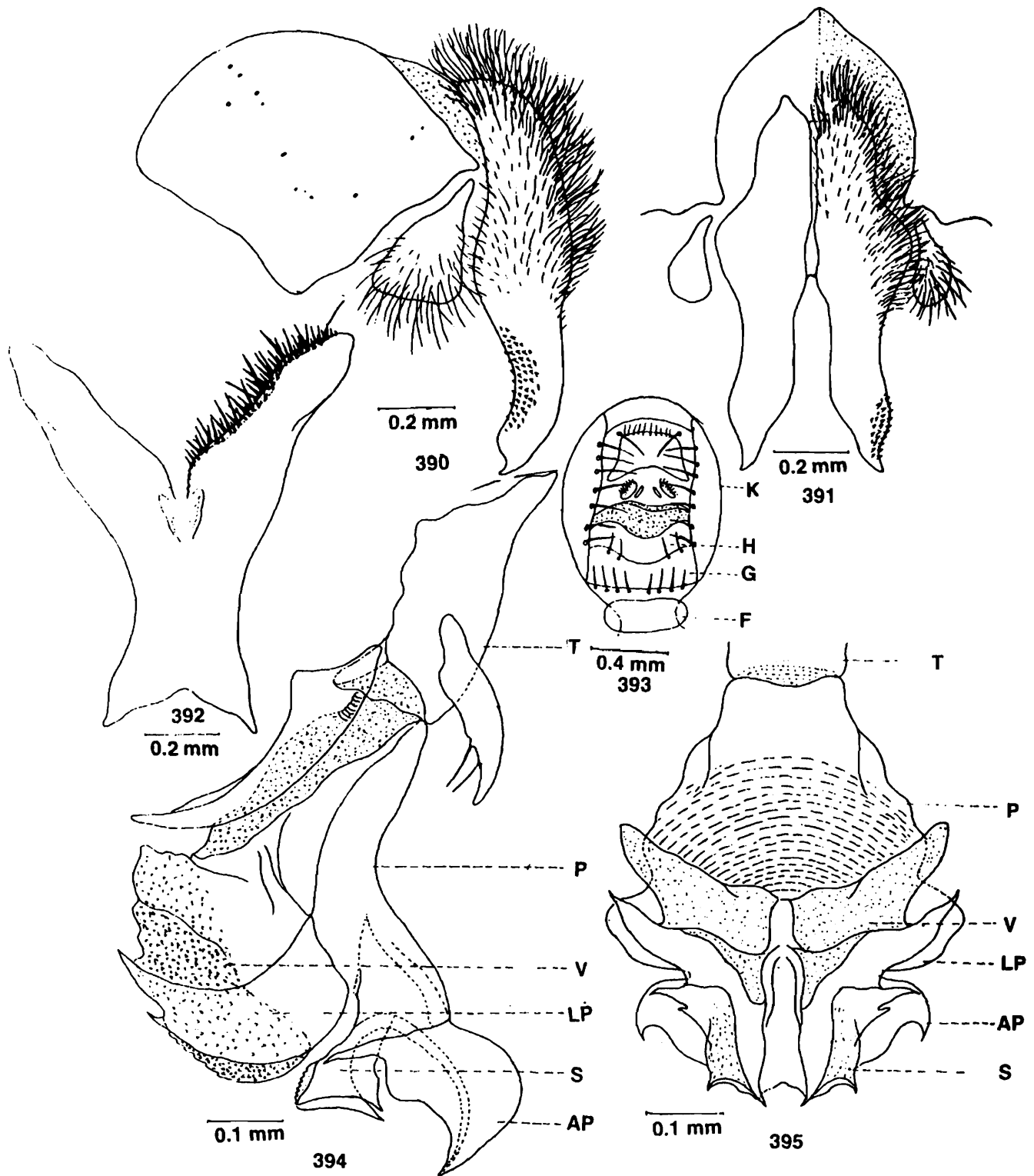
Male : Body length 8–12 mm.

Head : Width of frons about three-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons more than twice that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of about 4-5 hairs near the eye margin ; antennae blackish-brown and reaching up to about 0.8 distance to vibrissae, first and second segments black, third brownish with silvery pollen and about less than half of the second ; arista long, plumose along basal two-thirds ; facial ridge black with white pollen ; vibrissae long, crossed, distance between vibrissae more than one parafacial width ; frontal bristles 11, posterior 1 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; gena black with numerous black hairs ; post gena black with numerous long brownish hairs ; ocellar triangle black with black hairs ; outer vertical bristle absent, inner vertical well developed, post vertical short and about half of the inner vertical ; a pair of rows of postocular setae besides postocular cilia, first row well developed and regular and second row irregular, rest of the area with black and white hairs ; palpi slender and dark brown ; proboscis short and black.

Thorax : Blackish, silvery to golden pollen with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 (posterior 2 *dc* stout) ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 5 ; *hpl* 9 ; upper part of propleura brownish-black with white pollen and short black hairs ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of about 9–10 short setae located dorsally and extending up to more than half from the basal node to $r-m$ and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment a little shorter than the third, the former with short spines along less than basal half of its anterior margin ; costal spines not stout ; epaulet black with short spines ; basicostal scale light brown ; squama whitish ; halter brown.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 2-3 bristles along basal one-third of anterodorsal surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end ; mid femur with 2 bristles along basal one-third of anterodorsal surface, a row of 3-4 bristles along basal half and a row of short setae along distal half of anteroventral surface, numerous long hairs along basal half and short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with 2 bristles on middle portion of anterodorsal surface, 1 bristle each on anteroventral and posteroventral surfaces at about one-third the distance from the



Figs. 390-395 : *Boettcherisca karnyi* (Hardy). 390, Inner and outer forceps (lateral view); 391, Inner and outer forceps (posterior view); 392, Fifth sternite; 393, Genitalia ♀ (ventral view); 394, Penis (lateral view); 395, Penis (ventral view).

distal end and with a row of 3 long bristles along posterodorsal surface; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 2-3 bristles along distal half of posteroventral surface and with short hairs along ventral surface ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end, 1 bristle on anteroventral surface at about one-third the distance from the distal end and with short hairs along posteroventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 1 lateral marginal bristles, fourth with a pair of median and 1 lateral marginal bristles, fifth with a row of 16 marginal bristles ; sternites first to fourth with short hairs ; fifth sternite Y-shaped with short window and two rows of closely set bristles laterally on arms ; first genital segment black with black hairs, second blackish-brown with black hairs but without marginal bristles ; inner forceps blunt at end, notched terminally and with subapical spines anteriorly ; outer forceps almost triangular, broad at apex and with hairs along distal half ; anterior paramere longer, blunt at apex and with slight flap at subbasal end ; posterior paramere short, curved at apex and with 2 subapical hairs ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus curved, pointed at apex and with a pair of long pointed lateral processes; lateral plate of paraphallus well developed with a pair of large two-pointed unequal lateral plates of which anterior one more developed ; styli of glans without apical incision but with a median and two lateral processes ; ventralia bilobed, well developed, spinous and anterior margin almost rounded.

Female : Body length 6-12 mm.

Head : Ocellar bristle well developed ; outer vertical bristle half of the inner vertical.

Thorax : Apicoscutellar bristle absent.

Abdomen : Genital segment black ; sixth sternite with a row of strong bristles, seventh with concave posterior margin and few bristles, eighth membranous ; anal sternite membranous with few hairs ; seventh tergite wide medially with few bristles.

Material examined : 1 ♂, India : South Andaman ; Mini Zoo, 16.xii.1988, B.C. Nandi; 1 ♂, Little Andaman ; Netaji Nagar Palm Oil Extraction Centre area, 21.xii.1988, B. C. Nandi ; 1 ♂, Little Andaman ; Vivekanandapur, 22.xii.1988, B. C. Nandi.

Discussion on species : This species is similar to *B. peregrina* (R. D., 1830) but differs from it by the structures of apical plate of paraphallus and anterior paramere. Moreover, the structure of lateral plate of paraphallus is quite distinguishable here from *peregrina*.

Biology : This species is not so abundant which was collected from bushes. This species is attracted to fish and beef baits and reared on beef in captivity (Blackith and Blackith, 1988). The larvae have also been found in a dead lizard and the larvae breed in dead beetles-*Xylotrupes* sp. (Colcoptera), *Gryllotalpa* sp. (Orthoptera) and also in dead frogs. The larval stages of this species have been described by Lopes (1958).

Distribution : India ; AN (Mini Zoo, Netaji Nagar, Vivekanandapur) ; M (Mergui); Amboina ; Borneo ; Cocos Islands ; Guam ; Indonesia (Java) ; Malaysia ; Mariana Islands ; Marshall Islands ; Micronesia ; Philippines ; Thailand and Wake Islands.

Type deposited : *Holotype* ♂, BMJ, not examined.

57. *Boettcherisca peregrina* (Robineau-Desvoidy)

(Figs. 396-401)

1830. *Myophora peregrina* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. Sci. Inst. Fr.*, (2) 2 : 356.
1830. *Myophora subrotunda* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. Sci. Inst. Fr.*, (2) 2 : 357.
1830. *Myophora rapida* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. Sci. Inst. Fr.*, (2) 2 : 360.
1851. *Sarcophaga tritonia* Macquart, *Mém. Soc. Sci. Agric. Lille*, 4 : 234.
1869. *Sarcophaga ochripalpis* Thomson, *K. svenska fregatten Eugénies resa omkring jorden*, 2(1) : 537.
1912. *Sarcophaga fuscicauda* Böettcher, *Ent. Mitt.*, 1 : 168.
1921. *Sarcophaga irrequieta* Johnston and Tiegs, *Proc. R. Soc. Qd.*, 33(4) : 63 (not Walker, 1849, misidentification).
1923. *Sarcophaga hutsoni* Parker, *Ann. Mag. nat. Hist.*, (9) 11 : 127.
1937. *Boettcherisca peregrina* : Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 271 ; Nandi, 1992 *J. Beng. nat. Hist. Soc.*, 11(2) : 36.
1951. *Sarcophaga meriani* Zumpt, *J. ent. Soc. sth. Afr.*, 14(2) : 182.
1994. *Sarcophaga peregrina* : Kano and Shinonaga, *Jap. J. sanit. Zool.*, 45 : 263.

Male : Body length 9–12 mm.

Head : Width of frons about two-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial black with silvery to golden pollen, the former with short scattered black hairs, the latter with a row of black hairs near the eye margin ; antennae blackish-brown and reaching up to about 0.8 distance to vibrissae, first and second segments black, third brown with whitish pollen and about two and half times that

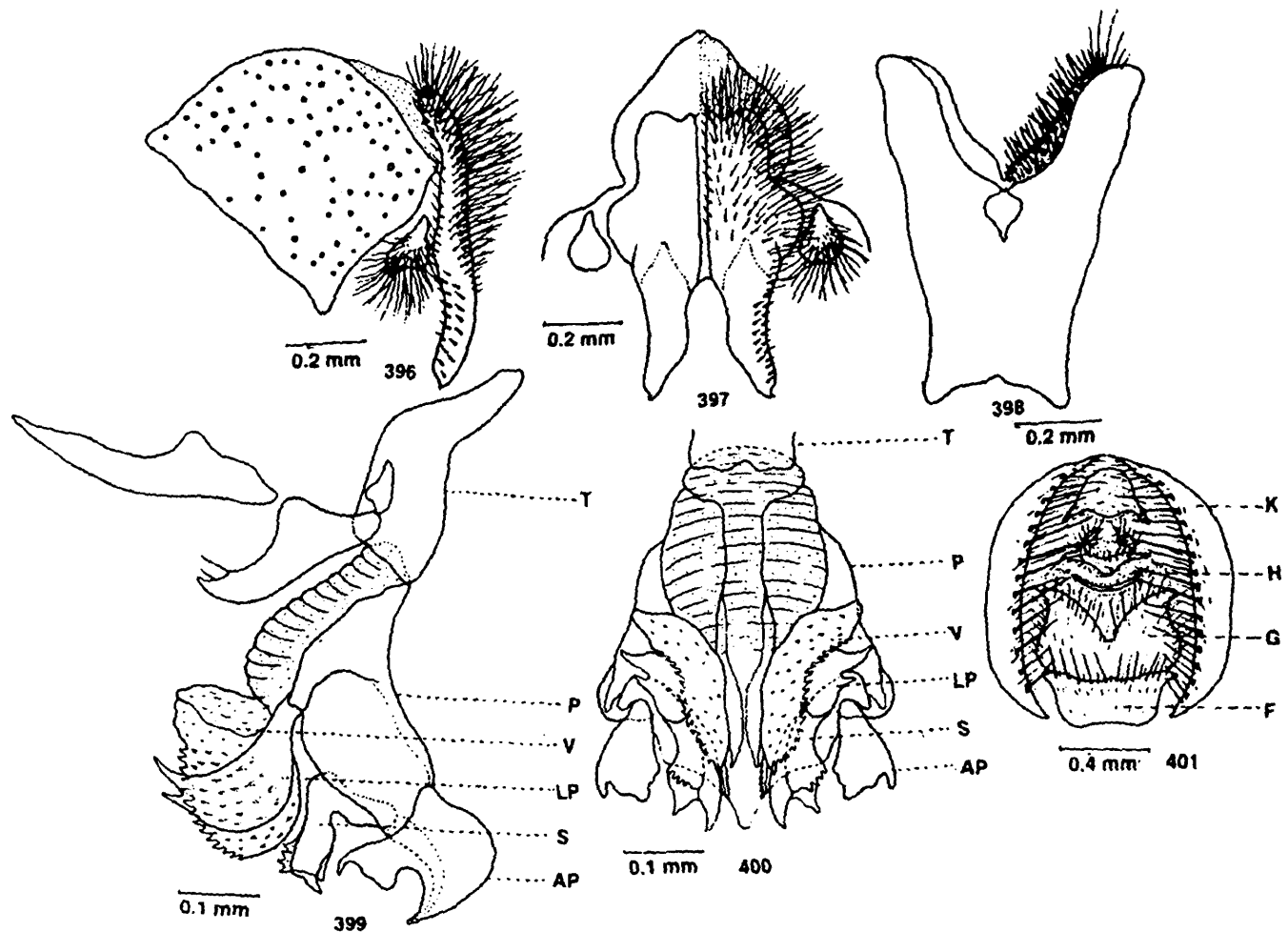
of the second ; arista long, plumose along basal two-thirds ; facial ridge black with white pollen ; vibrissae long, crossed, distance between vibrissae more than one parafacial width ; frontal bristles 10-12, posterior 2 to 3 reclinate, anterior 2 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; gena black with numerous black hairs ; post gena black with numerous black hairs ; ocellar triangle black with black hairs ; outer vertical bristle absent, inner vertical well developed, post vertical short about one-third the inner vertical ; a pair of rows of postocular setae besides postocular cilia, rest of the area with black and white hairs; palpi slender and dark brown ; proboscis black.

Thorax : Blackish, silvery to golden pollen and with three black longitudinal stripes; *ac* 0+1 ; *dc* 5+5 (posterior 2 *dc* short) ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3; *st* 1+1+1 ; *mpl* 7 ; *hpl* 8 ; upper part of propleura brownish-black, silvery pollen and with black hairs ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro-and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of about 8-9 short setae located dorsally and extending up to more than half from the basal node to $r-m$ and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment a little shorter than the third, the former with short spines along basal four-fifths of its anterior margin ; costal spines not stout ; epaulet black ; basicostal scale brown ; squama whitish ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of short bristles along basal one-third of anterodorsal surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end ; mid femur with a row of 3-4 bristles along middle portion of anterolateral surface, a row of 3-4 bristles along basal half and a row of short setae along distal half of anteroventral surface, numerous long hairs along basal half and a row of short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with 1 bristle on anterodorsal surface at about two-fifths the distance from the distal end, 1 bristle each on anteroventral and posteroventral surfaces at about two-thirds the distance from the basal end and a row of long and several short bristles along posterodorsal surface ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface and 2-3 bristles along distal half of posterodorsal surface ; hind tibia with 2 long and several short bristles along anterodorsal surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end, 1 bristle on distal half of anteroventral surface but without tuft of long hairs along ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of median and 3 pairs of lateral marginal bristles, fifth with a row of 18-20 marginal bristles ; sternites first to fourth with dense short black hairs ; fifth sternite Y-shaped with double rows of closely set bristles laterally on



Figs. 396-401 : *Boettcherisca peregrina* (Robineau-Desvoidy). 396, Inner and outer forceps (lateral view); 397, Inner and outer forceps (posterior view); 398, Fifth sternite; 399, Penis (lateral view); 400, Penis (ventral view); 401, Genitalia ♀ (ventral view).

arms and few hairs apically ; first genital segment black with black hairs, second blackish-brown with black hairs but without marginal bristles ; inner forceps blunt at apex and with many lateral subapical spines ; outer forceps almost triangular, broad at apex and with hairs along distal half ; anterior paramere with pointed apex but

without flap ; posterior paramere slightly curved at apex with two subapical hairs ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus curved, pointed at apex and with a pair of long wide slender lateral processes ; lateral plate of paraphallus well developed with a pair of short, two-pointed equal lateral processes ; styli of glans with a median and two lateral processes ; ventralia bilobed, spinous and with a membranous projection at the anterior margin of each lobe.

Female : Body length 8-13 mm.

Head : Similar to that of male except frons about three-fifths that of one eye ; fronto-orbital bristles 3 ; outer vertical bristle well developed ; ocellar bristle well developed ;

Thorax and Wings : Similar to that of male except apicoscutellar bristles absent.

Legs : Similar to that of male except hind femur with a row of 2 to 3 long bristles along posteroventral surface but without long hairs.

Abdomen : Sixth sternite wide, slightly concave anteriorly and with 8-10 bristles, seventh concave medially with 2 strong bristles, eighth membranous, less pigmented and with few hairs ; anal sternite membranous with short hairs ; seventh tergite wide, almost straight and with moderately long hairs.

Material examined : India ; Several male specimens from different localities of Assam, Bihar, Himachal Pradesh, Kerala, Maharashtra, Madhya Pradesh, Manipur, Mizoram, Nagaland, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal and the union territories of Andaman and Nicobar Islands, Dadra and Nagar Haveli and Pondicherry collected by B.C. Nandi.

Discussion on species : This species is similar to *B. karnyi* (Hardy, 1927) and *B. septentrionalis* Rohdendorf, 1937 but differs from them by the structures of lateral plate of paraphallus and inner forceps. Moreover, the detailed structures of lateral plate of paraphallus and styli of glans in this species are quite distinguishable from them.

Biology : This is a common species which was collected from bushes. It can be reared on decaying coconut leaflets, meat, dead *Achatina fulica* (Gastropoda), *Lepidiota pinguis* (Coleoptera) and rabbits. It has been reported as parasites on Lumbricid worms and grasshoppers. The larvae of this species may cause human tissue myiasis. They are attracted to dead bodies of different animals and *Aristolochia ridicula* flowers (Aristolochiaceae). The larvae of this species breed mainly in dead animals, garbages, privies and decaying animal matters around human dwellings. Johnston and Tiegs (1922) reported the breeding of this species from the butterfly-*Euploea corinna* (Nymphalidae) and the locust-*Chortoicetes terminifera* (Acrididae). Larval stages of this species (as *fuscicauda*) have been described by Eysell (1915), Kano, Sato and Tange (1951), Sanjean (1957), Hall and Bohart (1948), Ishijima (1967), Kano (1974) and Cantrell (1981). Few accounts of larval development have been

studied by Das and Dasgupta (1986). This species is associated with *Proteus morgani*, *Proteus rettgeri* and *Salmonella pullorum* (Greenberg, 1971).

Distribution : India ; Several localities of A, B, HP, Kt, K, Mr, MP, MnP, Me, N, O, S, TN, T, UP, WB and AN (Port Blair), DN (Dadra), Po (Auroville) ; BD (Dacca) ; Bh (several localities) ; M (Mergui, Rangoon) ; Ne (several localities) ; SL (several localities) ; Australia ; Bonin Islands ; Borneo ; Fiji; Gilbert Islands ; Guam; Hainan Island ; Hawaiian Islands ; Indonesia (Java) ; Japan (including Ryukyu Islands) ; Kiribati ; Korea ; Madagascar ; Malaysia ; Mariana Islands ; Mauritania; Mauritius ; New Britain ; New Zealand ; Niue ; Norfolk Island ; Ogasawara (Gunto Island) ; Papua New Guinea; Polynesia (Society Islands) ; Samoa ; Réunion; Russia; Seychelles ; Singapore ; South China ; Taiwan ; Thailand and Volcano Islands.

Type deposited : *Holotype* ♂, MNHN, not studied, probably lost.

58. *Boettcherisca septentrionalis* Rohdendorf

(Figs. 402-405)

1937. *Boettcherisca (Notochaetomima) septentrionalis* Rohdendorf, *Fauna USSR, Dipt.*, **19** (1) : 273.

1951. *Sarcophaga septentrionalis* : Kano and Sato, *Jap. J. exp. Med.*, **21** : 223.

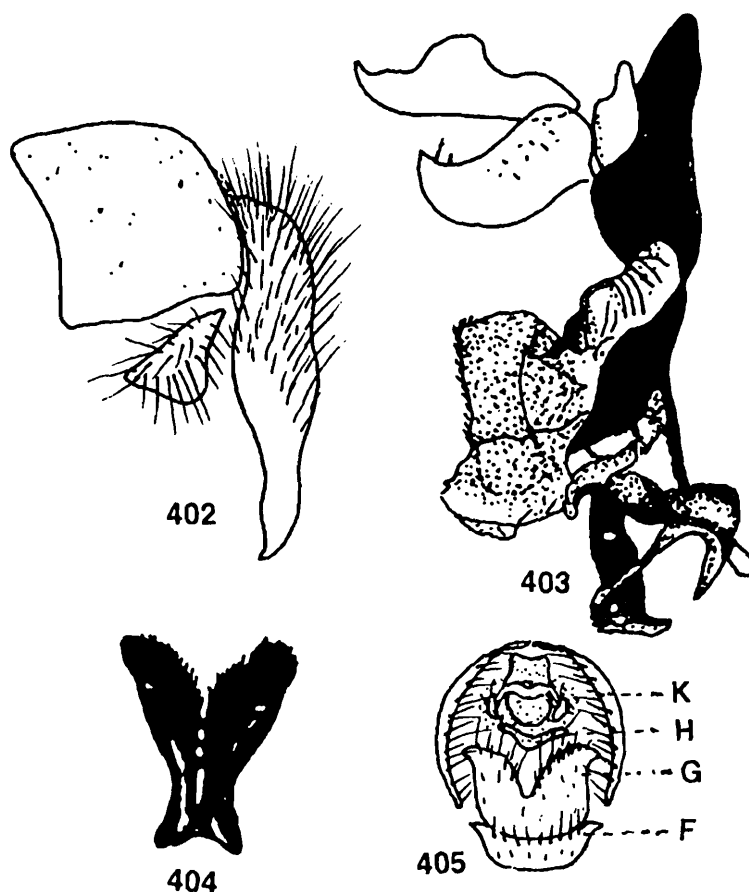
1961. *Boettcherisca septentrionalis* : Lopes, *Mems Inst. Oswaldo Cruz.*, **59**(1) : 78 ; Kano, Field and Shinonaga, 1967, *Fauna Japonica, Sarcophagidae* : 19 ; Kano and Sugiyama, 1983, *Jap. J. sanit. Zool.*, **34**(1) : 47; Verves, 1986, *Cat. Palae. Dipt.*, **12** : 161.

Male : Body length 10–14 mm.

Head : Width of frons about three-fifths that of one eye ; frontal vitta black ; parafrenal and parafacial with golden pollen ; antennae blackish-brown, third segment two and half times that of the second ; gena black with golden silvery pollen and black hairs and about one-fourth the height of one eye ; frontal bristles 11-13, anterior 2 to 3 divergent ; first row of postocular setae regular but other rows irregular ; palpi slender and black ; metacephalon with numerous yellowish white hairs.

Thorax : Silvery to golden pollen with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1; *mpl* 6 ; *hpl* 7 ; upper part of propleura with several hairs ; metathoracic spiracles with dense brown pile; prosternum with hairs on posterior half ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline ; R_1 bare ; R_{4+5} with a row of about 10 short setae located dorsally and extending up to more than half from the basal node to r-m and several setae along ventral surface of basal node of R_{4+5} ; fifth costal segment a little shorter than the third, the former with short spines along basal two-fifths of its anterior margin ; epaulet black ; basicostal scale light brown ; squama creamy white ; halter brown.



Figs. 402-405 : *Boettcherisca septentrionalis* Rohdendorf. 402, Inner and outer forceps (lateral view); 403, Penis (lateral view, after Rohdendorf, 1937); 404, Fifth sternite (after Kano *et al.*, 1967) ; 405, Genitalia ♀ (ventral view).

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of long bristles along posterior margin of ventral surface ; fore tibia with 3 short bristles along basal part of anterodorsal surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end ; mid femur with numerous long hairs along basal half of posteroventral surface, several short bristles along middle portion of anterolateral surface, 2 bristles on distal part of posterolateral surface and a row of bristles each along anterior and posterior margins of ventral surface ; mid tibia with 1 bristle on anterolateral surface at about two-thirds the distance from the distal end, 3 bristles along posterolateral surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end; hind femur with a row of bristles each along anterior and posterior margins of ventral surface, a pair of rows of long bristles along anterodorsal surface and 2 bristles on distal part of posterodorsal surface ; hind tibia with a row of bristles along anterodorsal surface and 1 bristle each on posterodorsal and posteroventral surfaces distally.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on third tergite weak or absent, fourth and fifth each with well developed several pairs of marginal bristles ; fifth sternite v-shaped with rows of closely set bristles laterally on arms ; first and second genital segments black with numerous black hairs but without marginal bristles ; inner forceps with long hairs but mostly without spines, apical part of inner forceps sharply pointed but without incision ; outer forceps slightly elongated with hairs ; anterior paramere without flap and widened medially ; posterior paramere curved with 1 hair apically ; apical plate of paraphallus well chitinized and its lateral process elongated ; lateral plate of paraphallus wide ; styli of glans elongated ; ventralia wide ; anterior margin of ventralia almost straight.

Female : Body length 8–14 mm.

Head : Characters similar to those of male except as follows : frons as wide as one eye ; fronto-orbital bristles 3 ; outer vertical bristle well developed.

Thorax and Wings : Similar to those of male but apicoscutellar bristles wanting.

Legs : Similar to those of male.

Abdomen : Sixth sternite wide, entirely uniform and with 8–10 strong bristles, seventh concave medially with strong bristles, eighth membranous and heavily pigmented with many hairs ; anal sternite more developed, membranous and with short hairs ; seventh tergite wide, almost straight and with moderately long hairs.

Material examined : I have not preserved the specimens of this species and the description is mainly based on Kano, Field and Shinonaga (1967).

Discussion on species : This species is closely related to *B. peregrina* (R. D., 1830) but differs from it by the black hairs on the posterior margin of gena, by the shape of the apex of inner forceps and elongated styli of glans. Moreover, the detailed structure of apical plate of paraphallus is also quite distinguishable here from *peregrina*.

Biology : The larvae breed in dead animals in nature and are reared from such media in the laboratory. The larval stages were described by Kano, Sato and Tange (1951) and Ishijima (1967).

Distribution : Bh (Thimpu) ; China ; Japan and Russia.

Type deposited : *Holotype* ♂, ZISP, not studied.

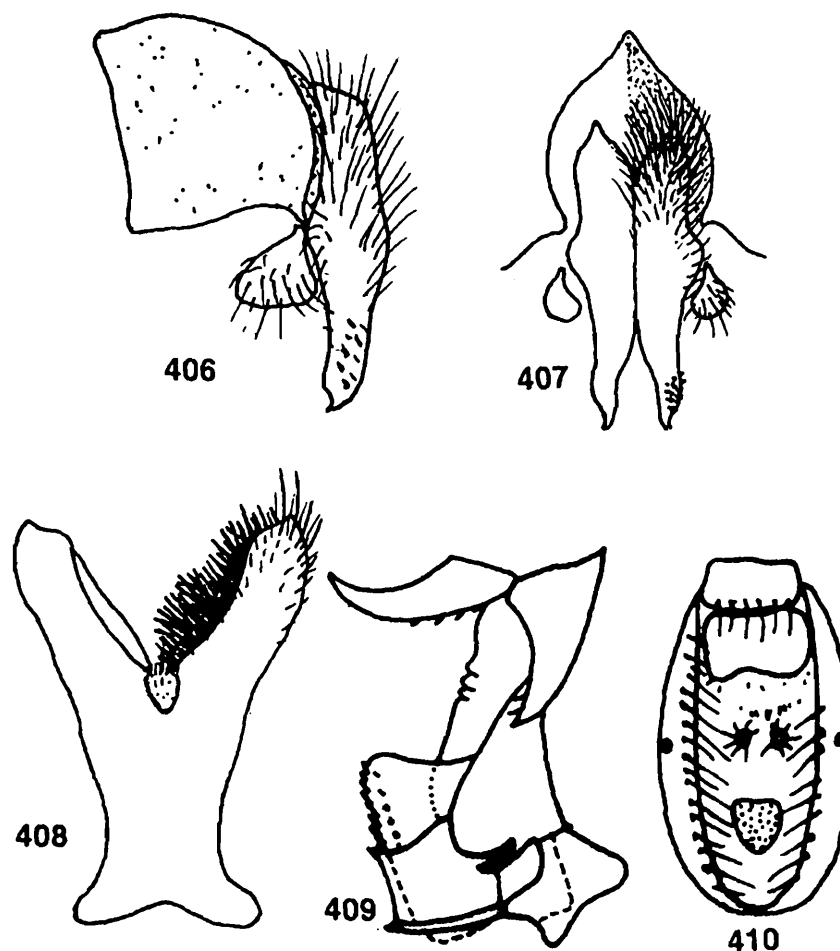
59. *Boettcherisca nepalensis* Kano and Sugiyama (Figs. 406-410)

1983. *Boettcherisca nepalensis* Kano and Sugiyama, *Jap. J. sanit. Zool.*, **34** (1) : 45.

1988. *Sarcophaga birganjensis* Sugiyama, Shinonaga and Kano, *Jap. J. sanit. Zool.*, **39** (4) : 357.

Male : Body length 7.5–10.7 mm.

Head : Width of frons about one-third that of one eye ; frontal vitta black, its width at narrowest point of frons about half that of one parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of 8–9 fine hairs near the eye margin ; antennae brown and reaching up to about 0.85 distance to vibrissae, first and second segments brownish-black, third greyish and about two to two and half times that of the second ; arista dark brown and plumose along basal two-thirds ; facial ridge brownish with silvery pollen ; vibrissae



Figs. 406-410 : *Boettcherisca nepalensis* Kano and Sugiyama. 406, Inner and outer forceps (lateral view); 407, Inner and outer forceps (posterior view); 408, Fifth sternite; 409, Penis (lateral view, after Kano and Sugiyama, 1983); 410, Genitalia ♀ (ventral view, after Kano and Sugiyama, 1983).

long, distance between vibrissae slightly greater than one and half times that of each parafacial width ; frontal bristles 10–13, posterior 4 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; gena black, silvery pollen and with numerous black hairs on upper anterior end and white hairs on lower posterior end ; post gena black

with whitish hairs ; ocellar region black with short bristles ; outer vertical bristle short, inner vertical well developed, post vertical one-third the inner vertical ; a pair of rows of postocular black setae, first row regular and second row irregular ; palpi slender and dark brown ; proboscis short and brownish.

Thorax : Greyish, silvery pollen and with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+4 ; *ia* 1+2 ; *ps* 1 ; *h* 3-4 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 7-8 ; *hpl* 10-11 ; upper part of propleura with hairs ; prostigmatic and propleural bristles well developed ; pro- and mesothoracic spiracles with short hairs and dense brown pile ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 8-10 short setae located dorsally and extending up to more than half from the basal node to r-m and 3-4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment slightly less than the third, the former with short spines along basal one-third of its anterior margin ; costal spines not stout ; squama creamy white, posterior margin of upper squama with short whitish hairs ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 3 bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface on distal one-third ; mid femur with a row of 6-7 bristles along middle portion of anterodorsal surface, a row of short bristles along anteroventral surface, a row of short hairs along posteroventral surface on basal two-thirds and with comb-like setae along distal one-third of posteroventral and anteroventral surfaces ; mid tibia with 1 bristle each on anterodorsal and posteroventral surfaces on distal one-third and 2 short bristles on posterolateral surface on basal one-third ; hind femur with a pair of rows of (one row incomplete) bristles along anterodorsal surface, a row of weak bristles along anteroventral surface and 2 bristles on posterodorsal surface on distal end ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface on distal one-third and 2 bristles apart medially on posterodorsal surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 3 lateral marginal bristles, fourth with a pair of median marginal bristles, fifth with a row of 15 marginal bristles ; sternites first to fourth with silvery pollen and short hairs ; fifth sternite Y-shaped with short window and bears closely set tuft of spines laterally on arms ; first and second genital segments light brown with numerous black hairs and bristles ; inner forceps slightly curved anteriorly, without incision but with few lateral subapical spines which do not extend to dorsal side ; outer forceps almost triangular with few hairs along distal end ; anterior paramere curved and pointed at

end; posterior paramere slightly curved at end with two subapical hairs; theca shorter than paraphallus; apical plate of paraphallus blunt, curved at end and with blunt bilobed lateral processes; lateral plate of paraphallus square-shaped with two pointed processes; anterior margin of ventralia straight and convex slightly.

Female : Body length 7.9–10.3 mm.

Head : General characters similar to those of male; frons 0.28–0.31 of head at the narrowest part; 2 proclinate and 1 reclinate fronto-orbital bristles; inner vertical bristle well developed.

Thorax : Same as that in male.

Abdomen : Elongated; male genitalia deeply oval; sixth sternite wide with 6 bristles, seventh more wider with slight groove bearing few short bristles, eighth membranous; seventh tergite elongated with many short bristles.

Material examined : 1♂, Nepal: Hetauda-Bharatpur; 15 km South of Hetauda, 21.vii. 1990, S. Shinonaga (det. R. Kano as *Sarcophaga birganjensis* = *B. nepalensis*; dep. in NSMT).

Discussion on species : This species is of medium size and differs from other species of the genus by the shape of ventralia and apical plate of paraphallus. It is also distinguished from *B. bengalensis* Nandi, 1992 by the structures of apical and lateral plates of paraphallus. Moreover, the inner forcep is sharply pointed with many strong spines here.

Biology : This species is not recorded from India. It was collected from a garden of a native house in the jungle which was attracted to human excrement.

Distribution : Ne (Biratnagar, Birganj, Hetauda Naubise–Monari, Nijgarh, Nipane, Pokhra and Ratanpur).

Type deposited : *Holotype* and *Paratypes* ♂, NSMT, not studied.

60. *Boettcherisca bengalensis* Nandi

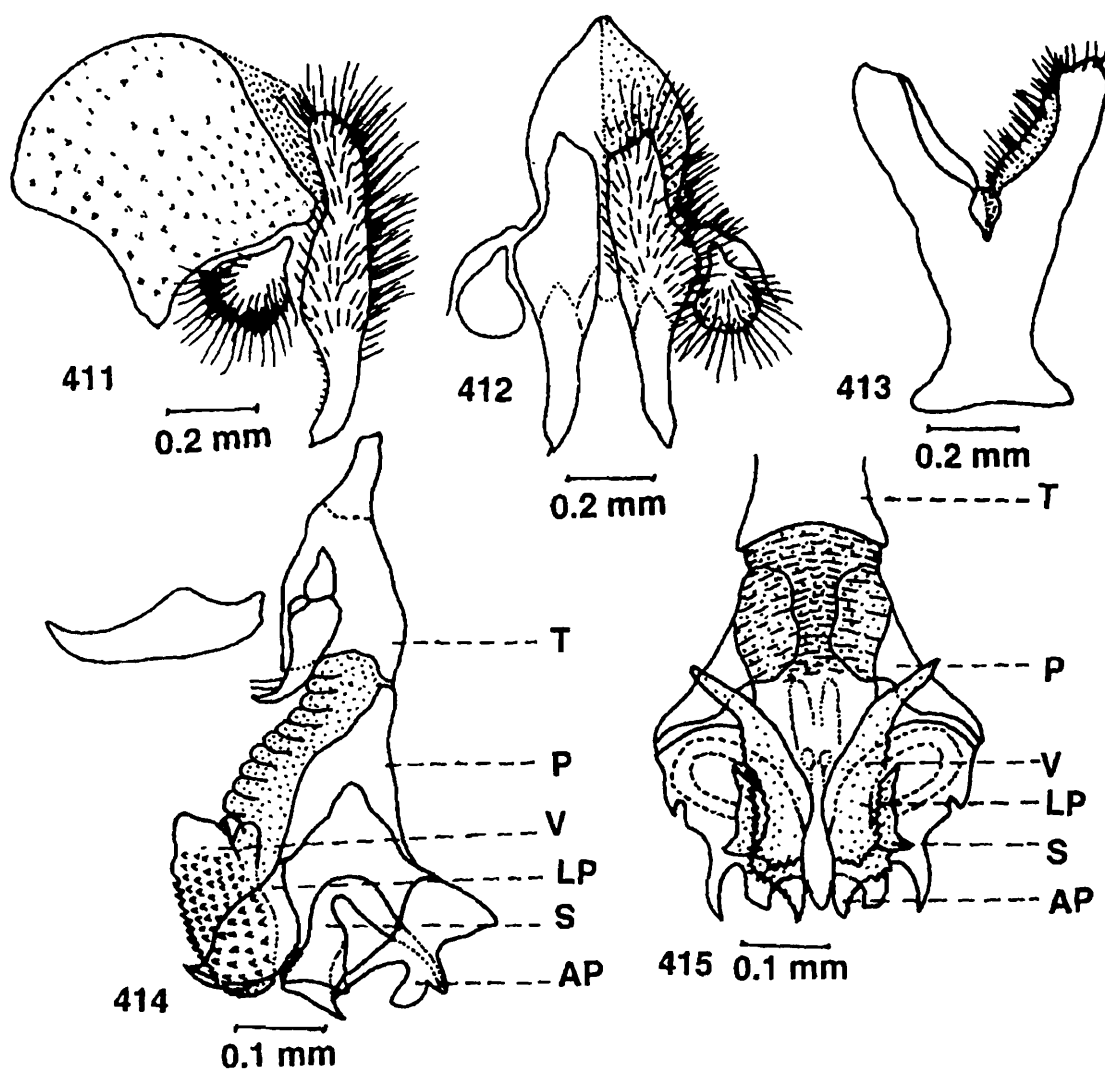
(Figs. 411–415)

1992. *Boettcherisca bengalensis* Nandi, *J. Beng. nat. Hist. Soc.*, **11** (1) : 35.

Male : Body length 7–13 mm.

Head : Width of frons about three-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafacial; parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of black hairs near the eye margin; antennae brownish and reaching up to about 0.85 distance to vibrissae, first and second segments blackish-brown with numerous short hairs, third brownish-black with white pollen and about three times that of the second; arista long, plumose along basal three-fifths; facial ridge black with white pollen; vibrissae long, cruciate, distance between vibrissae more than one

parafacial width ; frontal bristles 10–12, posterior 3 in some case 2 reclinate, anterior 2 below base of antennae and reaching up to about three-fifths of second antennal segment, rest cruciate and directed forwards ; gena blackish with numerous black hairs ; post gena black with long brownish hairs ; outer vertical bristle short, inner vertical well developed, post vertical about two-fifths that of the inner vertical ; ocellar bristles not stout, post ocellar longer than the ocellar ; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with black and white hairs ; palpi slender and dark brown ; proboscis short and black.



Figs. 411-415 : *Boettcherisca bengalensis* Nandi. 411, Inner and outer forceps (lateral view); 412, Inner and outer forceps (posterior view); 413, Fifth sternite; 414, Penis (lateral view); 415, Penis (ventral view).

Thorax : Blackish, silvery pollen and with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 (posterior two *dc* stout) ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 7 ; *hpl* 7–8 ; upper part of propleura black with short hairs ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro-and

mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 9–10 short setae located dorsally and extending up to about three-fifths from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than the third, the former with short spines along basal one-third of its anterior margin ; costal spines not so stout ; epaulet black with short spines ; basicostal scale light brown ; squama white ; halter brownish-black.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2 short bristles on basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row of short setae along distal half and a row of 3 bristles along basal half of anteroventral surface, a row of short setae along distal half and a row of long hairs along basal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with 1 bristle on anterodorsal surface at about two-fifths the distance from the distal end, 1 bristle on anteroventral surface at about one-third the distance from the distal end, 1 bristle on posterodorsal surface at about three-fifths the distance from the distal end and numerous long bristles along posteroventral surface ; hind femur with 2 bristles along anterodorsal surface, a row of bristles along anteroventral surface and numerous long hairs along posteroventral surface ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle each on posterodorsal surface at about one-fourth and half the distances from the basal end, 2 bristles on distal half of posteroventral surface but without tuft of hairs along ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of median and 3 pairs of lateral marginal bristles, fifth with a row of about 18–20 marginal bristles ; sternites first to fourth without bristles but with short hairs ; fifth sternite Y-shaped with a row of closely set bristles laterally and few hairs terminally on arms ; first genital segment black with black hairs, second black with black hairs but without marginal bristles ; inner forceps curved, notched at apex and with 4–5 marginal subapical spines ; outer forceps almost triangular, broad at apex and with hairs almost on its entire length ; anterior paramere almost straight and pointed at apex ; posterior paramere shorter, curved at apex and with 2 short preapical hairs ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus curved, blunt at apex and with three lateral processes of which anterior process is long and slender and posterior 2 blunt ; lateral plate of paraphallus sclerotised, wide at middle and with a short hook-shaped process ; styli

of glans pointed with a median pair of bars and 2 lateral processes bearing spines on outside; ventralia lobed, its anterior margin straight, spinous and with short membranous projection on anterior margin of each lobe.

Female : Unknown.

Material examined : *Holotype*, ♂, India : West Bengal ; Midnapore Arabari Forest, 26. xi. 1974, B. C. Nandi ; *Paratypes*, 2 ♂♂, Midnapore ; Arabari Forest, 26. xi. 1974, B. C. Nandi ; 2 ♂♂, Bankura ; Bhatpur, 20. xi. 1974, B. C. Nandi ; 1♂, Bankura ; Susunia Falls area, 21. vi. 1974, B. C. Nandi ; 1♂, Birbhum ; Charicha Forest, 15. xi. 1974, B. C. Nandi ; 1♂, Birbhum ; Suri D. F. O. Campus, 9. xi. 1974, B. C. Nandi.

Discussion on species : Externally this species is closely similar to *B. peregrina* (Robineau-Desvoidy, 1930) but differs from it by the structures of apical and lateral plates of paraphallus. Moreover, the inner forcep is with few spines apically here.

Biology : This is a relatively rare species which was collected by bush-sweeping.

Distribution : India ; Gu (Dwarka, Gir Sanctuary, Sasangir), Mr (Aurangabad, Nagpur) and WB (Arabari Forest, Bhatpur, Charicha Forest, Suri, Susunia Falls).

Type deposited : *Holotype* ♂, ZSIC, studied.

Genus 28. *Fengia* Rohdendorf, 1964

1964. *Fengia* Rohdendorf, *Ént. Obozr.*, 43(1) : 83 ; Fan, 1965, *Synan. flies China*, 15 : 247.

Type species : *Sarcophaga ostindicae* Senior-White, 1924.

Morphology : Frons narrow and more than twice that of each parafrontal ; third antennal segment always long and about three to four times that of the second ; propleura bare ; acrostichal bristles well developed and long ; posterior dorsocentral bristles 4 ; third and fourth abdominal sternites without long hairs ; penis not claw-shaped but short ; paraphallus massive and wide ; apical and lateral plates of paraphallus blunt but without processes ; styli of glans very slender, long and projecting for a long spirals.

Discussion : This genus was created by Rohdendorf (1964) who placed it under the subtribe Bezzolina in 1965. Only 2 species have been reported from the Oriental region, which are also present in India. This genus is similar to *Tricholioproctia* Baranov, 1938, but may be distinguished from it by its narrow frons and very slender and spiraled styli of glans.

Biology : Larvae of the genus and the mode of life of the larvae are unknown. Specimens were collected from bushes. Rohdendorf (1964) mentioned the species to be associated with the shades of tropical forests in the Oriental region.

Distribution : This genus is only present in the Oriental region.

Key to male species

1. Third segment of antennae four times that of the second ; anterior paramere beak-like, abruptly curved and pointed at end ; apical plate of paraphallus blunt but without process.....*ostindicae* (Senior-White)
 Third segment of antennae three times that of the second ; anterior paramere gradually curved and rounded at end ; apical plate of paraphallus pointed with one lateral process.....*kaimaraensis* Nandi

61. *Fengia ostindicae* (Senior-White)

(Figs. 416-420)

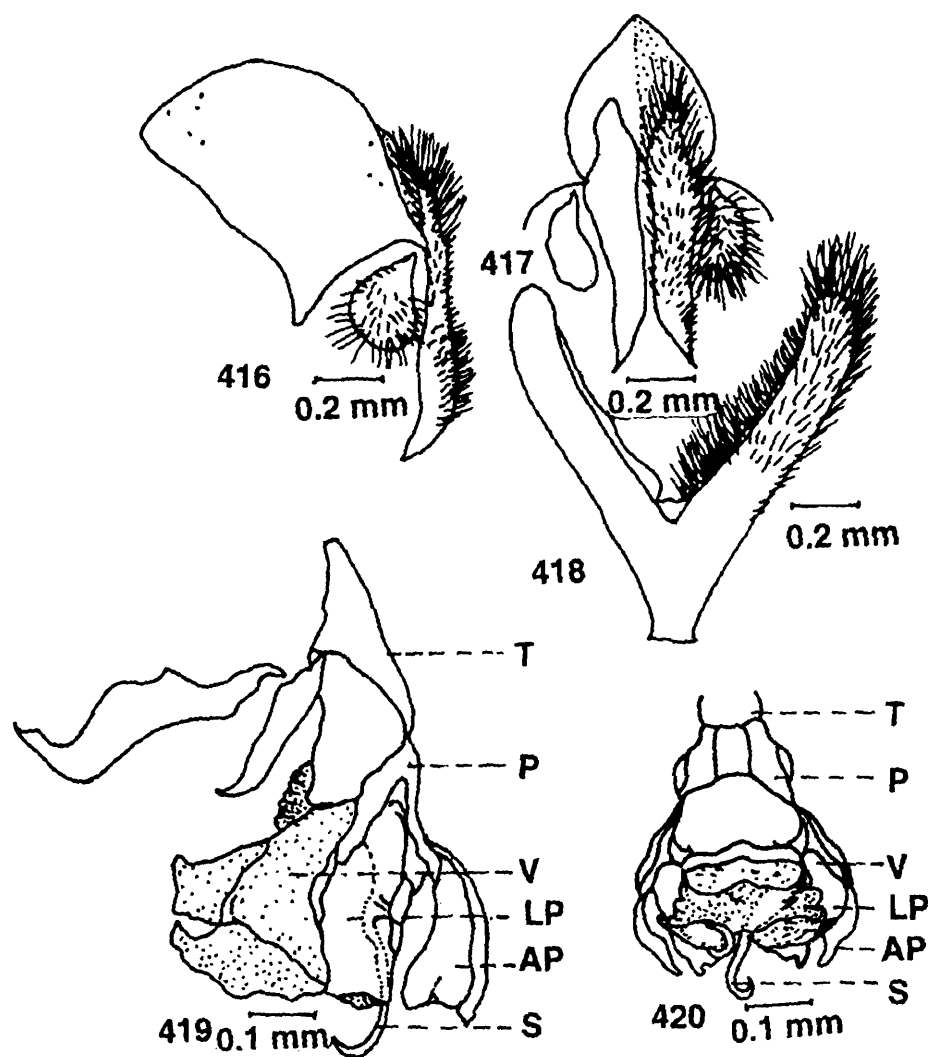
1924. *Sarcophaga ostindicae* Senior-White, *Rec. Indian Mus.*, **26**(3) : 233 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 235.
 1965. *Fengia ostindicae* : Rohdendorf, *Ent. Obozr.*, **44**(3) : 695 ; Nandi, 1989, *J. Beng. nat. Hist. Soc.*, **8**(1) : 30.

Male : Body length 9 mm.

Head : Width of frons about two-fifths that of one eye ; frontal vitta brownish, its width at narrowest point of frons about more than twice that of each parafrontal ; parafrontal and parafacial brownish-black with silvery pollen, the former with short scattered black hairs, the latter with a row of 6–7 short black hairs near the eye margin ; antennae brownish-black and reaching up to about 0.9 distance to vibrissae, first and second segments brownish-black, third brownish with silvery pollen and about four times that of the second ; arista long, plumose along basal three-fifths ; facial ridge brownish with silvery pollen ; vibrissae long, distance between vibrissae greater than one parafacial width ; frontal bristles 11, posterior 3 reclinate, anterior 3 below base of antennae and reaching up to about more than half of second antennal segment, rest cruciate and directed forwards ; gena blackish with silvery pollen and long black hairs ; post gena black with greyish hairs ; ocellar triangle black with short black hairs ; outer vertical bristle not differentiated, inner vertical well developed, post vertical half the length of inner vertical ; ocellar bristles short, post ocellar longer than ocellar, almost one-third the inner vertical ; a row of regular postocular setae besides postocular cilia, rest of the area with short setae and brownish hairs ; palpi slender ; proboscis black.

Thorax : Black with three black longitudinal stripes ; *ac* 4+3 ; *dc* 4+4 ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 4 ; *sa* 2 ; *st* 1+1+1 ; *mpl* 7 ; *hpl* 8 ; upper part of propleura bare, black and with silvery pollen ; prostigmatic and propleural bristles well developed and accompanied with short black hairs ; pro-and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of about 10–11 short setae located dorsally and extending up to four-fifths from the basal node to r-m and 3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment greater than the third, the former with short spines along basal two-fifths of its anterior margin ; costal spines not stout ; epaulet black with short spines ; basicostal scale white ; squama creamy white ; halter brown.



Figs. 416-420 : *Fengia ostindicae* (Senior-White). 416, Inner and outer forceps (lateral view); 417, Inner and outer forceps (posterior view); 418, Fifth sternite; 419, Penis (lateral view); 420, Penis (ventral view).

Legs : Black ; fore femur with a row of bristles along posterodorsal surface and a row of bristle along posterior margin of ventral surface ; fore tibia with a row of short bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row of 4 bristles along middle portion of anterolateral surface, a row of short

setae along distal half of posteroventral surface and 1 bristle each on anterodorsal, anterolateral and anteroventral surfaces on distal end ; mid tibia with a row of short bristles along anterodorsal surface, 1 bristle each on anterodorsal, anteroventral and posteroventral surfaces on distal end and a row of bristles along posterodorsal surface ; hind femur with 2 bristles along anterodorsal surface, a row of bristles along anteroventral surface, a row of bristles along posterior margin of ventral surface and 1 bristle on posterodorsal surface distally ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end, 1 bristle each on posteroventral surface at about one-third and two-thirds the distances from the basal end and a row of hairs along posterior margin of ventral surface at about two-thirds the distance from the distal end.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 3 lateral marginal bristles, fourth with 1 median and 3 lateral marginal bristles, fifth with a row of 18 marginal bristles, sternites first to fourth with short hairs ; fifth sternite Y-shaped without window but with setae laterally and short hairs terminally on arms ; first genital segment brown, second brownish-black with short hairs ; inner forceps elongated, curved at end and with numerous hairs on outer side apically ; outer forceps oval with short hairs ; anterior paramere beak-like, abruptly curved and with pointed at end ; posterior paramere short, slender and gradually curved at end ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus wide, strongly sclerotised, blunt at end but without process ; lateral plate of paraphallus slightly membranous and blunt at end ; styli of glans slender, long, curved at end, without serration and crosses the apical plate of paraphallus ; ventralia well developed, membranous, without serration and provided with lobes.

Female : Unknown.

Material examined : 1♂, India : Mizoram ; Aizawl P.U. College campus, 1,100m, 9.vi.1989, B. C. Nandi ; 1♂, Aizawl ; Bonkon, 1,050 m, 11.vi.1989, B. C. Nandi ; 1♂, Kolasib, 800m, 17.vi.1989, B. C. Nandi.

Discussion on species : This species is similar to *F. kaimaraensis* Nandi 1992, but differs from it by the structures of ventralia and apical plate of paraphallus. Moreover, the lateral plate of paraphallus is wide and blunt in this species.

Biology : This is a relatively rare species which was collected from bushes.

Distribution : India ; Mz (Aizawl, Bonkon, Kolasib) and UP (Dehra Dun) ; China ; Hainan Island and Taiwan.

Type deposited : *Holotype* ♂, VM, not studied.

62. *Fengia kaimaraensis* Nandi

(Figs. 421-425)

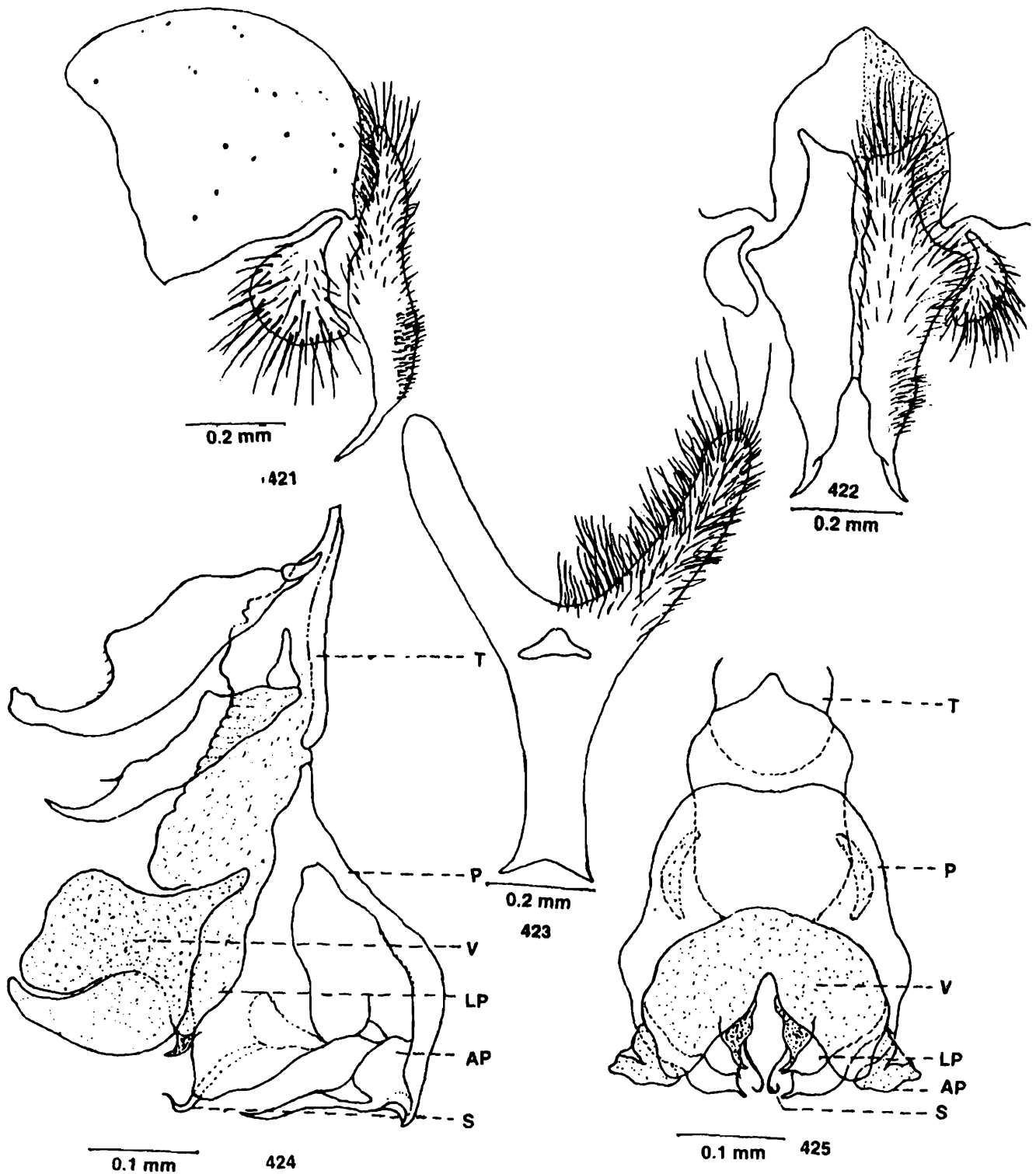
1992. *Fengia kaimaraensis* Nandi, *Hexapoda*, 4 (1) : 67.*Male* : Body length 8 mm.

Head : Width of frons about two-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about more than twice that of each parafrontal ; parafrontal and parafacial brownish-black with silvery pollen, the former with short scattered hairs, the latter with a row of 8 short hairs near the eye margin ; antennae blackish-brown and reaching up to about 0.9 distance to vibrissae, first and second segments black, third brownish-black, silvery pollen and about three times that of the second ; arista long, plumose along basal three-fifths ; facial ridge brownish with silvery pollen ; vibrissae long, crossed, distance between vibrissae greater than one parafacial width ; frontal bristles 11, posterior 3 reclinate, anterior 3 below base of antennae and reaching up to about more than half of second antennal segment, rest cruciate and directed forwards ; gena blackish, silvery pollen and with short black hairs ; post gena black with greyish hairs ; ocellar triangle black with short black hairs ; outer vertical bristles not differentiated, inner vertical well developed, post vertical half the length of inner vertical ; ocellar bristles short ; postocellar bristle longer than ocellar and almost one-third the inner vertical ; a row of regular postocular setae besides postocular cilia, rest of the area with short setae and brownish hairs ; palpi slender ; proboscis black.

Thorax : Black with three black longitudinal stripes ; *ac* 4+3 ; *dc* 4+4 ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 4 ; *sa* 2 ; *st* 1+1+1 ; *mpl* 8 ; *hpl* 8 ; upper part of propleura bare, black and with silvery pollen ; prostigmatic and propleural bristles well developed and accompanied with short black hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of short setae located dorsally and extending up to three-fifths from the basal node to r-m and 4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to the third, the former with short spines along basal two-thirds of its anterior margin ; costal spines not stout ; epaulet black with short spines ; basicostal scale white ; squama whitish ; halter brown.

Legs : Black ; fore femur with a row of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal



Figs. 421-425 : *Fengia kaimaraensis* Nandi. 421, Inner and outer forceps (lateral view); 422, Inner and outer forceps (posterior view); 423, Fifth sternite; 424, Penis (lateral view); 425, Penis (ventral view).

surface at about one-third the distance from the distal end ; mid femur with a row of bristles along basal half and a row of short setae along distal half of anteroventral surface and a row of short setae along distal half of posteroventral surface, 1 bristle each on posterodorsal, posterolateral and posteroventral surfaces on distal part and with long hairs along posteroventral surface ; mid tibia with 1 bristle each on anterolateral, anteroventral and posteroventral surfaces at about one-third the distance from the distal end and 1 bristle on posterodorsal surface at about one-third the distance from the basal end ; hind femur with a row of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 1 bristle on posterodorsal surface at about one-third the distance from the distal end and with tuft of long hairs along ventral surface ; hind tibia with 2 long and a row of short bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end and a row of long hairs along posterior margin of ventral surface at about two-thirds the distance from the distal end.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but second with 3 and third with 1 lateral marginal bristles, fourth with 2 median and 3 lateral marginal bristles, fifth with a row of 18 marginal bristles ; sternites first to fourth with short hairs ; fifth sternite Y-shaped with slight window and short hairs laterally and long hairs terminally on arms ; first genital segment brown but without marginal bristles, second brownish-black with short hairs ; inner forceps beak-shaped with short spines on outside on subapical end ; outer forceps oval with short hairs ; anterior paramere gradually curved, rounded at end and bearing few short hairs along inner margin ; posterior paramere slightly curved apically with 1 hair ; theca shorter than paraphallus ; apical plate of paraphallus slightly pointed with one long lateral process ; lateral plate of paraphallus short and membranous ; styli of glans short, hook-shaped but without serrations ; ventralia transparent with 2 lobes.

Female : Unknown.

Material examined : *Holotype* ♂, India : Karnataka ; Kaimara, 1,480m, 26.vi.1990, B. C. Nandi ; *Paratypes* 2 ♂♂, same data as *Holotype*.

Discussion on species : This species resembles *F. ostindicae* (Senior-White, 1924) but differs from it by the structures of apical plate of paraphallus and ventralia. Moreover, the structures of inner forceps and lateral plate of paraphallus are also distinguishable here.

Biology : It is a rare species which was collected from bushes.

Distribution : India ; Kt (Kaimara).

Type deposited : *Holotype* ♂, ZSIC, studied.

Genus 29. *Lioproctia* Enderlein, 1928

1928. *Lioproctia* Enderlein, *Arch. kalssif. phylogen. Ent.*, 1(1) : 26.

Type species : *Lioproctia aurifrons* Doleschall, 1858, sensu Enderlein, 1928

(= *Lioproctia enderleini* Kano and Lopes, 1970).

1963. *Ceratophalla* Rohdendorf, *Stuttg. Beitr. Naturk.*, 124 : 11.

Type species : *Ceratophalla lomagundica* Rohdendorf, 1963.

1964. *Burmanomyia* Fan, *Acta zootax.sin.*, 1(2) : 305.

Type species : *Sarcophaga beelsoni* Senior-White, 1924.

1959. *Johnstonimyia* Lopes, *Studia Ent.*, 2(1) : 48.

Type species : *Sarcophaga kappa* Johnston and Tiegs, 1921.

Morphology : Preacrostichal and predorsocentral bristles well developed ; postsutural dorsocentral bristles 4 or 5 ; sternites first to fourth with numerous long hairs ; outer margin of anterior paramere with small branch and its basal lobe with sclerotised pointed process ; styli of glans with inner and outer branches, inner one enlarged apically with numerous hairs, median one strong, large and bent ventrally ; apical plate of paraphallus bifid; flat but without median process and its middle part enlarged ; presence of a pair of lateral projections of paraphallus which are strongly constructed ; ventralia well developed and not petiolate ; inner forceps without spines.

Discussion : This genus was created by Enderlein in 1928. Fan (1964) made a new genus *Burmanomyia* on the basis of character of bare propleura and paired membranous process of apical plate of paraphallus. Rohdendorf (1965) synonymized *Burmanomyia* with *Ceratophalla* Rohdendorf, 1963 and Zumpt (1972) further synonymized the genus *Ceratophalla* with *Prionophalla* Rohdendorf, 1963 and placed a total of 9 species under this genus. Lopes *et al.* (1967) synonymized *Burmanomyia* with *Lioproctia* Enderlein, 1928 and only 4 species from the Oriental and 1 species from the Palaearctic regions have been reported. Lopes (1989) reported 7 valid species from the Australasian and Oceanian regions. This genus has been divided into two subgenera : *Lioproctia* Enderlein and *Coonooria* Fan by Fan in 1964. Verves (1989) placed this genus under the subtribe Boettcheriscina Verves, 1989 and divided it into three subgenera : *Burmanomyia* Fan, *Lioproctia* Enderlein and *Coonooria* Fan, of which only the last two genera are present here.

Biology : Members of the genus may be collected from bushes and they breed in different kinds of dead animals.

Distribution : This genus is distributed in the Oriental, Palaearctic and Australasian and Oceanian regions.

Key to subgenera

1. Propleura bare ; ventralia short and lobulated ; inner forceps beak-shaped with strong spines*Lioproctia* Enderlein.
Propleura hairy ; ventralia large and beak-shaped ; inner forceps straight with short hair*Coonooria* Fan

Subgenus ***Lioproctia*** Enderlein, 1928

1928. *Lioproctia* Enderlein, *Arch. klassif. phylogen. Ent.*, 1(1) : 26.

Type species : *Lioproctia aurifrons* Doleschall, 1858, sensu Enderlein, 1928

(= *Lioproctia enderleini* Kano and Lopes, 1970)

Morphology : Abdomen with checkered pattern ; upper part of propleura bare ; parafacial with a few short setae ; inner forceps beak-shaped with strong spines ; preacrostichal bristle 1 ; fifth sternite with or without protuberance ; apical plate of paraphallus longer than short styli, bifid, flat and its middle part enlarged ; styli of glans long ; ventralia lobulated.

This is a small subgenus and only 2 species are present here.

The species of this subgenus was collected from bushes of forest areas and they breed in a variety of dead bodies.

This subgenus is distributed in the Oriental, Palaeartic and Australasian and Oceanian regions.

Key to male species

1. Ventralia chitinous and trilobed ; apical plate of paraphallus with cup-shaped grooved and two projections ; anterior paramere pointed apically*beesoni* (Senior-White)
Ventralia membranous and bilobed ; apical plate of paraphallus without groove and blind ; anterior paramere wide apically*annandalei* (Senior-White)

63. *Lioproctia* (s. str.) *beesoni* (Senior-White)

(Figs. 426-430)

1924. *Sarcophaga beesoni* Senior-White, *Rec. Indian Mus.*, 26 (3) : 242 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, 6 : 248 ; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, 45 : 263.

1964. *Burmanomyia* (*Burmanomyia*) *beesoni* : Fan, *Acta zootax. sin.*, 1 (2) : 305 ; Fan, 1965, *Synan. flies China*, 15 : 250.

1965. *Johnstonimyia beesoni* : Kano and Shinonaga, *Illus. key adult flies Japan* : 16.

1967. *Burmanomyia beelsoni* : Kano, Field and Shinonaga, *Fauna Japonica*, Sarcophagidae : 30.
1977. *Lioproctia (s. str.) beelsoni* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 566.
1986. *Lioproctia beelsoni* : Verves, *Cat. Palae. Dipt.*, **12** : 162 ; Nandi, 1990, *J. Beng. nat. Hist. Soc.*, **9(2)** : 12.
1989. *Lioproctia (Burmanomyia) beelsoni* : Verves, *Mems Inst. Oswaldo Cruz*, **84(4)** : 542.

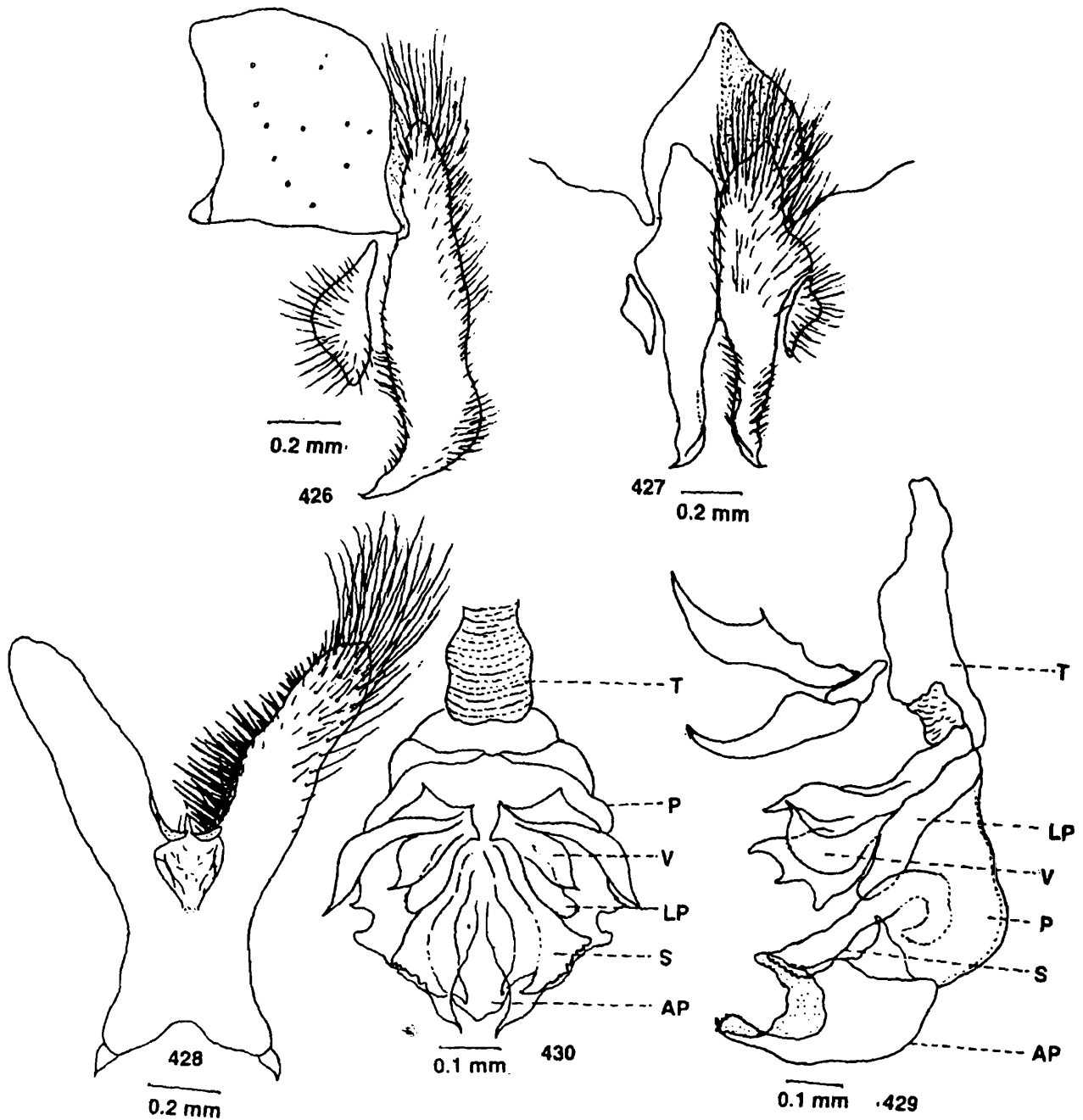
Male : Body length 10 mm.

Head : Width of frons about twice that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrenal ; parafrenal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of 8–9 short hairs near the eye margin ; antennae brownish-black and reaching up to about 0.85 distance to vibrissae, first and second segments blackish-brown, third brown, silvery pollen and about four times that of the second ; arista long, plumose along basal three-fifths ; facial ridge black with silvery pollen ; vibrissae long, crossed, distance between vibrissae slightly greater than one parafacial width ; frontal bristles 13, posterior 2 reclinate, anterior 4 below base of antennae and reaching up to about half of second antennal segment, rest cruciate and directed forwards ; gena black with brownish hairs ; post gena blackish with long silvery hairs ; ocellar triangle black with long hairs ; outer vertical bristle short, inner vertical well developed, post vertical half the length of inner vertical ; ocellar and postocellar bristles short, postocellar less than half of inner vertical ; a row of regular postocular setae besides postocular cilia, rest of the area with long silvery hairs ; palpi long and black ; proboscis short and black.

Thorax : Black with three black longitudinal stripes ; *ac* 1+1 ; *dc* 5+4 (posterior 2 post *dc* short) ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 3 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 9 ; *hpl* 11 ; upper part of propleura bare ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 9 short setae located dorsally and extending up to more than half from the basal node to r–m and 4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment slightly less than the third, the former with short spines along basal one-third of its anterior margin ; costal spines not stout ; epaulet black with short spines ; basicostal scale yellowish ; squama whitish ; halter brown.

Legs : Black ; fore femur with a row of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 short bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur



Figs. 426-430 : *Lioproctia (s. str.) beesoni* (Senior-White). 426, Inner and outer forceps (lateral view); 427, Inner and outer forceps (posterior view); 428, Fifth sternite; 429, Penis (ventral view); 430, Penis (lateral view).

with a row of 6 bristles along anterodorsal surface, a row of short hairs along basal half and a row of short setae along distal half of anteroventral surface, a row of short hairs along basal half of posteroventral surface and 1 bristle each on posterodorsal and posteroventral surfaces on distal end ; mid tibia with a row of 3 long bristles along posterodorsal surface, 1 bristle each on posterolateral and posteroventral surfaces at about one-third the distance from the distal end but without tuft of hairs along ventral surface ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 2 bristles on distal one-third of posterodorsal surface, 1 bristle distally on posterolateral surface and a row of long hairs along distal half of posteroventral surface ; hind tibia with a row of 5 bristles and a few short hairs along anterodorsal surface, 1 bristle on anteroventral surface at about one-fourth the distance from the distal end, 2 bristles on posterodorsal surface medially and with numerous long hairs along anterior and posterior margins of ventral surface up to two-thirds of distal end.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 1 lateral marginal bristles, fourth with 2 median and 1 lateral marginal bristles, fifth with a row of 10 marginal bristles ; sternites first to fourth with short hairs ; fifth sternite v-shaped with short bristles laterally and long hairs terminally on arms ; first genital segment black, second blackish, shiny without marginal bristles but with long hairs ; inner forceps almost straight, beak-like and with short hairs on outer and inner margins ; outer forceps slightly elongated with hairs on outer margin ; anterior paramere pointed, curved at end and with short median process ; posterior paramere curved but without hairs ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus with cup-shaped grooved and short lateral projections ; lateral plate of paraphallus short ; styli of glans short and blunt at end ; ventralia well developed, chitinous and trilobed.

Female : Unknown.

Material examined : *Holotype* ♂, Myanmar : Mòhnyin, 23.v.1919, C. V. C. Beeson ; 1♂, India : West Bengal ; Darjeeling (Sukna Forest), 200m, 10. vii. 1978, B. C. Nandi.

Discussion on species : This species is close to *L. (s.str.) annandalei* (Senior-White, 1924) but differs from it by the structures of apical plate of paraphallus and ventralia. Moreover, the structure of anterior paramere is quite different here from *annandalei*.

Biology : This is a rare species which was collected from forest bushes.

Distribution : India ; WB (Sukna Forest) ; M (Mòhnyin) ; China ; Japan ; Taiwan and Thailand.

Type deposited : *Holotype* ♂, BMNH, studied.

Discussion on type : The author studied the *Holotype* and the description has been compared with this species. The type is in good condition. The abdomen has been dissected out and the genitalia have been kept on a separate slide.

64. *Lioproctia* (*s. str.*) *annandalei* (Senior-White)

(Figs. 431–436)

1924. *Sarcophaga annandalei* Senior-White, *Rec. Indian Mus.*, **26**(3) : 233.
 1977. *Seniorwhitea annandalei* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 581.
 1978. *Lioproctia midnaporensis* Nandi, *Orient. Insects*, **12** (3) : 378 ; Nandi, 1990, *J. Beng. nat. Hist. Soc.*, **9**(1) : 18.
 1984. *Harpagophalla annandalei* : Sugiyama and Kano, *Jap. J. sanit. Zool.*, **35**(4) : 349.
 1995. *Lioproctia* (*s. str.*) *annandalei* : Nandi, *J. Beng. nat. Hist. Soc.*, **14** (1) : 53.

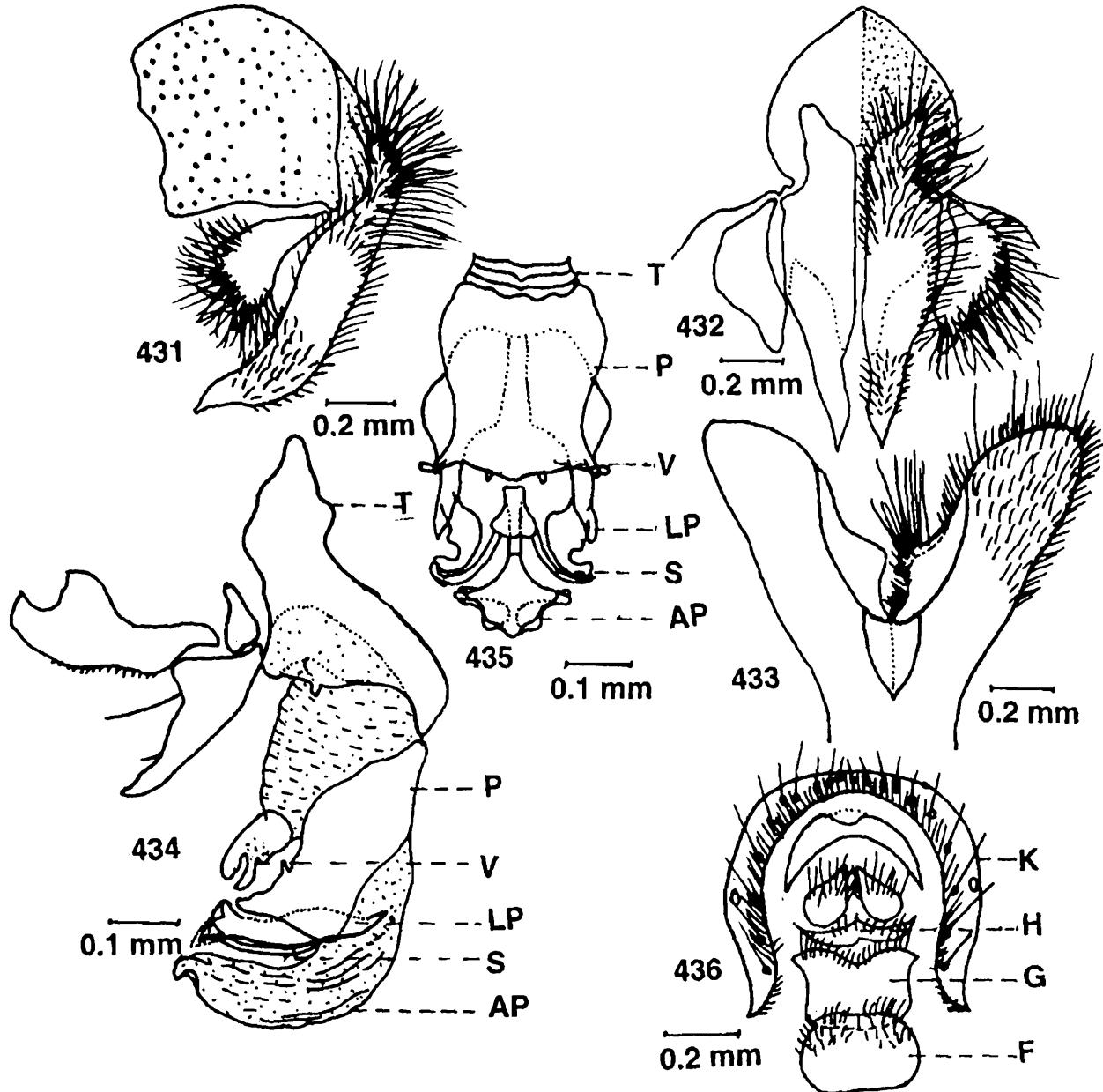
Male : Body length 11–14 mm.

Head : Width of frons about three-fourths that of one eye ; frontal vitta black, its width at narrowest point of frons about less than half that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of hairs near the eye margin ; antennae brownish-black and reaching up to about 0.85 distance to vibrissae, first and second segments blackish-brown, third brown with silvery pollen and about four times that of the second ; arista long, plumose along basal three-fifths ; facial ridge black with silvery pollen ; vibrissae long, distance between vibrissae less than twice that of one parafacial width ; frontal bristles 13, posterior 3 reclinate, anterior 4 below base of antennae and reaching up to about two-thirds of second antennal segment, rest cruciate and directed forwards ; gena black with brownish hairs ; post gena black with short silvery hairs ; ocellar triangle black with long hairs ; outer vertical bristle short, inner vertical well developed, post vertical half the length of inner vertical ; ocellar and postocellar bristles short ; postocellar less than half of inner vertical ; a row of regular postocular setae besides postocular cilia, rest of the area with long silvery hairs ; palpi long, black ; proboscis short and black.

Thorax : Greyish with three black longitudinal stripes ; *ac* 1+1 ; *dc* 5+4 (posterior 2 post *dc* strong) ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 8 ; *hpl* 11 ; upper part of propleura black ; prostigmatic and propleural bristles well developed and accompanied with short black hairs ; pro- and mesothoracic spiracles dark brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 10 short setae located dorsally and extending up to more than half from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment

about half that of the third, the former with short spines along basal one-third of its anterior margin; costal spines not stout; epaulet black with short spines; basicostal scale yellowish; squama white; halter brown.



Figs. 431-436 : *Lioproctia (s. str.) annandalei* (Senior-White). 431, Inner and outer forceps (lateral view); 432, Inner and outer forceps (posterior view); 433, Fifth sternite; 434, Penis (lateral view); 435, Penis (ventral view); 436, Genitalia ♀ (ventral view).

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 4 short bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur

with a row of 5 bristles along middle portion of anterolateral surface, a row of short bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of short bristles along basal half and few short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posteroventral surfaces on distal end ; mid tibia with 1 long and a row of few short bristles along posterodorsal surface, 1 bristle each on anterolateral and posterolateral surfaces at about one-third the distance from the distal end and with tuft of long hairs along distal half of ventral surface ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 2 bristles on distal one-fourth of posterodorsal surface, 1 bristle on posterolateral surface and a row of long hairs along distal half of posteroventral surface ; hind tibia with a row of 2 long and several short bristles along anterodorsal surface, 2 bristles on posterodorsal surface medially and with numerous long hairs along anterior and posterior margins of ventral surface on four-fifths the distance from the distal end.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of 10 marginal bristles ; sternites first and second with long black hairs, third and fourth with short hairs ; fifth sternite v-shaped, with curved projection basally bearing long bristles laterally and long hairs distally on arms ; first genital segment grey, second brownish-black but both without marginal bristles ; inner forceps curved with scattered short spines on much of its distal half and with dense hairs along basal half ; outer forceps almost triangular ; anterior paramere wide, slightly grooved at distal end and with lateral wide process on the inner margin and short hairs on the outer margin ; posterior paramere almost straight, sharply pointed at end and with 1 long and 1 short hairs ; theca almost equal to paraphallus, both are sclerotised ; apical plate of paraphallus without groove, slightly curved, blind, almost obtuse at the apex and mostly membranous ; lateral plate of paraphallus sclerotised with 2 short unequal pointed processes ; styli of glans long, stout and wide at end ; ventralia membranous, small and bilobed.

Female : Body length 8 mm ; absence of a few scutellar bristles ; frontal bristles 8, 2 proclinate ; fronto-orbital bristles 2 ; outer vertical bristle well developed and about three-fifths of inner vertical ; 6th sternite almost round with short hairs, seventh grooved at the distal end and with short marginal lobes and hairs, eighth membranous with hairs and anal sternite with short bristles.

Material examined : *Holotype* ♂, Sri Lanka : Suduganga, 3. viii. 1920. Senior-White ; 1♂, India : West Bengal ; Midnapore (Digha), 28. xi. 1974, B. C. Nandi ; 1♂, Bihar ; Deoghar, 245m, 15. xi. 1988, B. C. Nandi ; 1♂, Gujarat ; Saputara, 875m, 8. x. 1990, B. C. Nandi.

Discussion on species : This species is similar to *L. (s.str.) beelsoni* (Senior-White, 1924) but differs from it by the structures of apical plate of paraphallus and ventralia. Moreover, this species is quite separable from *beelsoni* by the structures of anterior paramere, lateral plate of paraphallus and also by the distribution of spines on inner forceps.

Biology : This is a relatively rare species which has been bred from dead snails-*Achatina fulica* (Gastropoda), a dead rabbit and a dead bat.

Distribution : India ; B (Deoghar, Pusa, Chota Nagpur), Gu (Saputara), TN (Nilgiri Hills, Coonoor, Coimbatore), UP (Dehra Dun) and WB (Digha) and SL (Matale, Suduganga).

Type deposited : Holotype ♂, BMNH, examined.

Discussion on type : Nandi (1978) described *Lioproctia midnaporensis* from West Bengal and differentiated it from *Sarcophaga annandalei* Senior-White, 1924. The figures of *annandalei* drawn by Senior-White is very poor and after comparing this species with Senior-White's species, the author is confident that these two species are conspecific. The author studied the type species of *annandalei* and found that the type is in good condition.

Subgenus *Coonooria* Fan, 1964

1864. *Coonooria* Fan, *Acta zootax. sin.*, 1(2) : 305.

Type species : *Sarcophaga pattoni* Senior-white, 1924.

Morphology : Upper part of propleura hairy; inner forceps straight with slight groove at the end and short hairs posteriorly; predorsocentral bristles 5; fifth sternite without protuberance but with strong spines laterally; ventralia beak-shaped; apical plate of paraphallus as long as styli; lateral plate of paraphallus backwardly curved; styli of glans short with projections; parafacial without rows of setae but with irregular hairs.

Fan (1964) created this subgenus to accommodate the species of *Sarcophaga pattoni* Senior-White, 1924 mainly on the basis of hairy propleura and unpaired membranous process of apical plate of paraphallus. Only 1 species in present in this area.

The species of this subgenus has been bred from dead rabbit and it is attracted to such media including carcasses. This subgenus is distributed only in the Oriental.

65. *Lioproctia (Coonooria) pattoni* (Senior-White)

(Figs. 437-441)

1924. *Sarcophaga pattoni*, Senior-White, *Rec. Indian Mus.*, 26 (3) : 242; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, 6 : 248; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, 45 : 263.

1946. *Sarcophaga pilipleuris* Salem, *Bull. Inst. Égypte*, **27** : 192.
 1954. *Tricholioproctia pattoni* : Lopes, *Anais Acad. bras. Cienc.*, **26**(2) : 274.
 1964. *Burmanomyia (Coonooria) pattoni* : Fan, *Acta zootax. sin.*, **1**(2) : 305.
 1977. *Lioproctia (Coonooria) pattoni* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 567; Nandi, 1989, *Mems Inst. Oswaldo Cruz.*, **84**(4) : 395; 1992, *J.Beng. nat. Hist. Soc.*, **11**(2) : 36.

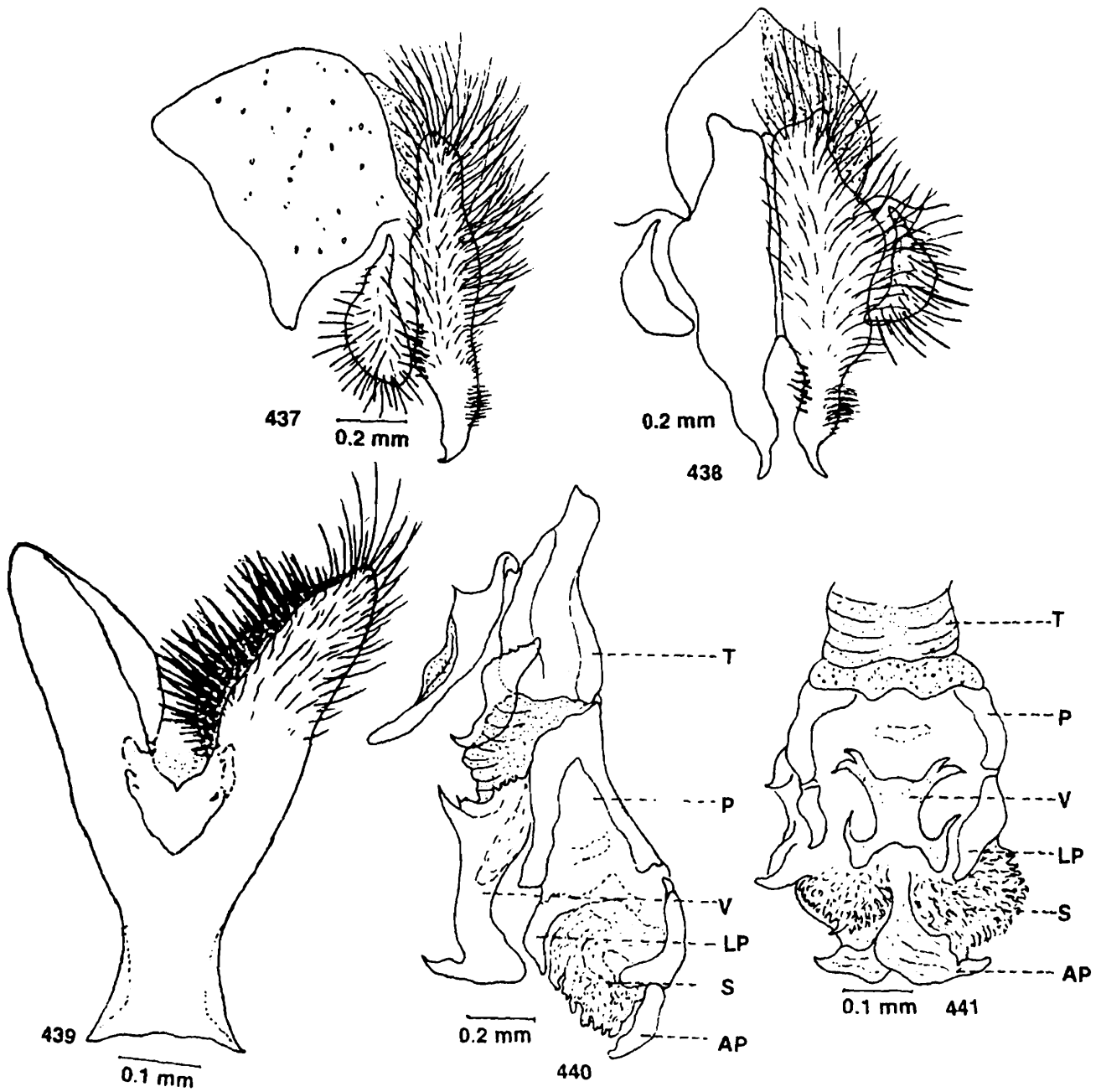
Male : Body length 13–15 mm.

Head : Width of frons about more than twice that of one eye; frontal vitta black, its width at narrowest point of frons about three times that of each parafrontal; parafrontal and parafacial brownish with silvery pollen, the former with short scattered hairs, the latter with a row of short scattered irregular hairs near the eye margin; antennae blackish-grey and reaching up to about 0.8 distance to vibrissae, first and second segments blackish, third greyish with silvery pollen and about three times that of the second; arista long, plumose along basal two-thirds; facial ridge blackish, silvery pollen and with black spines along lower half; vibrissae long, distance between vibrissae less than twice that of each parafacial width; frontal bristles 12, posterior 2 reclinate, anterior 2 below base of antennae and reaching up to about half of second antennal segment, rest cruciate and directed forwards; gena black with brownish hairs; post gena black with long hairs; outer vertical bristle short, inner vertical well developed, post vertical shorter than inner vertical; ocellar and postocellar bristles short; a row of regular postocular setae besides postocular cilia, rest of the area with long grey hairs; palpi long and brownish; proboscis short and black.

Thorax : Greyish with three black longitudinal stripes; *ac* 1+1; *dc* 5+4; *ia* 1+3; *ps* 1; *h* 1; *ph* 2; *np* 4; *pa* 1; *sa* 2; *st* 1+1+1; *mpl* 6-7; *hpl* 9; upper part of propleura black with hairs; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles dark brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 10-13 short setae located dorsally and extending up to half to two-thirds the distance from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment shorter than the third, the former with short spines along basal two-thirds of its anterior margin; costal spines not stout; epaulet black with short spines; basicostal scale yellowish; squama whitish; halter brown.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 short bristles along basal two-thirds of anterodorsal surface, 2 bristles on posterodorsal surface at about two-thirds the distance from the basal end and 1 bristle on anteroventral surface at about one-third the distance from the distal end;



Figs. 437-441 : *Lioproctia (Coonooria) pattoni* (Senior-White). 437, Inner and outer forceps (lateral view); 338, Inner and outer forceps (posterior view); 439, Fifth sternite; 440, Penis (lateral view); 441, Penis (ventral view).

mid femur with a row of 4 bristles along middle portion of anterolateral surface, a row of long hairs along basal half and a row of short setae along distal half of anteroventral surface, a row of short hairs along basal half and a row of setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end; mid tibia with 1 long bristle on anteroventral surface at about one-fourth the distance from the distal end, a row of short setae along posterodorsal surface and 1 long bristle on posterolateral surface at about one-third the distance from the distal end; hind femur with a pair of rows of long bristles along anterodorsal surface, few bristles along anteroventral surface at about one-third the distance from the distal end, 2 bristles on distal one-fourth of posterodorsal surface and a row of long hairs along posteroventral surface; hind tibia with a row of bristles along anterodorsal surface, 2 bristles on posterodorsal surface on basal half and numerous long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with 1 lateral marginal bristle, fourth with 1 median and 3 lateral marginal bristles, fifth with a row of 18 marginal bristles; sternites first to fourth with short hairs; fifth sternite Y-shaped with wide window and bearing long setae laterally and hairs terminally on arms; first and second genital segments brownish with long hairs but without marginal bristles; inner forceps almost straight with short subapical spines posteriorly; outer forceps elongated with short hairs on distal end; anterior paramere long, almost straight and slightly pointed at end; posterior paramere short, curved, pointed at end but without hairs; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus short, slightly curved, almost pointed at end and with one anterior membranous process; lateral plate of paraphallus short and pointed; styli of glans short with projections; ventralia long, hook-shaped and with subbasal pointed projections.

Female : Unknown.

Material examined : *Holotype* ♂, India : Tamil Nadu; Nilgiri Hills (Coonoor), 15. iv. 1920, W.S. Patton; 2 ♂♂, Aizawl; Assam Rifle area, 1, 132 m, 9. vi. 1989, B.C. Nandi; 1 ♂, Nagaland; Mokokchung, 1, 325 m, 27.x. 1989, B. C. Nandi; 1 ♂, Tripura; Vanghmun, 900 m, 20. vi. 1989, B.C. Nandi; 1 ♂, Tripura; Kanchanpur, 21. vi. 1989, B.C. Nandi.

Discussion on species : This species has peculiar beak-shaped and well developed ventralia, well developed transparent membranous portion anterior to apical plate of paraphallus and numerous spines on lateral sides of fifth sternite, which has a wide window. Sugiyama *et al.* (1987) synonymized this species with *S. pilipleuris* Salem, 1946.

Biology : This species is not so abundant which was collected from bushes near carcasses. It has been bred from a dead rabbit.

Distribution : India ; Mz (Aizawl), N (Mokokchung), T (Kanchanpur, Vanghmun), TN (Coonoor); Ne (several localities); Indonesia; Malaysia; Philippines; Singapore; South China; Taiwan and Vietnam.

Type deposited : *Holotype* ♂ , BMNH, studied.

Discussion on type : The author studied the type material and found that the type is in good condition. The genitalia parts were dissected out and mounted on separate slide.

Genus 30. *Parasarcophaga* Johnston and Tiegs, 1921

1921. *Parasarcophaga* Johnston and Tiegs, *Proc. R. Soc. Qd.*, **33**(4) : 86.

Type species : *Sarcophaga omega* Johnston and Tiegs, 1921 (= *Sarcophaga sericea* Walker, 1852).

1928. *Ptilocnema* Enderlein, *Arch. klassif. phylogen. Ent.*, **1**(1) : 43.

Type species : *Ptilocnema miniaticauda* Enderlein, 1928 (= *Sarcophaga hirtipes* Wiedemann, 1830).

1967. *Horia* Kano, Field and Shinonaga, *Fauna Japonica*, Sarcophagidae : 28.

Type species : *Sarcophaga oitana* Hori, 1955 (a junior homonym of *Horia* Fabricius, 1787).

1967. *Horisarcophaga* Kano and Shinonaga, *Jap. J. sanit. Zool.*, **18**(4) : 240.

Type species : *Sarcophaga oitana* Hori, 1955.

1977. *Belgiella* Lehrer, *Bull. Anns Soc. r. ent. Belg.*, **113** : 52.

Type species : *Parasarcophaga longchampsii* Lehrer, 1977 (= *Sarcophaga cultellata* Pandellé, 1896).

1979. *Varirosellea* Hsue, *Acta ent. sin.*, **22**(2) : 192.

Type species : *Sarcophaga uliginosa* Kramer, 1908.

Morphology : Third antennal segment two to three times that of the second; acrostichal bristles 0+1 (rarely preacrostichal bristles present); postsutural dorsocentral bristles 4 or 5, only posterior 2 stout; R₁ bare; first genital segment of male usually without marginal bristles; third abdominal tergite normally without long bristles; anal tergite sometimes red; paraphallus comparatively short and heavily sclerotised; apical plate of paraphallus well developed, with long lateral process and always shorter than remainder of paraphallus, if almost same size, the lateral processes are long and lamellate; styli of glans curved, stout, slender and never closely adjacent to apical plate; basal part of styli of glans coiled; lateral plate of paraphallus well developed, single but without process; ventralia always present with 2 pairs of lobes.

Discussion : This genus is a much diversified and richly developed group in the Oriental and Palaearctic regions. Rohdendorf (1937) defined the concept of this genus

in a broader sense and divided it into several subgenera. He revised these subgenera from USSR in 1937 and described many new species. Kano *et al.* (1967) reviewed this genus from Japan and reported a fairly large number of species. Lopes *et al.* (1977) divided the Oriental species of this genus into seven subgenera and all the subgenera except *Phallantisca* Rohdendorf, 1965 are present in the region under study. One subgenus *Baranovisca* Lopes is also added here. Verves (1986) reorted 15 subgenera from the Palaearctic region with numerous species. Dear (1980) placed all the species of Afrotropical *Parasarcophaga* under the genus *Sarcophaga*. Povolny' (1987) reviewed the genitalia structure of this group.

Biology : Most of the members of the genus breed in dead bodies of different animals. Larvae of a few species are internal parasites of living caterpillars of moths and also have the record of being causative agents of intestinal myiasis (Kano *et al.* 1967). Pape (1987b) recorded the larvae of a few species as parasites or predators of lepidopterous pupae : *Aporia sp.*, *Dendrolimus sp.* and *Lymantria sp.* and beetle larvae : *Oryctes*, *Melolontha*, *Polyphylla* and *Saperda*. The larvae breed in privies, garbages, animal carcasses and dead fish and birds. Larvae of a few species have been described by Kano, Sato and Tange (1951), Ishijima (1967) and Nandi (1982) from the Oriental region.

Distribution : The genus is almost cosmopolitan in distribution.

Key to subgenera

1. Presutural acrostichal bristles well differentiated; arista short; lateral plate of paraphallus short; apical plate of paraphallus with apical membranous lobes ..
.....*Baranovisca* Lopes
- Presutural acrostichal bristles not well differentiated; arista long; lateral plate of paraphallus long; apical plate of paraphallus without apical membranous lobes
.....2
2. Apical plate of paraphallus with clearly separate median portion and a pair of lateral process.....*Thomsonia* Rohdendorf
- Apical plate of paraphallus with almost no median section and without a pair of lateral process3
3. Lateral plate of paraphallus in the form of lamellate hook-shaped process4
- Lateral plate of paraphallus in the form of an unpaired pedunculate process
.....*Parasarcophaga* Johnston and Tiegs
4. Lateral plate of paraphallus rudimentary; posterior part of penis membranous owing to division along median line of basal part of paraphallus; lateral processes of apical part of paraphallus with sharp teeth extending forward
.....*Liopygia* Enderlein

- Lateral plate of paraphallus well developed; posterior part of penis invariably sclerotised; lateral processes of apical part of paraphallus without teeth extending forward5
5. Lateral plate of paraphallus in the form of narrow stout process extending forward; apical part plate-like, narrow in profile and extending forward
..... *Curraea* Rohdendorf
- Lateral plate of paraphallus lamellate or slender and sharp, not erect and not stout; apical part extending distad, not pointed and extending forward.....6
6. Lateral plate of paraphallus with two pairs of slender, sharp membranous processes; basal part of paraphallus long and slender; anal tergite black.....
.....*Pandelleisca* Rohdendorf
- Lateral plate of paraphallus with a single pair of lamellate processes; basal part of paraphallus only moderately elongate; anal tegite sometimes red
.....*Liosarcophaga* Enderlein

Subgenus *Baranovisca* Lopes, 1985

1985. *Baranovisca* Lopes, *Austr. Ent. Mag.*, **12** : 51 (as distinct genus).

Type species : *Baranovisca arachnivora* Lopes, 1985.

1989. *Baranovisca* : Verves, *Mems Inst. Oswaldo Cruz.*, **84** (4) : 540 (as subgenus of *Parasarcophaga*).

Morphology : Presutural dorsocentral and presutural acrostichal bristles differentiated; presence of 4 long postsutural dorsocentral bristles; arista short and plumose; vibrissae near oral margin are not approximated; episternum bare; R_{4+5} with setae; anal tergite black to brown; first genital segment without marginal bristles; second abdominal sternite with long and third and fourth with short hairs; fifth sternite with few bristles laterally; inner forceps more or less parallel; theca well sclerotised and longer than paraphallus; styli of glans slender; ventralia well developed and sclerotised; apical plate of paraphallus with membranous lobes.

This is a very small subgenus and only 4 species have been reported from the Australasian and Oceanian regions. Only 1 species has been reported from the Oriental region.

The species of this subgenus have mostly been reported from egg sacs or eggs of spiders or from spider egg cases.

This subgenus is distributed in the Oriental and Australasian and Oceanian regions.

66. *Parasarcophaga (Baranovisca) cantrelli* Verves

(Figs. 442-443)

1991. *Parasarcophaga (Baranovisca) cantrelli* Verves, *Proc. Zool. Inst., USSR*, **240** : 133.

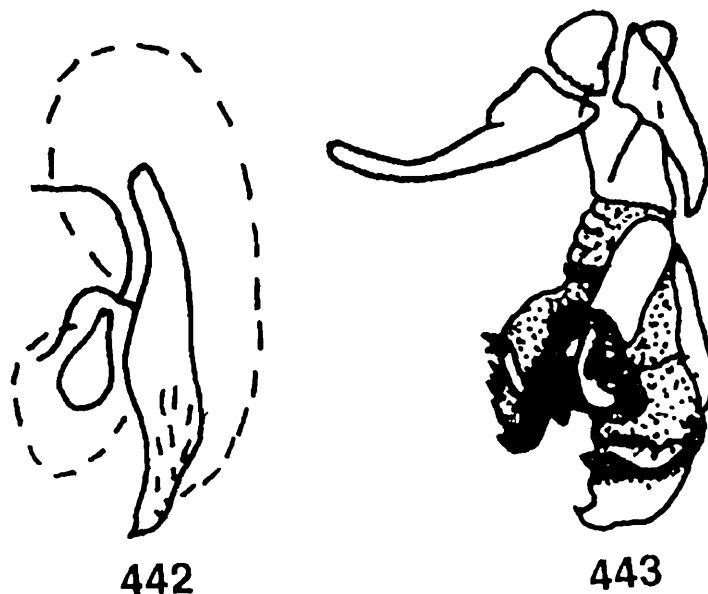
Male : Body length 11 mm.

Head : Width of frons at narrowest point of front 0.17, at ocellar region 0.23 and at face level with base of antennae 0.38 that of head width; frontal vitta at the middle of frons twice that of one eye width; third segment of antennae 2-3 times that of the second; arista short and plumose; parafacial width at base of antennae 0.14 and above of gena 0.19 that of one eye width; outer vertical bristle ill-developed; ocellar bristle strong; frontal bristles 12-13, strong and crossed; parafacial with a row of bristles; gena and post gena with short black hairs, the latter with grey coating; a row of regular postocular setae besides postocular cilia, rest of the area with hairs; numerous short setae along above the vibrissal bristles which extend up to one-third of its length; antennae long and widened a little at the end; frontal vitta and antennae black; parafrontal, parafacial and anterior part of gena with bright silvery coating and yellowish shade.

Thorax : Bright silvery white coating with three black longitudinal stripes; *ac* 4-5+1; *dc* 4+4; *ia* 1+3; *h* 5-6; *ph* 2; *np* 2 long and 2 short; *sa* 3; *pa* 2; propleura bare; pro- and mesothoracic spiracles black; scutellum with 2-3 pairs of apicoscutellar and a pair of discoscutellar bristles.

Wings : Transparent; R_1 bare; R_{4+5} with a row of short setae along basal three-fifths of its anterior margin; bending of *m* rectangular but without process; t_p s-shaped and curved; fifth costal segment one to three times that of the second; squama white.

Legs : Black; mid and hind femurs with long hairs at basal end; hind tibia with short hairs at basal end; comb-like setae on mid femur not prominent.



Figs. 442-443 : *Parasarcophaga (Baranovisca) cantrelli* Verves. 442, Inner and outer forceps (lateral view); 443, Penis (lateral view); (after Verves, 1991).

Abdomen : Grey with silvery-grey coating; third abdominal tergite without median marginal bristles; fourth sternite with short hairs; genital segments black.

Female : Unknown.

Material examined : No material was available for the present study and the description is based on the original description.

Discussion on species : Verves (1991) did not indicate any relationship of this species with other species of the group. This species is almost similar to *Sarcophaga pusana* (Senior-White, 1924) externally as well as by the structures of ventralia, inner forceps and anterior parameres but differs from it by the structures of apical plate of paraphallus and posterior parameres. I have not seen the type specimen and nothing can be said regarding its generic status.

Biology : Reared from the eggs of *Argiope pulchella* (Aranei).

Distribution : India ; TN (Pami).

Type deposited : Holotype ♂, BMNH, not examined.

Subgenus *Liopygia* Enderlein, 1928

1928. *Liopygia* Enderlein, *Arch. klassif. phylogen. Ent.*, 1(1) : 41 (as distinct genus).

Type species : *Musca ruficornis* Fabricius, 1794.

1937. *Jantia* Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 451 (as subgenus of *Parasarcophaga*).

Type species : *Parasarcophaga securifera* Villeneuve, 1908 (= *Sarcophaga crassipalpis* Macquart, 1839).

1963. *Sclerophalla* Rohdendorf, *Stuttg. Beitr. Naturk.*, 124 : 9.

Type species : *Sarcophaga santosdiasi* Zumpt, 1951.

Morphology : Propleurra bare or setose; lateral plate of paraphallus in the form of hook-shaped slender paired processes and relatively short; ventralia short and its proximal end knob-like; styli of glans not stout; apical plate of paraphallus well developed and in most cases terminating in a pair of lateral processes, posterior end of paraphallus membranous; inner forceps without spines.

Liopygia was described by Enderlein as a distinct genus. Lopes *et al.* (1977) placed this as subgenus under the genus *Parasarcophaga* and this concept was also accepted by Verves (1986). Later on, Verves (1989) and Lopes (1989) gave it full generic status. Dear (1980) reported 13 species from the Ethiopian region under this subgenus and placed it under the genus *Sarcophaga*. Only 1 species available in each of the Oriental and Palaearctic regions.

Larval development of a species has been studied by Nandi (1980) and Das and Dasgupta (1986). Larvae of a few members of this subgenus cause intestinal and dermal myiasis in man and different animals. The larvae breed in different dead bodies.

This subgenus is distributed in the Oriental, Palaearctic and Afrotropical regions.

67. *Parasarcophaga (Liopygia) ruficornis* (Fabricius)

(Figs. 444-450)

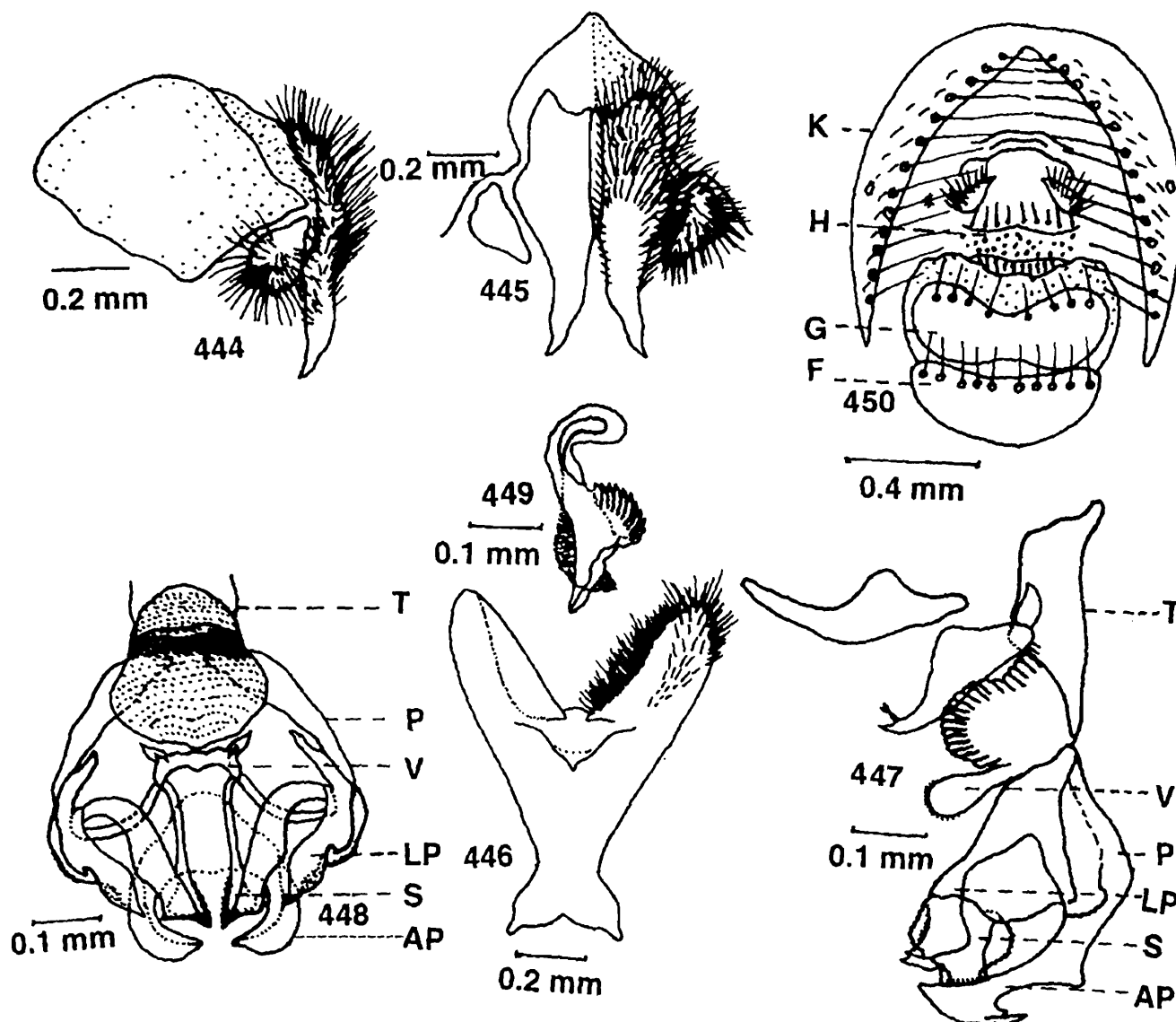
1794. *Musca ruficornis* Fabricius, *Ent. Syst.*, 4 : 314.
1851. *Sarcophaga ruficornis* : Macquart, *Mém. Soc. Sci. Agric. Lille*, : 206 (preoccupied, Fabricius, 1794).
1928. *Liopygia ruficornis* : Enderlein, *Arch. klassif. phylogen. Ent.*, 1(1) : 41.
1928. *Liopygia friederichsiana* Enderlein, *Arch. klassif. phylogen. Ent.*, 1(1) : 42.
1830. *Sarcophaga ruficornis* : Wiedemann, *Aussereurop. zweifl. Insekt.*, 2 : 361; Kano and Shinonaga, 1994, *Jap. J. sanit. zool.*, 45 : 261.
1943. *Sarcophaga (Parasarcophaga) ruficornis* : Hardy, *Proc. Linn. Soc. N.S.W.*, 68 : 29.
1945. *Parasarcophaga ruficornis* : Lopes, *Revta bras. Biol.*, 5(3) : 401; Kano, Field and Shinonaga, 1967, *Fauna Japonica, Sarcophagidae* : 74.
1950. *Sarcophaga muspratti* Zumpt, *Proc. R. ent. Soc. Lond.*, (B) 19 : 185.
1958. *Parasarcophaga (Jantia) ruficornis* : Lopes, *Ins. Micro.*, 13(2) : 48.
1963. *Parasarcophaga (Liopygia) ruficornis* : Rohdendorf, *Stuttg. Beitr. Naturk.*, 124 : 9; Nandi, 1992, *J. Beng. nat. His. Soc.*, 11(2) : 36.

Male : Body length 7–13 mm.

Head : Width of frons about two-fifths that of one eye; frontal vitta black, slightly diverging below and its width at narrowest point of frons more than twice that of each parafrontal; parafrontal and parafacial black with golden pollen, the former with short scattered hairs, the latter with a row of 7-8 long black hairs near the eye margin; antennae orange and reaching up to about 0.8 distance to vibrissae, first and second segments black, third orange with golden pollen and about two and half times that of the second; arista long, plumose along basal half; facial ridge light brown and bare; vibrissae long, crossed, distance between vibrissae about twice that of each parafacial width; frontal bristles 12, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena black with silvery pollen and yellowish hairs; post gena black with greyish hairs; ocellar triangle black with black hairs; outer vertical bristle short, inner vertical well developed, post vertical two-thirds the inner vertical; ocellar bristles short, postocellar less than inner vertical; a pair of rows of postocular setae of which the first row regular and second row irregular, rest of the area with black hairs; palpi slender; proboscis short and brownish-black.

Thorax : Black, silvery pollen and with three black longitudinal stripes; *ac* 0+1; *dc* 6+4-5 (posterior 2 *dc* well developed); *ia* 1+3; *ps* 1; *h* 3; *ph* 2; *np* 3; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 4; *hpl* 9; upper part of propleura bare, black and with white pollen; prostigmatic and propleural bristles well developed and accompanied with short black hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles short, 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 10 short setae located dorsally and extending up to more than half from the basal node to r-m and 4-5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment about half that of the third, the former with short spines along basal half of its anterior margin; costal spines not stout; epaulet black with 2 long and many short black hairs; basicostal scale light brown; squama whitish; halter brown.



Figs. 444-450 : *Parasarcophaga (Liopygia) ruficornis* (Fabricius). 444, Inner and outer forceps (lateral view); 445, Inner and outer forceps (posterior view); 446, Fifth sternite; 447, Penis (lateral view); 448, Penis (ventral view); 449, Styli of glans (lateral view); 450, Genitalia ♀ (ventral view).

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with 2-3 bristles along basal half of anterodorsal surface and 1 bristle on posterolateral surface

at about one-third the distance from the distal end; mid femur with a row of 3 bristles along middle portion of anterolateral surface, 1 bristle on posterodorsal and 2 bristles on posterolateral surfaces on distal end, a row of long bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of several bristles along basal half and a row of short setae along distal half of posteroventral surface; mid tibia with 1 bristle on anterodorsal surface at about one-third the distance from the distal end, a row of bristles along posterodorsal surface and 1 bristle each on posterolateral and posteroventral surfaces at about one-fourth the distance from the distal end; hind femur with a pair of rows of bristles along anterodorsal surface, 1 bristle each on distal part of posterodorsal and posterolateral surfaces and a row of bristles along posteroventral surface; hind tibia with a row of 3 long bristles along anterodorsal surface, 1-2 bristles along anteroventral surface at about one-fourth the distance from the distal end, 2 bristles on posterodorsal surface and with tuft of short hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with a pair of well developed lateral marginal bristles, fourth with a pair of median and 3 pairs of lateral marginal bristles, fifth with a row of 20 marginal bristles; sternites first to fourth with black hairs but without any differentiated bristles; fifth sternite v-shaped with wide window and spines laterally and long hairs terminally on arms; first genital segment blackish with 3 pairs of marginal bristles, second with black hairs but without any marginal bristles; penis with membranous bulbous portion in between theca and paraphallus; inner forceps densely covered with long hairs and ending in an acute point at the end; outer forceps somewhat oval; anterior paramere bent, pointed at end and with short hairs along posterior margin; posterior paramere curved, pointed at end and with 1 short hair; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus not sclerotised but composed of two plates, one of which with a backwardly projecting spines; lateral plate of paraphallus small and serrated anteriorly; styli of glans well developed, divided into a pointed membranous portion and another having a rosette-like structure; ventralia bulbous, much sclerotised at end and with a long stalk and a subbasal spinous portion.

Female : Body length 8-12 mm.

Head : Width of frons nearly equal to that of one eye; frontal bristles 8-9; fronto-orbital bristles 2 and proclinate; outer vertical bristle moderately developed and about three-fifths that of inner vertical.

Thorax : Same as that in male.

Legs : Chaetotaxy same as in male but differs for the followings : mid tibia with 3 bristles medially along anterodorsal surface, 2 bristles on anteroventral surface

along basal half; hind femur with a row of bristles along anterodorsal surface; hind tibia with tuft of hairs along anterior and posterior margins of ventral surface.

Abdomen : Second and third abdominal sternites each with a row of bristles, fourth and fifth each with 6 bristles, sixth with a row of about 10 bristles, seventh slightly concave with short hairs on distal end, eighth membranous but without hairs and concave on distal end; seventh tergite entire with stout marginal bristles and hairs.

Material examined : India : Several male specimens from different localities of Andhra Pradesh, Assam, Bihar, Goa, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Nagaland, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal and the union territories of Andaman and Nicobar Islands, Dadra and Nagar Haveli, Delhi, Lakshadweep and Pondicherry collected by B. C. Nandi.

Discussion on species : This species is characterised by having bulbous ventralia, elongated apical plate of paraphallus with backwardly projecting spines and a peculiar type of styli of glans.

Biology : This species is abundantly available which was collected from bushes nearby dead bodies and human excrement. It is generally attracted to dead bodies of different animals. It has been bred in garbages, privies, dead grasshoppers, snakes, rabbits, squirrels, *Calotes* sp. (Reptilia), rats and meat. The larvae of this species can be reared on *Achatina fulica* (Gastropoda) and the larvae cause intestinal myiasis in man and occasionally dermal myiasis in domesticated animals like dogs and poultry. Zumpt (1965) reported it as a facultative myiasis producer and Roy and Dasgupta (1977) recorded it as a parasite of *Bufo melanostictus* (Amphibia). Sinton (1921) and Lopes (1945) presented a short description of the larvae and later on, Hall and Bohart (1948), Lopes (1958) and Nandi (1980) described in detailed the different larval stages. Das and Dasgupta (1986) reported a short account of the life history of this species. Nandi (1992) reared it on a dead *Calotes versicolor* from India and Amoudi *et al.* (1992) recorded its developmental accounts under laboratory conditions from Soudi Arabia.

Distribution : India ; Several localities of AnP, A, B, D, G, Gu, H, HP, Kt, K, Me, MP, Mz, Mr, MnP, N, O, P, R, TN, UP, WB, AN, DN, Po, and Ld; BD (Sylhet); Bh (Wangdiphodrong); Ne (several localities); Pa (several localities); SL (Matale, Ratmalana); Borneo; Botswana; Brazil; Canada; Guam; Hainan Island; Hawaiian Islands; Japan (including Ryukyu Islands); Korea; Madagascar; Malaysia; Mariana Islands; Moluccas Islands; Myanmar; Nigeria; Panama; Papua New Guinea; Philippines; Saudi Arabia; Singapore; Socotra Island; South Africa; Taiwan; Thailand; Uganda; USA; Western Samoa and Zaire.

Type deposited : *Lectotype* ♀, ZMUC, not examined.

Discussion on type : Pape (1986a) designated one as *Lectotype* present in ZMUC which is in good condition.

Subgenus *Liosarcophaga* Enderlein, 1928

1928. *Liosarcophaga* Enderlein, *Arch. klassif. phylogen. Ent.*, 1(1) : 18 (as distinct genus).

Type species : *Cynomyia madejrensis* Schiner, 1868.

Morphology : Apical plate of paraphallus somewhat sclerotised with a pair of long processes usually bifurcated at end and with short median posterior basal process; lateral plate of paraphallus with 1 or 2 lamella-like hook-shaped or narrow slender flat processes; styli of glans long and thin but rarely thick; genital segment without bristles; anal tergite sometimes red; gena moderately wide.

This is rather large subgenus, richly represented in the Palaearctic region in comparison to other regions and it is now the largest subgenus of the genus *Parasarcophaga*. Rohdendorf (1937) revised this subgenus from USSR and described some new species. Zumpt (1972) synonymized this with *Thyrsocnema* Enderlein 1928, *Kramerella* Enderlein, 1928, *Engelisca* Rohdendorf, 1937 and *Parathalattisca* Rohdendorf, 1963. Lopes (1989) treated it as separate genus and listed 6 species from the Australasian and Oceanian regions. Lopes *et al.* (1977) reported quite a large number of species from the Oriental region and 11 species are reported here.

The larvae of the species of this subgenus breed in a variety of dead bodies such as fish, birds and mammals and also in dead grasshoppers and caterpillars of moths. Some larvae cause intestinal and dermal myiasis in man including wild as well as domesticated animals. Some members are also predators of different insects. Adults are associated with different microorganisms (Greenberg, 1971) and cause health hazards to human beings.

This subgenus is mostly distributed in the Oriental, Palaearctic, Afrotropical and Australasian and Oceanian regions.

Key to male species

1. Lateral process of apical plate of paraphallus long and slender; inner forceps gradually tapering and pointed at end2
Lateral process of apical plate of paraphallus short and oval; inner forceps wide medially and pointed at end*saputaraensis* Nandi
2. Lateral process of apical plate of paraphallus bifurcated.....3
Lateral process of apical plate of paraphallus not bifurcated.....
.....*amplicercus* Shinonaga and Tumrasvin

3. Lateral process of apical plate of paraphallus is apically divided into two equal halves8
 Lateral process of apical plate of paraphallus is apically divided into two unequal halves4
4. Ventralia strongly curved; lateral plate of paraphallus wide and blunt at end*sarupi* Nandi
 Ventralia almost straight; lateral plate of paraphallus narrow and pointed at end5
5. Ventralia elongated and bilobed6
 Ventralia not elongated and single7
6. Posterior paramere and lateral plate of paraphallus blunt at end*idmais* (Séguy)
 Posterior paramere and lateral plate of paraphallus pointed at end*jaipurensis* Nandi
7. Posterior paramere widened at subterminal end; ventralia and lateral plate of paraphallus almost uniform throughout and elongated.....*harpax* (Pandellé)
 Posterior paramere widened medially; ventralia and lateral plate of paraphallus widened medially and abruptly pointed.....10
8. Anterior paramere broad, abruptly pointed and curved at apex; lateral plate of paraphallus long9
 Anterior paramere slender, gradually pointed and almost straight at apex; lateral plate of paraphallus short*brevicornis* (Ho)
9. Ventralia short, wide and equal to lateral plate of paraphallus11
 Ventralia very elongated and shorter than lateral plate of paraphallus.....*portschinskyi* Rohdendorf
10. Anterior paramere wide at middle and curved apically*josephi* n.sp.
 Anterior paramere uniform and straight.....*dux* (Thomson)
11. Inner forceps slightly s-shaped, curved and sharply protruded; process of apical plate of paraphallus blunt at end*tuberosa* (Pandellé)
 Inner forceps straight and slightly widened at subterminal end; process of apical plate of paraphallus pointed at end*aegyptica* (Salem)

68. *Parasarcophaga (Liosarcophaga) saputaraensis* Nandi

(Figs. 451-455)

1992. *Parasarcophaga (Liosarcophaga) saputaraensis* Nandi, *Proc. Zool. Soc., Calcutta*, **45** (2) : 189.

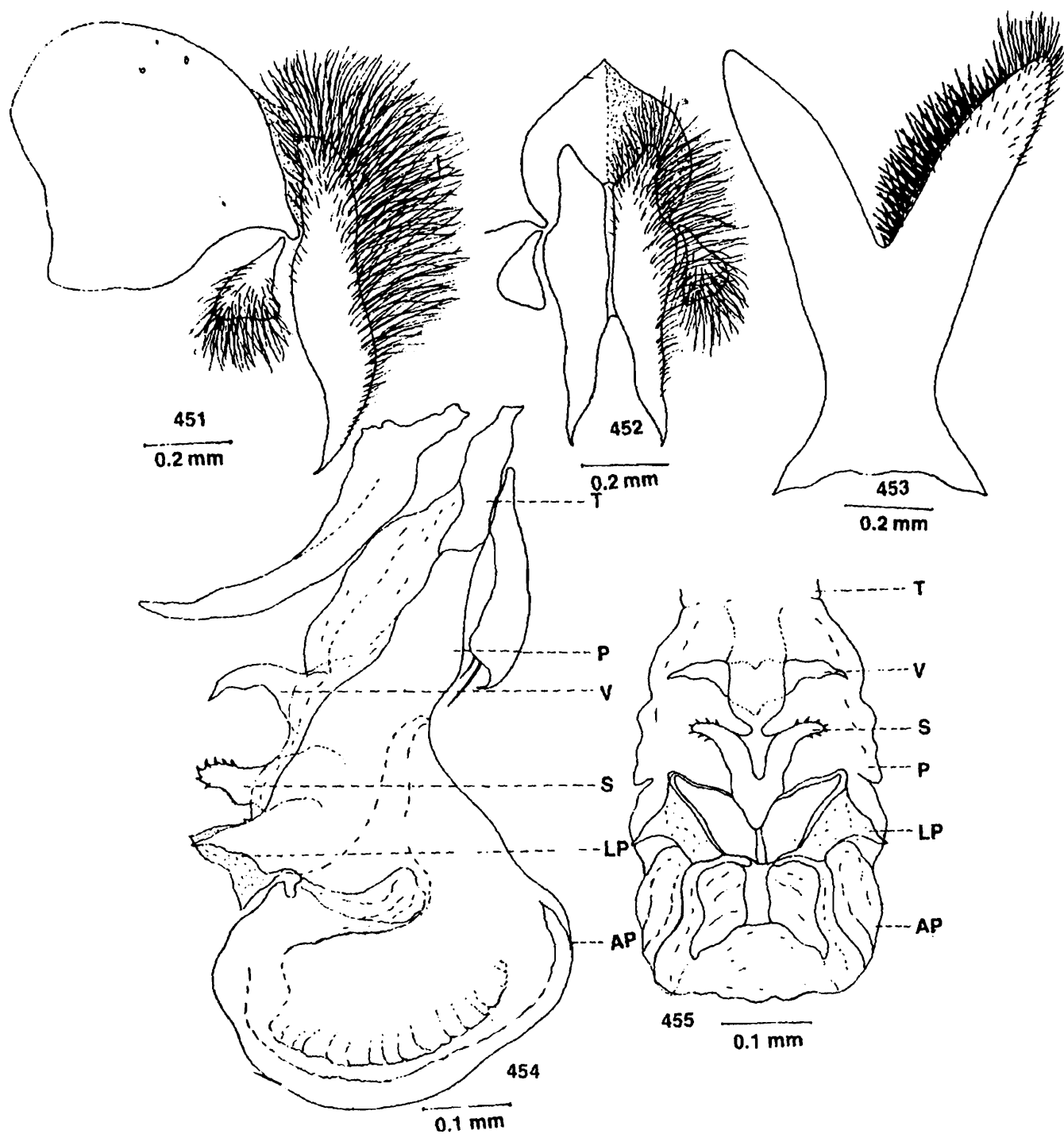
Male : Body length 10–11 mm.

Head : Width of frons about less than that of one eye; frontal vitta greyish-black with silvery pollen, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial blackish with golden pollen, the former with short scattered hairs, the latter with a row of 8-9 short hairs near the eye margin; antennae blackish-brown and reaching up to about 0.85 distance to vibrissae, first and second segments blackish with short hairs, third brownish, silvery pollen and about three times that of the second; arista long, plumose along basal three-fifths; vibrissae long, distance between vibrissae about one parafacial width; facial ridge brownish with golden pollen and bearing short hairs; frontal bristles 10, posterior 4 reclinate, anterior 2 below base of antennae and reaching up to about less than half of second antennal segment, rest cruciate and directed forwards; gena blackish; post gena black, silvery pollen and with short hairs; outer vertical bristle not differentiated, inner vertical well developed, post vertical equal to the inner vertical; ocellar bristles short, post ocellar equal to the post vertical; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with blackish hairs; palpi blackish, long and slender; proboscis black.

Thorax : Greyish-black with three black longitudinal stripes; *ac* 0+1; *dc* 5+5; *ia* 0+3; *ps* 3; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 5; *hpl* 9; upper part of propleura bare with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brownish; apicoscutellar, discoscutellar and lateroscutellar bristles 1 pair each.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 8-9 short setae located dorsally and extending up to four-fifths from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment greater than the third, the former with short spines along basal half of its anterior margin; costal spines short; basicostal scale light brown; epaulet creamy white; squama whitish; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface, fore tibia with a row of 3 long bristles along basal one-third of anterodorsal surface and 1 bristle on posterolateral surface at about one-third the distance from the distal end; mid femur with a row of 3-4 bristles along middle portion of anterolateral surface, a row of bristles along basal two-thirds and a row of comb-like setae along distal one-third of anteroventral surface, a row of long bristles along basal three-fourths and a row of long setae along distal one-fourth of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end; mid tibia with 1 bristle each on anterolateral surface at about one-third and two-thirds the distances from the basal end, 2 bristles on posterolateral surface at about one-third the distance from the basal end and 1 bristle on posteroventral surface at about two-



Figs. 451-455 : *Parasarcophaga (Liosarcophaga) saputaraensis* Nandi. 451, Inner and outer forceps (lateral view); 452, Inner and outer forceps (posterior view); 453, Fifth sternite; 454, Penis (lateral view); 455, Penis (ventral view).

fifths the distance from the distal end; hind femur with a pair of rows of bristles along anteroventral surface, a row of long hairs along posteroventral surface and 1 bristle on posterodorsal surface on distal end; hind tibia with a row of 4 bristles along basal half of anterolateral surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end, 1 bristle on anteroventral surface at about one-fourth the distance from the distal end but without tuft of long hairs along ventral surface.

Abdomen : Black with silvery checked pattern; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 1 lateral marginal bristles, fourth with a pair of median and 2 lateral marginal bristles, fifth with a row of 16 marginal bristles; sternites first to fourth with short hairs; fifth sternite Y-shaped, without window but with strong spines laterally and long hairs terminally on arms; first and second genital segments blackish-brown but without marginal bristles; inner forceps broad medially, curved, pointed apically and with long hairs; outer forceps almost oval with long hairs; anterior paramere longer and slightly curved at end; posterior paramere short, wide at end, abruptly curved, pointed apically and with 2 hairs at the groove; theca very short and shorter than paraphallus, both are sclerotised; apical plate of paraphallus wide, membranous and oval at end; lateral plate of paraphallus wide and membranous apically; styli of glans broad, sclerotised with spines apically; ventralia elongated, curved posteriorly and pointed at end.

Female : Unknown.

Material examined : *Holotype* ♂, India : Gujarat; Saputara, 875 m, 18. x. 1990, B. C. Nandi; *Paratype* ♂, same data as *Holotype*.

Discussion on species : This species is somewhat similar to *P. (Liosarcophaga) semenovi* Rohdendorf, 1925, but differs from it by the structures of apical and lateral plates of paraphallus. Moreover, the structures of styli of glans and ventralia in this species are quite distinguishable from *semenovi* as well as also from other species of this subgenus.

Biology : This is a rare species which was collected from bushes.

Distribution : India ; Gu (Saputara).

Type deposited : *Holotype* ♂, ZSIC, examined.

**69. *Parasarcophaga (Liosarcophaga) amplicercus* Shinonaga and Tumrasvin
(Fig. 456)**

1979. *Parasarcophaga amplicercus* Shinonaga and Tumrasvin, *Jap. J. sanit. Zool.*, 30(2) : 143.
1996, *Parasarcophaga (Liosarcophaga) amplicercus* : Nandi, n. comb.

Male : Body length 13–14 mm.

Head : Frons at vertex about 0.22 of head width; frontal vitta black; parafrontal and parafacial with silvery to golden pollen; antennae dark brown, length of third segment about 2.5 times that of the second, arista long plumose along the basal two-thirds; gena covered with silvery pollen and with white hairs; gena about one-fourth the height of an eye; frontal bristles 9-11 pairs, lower 1 pair divergent; outer vertical bristles undeveloped ; a row of black postocular setae; palpi light brown (if orange-brown, they are bright orange apically); metacephalon with white hairs.

Thorax : Pale ashy-grey with three black longitudinal stripes; *ac* 0+1; *dc* 5(-6) + 5(-7); *ia* 1+3 (-4); *ps* 1; *h* 4; *ph* 2; *np* 4(-6); *pa* 2; *sa* 4(-5); *st* 1+1+1; *scut* 4+1; propleura bare; prosternum hairy posteriorly.

Wings : Hyaline; veins yellowish-brown; R_1 bare; R_{4+5} with a row of 8-9 bristles located dorsally and extending more than half way from the basal node to r-m and 4+5 bristles along ventral surface of basal node; length of section third about 2 times that of section fifth; section fifth of costa with short spines along basal one-third of its anterior margin; basicostal scale yellowish-white; epaulet dark brown; squama creamy white; halter brown.

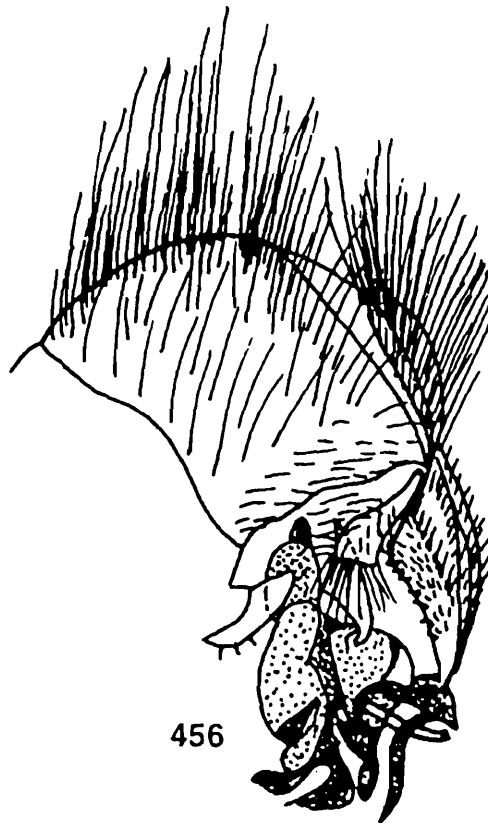


Fig. 456 : *Parasarcophaga (Liosarcophaga) amplicercus* Shinonaga and Tumrasvin. 456, Penis with inner and outer forceps (lateral view, after Shinonaga and Tumrasvin, 1979).

Legs : Black; fore femur with 2 rows of long *pd* and 1 row of long *pv* ; fore tibia with 3 *ad*, 1 *pv* and a row of short and inconspicuous *pd*; mid femur with a row of 3-5 *al*, a row of *av*, a row of comb-like *pv*, short fringe on basal half of *av* and *pv* surfaces, 2 long *pd* and *pl*; mid tibia with 1 long and 1 short *ad*, a row of conspicuous *pd* and 1 *pl*; hind femur with 2 rows of long *ad*, a row of long *v*, some long *pv*, 1 *pd* and 1 *pl*; hind tibia with a row of conspicuous *ad*, 2 long *pd*, 1 long and a row of hair-like *av* and fringe on the apical two-thirds of posterior margin of ventral surface.

Abdomen : Same colour as thorax and checkered pattern; 3rd tergite without median marginal bristle but well developed on 4th and 5th tergites; 5th sternite with strong spines on inner margin; 1st genital tergite light brown with greyish pollen posteriorly; 2nd genital tergite dark brown with greyish pollen posteriorly; inner forceps expanded posteriorly, hook-liked at apex and with some short spines along the anterior part; theca short; ventralia two-lobed and sclerotised, the lowest one serrated; apical plate of paraphallus big and well differentiated, its lateral processes very long and slender.

Female : Unknown.

Material examined : No material was available for the present study and the description provided here is based on Shinonaga and Tumrasvin (1979).

Discussion on species : Shinonaga and Tumrasvin (1979) reported the relationship of this species with *P. angarosinica* (Rohdendorf, 1937) but distinguished from it by having white hairs on gena, only one row of black postocular setae and sclerotised ventralia. This species is also differentiated from *P. (Liosarcophaga) sarupi* Nandi, 1979 by having spined inner forceps, unbranched lateral process of apical plate of paraphallus and detailed structure of ventralia.

Biology : Kaul *et al.* (1994) reported the rearing of this species after collecting with bait trap method. They also studied the *isoenzyme* pattern of the species from India.

Distribution : India ; TN (Marudamali Forests), MP (Jabalpur), Kt (Bandipur) and Thailand.

Type deposited : *Holotype* ♂, NSMT, not studied.

70. *Parasarcophaga (Liosarcophaga) sarupi* Nandi

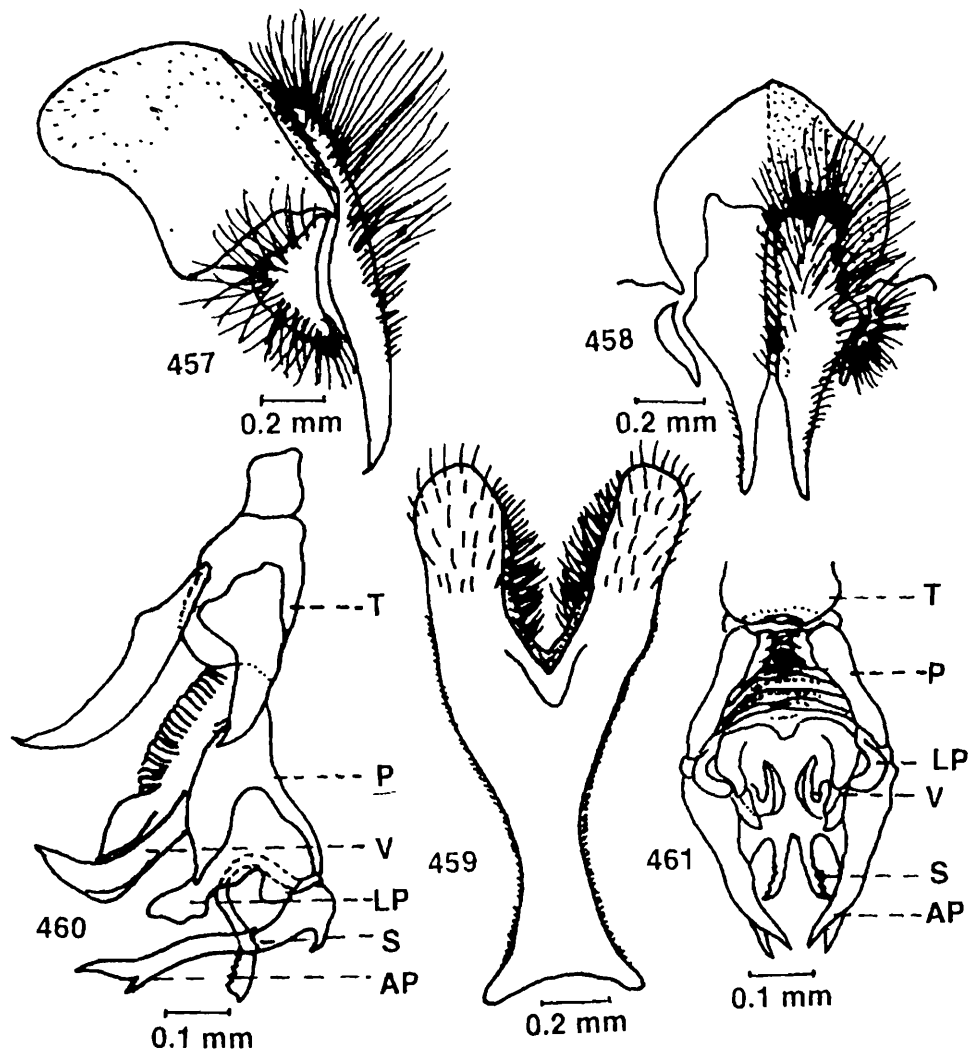
(Figs. 457-461)

1979. *Parasarcophaga (Liosarcophaga) sarupi* Nandi, *Orient. Insects*, **13** (1-2) 191; Nandi, 1992, *J. Beng. nat. Hist. Soc.*, **11** (2) : 37.

Male : Body length 12 mm.

Head : Width of frons about two-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with brown pollen, the former with short scattered hairs, the latter with a row of 9-10 black hairs near the eye margin; antennae black and reaching up

to about 0.83 distance to vibrissae, first and second segments black with short black hairs, third blackish-brown with brown pollen and about two and half times that of the second; arista long, plumose along basal two-thirds; facial ridge brownish with silvery pollen; vibrissae long, crossed, distance between vibrissae about less than twice that of one parafacial width; frontal bristles 13, posterior 2 reclinate, anterior 5 below base of antennae and reaching up to about two-thirds of the second antennal segment, rest cruciate and directed forwards; gena black, silvery pollen and with short hairs; post gena black with black and white hairs; ocellar triangle black with black hairs; outer vertical bristle short, inner vertical well developed, post vertical about one-third the inner vertical; ocellar bristles short, postocellar less than half of inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with irregular black and white hairs; palpi slender and black; proboscis black.



Figs. 457-461 : *Parasarcophaga (Liosarcophaga) sarupi* Nandi. 457, Inner and outer forceps (lateral view); 458, Inner and outer forceps (posterior view); 459, Fifth sternite; 460, Penis (lateral view); 461, Penis (ventral view).

Thorax : Black with three black longitudinal stripes; *ac* 0+5; *dc* 5+5; *ia* 1+3 ; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 4; *st* 1+1+1; *mpl* 7; *hpl* 7-9; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro-and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of short setae located dorsally and extending up to more than half from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than one and half times that of the third, the former with short spines along basal half of its anterior margin; costal spines short; epaulet black; basicostal scale yellowish; squama white; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of 5 bristles along middle portion of anterolateral surface, a row of about 5 bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of hairs along basal half and a row of short setae along distal half of posteroventral surface on distal end; mid tibia with 1 bristle each on anteroventral and posterolateral surfaces at about one-third the distance from the distal end and a row of bristles along posterodorsal surface; hind femur with a pair of rows of bristles along anterodorsal surface; a row of 6 long and few short bristles along anteroventral surface, 2 bristles on distal half of posterodorsal surface and a row of hairs along posteroventral surface; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-fourth the distance from the distal end, 2 bristles on posterodorsal surface and numerous long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with 3 lateral marginal bristles, fourth with 2 median and 3 lateral marginal bristles, fifth with a row of 14 marginal bristles; sternites first to fourth with short hairs; fifth sternite Y-shaped with tuft of short spines laterally on arms; first genital segment brown but without marginal bristles, second black with long hairs; inner forceps gradually tapering, bearing notch on distal end and with hairs almost three-fourths of its basal end; outer forceps almost oval with long hairs; anterior paramere almost straight, slender and slightly pointed at end; posterior paramere curved at end and pointed apically; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus sclerotised, long, pointed at end and with long lateral processes, the end of the processes are bifurcated and one of which is longer than the other; lateral plate of paraphallus wide, blunt

at end and almost membranous; styli of glans long and pointed; ventralia membranous, strongly curved anteriorly and pointed terminally.

Female : Unknown.

Material examined : *Holotype* ♂, India : Uttar Pradesh; Nainital, 1,230 m, viii. 1937, R. Surup; 1 ♂, Uttar Pradesh; Kaushani, 1,890 m, 7.x. 1986, B. C. Nandi; 1 ♂, Mizoram; Champhai, P. W. D. Campus, 1,600 m, 13.ii. 1989, B.C. Nandi; 1 ♂, Champhai Assam Rifle Area, 1,615 m, 14. vi 1989, B. C. Nandi.

Discussion on species : This species is similar to *P. (Liosarcophaga) jaipurensis* Nandi, 1990 but differs from it by the structures of ventralia and apical and lateral plates of paraphallus.

Biology : It is relatively rare species which was collected from rock bushes.

Distribution : India : Me (Barapani), Mz (Champhai) and UP (Kaushani, Nainital).

Type deposited : *Holotype* ♂, IARI, examined.

71. *Parasarcophaga (Liosarcophaga) jaipurensis* Nandi

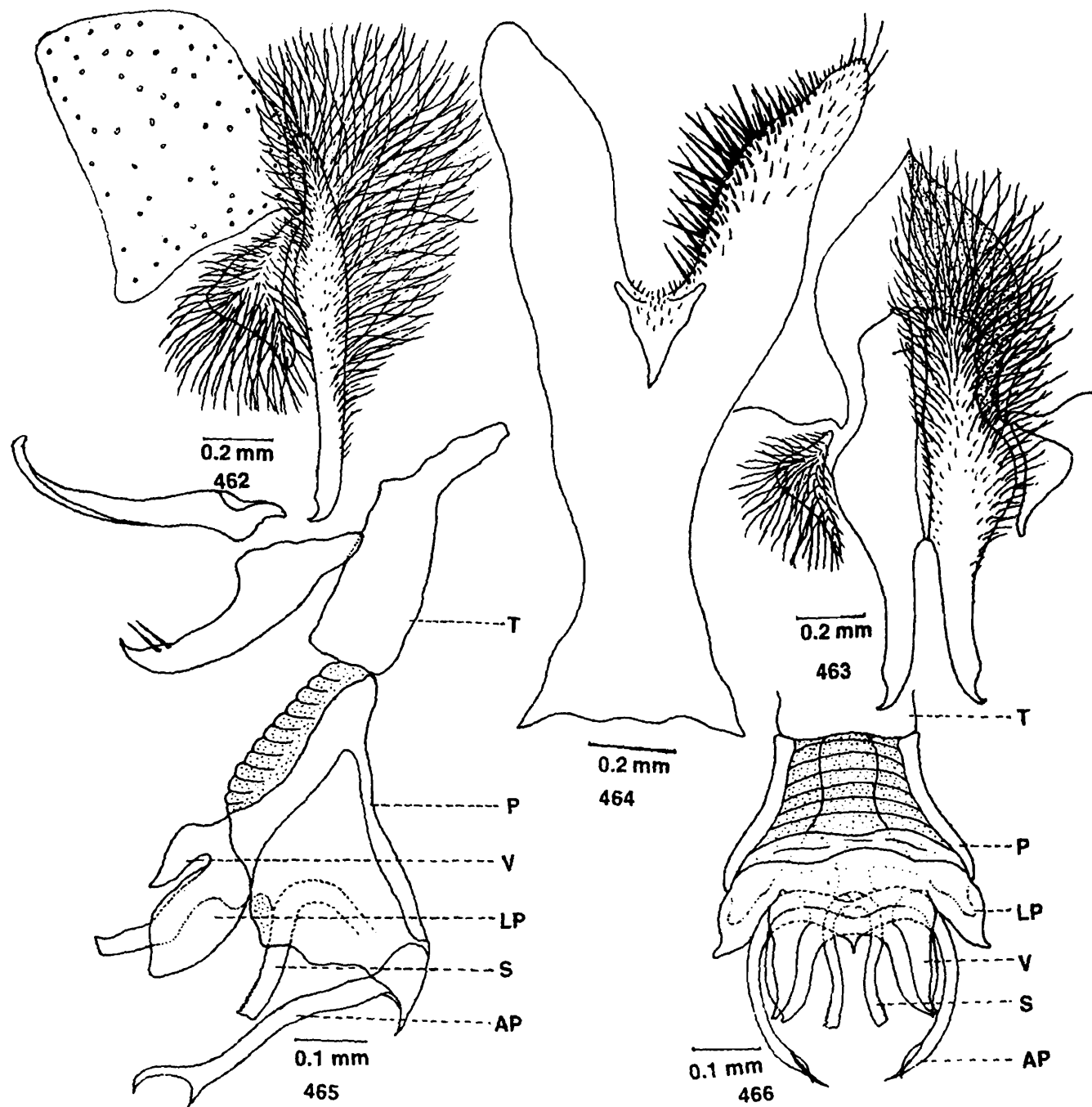
(Figs. 462-466)

1990. *Parasarcophaga (Liosarcophaga) jaipurensis* Nandi, *J. Beng. nat. Hist. Soc.*, 9(1) : 50.

Male : Body length 7–9 mm.

Head : Width of frons about half that of one eye; frontal vitta black, its width at narrowest point of frons about more than twice that of each parafrostral; parafrostral and parafacial brownish with silvery pollen, the former with short scattered hairs, the latter with a row of 6 short black hairs near the eye margin; antennae brownish and reaching up to about 0.85 distance to vibrissae, first and second segments brownish, third slightly brownish, silvery pollen and about three and half times that of the second; arista long, plumose along basal two-thirds; facial ridge brownish, silvery pollen and with short spines along lower half; vibrissae long, crossed, distance between vibrissae twice that of one parafacial width; frontal bristles 11, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena brownish, silvery pollen and with black hairs; post gena blackish with silvery pollen; ocellar triangle black with black hairs; outer vertical bristle short, inner vertical well developed, post vertical about one-third the inner vertical; ocellar bristles short, postocellar longer than ocellar and more than half of inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with irregular black hairs; palpi slender and brownish; proboscis brownish.

Thorax : Blackish with three black longitudinal stripes; *ac* 0+1; *dc* 5+5; *ia* 1+2; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 4; *st* 1+1+1; *mpl* 8; *hpl* 7; upper part of propleura brownish with silvery pollen; prostigmatic and propleural bristles well developed and



Figs. 462-466 : *Parasarcophaga (Liosarcophaga) jaipurensis* Nandi. 462, Inner and outer forceps (lateral view); 463, Inner and outer forceps (posterior view); 464, Fifth sternite; 465, Penis (lateral view); 466, Penis (ventral view).

accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown venis; R_1 bare; R_{4+5} with a row of 8-9 short setae located dorsally and extending up to two-thirds from the basal node to r-m and 5-6 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than the third, the former with short spines along basal half of its anterior margin; costal spines short; epaulet black; basicostal scale yellowish; squama white; halter brownish.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along basal one-third of anterodorsal surface; fore tibia with a row of 3 bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of 4 bristles along middle portion of anterolateral surface, a row of long hairs along basal half and a row of short setae along distal half of anteroventral surface, a row of short setae along distal half of posteroventral surface, 2 bristles on posterodorsal and 1 bristle on posterolateral surfaces on distal end; mid tibia with a row of bristles along anterodorsal surface, 1 bristle each on anteroventral and posterolateral surfaces at about one-third the distance from the distal end; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface and 2 bristles on posterodorsal surface on distal half; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end and with numerous long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 4 and third with 2 lateral marginal bristles, fourth with short median and a pair of lateral marginal bristles, fifth with a row of 14 marginal bristles; sternites first to fourth with short hairs; fifth sternite Y-shaped with window and numerous bristles and long hairs laterally on arms; first and second genital segments brown with short hairs but without marginal bristles; inner forceps almost straight with slight notch on distal end; outer forceps almost oval with long hairs apically; anterior paramere almost straight, slender and slightly curved at end; posterior paramere curved, pointed at end and with 2 short hairs at the anterior end; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus sclerotised, pointed at apex and with long subapical process, the end of the process bifurcated, upper one longer and curved than the other; lateral plate of paraphallus long, medially wide, pointed at end and membranous; styli of glans long and serrated; ventralia straight, membranous, elongated, bilobed and one of the lobe is more elongated.

Female : Unknown.

Material examined : Holotype ♂, India : Rajasthan; Nahargarh Fort area, 19. xii. 1986, B.C. Nandi; 1 ♂, Haryana; Kalka, 12. x. 1988, B.C. Nandi; 2♂♂, Himachal Pradesh; Solan, 1, 500 m, 14. x. 1988, B.C. Nandi; 1 ♂, Meghalaya; Singimari, 1,000 m, 3. xi. 1989, B.C. Nandi.

Discussion on species : This species is similar to *P. (Liosarcophaga) sarupi* Nandi, 1979 but differs from it by the structures of ventralia and lateral process of apical plate of paraphallus. Moreover, the lateral plate of paraphallus is more wider here than *sarupi*.

Biology : This is relatively rare species which was collected from bushes nearby human excrement and mostly attracted to such media.

Distribution : India ; H (Kalka), HP (Manali, Solan), MnP (Mao), Me (Singimari), N (Tuensang) and R (Nahargarh).

Type deposited : Holotype ♂, ZSIC, examined.

72. *Parasarcophaga (Liosarcophaga) idmais* (Séguy)

(Figs. 467-468)

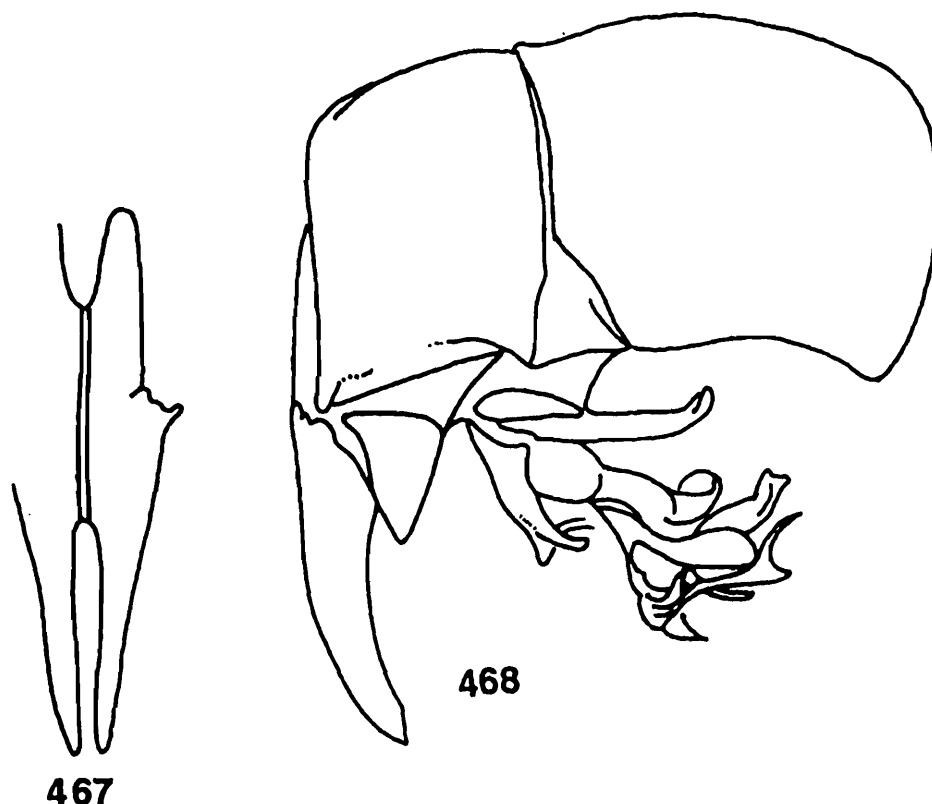
1934. *Sarcophaga idmais* Séguy, *Encycl. ent., (BII), Dipt., 7* : 24; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool., 45* : 259.

1977. *Parasarcophaga (Liosarcophaga) idmais* : Lopes, Kano and Shinonaga, *Cat. Dipt. Orient. Region, 3* : 569; Verves, 1986, *Cat. Palae. Dipt., 12* : 168.

Male : Body length 12–13 mm.

Head : Width of frons slightly less than half that of one eye; frontal vitta light black, its width at narrowest point of frons about more than that of each parafrontal; parafrontal and parafacial brownish with silvery pollen, the former with short scattered hairs, the latter with a row of 5-6 short black hairs near the eye margin; antennae blackish-brown and reaching up to about 0.85 distance to vibrissae, first and second segments black, third brown, silvery pollen and about three and half times that of the second; arista long, plumose along basal two-thirds, facial ridge brownish, silvery pollen and with short spines along lower half; vibrissae long, crossed, distance between vibrissae less than twice that of one parafacial width; frontal bristles 10, posterior 1 reclinate, anterior 2 below base of antennae and reaching up to about base of second antennal segment, rest cruciate and directed forwards; gena black, silvery pollen and with black hairs; post gena blackish with silvery pollen and black hairs; ocellar triangle black with black hairs; outer vertical bristle short, inner vertical well developed, post vertical about one-third the inner vertical; ocellar bristles short; postocellar longer than ocellar and more than half of inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with irregular black hairs; palpi slender and brownish; proboscis brownish.

Thorax : Blackish with three black longitudinal stripes; *ac* 0+1; *dc* 5+5; *ia* 1+2 ; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 4; *st* 1+1+1; *mpl* 8; *hpl* 11; upper part of propleura brownish with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro-and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.



Figs. 467-468 : *Parasarcophaga (Liosarcophaga) idmais* (Séguy). 467, Inner forceps (posterior view); 468, Penis with anterior and posterior parameres and outer and inner forceps (lateral view); (after Séguy, 1934).

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 8-9 short setae located dorsally and extending up to two-thirds from the basal node to r-m and 4-5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than the third, the fromer with short spines along less than basal half of its anterior margin; costal spines short; epaulet black; basicostal scale yellowish; squama white; halter brownish.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 short bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of bristles along middle portion of anterolateral surface, a row of

long hairs along basal half and a row of short setae along distal half of posteroventral surface, 2 bristles on posterodorsal surface and 1 bristle on posteolateral surface on distal end; mid tibia with a row of bristles along basal half of anterodorsal surface and 1 bristle each on anteroventral and posterolateral surfaces at about one-third the distance from the distal end; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface and 3 bristles along posterodorsal surface on distal half; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end and with numerous long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second, third and fourth abdominal tergites absent, but each with 2 lateral marginal bristles; fifth with a row of 16 marginal bristles and long hairs laterally on arms; first and second genital segments brown with short hairs but without marginal bristles; inner forceps almost straight with short hairs but without marginal bristles; outer forceps almost straight with short hairs but without marginal bristles; outer forceps almost oval with long hairs apically; anterior paramere almost straight, slender and slightly curved at end; posterior paramere curved, blunt at end and with 2 short hairs at the anterior end; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus sclerotised, pointed at end and with long subapical process, the end of the process bifurcated, upper one longer than the other; lateral plate of paraphallus long, blunt at end and membranous; styli of glans long and serrated; ventralia straight, membranous, elongated, slightly curved anteriorly and bilobed and one of the lobe is more elongated.

Female : Unknown.

Material examined : 1♂, Nepal : Kathmandu; Hetauda, 2. viii. 1992, H. Kurahashi; (dep. in NSMT).

Discussion on species : This species is similar to *P. (Liosarcophaga) jaipurensis* Nandi but differs from it by the structures of posterior paramere and ventralia. Moreover, the styli of glans is more elongated in this species. Verves (1986) synonymized this species with *P. (Liosarcophaga) scopariiformis* (S. W.) but the study of both the species shows that they are different species. Of course, the *Holotype* must be examined before coming into final conclusion.

Biology : Nothing is known regarding the biology of the species.

Distribution : Ne (several localities); Pa (several localities); China; Taiwan and Thailand.

Type deposited : *Holotype* ♂, MNHN, not examined

73. *Parasarcophaga (Liosarcophaga) harpax* (Pandellé)

(Figs. 469-474)

1896. *Parasarcophaga harpax* Pandellé, *Revue Ent.*, 15 : 189.
1905. *Sarcophaga ambigua* Karmner, *Z. syst. Hymenopt. Dipterol.*, 5 : 331.
1912. *Sarcophaga tuberosa* var. *harpax* Böettcher, *Dt. ent. Z.* Berlin, 6 : 735.
1940. *Sarcophaga dux* var. *harpax* Senior-White, Aubertin and Smart, *Fauna Br. India, Dipt.*, 6 : 267.
1937. *Parasarcophaga (Liosarcophaga) harpax* : Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 227; Lopes, Kano, Shinonaga and Kurahashi, 1977, *Cat. Dipt. Orient. Region*, 3 : 569; Verves, 1986, *Cat. Palae. Dipt.*, 12 : 167.
1941. *Sarcophaga misera* var. *harpax* Séguy, *Encycl. ent.*, (A), 21 : 123.
1962. *Parasarcophaga harpax* : Park, *Korean J. Zool.*, 5(2) : 3; Kano, Field and Shinonaga, 1967, *Fauna Japonica, Sarcophagidae* : 52; Mihályi, 1979, *Fauna Hung. Dipt.*, 15(16) : 131.

Male : Male : Body length 10–16 mm.

Head : Width of frons about half that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrenal; parafrenal and parafacial black with golden pollen, the former with short scattered hairs, the latter with a row of 10-11 short hairs near the eye margin; antennae dark brown and reaching up to about 0.80 distance to vibrissae, first and second segments slightly blackish, third brown with silvery pollen and about two and half times that of the second; arista long, plumose along basal two-thirds; facial ridge brownish with silvery pollen; vibrissae long, crossed, distance between vibrissae less than one parafacial width; frontal bristles 11-12, posterior 3 reclinate, anterior 4 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena black with silvery to golden pollen; post gena blackish with numerous long hairs; ocellar triangle black with long hairs; outer vertical bristle ill-developed, inner vertical well developed, post vertical greater than half of inner vertical; ocellar bristles short, postocellar more than half of inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with irregular greyish hairs; palpi black; proboscis blackish-brown.

Thorax : Greyish with three black longitudinal stripes; *ac* 0+1; *dc* 6+5; *ia* 1+3; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 4; *st* 1+1+1; *mpl* 7-8; *hpl* 8-10; upper part of propleura bare, black with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles dense brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of about 10 short setae located dorsally and extending up to more than half from the basal node to r-m and

4-5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than the third, the former with short spines along basal one-third of its anterior margin; costal spines not stout; epaulet black; basicostal scale light brown; squama creamy white; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 short bristles along basal half of anterodorsal surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end; mid femur with a row of 4 bristles along middle portion of anterolateral surface, numerous long hairs along basal half and a row of short setae along distal half of anteroventral surface and a row of bristles along basal half of posteroventral surface; mid tibia with 2 bristles on anterodorsal surface, 1 bristle each on anteroventral and posterolateral surfaces at about one-third the distance from the distal end and a row of short bristles along posterodorsal surface; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 2 bristles along distal part of posterodorsal surface and numerous long hairs along ventral surface; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end, 1 long bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end and numerous long hairs along anterior and posterior margins of ventral surface.

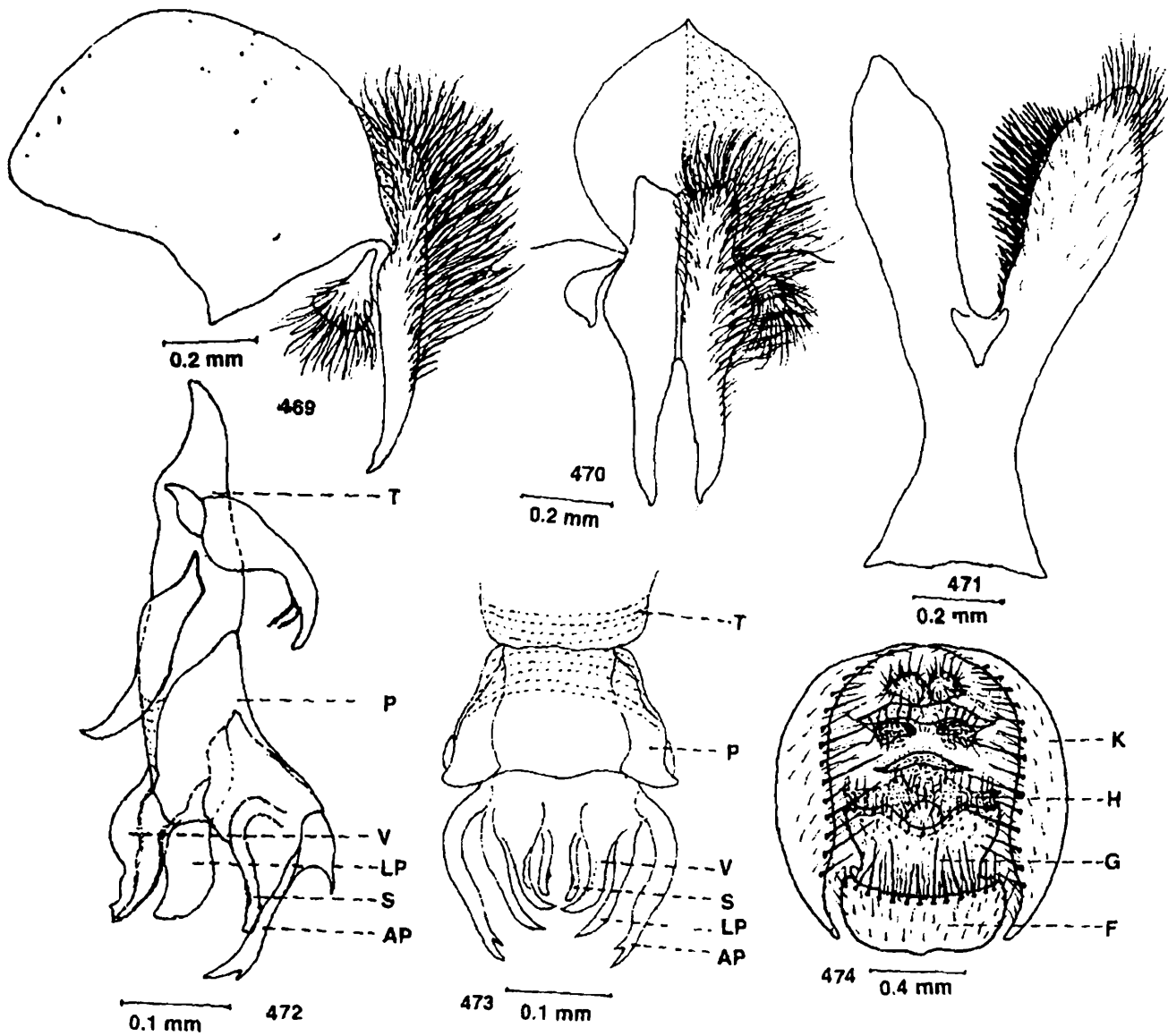
Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 3 and third with 1 lateral marginal bristles, fourth with 2 median and 4 lateral marginal bristles, fifth with a row of 16 marginal bristles; sternites first to fourth with short hairs; fifth sternite Y-shaped with window and numerous bristles laterally on arms; first genital segment greyish-black with greyish pollen but without marginal bristles, second shiny black with long hairs; inner forceps almost straight with slight knob terminally; outer forceps almost oval; anterior paramere elongated and almost straight apically; posterior paramere curved, widened at subterminal end and with 2 hairs on distal end; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus pointed with small bifurcated unequal lateral processes, the upper one longer and straight; lateral plate of paraphallus broad and membranous; styli of glans long and serrated; ventralia single, membranous, wide and slightly elongated.

Female : Body length 10–13 mm.

Head : Similar to that of male except the width of frons as that of one eye; 2 fronto-orbital bristles present; outer vertical bristle well developed.

Thorax : Absence of apicoscutellar bristles.

Legs : Hind femur with a row of bristles along anterodorsal surface.



Figs. 469-474 : *Parasarcophaga (Liosarcophaga) harpax* (Pandellé). 469, Inner and outer forceps (lateral view); 470, Inner and outer forceps (posterior view); 471, Fifth sternite; 472, Penis (lateral view); 473, Penis (ventral view); 474, Genitalia ♀ (ventral view).

Abdomen : Similar to that of male but differs for the followings : Sixth abdominal sternite with a row of 12-14 marginal bristles, seventh deeply concave; anal sternite kidney-shaped with short hairs; seventh tergite with many bristles.

Material examined : 3 ♂♂, Japan : Ozegahara; Gumma Pref., 9-13. viii. 1979, H. Kurahashi (det. by H. Kurahashi; dep. in NSMT).

Discussion on species : This species is similar to *P. (Liosarcophaga) dux* (Thomson, 1869) but differs from it by the structures of ventralia and lateral plate of paraphallus. Moreover, the structure of posterior paramere also differs here from *dux*. This species is also distinguishable from *P. (Liosarcophaga) jaipurensis* Nandi, 1990 by the structures of ventralia and lateral plate of paraphallus.

Biology : This species is not so much abundant and the larvae breed in dead grasshoppers and dead fish, birds and mammals. It is attracted to *Aristolochia ridicula* flowers (*Aristolochiaceae*) and also to almost all decaying substances. This species has been reported as an internal parasite of living caterpillars of moth-*Dendrolimus spectabilis* (Lasiocampidae) in nature (Ishijima, 1967) and also as predator of several species of Lepidoptera (Rohdendorf and Verves, 1978). It seems to be a parasitoid of bombycid caterpillars (Povolny', 1987). This species can be reared on different types of dead bodies in the laboratory. Third instar larva of it has been described by Ishijima (1967).

Distribution : India ; AnP (Ambadola), B (Chakradharpur, Chapra, Pusa), O (Barkuda Island, Dongoaposi), UP (Kotdwara), WB (Baharampur, Santragachi); BD (Dacca); SL (Peradeniya); Austria; Azerbaijan; Bulgaria; Byelorussia; China; Czech Republic; Fiji; France; Germany; Gruzia; Guam; Hawaiian Islands; Hungary; Japan; Kazakhstan; Korea; Moldova; Mongolia; Namibia; New York; Philippines; Poland; Romania; Russia; Samoa; Serbia; Singapore; Slovakia; Taiwan; Tajikistan; and Ukraine.

Type deposited : *Holotype* ♂, MNHN, not examined.

74. *Parasarcophaga (Liosarcophaga) dux* (Thomson)

(Figs. 475-480)

1869. *Sarcophaga dux* Thomson, *K. svenska Vetensk Akad. fregatten Eugenes resa omkring jorden*, 2(1) : 534; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, 45 : 259.
1896. *Sarcophaga exuberans* Pandellé, *Revta Ent.*, 15 : 186.
1917. *Sarcophaga subtuberosa* Parker, *Proc. U. S. natn. Mus.*, 54 : 89.
1919. *Sarcophaga dux luzonensis* Parker, *Bull. Brooklyn ent. Soc.*, 14 : 43.
1923. *Sarcophaga ceylonensis* Parker, *Ann. Mag. nat. Hist.*, (9)11 : 125; Provolny' 1987, *Acta ent. Mus. natn. Prague*, 42 : 159.

1923. *Sarcophaga craggi* Parker, *Ann. Mag. nat. Hist.*, 9(11) : 126.
1937. *Parasarcophaga (Liosarcophaga) misera* : Rohdendorf, *Fauna USSR, Dipt.*, 19 (1) : 223 (misidentification, not Walker, 1849).
1964. *Sarcophaga exuberansoides* Zumpt, *Verh. naturf. Ges. Basel*, 75 : 70.
1977. *Parasarcophaga (Liosarcophaga) dux* : Nandi, *Rec. zool. Surv. India*, 73 : 214; Nandi 1992, *J. Beng. nat. Hist. Soc.*, 11(2) : 37.

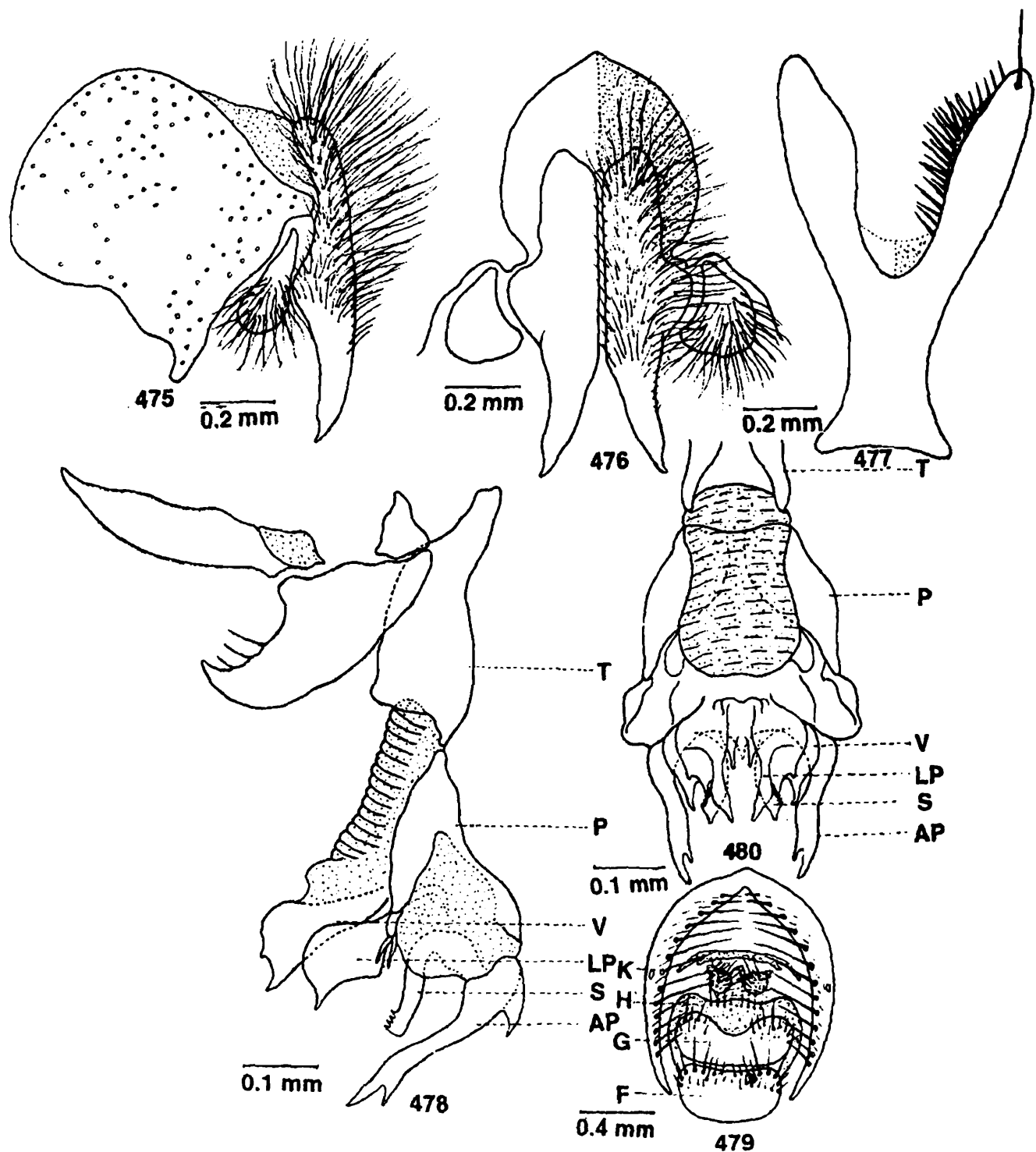
Male : Body length 10–14 mm.

Head : Width of frons about two-thirds that of one eye; frontal vitta black, its width at narrowest point of frons about more than twice that of each parafrontal; parafrontal and parafacial black with silvery to golden pollen, the former with short scattered hairs, the latter with a row of about 9 short hairs near the eye margin; antennae brownish, with silvery pollen and reaching up to about 0.8 distance to vibrissae; first and second segments blackish-brown, tip of the second reddish, third brown and about two and half times that of the second; arista long, plumose along basal two-thirds; facial ridge light brown with silvery pollen; vibrissae long, crossed, distance between vibrissae about twice that of one parafacial width; frontal bristles 9-10, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena black with black hairs; post gena black with silvery hairs; ocellar triangle black with black hairs; outer vertical bristle short, inner vertical well developed, post vertical short about one-fourth the inner vertical; ocellar and postocellar bristles moderately developed, postocellar less than half of inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with greyish hairs; palpi slender and black; proboscis long and black.

Thorax : Blackish with three black longitudinal stripes; *ac* 0+1; *dc* 5+5 (posterior 2 *dc* stout); *ia* 1+3; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 4; *st* 1+1+1; *mpl* 6; *hpl* 9; upper part of propleura bare with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro-and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of about 9-10 short setae located dorsally and extending up to about two-thirds from the basal node to r-m and 3-4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment about one and half times that of the third, the former with short spines along basal half of its anterior margin; costal spines stout; epaulet black with short black spines; basicostal scale yellowish; squama white; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of



Figs. 475-480 : *Parasarcophaga (Liosarcophaga) dux* (Thomson). 475, Inner and outer forceps (lateral view); 476, Inner and outer forceps (posterior view); 477, Fifth sternite; 478, Penis (lateral view); 479, Penis (ventral view); 480, Genitalia ♀ (ventral view).

4-5 bristles along middle portion of anterodorsal surface, a row of short bristles along basal half and a row of short setae along distal half of anteroventral surface, numerous long hairs along basal half and a row of short setae along distal half of posteroventral surface, 1 bristle on posterodorsal and 2 bristles on posterolateral surfaces on distal end; mid tibia with a row of 2-3 bristles along middle portion of anterodorsal surface, 1 bristle on distal one-third of anteroventral surface, a row of bristles along posterodorsal surface and 1 on posteroventral surface at about one-third the distance from the distal end; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 1 bristle each on posterodorsal and posterolateral surfaces on distal end and numerous long hairs along posterior margin of ventral surface; hind tibia with 2 long and a row of short bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-fourth the distance from the distal end, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end and a row of long hairs along anterior and posterior margins of ventral surface at about three-fourths the distance from the distal end.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with 2 pairs of lateral marginal bristles, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of about 16 marginal bristles; sternites first and second with long hairs, third and fourth each with short bristles and hairs; fifth sternite v-shaped with short bristles laterally and 1 long hair terminally on arms; first and second genital segments reddish to brownish with short hairs but without marginal bristles; inner forceps almost straight, pointed and slightly curved at end; outer forceps nearly oval with hairs on distal end; anterior paramere uniform, straight and pointed at end; posterior paramere curved, widened medially and with 2-3 hairs; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus with straight lateral process and its end unequal; lateral plate of paraphallus wide and abruptly pointed apically; styli of glans short and comb-like anteriorly; ventralia wide, well developed and plate-like.

Female : Body length 7-11 mm.

Head : Width of frons almost same as in male; frontal bristles 10-12; 2 proclinate fronto-orbital bristles; outer vertical bristle well developed.

Thorax : Similar to that of male but for the absence of apicoscutellar bristles.

Wings : Similar as in male.

Legs : Chaetotaxy same as in male but differs for the followings : mid femur with a row of 3 bristles along anterodorsal surface ; hind femur with a row of bristles along anteroventral surface ; hind tibia only with 2 bristles on anteroventral surface but without long hairs along anterior and posterior margins of ventral surface.

Abdomen : Second and fourth abdominal sternites each with 4, third with 6, fifth with 8 and sixth with a row of 18 bristles, seventh and eighth with weakly developed

bristles and concave at the anterior end; anal sternite nut-shaped with short hairs; seventh tergite undivided with strong bristles.

Material examined : India : Several male specimens from different localities of Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Gujarat, Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Mizoram, Orissa, Punjab, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal and the union territories of Andaman and Nicobar Islands and Lakshadweep collected by B. C. Nandi.

Discussion on species : This species is similar to *P. (Liosarcophaga) harpax* (Pandelle, 1896) but differs from it by the structures of ventralia and lateral plate of paraphallus. Moreover, the styli of glans is more thicker and shorter here.

Biology : This species is abundantly available, attracted to human excrement and dead bodies of different animals and was mostly collected from bushes. The larvae breed in rotten *Cajanus indicus*, Cucumber, Oyster, *Achatina fulica* and dead *Indoplanorbis exustus* (Gastropoda) wound in cow, dead beetle, dead snake, meat, grasshopper, dead toad, dead squirrel, dead *Acherontia* sp. (Sphingidae, Lepidoptera) and decomposing egg of *Corvus* sp. (Passeriformes, Aves). Larvae are parasite on locust and cause human and bovine tissue myiasis in camel, bullocks and cows. According to Zumpt (1972) quoted from Cuthbertson (1938) the larvae of this species (as *exuberans*) have been successfully reared on decomposing ox-liver, fresh cattle dung and human excrement. Povolny (1987) reported the development of larvae in human excrement. Zumpt (1972) mentioned the rearing of this species on dead moribund caterpillars of the saturnid moth-*Cynanisa maia* (Klug) (Saturniidae, Lepidoptera). Alwar and Seshiah (1958) studied the life history of this species and larval stages have been described by Hall and Bohart (1948) and Nandi (1980). Povolny (1987) recorded the larvae of this species from intestine of dead locust and the larvae emerged from the field locusts-*Schistocerca* sp. and *Locusta* sp. (Acrididae, Orthoptera).

Distribution : India ; Several localities of A, AnP, ArP, B, G, Gu, JK, Kt, K, Mr, MnP, Me, MP, Mz, N, O, P, R, TN, T, UP, WB and union territories of AN; BD (Dacca); Bh (Wangdiphodrong); Ne (Biratnagar); Pa (Peshawar); M (several localities); SL (several localities); Albania; Australia; Austria; Azerbaijan; Azores; Bismarck Archipelago; Bonin Islands; Borneo; Bulgaria; Cape Verde Islands; Caroline Islands; China; Christmas Island ; Cyprus; Croatia ; Czech Republic; Denmark; Egypt; Fiji; Finland; France; Germany; Great Britain; Greece; Gruzia; Guam; Hainan Island; Hawaiian Islands; Hungary; Indonesia (Irian Jaya); Israel; Italy; Japan (including Ryukyu Islands; Kazakhstan; Kiribati; Madagascar; Malta; Mariana Islands; Marshall Islands; Micronesia; Mongolia; New Guinea; Niue; Palau; Philippines; Poland; Pitcairn Islands; Romania; Russia; Serbia; Singapore; Slovakia; South Korea; Spain; Sweden; Switzerland; Tajikistan; Taiwan; Thailand; Turkmenistan; Ukraine; Uzbekistan; Wake Islands and Western Samoa.

Type deposited : *Holotype* ♂, NRM, not examined.

75. *Parasarcophaga (Liosarcophaga) brevicornis* (Ho)

(Figs. 481-486)

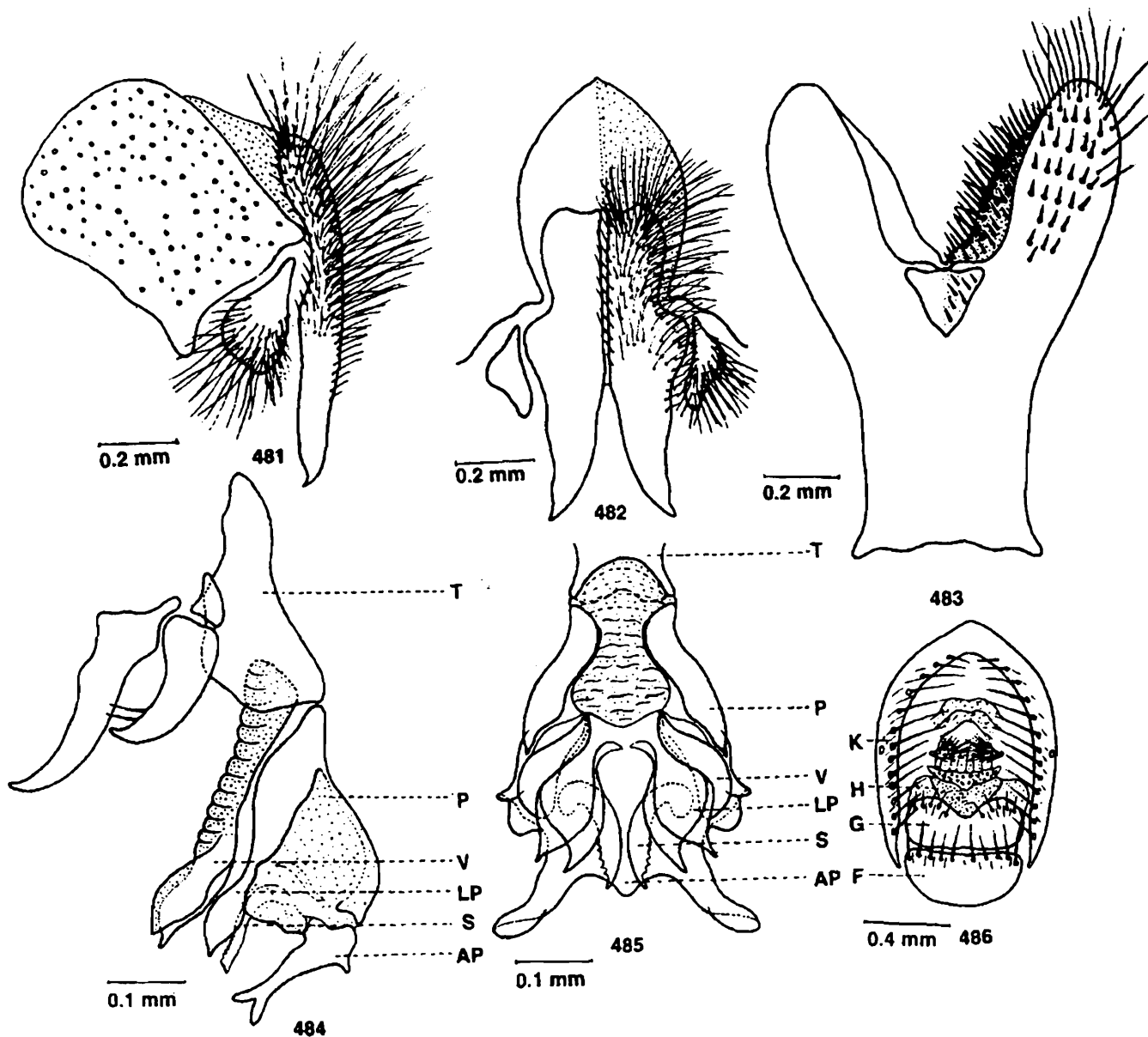
1934. *Sarcophaga brevicornis* Ho, *Bull. Fan meml Inst. Biol.*, **5**(1) : 33; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 262; Kano and Shinonaga, 1994. *Jap. J. sanit. Zool.*, **45** : 260.
1937. *Parasarcophaga (Liosarcophaga) brevicornis* : Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 222; Nandi, 1992, *J. Beng. nat. Hist. Soc.*, **11**(2) : 37.
1977. *Parasarcophaga brevicornis* : Park, *Bull. Tokyo med. dent. Univ.*, **24** (4) : 260, Kano, Field and Shinonaga, 1967, *Fauna Japonica, Sarcophagidae* : 50.

Male : Body length 8–15 mm.

Head : Width of frons about two-fifths that of one eye; frontal vitta black, its width at narrowest point of frons less than twice that of each parafrontal; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of about 5-6 long hairs near the eye margin; antennae orange to black, silvery pollen and reaching up to about 0.8 distance to vibrissae, first and second segments blackish-brown, third orange and about two and half times that of the second; arista long, plumose along basal three-fifths; facial ridge light brown with silvery pollen; vibrissae long, crossed, distance between vibrissae about twice that of each parafacial width; frontal bristles 10, posterior 1 reclinate, anterior 3 below base of antennae and reaching up to about two-thirds of second antennal segment, rest cruciate and directed forwards; gena black with black hairs; post gena black with grey hairs; ocellar triangle black with short hairs; outer vertical bristle short, inner vertical well developed, post vertical about half of inner vertical; ocellar and postocellar bristles well developed; postocellar half of inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with greyish hairs; palpi slender and black; proboscis black with brownish tinge basally.

Thorax : Blackish with three black longitudinal stripes; *ac* 0+1; *dc* 5+6 (posterior 2 *dc* stout); *ia* 1+3; *ps* 1; *h* 3; *ph* 2; *np* 4; *pā* 2; *sa* 4; *st* 1+1+1; *mpl* 6; *hpl* 9; upper part of propleura bare with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of about 10 short setae located dorsally and extending up to about two-thirds from the basal node to r-m and 2-3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment a little shorter than the third, the former with short spines along basal half of its anterior margin; costal spines stout; epaulet black; basicostal scale brownish; squama white; halter brown.



Figs. 481-486 : *Parasarcophaga (Liosarcophaga) brevicornis* (Ho). 481, Inner and outer forceps (lateral view); 482, Inner and outer forceps (posterior view); 483, Fifth sternite; 484, Penis (lateral view); 485, Penis (ventral view); 486, Genitalia ♀ (ventral view).

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row 3-4 bristles along basal one-third of anterodorsal surface and 1 bristle on posterolateral surface at about one-third the distance from the distal end; mid femur with a row of 6-7 bristles along middle portion of anterodorsal surface, a row of short bristles along basal half and a row of short setae along distal half of anteroventral surface, numerous long hairs along basal half and short setae along distal half of posteroventral surface, 1 bristle on posterodorsal and 2 on posterolateral surfaces on distal end; mid tibia with a row of 2-3 bristles along anterodorsal surface on distal half, 1 bristle each on anteroventral, posterodorsal and posterolateral surfaces at about one-third the distance from the distal end and a row of short bristles along posterodorsal surface; hind femur with a pair of rows of long bristles along anterodorsal surface, a row of bristles along anteroventral surface, 2-3 bristles along distal part of posterodorsal surface and numerous long hairs along posterior margin of ventral surface; hind tibia with 2 long and a row of short bristles along anterodorsal surface, 2 bristles medially on posteroventral surface, sometimes 1 bristle on anteroventral surface and a row of long hairs along anterior and posterior margins of ventral surface at about three-fourths the distance from the distal end.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of median and 3 pairs of lateral marginal bristles, fifth with a row of about 16 marginal bristles; sternites first to fourth with brush of hairs but without marginal bristles, fifth sternite v-shaped, with window and short spines laterally but long hairs terminally on arms; first genital segment blackish, second shiny black but both without marginal bristles; inner forceps almost straight, curved and pointed at end; outer forceps somewhat oval with hairs on distal end; anterior paramere longer, gradually pointed and almost straight at end; posterior paramere shorter, curved at apex and with 2 short hairs apically; apical plate of paraphallus with short apical and lateral process, one of its with equal bifurcation; lateral plate of paraphallus short, sphere-shaped and pointed at apex; styli of glans long and comb-like anteriorly; ventralia with two processes, one heavily sclerotised and the other membranous.

Female : Body length 10-13 mm.

Head : Width of frons nearly equal to that of one eye; frontal bristles 11; fronto-orbital bristles 2, proclinate; outer vertical bristle well developed and about three-fifths that of inner vertical.

Thorax : Similar to that of male but for the absence of apicoscutellar bristles.

Wings : Same as in male.

Legs : Chaetotaxy same as in male except for the followings : mid femur without hairs but with 4-5 bristles along basal half of posterolateral surface; hind femur without hairs but with a row of bristles along anterodorsal surface and 2 bristles on posterior margin of ventral surface; hind tibia without hairs along anterior and posterior margins of ventral surface.

Abdomen : Second to fourth sternites each with 4 bristles, fifth with 6 bristles, sixth wider than the rest and with a row of about 10 bristles, seventh deeply concave anteriorly with 6-8 short bristles, eighth membranous but without hairs; anal sternite with long hairs; seventh tergite entire with stout bristles and short hairs.

Material examined : India : Several male specimens from different localities of Andhra Pradesh, Assam, Bihar, Gujarat, Himachal Pradesh, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Rajasthan, Tripura and West Bengal collected by B. C. Nandi.

Discussion on species : This species is similar to *P. (Liosarcophaga) josephi* Nandi but differs from it by the structures of ventralia and lateral plate of paraphallus. Moreover, the structure of anterior paramere is quite distinguishable here from *josephi*.

Biology : This species is not so abundant which was collected from bush-sweeping near dead bodies. The larvae of this species develop in dead fish, meat and different vertebrate animal carcasses in nature and are easily reared in meat in the laboratory.

Distribution : India ; Several localities of A and AnP, ArP, B,D, Gu, HP, K, MP, Mr, MnP, Me, Mz, N, O, R, T and WB; Ne (Biratnagar, Nijgarh); M (several localities); Pa (several localities); SL (Colombo, Manna); Australia; Borneo; China (Kwangtung); Hainan Island; Indonesia; Japan (including Ryukyu Islands); Malaysia; Philippines; Russia; Singapore; South Korea; Taiwan and Thailand.

Type deposited : *Holotype* ♂ FMIBP, not studied.

76. *Parasarcophaga (Liosarcophaga) josephi* n.sp.

(Figs. 487-490)

Male : Body length 10 mm.

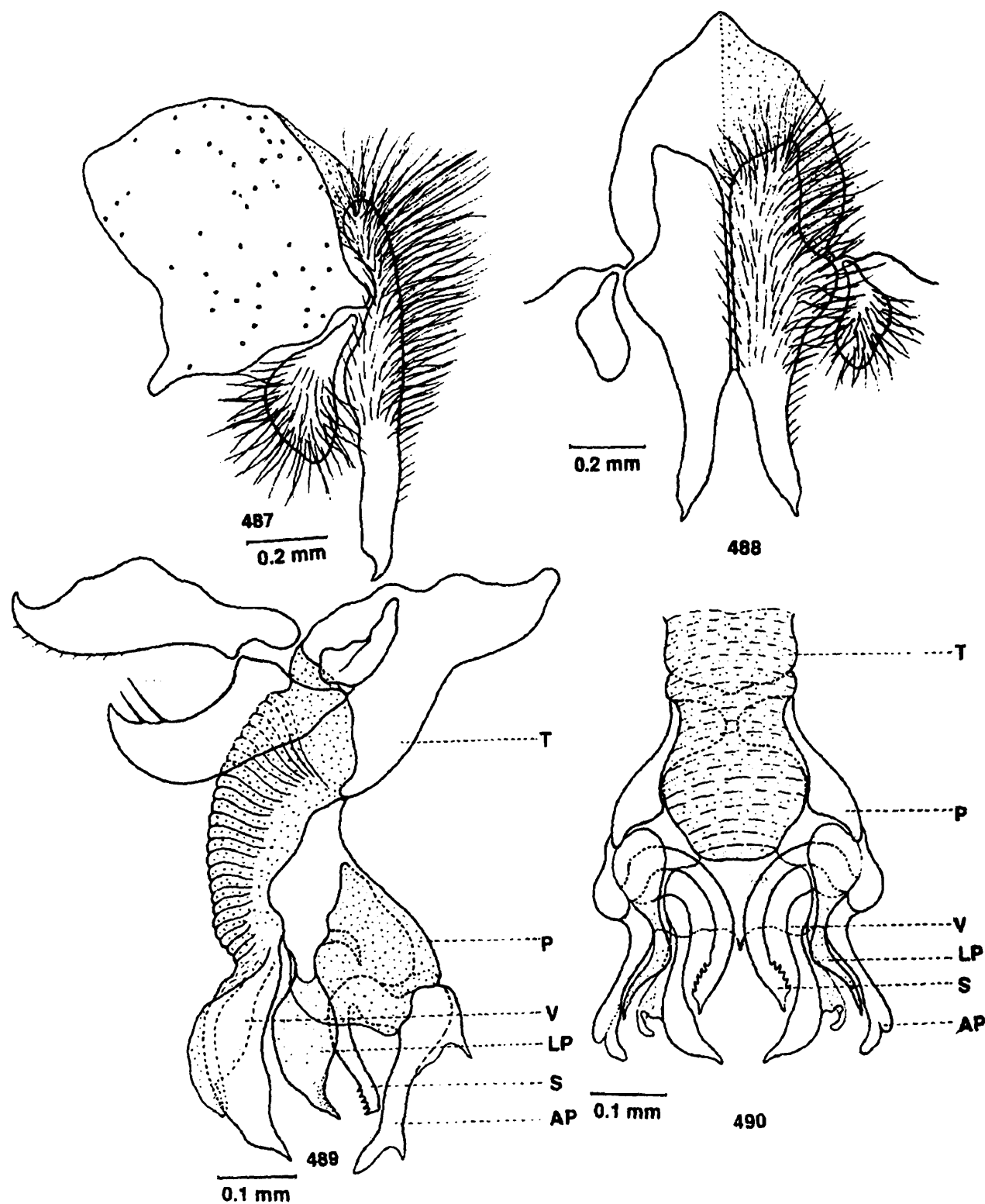
Head : Width of frons about two-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about less than twice that of each parafrontal; parafrontal and parafacial black with golden pollen, the former with short irregular scattered hairs, the latter with a row of short hairs near the eye margin; antennae black, silvery pollen and reaching up to about 0.9 distance to vibrissae, first segment blackish-brown. third brown, silvery pollen and reaching up to more than twice that of the second; arista long, plumose along basal half; facial ridge black with silvery pollen; vibrissae long, distance between vibrissae about half of each parafacial width; frontal bristles 10, posterior 2 reclinate, anterior 2 below base of antennae and reaching up

to about half of second antennal segment, rest cruciate and directed forwards; gena black, silvery pollen and with short black hairs; post gena black with greyish hairs; ocellar triangle black, silvery pollen and with short hairs; outer vertical bristle very short, inner vertical well developed, post vertical almost half of the inner vertical; ocellar and postocellar bristles well developed, postocellar less than half of inner vertical; a pair of rows of postocular setae besides postocular cilia, first row regular and second row irregular, rest of the area with short and long hairs; palpi slender and black; proboscis black.

Thorax : Blackish with three black longitudinal stripes; *ac* 0+1; *dc* 5+5 (posterior 1 *dc* stout); *ia* 1+3; *ps* 1; *h* 3; *ph* 3; *np* 4; *pa* 2; *sa* 4; *st* 1+1+1; *mpl* 6; *hpl* 7; upper part of propleura bare with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro-and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 8 short setae located dorsally and extending up to about two-thirds from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment a little shorter than the third, the former with short spines along more than basal half of its anterior margin; costal spines stout; epaulet with short spines; basicostal scale brown; squama creamy white; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 short bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of 5 bristles along middle portion of anterolateral surface, a row of about 5 bristles along middle portion of anterolateral surface, a row of about 5 bristles along basal half and a row of short setae along distal half of anteroventral surface, numerous long hairs along basal half and a row of short setae along distal half of posteroventral surface, 1 bristle on posterodorsal and 2 on posteroventral surfaces on distal end; mid tibia with 2 bristles along middle portion of anterodorsal surface, a row of short and 3 long bristles along posterodorsal surface and 1 bristle on posterolateral surface at about one-third the distance from the distal end; hind femur with a pair of rows of long bristles along anterodorsal surface, a row of bristles along anteroventral surface, 2 bristles on distal part of posterodorsal surface and numerous long hairs along posterior margin of ventral surface; hind tibia with a pair of rows of bristles along anterodorsal surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end, 1 bristle on anteroventral surface at about one-fourth the distance from the distal end and numerous long hairs along anterior and posterior margins of ventral surface at about one-fourth the distance from the distal end.



Figs. 487-490 : *Parasarcophaga (Liosarcophaga) josephi* n. sp. 487, Inner and outer forceps (lateral view); 488, Inner and outer forceps (posterior view); 489, Penis (lateral view); 490, Penis (ventral view).

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent, but each with a pair of lateral marginal bristles, fourth with a pair of median and 3 pairs of lateral marginal bristles, fifth with a row of 16 marginal bristles; sternites first to fourth with short hairs; first genital segment blackish, second black with long hairs but both without marginal bristles; inner forceps elongated, almost straight, curved and pointed at end; outer forceps somewhat triangular with hairs only on distal end; anterior paramere wide at middle, pointed at end and with short hairs posteriorly; posterior paramere curved at end with 2 hairs at subapical end; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus with apical process, lateral process of apical plate of paraphallus unequally bifurcated, the upper one strong and long; lateral plate of paraphallus, wide, long, with slightly sclerotised pointed end; styli of glans long and comb-like anteriorly; ventralia wide medially with 2 lobes, one of them is more sclerotised than the other.

Female : Unknown.

Material examined : *Holotype* ♂, India : West Bengal; Bokkhali, 7. xi. 1974, B. C. Nandi; *Paratype* ♂, same data as *Holotype*.

Discussion on species : This species is similar to *P. (Liosarcophaga) brevicornis* (Ho, 1934) but differs from it by the structures of anterior paramere and lateral plate of paraphallus, Moreover, the lobes of ventralia is more massive and pointed and membranous region between theca and paraphallus is more bulgy. This species also may be distinguished from a Malaysian species, *Sarcophaga mimobrevicornis* Sugiyama, 1990 by the detailed structures of ventralia and anterior paramere.

Biology : This species was collected from dead and rotten specimens of a crustacea belonging to the species *Macrobrachium rosenbergii*.

Distribution : India ; WB (Bokkhali). This species is named after Oriental Dipterologist Dr. A. N. T. Joseph.

Type deposited : *Holotype* ♂, ZSIC, studied.

77. *Parasarcophaga (Liosarcophaga) portschinskyi* Rohdendorf

(Figs. 491-496)

1937. *Sarcophaga (Liosarcophaga) portschinskyi* Rohdendorf, *Fauna USSR, Dipt.*, **19** (1) : 226; Verves, 1986, *Cat. Palae. Dipt.*, **12** : 168.

1945. *Parasarcophaga verticina* Ringdahl, *Opusc ent.*, **10** : 35 (as subspecies of *tuberosa* Pandelle', 1896).

1979. *Parasarcophaga portschinskyi* : Mihályi, *Fauna Hung. Dipt.*, **15** (16) : 132.

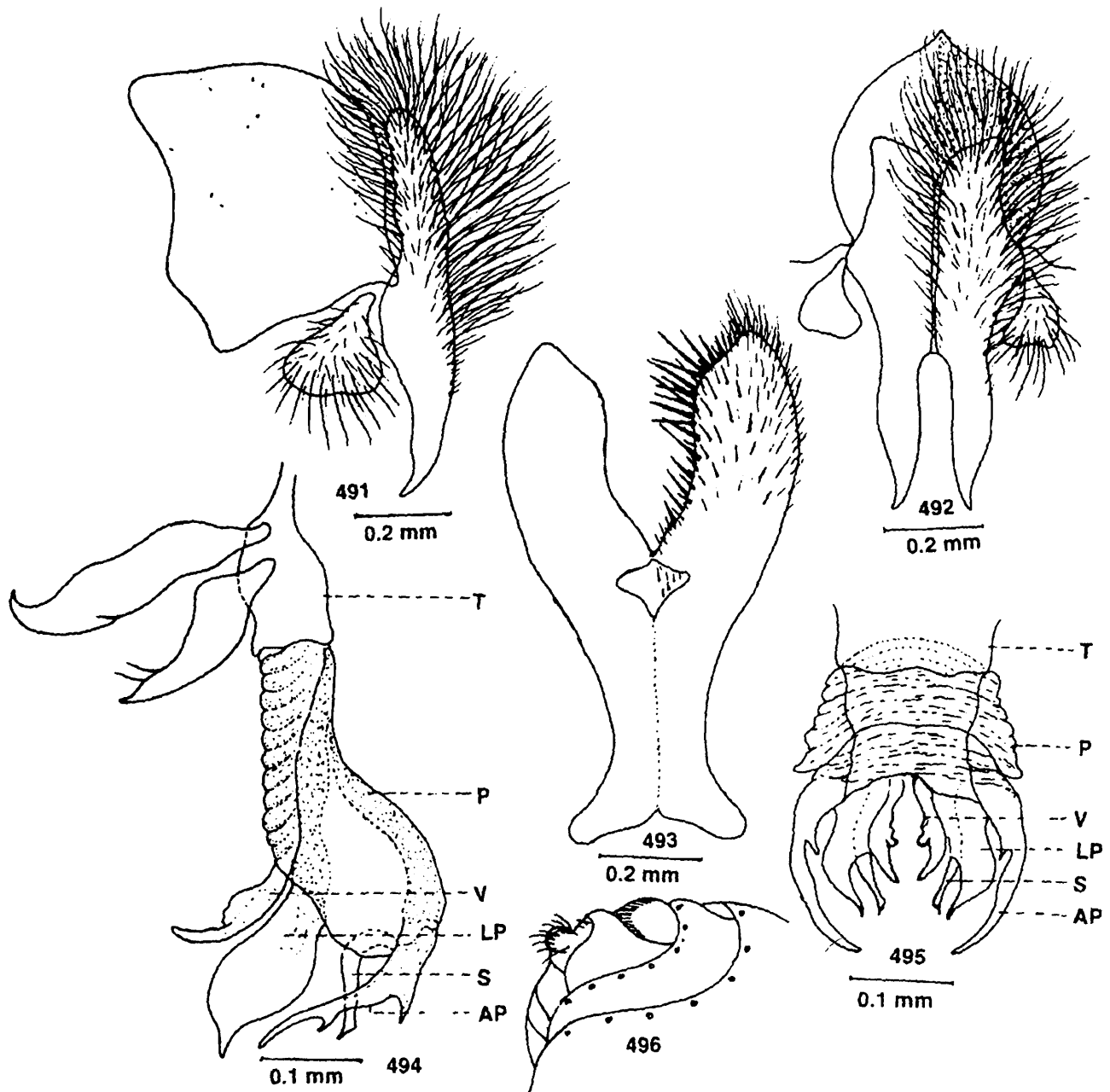
Male : Body length 7.5–15 mm.

Head : Greyish black; width of frons about two-thirds that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with silvery pollen, the former with few short hairs, the latter with a row of 8-9 short hairs near the eye margin; antennae medium in length, black and reaching up to about 0.73 distance to vibrissae, first and second segments black, tip of the second reddish-brown, third less black and about two to two and half times that of the second; arista long, plumose along more than basal half; facial ridge black with few short hairs; vibrissae long, distance between vibrissae about twice that of one parafacial width; frontal bristles 10-13, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about less than half of the second antennal segment, rest cruciate and directed forwards; gena black, silvery pollen and with short hairs; post gena black with hairs; ocellar triangle black with long hairs; outer vertical bristle wanting, inner vertical well developed, post vertical about one-fourth the inner vertical; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with irregular silvery hairs; palpi long, blackish; proboscis short and black.

Thorax : Black with three black longitudinal stripes; *ac* 0 + 1; *dc* 5+4; *ia* 1+3; *ps* 1; *h* 4 (2 short); *ph* 1; *np* 3; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 5; *hpl* 7; pro- and mesothoracic spiracles brown; upper part of propleura bare and black; prostigmatic and propleural bristles well developed and accompanied with short hairs; apicoscutellar and discoscutellar bristles short, 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 9 to 10 short setae located dorsally and extending up to more than basal half from the basal node to *r-m* and 3-4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment slightly less than the third, the former with short spines along basal half of its anterior margin; costal spines strong; epaulet black; basicostal scale light brown; squama creamy white; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal one-third of anterodorsal surface and 1 bristle on posteroventral surface on distal one-third; mid femur with a row of bristles along anteroventral surface, a row of bristles along basal two-thirds of posteroventral surface and a row of setae along distal one-third of posteroventral surface; mid tibia with 1 bristle on anterodorsal surface on distal one-third and 1 bristle each on one-third and two-thirds the distances from the distal end on posterodorsal surface; hind femur with two rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface and 1 bristle on posterodorsal surface on distal one-third; hind tibia with long bristles along posteroventral surface and 1 bristle each on distal one-third and two-thirds of anterodorsal and posterodorsal surfaces.



Figs. 491-496 : *Parasarcophaga (Liosarcophaga) portschinskyi* Rohdendorf. 491, Inner and outer forceps (lateral view); 492, Inner and outer forceps (posterior view); 493, Fifth sternite; 494, Penis (lateral view); 495, Penis (ventral view); 496, Genitalia ♀ (posterolateral view, after Pape, 1987b).

Abdomen : Black with checkered pattern; median marginal bristles on second and third abdominal tergites absent but third with a lateral marginal bristle, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of 14 marginal bristles; sternites first to fourth with short hairs; fifth sternite Y-shaped with window and many bristles laterally on arms; first and second genital segments blackish but without marginal bristles; inner forceps almost straight, pointed apically and with long hairs at subbasal end; outer forceps triangular with short hairs; anterior paramere broad, strongly curved and sickle-shaped at tip; base of posterior paramere narrow, its apex pointed and 2 short hairs at subbasal end; theca short, shorter than paraphallus, both are sclerotised; apical plate of paraphallus with distinct apical and two pointed lateral processes, one of lateral process is more longer; lateral plate of paraphallus transparent, long and wide medially; styli of glans sclerotised, long and terminating before tip of lateral process of apical plate of paraphallus; ventralia with a folded at base, somewhat sclerotised, shorter than lateral plate of paraphallus and curved anteriorly.

Female : Almost similar to male but for the following differences; frons slightly wider than male; terminalia red to dark blackish-red; sixth tergite entire but with weak median longitudinal fold; marginal bristles of sixth tergite with closely set short hairs.

Material examined : 1 ♂, France : Gorgede 1' Aude; 10 kms. S. W. of Axat, Sept., 1988 (det. T. Pape; dep. in ZMUC).

Discussion on species : This species is similar to *P. (Liosarcophaga) brevicornis* (Ho, 1934) and *P. tuberosa* (Pandellé, 1896) but differs from them by the structures of ventralia and apical plate of paraphallus. Moreover, the process of apical plate of paraphallus in this species is half of its length and ventralia is unfolded here.

Biology : Aradi and Mihályi (1979) reported that this species is attracted to decaying meat, bread, fruit and human excrement. Pape (1987) recorded the breeding of this species from grass snake. Draber-Mónko (1973) described the larval stages of this species. Rohdendorf and Verves (1989) reported the larvae are necrophagous and also may be predator of adult butterflies and occasionally on their larvae (Blackith and Blackith, 1994).

Distribution : Pa (several localities); Albania; Armenia; Austria; Azerbaijan; Bulgaria; Byelorussia; China; Czech Republic; Denmark; Estonia; Finland; France; Greece; Gruzia; Hungary; Ireland; Italy; Kazakhstan; Malta; Moldova; Mongolia; Norway; Poland; Romania; Russia; Slovakia; South Sweden; Switzerland; Tajikistan; Turkey; Turkmenistan; Ukraine; Uzbekistan and Yugoslavia (former).

Type deposited : *Holotype* ♂, ZISP, not studied.

78. *Parasarcophaga (Liosarcophaga) tuberosa* (Pandellé)

(Figs. 497-502)

1896. *Sarcophaga tuberosa* Pandellé, *Revue Ent.*, **15** : 192.
 1937. *Parasarcophaga (Liosarcophaga) tuberosa* : Rohdendorf, *Fauna USSR, Dipt.*, **19** (1) : 223; Verves, 1976, *Cat. Palae. Dipt.*, **12** : 169.
 1941. *Sarcophaga misera* var. *tuberosa* Séguy, *Encycl. ent. (A)*, **21** : 24.
 1967. *Parasarcophaga tuberosa* : Kand, Field and Shinonaga, *Fauna japonica, Sarcophagidae* : 54 ; Mihályi, 1979, *Fauna Hung. Dipt.*, **15** (16) : 131.

Male : Body length 9–16 mm.

Head : Width of frons about three-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about less than twice that of each parafrontal; parafrontal and parafacial black with golden pollen, the former with short scattered hairs, the latter with a row of 6-7 hairs near the eye margin; antennae dark brown and reaching up to about 0.85 distance to vibrissae, first and second segments black, third slightly brownish and about twice that of the second; arista long, plumose along basal half; facial ridge light brown with silvery pollen; vibrissae long, crossed, distance between vibrissae about twice that of one parafacial width; frontal bristles 10-11, posterior 3 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena black, silvery pollen and with short black hairs; post gena black with silvery pollen; inner vertical bristle well developed, outer vertical short, post vertical half of the inner vertical; ocellar and postocellar bristles moderately developed, postocellar less than half of inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with greyish hairs; palpi slender and greyish; proboscis long and black.

Thorax : Blackish, silvery to golden pollen and with three black longitudinal stripes; *ac* 0+1; *dc* 5–6+5; *ia* 1+3; *ps* 1; *h* 3–5; *ph* 3; *np* 4; *pa* 2; *sa* 4; *st* 1+1+1; *mpl* 6; *hpl* 9; upper part of propleura bare with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 3 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 10 short setae located dorsally and extending up to more than half from the basal node to r-m and 3-4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment a little shorter than the third, the former with short spines along about basal half of its anterior margin; costal spines stout; epaulet black with short black spines; basicostal scale light brown; squama creamy white; halter brown.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of long bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of several short bristles along middle portion of anterodorsal surface, a row of short setae each along distal half of anteroventral and posteroventral surfaces and with long hairs along basal half of anteroventral and posteroventral surfaces; mid tibia with 2 bristles along middle portion of anterodorsal surface, a row of short bristles along posterodorsal surface and 1 bristle each on anteroventral and posteroventral surfaces at about one-third the distance from the distal end; hind femur with a pair of rows of long bristles along anterodorsal surface, a row of long bristles along anteroventral surface, 3 bristles along distal part of posterodorsal surface, 1 bristle on distal part of posterolateral surface and numerous long hairs along ventral surface; hind tibia with 2 long and a row of short bristles along anterodorsal surface, 2 long bristles on posterodorsal surface, 1 bristle on anteroventral surface at about one-fourth the distance from the distal end and numerous long hairs along anterior and posterior margins of ventral surface.

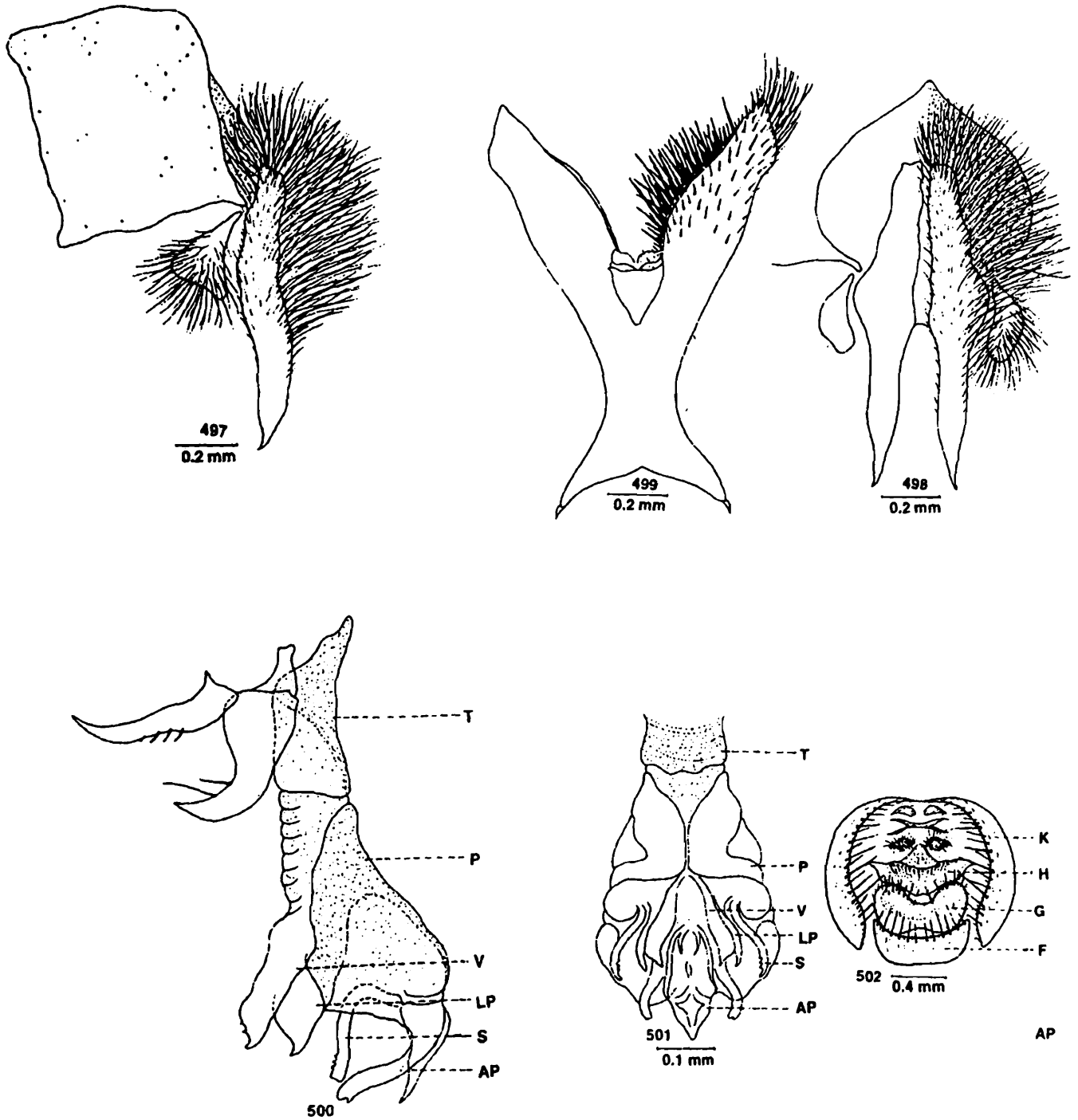
Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with 2 lateral marginal bristles, fifth with a row of 16 marginal bristles; sternites first to fourth with long hairs; fifth sternite Y-shaped, with window and strong spines laterally and many long hairs terminally on arms; first and second genital segments black (often second segment black) with numerous long hairs but without marginal bristles; inner forceps slightly s-shaped, slender, pointed terminally and with long hairs on basal end; outer forceps slightly elongated; anterior paramere almost straight, slender with 3-4 short hairs along middle portion of anterior end; posterior paramere tapering at apex, without notch, wide medially and deeply curved but with 2 hairs at subapical end; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus long and pointed, process of apical plate of paraphallus almost blunt at end; lateral plate of paraphallus wide, blade-like with slight pointed apically; ventralia uniformly wide, elongated and slightly hook-shaped at end; styli of glans long with serrations anteriorly.

Female : Body length 13 mm.

Head : General characters similar to those of male but width of frons as the width of one eye; presence of 2 proclinate fronto-orbital bristles; outer vertical bristle well developed.

Thorax and Wings : Similar to those of male but absence of apicoscutellar bristles.

Legs : Hind femur with a row of bristles along anterodorsal surface but a pair of rows in case of male; hind tibia with 2 bristles on anteroventral surface but 1 bristle in case of male but without long hairs.



Figs. 497-502 : *Parasarcophaga (Liosarcophaga) tuberosa* (Pandellé). 497, Inner and outer forceps (lateral view); 498, Inner and outer forceps (posterior view); 499, Fifth sternite; 500, Penis (lateral view); 501, Penis (ventral view); 502, Genitalia ♀ (ventral view).

Abdomen : General characters similar to those of male but the followings are in female terminalia : sixth abdominal sternite slightly cup-shaped with few hair-like bristles, seventh wide, concave with few short hairs, eighth highly membranous with few hairs; anal sternite with few hairs; seventh tergite with some bristles.

Material examined : I have not seen the Indian specimens and the description is based on Russian specimen identified by Yu. G. Verves.

Discussion on species : This species is similar to *P. (Liosarcophaga) aegyptica* (Salem, 1935) but differs from it by the structures of ventralia, lateral plate of paraphallus and process of apical plate of paraphallus. Moreover, the apex of the apical plate of paraphallus is distinguishable here from *aegyptica*.

Biology : This species is found along mountains paths, streams and sea shores and is attracted to fruit and meat in open-air markets (Mihályi, 1966). Povolny' (1987) reported it as a parasite or predator of insects specially noctuid larvae (Noctuidae, Lepidoptera).

Distribution : Pa (Utar Glacier); Australia; Austria; Azerbaijan; Bulgaria; China; Czech Republic; Finland; France; Germany; Great Britain; Greece; Gruzia; Hungary; Italy; Japan (including Ryukyu Islands); Kazakhstan; Korea; Kyrgyzstan; Mongolia; North America; Poland; Romania; Russia; Serbia; Slovakia; Sweden; Switzerland; Taiwan; Tajikistan; Turkmenistan; Ukraine; United Kingdom; Uzbekistan and Yugoslavia (former).

Type deposited : Holotype ♂, MNHN, not studied.

79. *Parasarcophaga (Liosarcophaga) aegyptica* (Salem)

(Figs. 503-507)

1935. *Sarcophaga dux* var. *aegyptica* Salem, *Publ. Égypt. Univ. Fac. Med.*, **5** : 56.
 1936. *Sarcophaga aegyptica* Salem, *Bull. Soc. ent. Égypte*, **20** : 242.
 1937. *Parasarcophaga (Liosarcophaga) parkeri* Rohdendorf, *Fauna USSR, Dipt.*, **19** (1) : 220; Verves, 1986, *Cat. Palae. Dipt.*, **12** : 116.
 1941. *Sarcophaga misera* var. *aegyptica* Séguy, *Encycl. ent.*, (A), **21** : 121.
 1972. *Sarcophaga (Thyrsocnema) aegyptica* : Zumpt, *Explor. Parc natn. Virunga*, **101**: 49; Dear. 1980, *Cat. Dipt. Aftrop. Region*, **821** : 815.
 1979. *Parasarcophaga aegyptica* : Mihályi, *Fauna Hung. Dipt.*, **15** (16) : 124.

Male : Body length 10.5–13.5 mm.

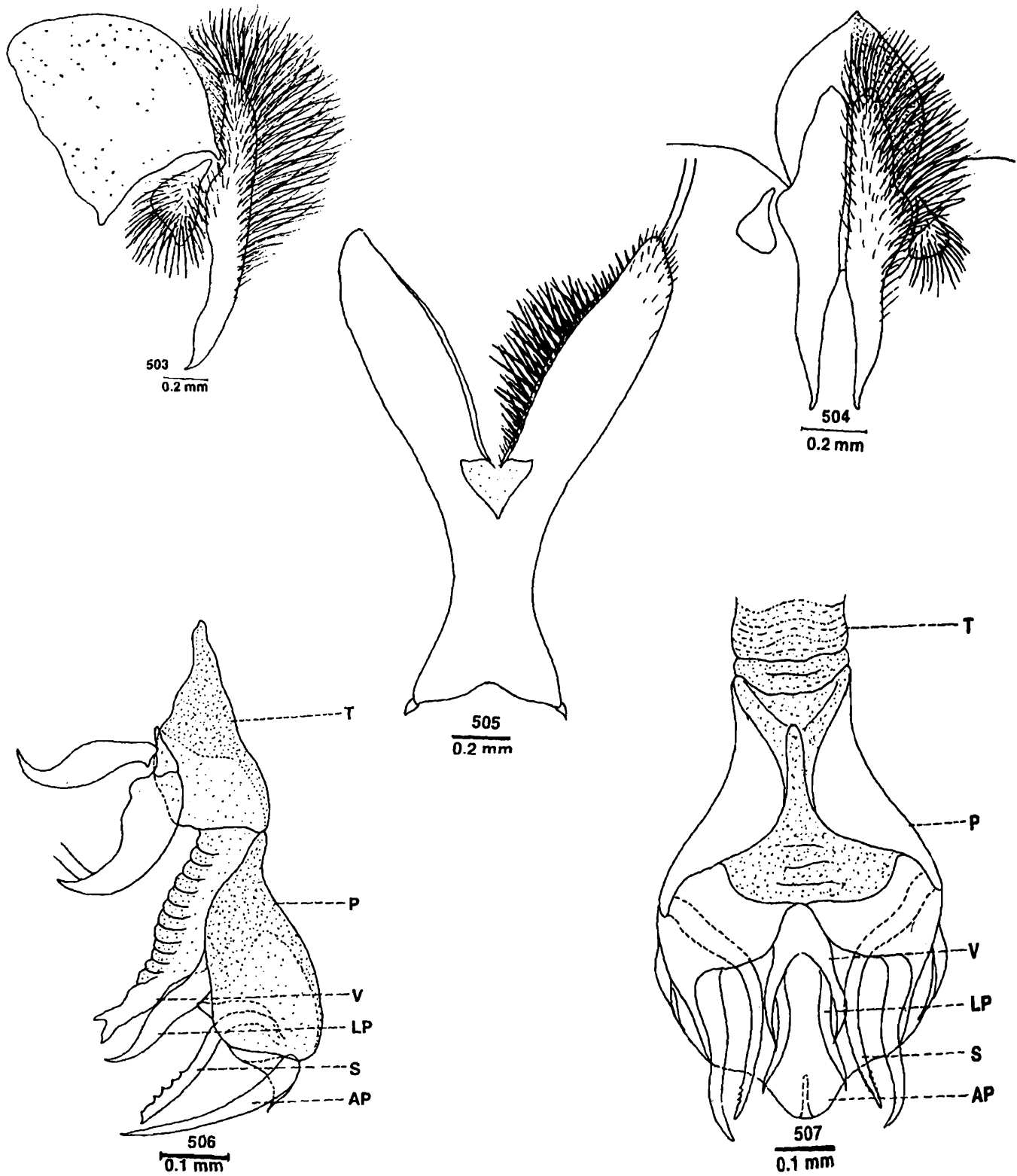
Head : Width of frons about less than that of one eye; frontal vitta blackish with shiny pollen, its width at narrowest point of frons about less than twice that of each parafrontal; parafrontal and parafacial blackish with silvery pollen, the former with short scattered hairs, the latter with a row of 4-5 short hairs near the eye margin;

antennae blackish-brown and reaching up to about 0.8 distance to vibrissae, first and second segments black with short black hairs, third brownish with silvery pollen and about two and half times that of the second; arista long, crossed, distance between vibrissae less than one parafacial width; frontal bristles 9, posterior 3 reclinate, anterior 2 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; facial ridge brownish with silvery pollen; gena blackish with silvery pollen and black hairs; post gena black, silvery pollen and with short white hairs; outer vertical bristle short, inner vertical well developed, post vertical longer than inner vertical; ocellar bristles short, post ocellar less than inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with irregular short black and white hairs; palpi black; proboscis blackish-brown.

Thorax : Greyish with three black longitudinal stripes; *ac* 0+3; *dc* 5+5; *ia* 0+3; *ps* 1; *h* 3; *ph* 2 or 3; *np* 4; *pa* 2; *sa* 4; *st* 1+1+1; *mpl* 7; *hpl* 12; upper part of propleura bare, black and with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro-and mesothoracic spiracles dense brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 5-6 short setae located dorsally and extending up to about one-third from the basal node to r-m and 4-5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment shorter than the third, the former with a row of short setae along basal half of its anterior margin; costal spines short; epaulet creamy white; basicostal scale slightly brownish; squama white ; halter brownish.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal one-third of anterodorsal surface, 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of 3 bristles along middle portion of anterodorsal surface, a row of short setae each along distal half of anteroventral and posteroventral surfaces, long hairs along basal half of anteroventral surface and 1 bristle on posterodorsal and 2 on posterolateral surfaces on distal end; mid tibia with a row of 2-4 bristles along middle portion of anterodorsal surface and 1 bristle each on distal one-third of anteroventral, posteroventral and posterodorsal surfaces; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end; hind tibia with a row of bristles along middle portion of anterodorsal surface, 1 bristle each on about one-third and two-thirds the distances from the distal end, 1 bristle on anteroventral surface on distal one-fourth and with moderately long hairs along anterior and posterior margins of ventral surface on distal half.



Figs. 503-507 : *Parasarcophaga (Liosarcophaga) aegyptica* (Salem). 503, Inner and outer forceps (lateral view); 504, Inner and outer forceps (posterior view); 505, Fifth sternite; 506, Penis (lateral view); 507, Penis (ventral view).

Abdomen : Blackish with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with 1 lateral marginal bristle, fourth with a pair of median 2 lateral marginal bristles, fifth with row of 14 marginal bristles; sternites first to fourth with short hairs; fifth sternite Y-shaped with prominent window and strong spines laterally on arms; first and second genital segments dark brown, without marginal bristles but with short hairs; inner forceps almost straight and accurately incised on the anterior margin before apex; outer forceps almost oval with hairs on distal end; anterior paramere stout, deeply curved at end and slightly shorter than posterior paramere; posterior paramere gradually curved, broad at subbasal end and with 2 hairs; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus with pointed long lateral processes; lateral plate of paraphallus almost leaf-like, elongated and transparent; ventralia membranous, wide and slightly bifurcated at end; styli of glans long and serrated anteriorly.

Female : Unknown.

Material examined : 1 ♂, Pakistan : Kalash Valley; N. W. Frontier Province, 1,800 m, 4. x. 1986, H. Kurahashi (det. E. Sugiyama as *Sarcophaga aegyptica* ; dep. in NSMT).

Discussion on species : This species is similar to *P. (Liosarcophaga) tuberosa* (Pandellé, 1896) but differs from it by the structures of ventralia and lateral plate of paraphallus. The apical process of apical plate of paraphallus and styli of glans are longer in this species. Moreover, the lateral process of apical plate of paraphallus is not bifurcated at apex here.

Biology : This species is very rare and generally attracted to fruit and meat in open air markets in Budapest and visits meat and faeces (Mihályi, 1966). The larvae develop in carcasses of insects and vertebrates (Povolny', 1987).

Distribution : Pa (several localities); Albania; Armenia; Austria; Azerbaijan; Bulgaria; Czech Republic; Egypt; Ethiopia; Gruzia; Hungary; Iran; Isreal; Kazakhstan; Moldova; North West China; Romania; Russia; Slovakia; Tajikistan; Turkmenistan; Ukraine; Uzbekistan and Yugoslavia (former).

Type deposited : *Holotype* ♂, EU, not studied.

Subgenus *Curranea* Rohdendorf, 1937

1937. *Curranea* Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 255 (as subgenus of *Parasarcophaga*).

Type species : *Sarcophaga beckeri* Villeneuve, 1908 = (*Sarcophaga tibialis* Macquart, 1851).

1963. *Batissophalla* Rohdendorf, *Stuttg. Beitr. Naturk.*, 124 : 6 (as distinct genus).

Type species : *Sarcophaga batissa* Curran, 1934.

Morphology : Basal part of paraphallus long, its apical part more or less reduced or short or plate-like; lateral plate of paraphallus with a narrow short process; ventralia long or rudimentary, thorn or hook-shaped; styli of glans long, well developed and rod-shaped; inner forceps without spines; anal tergite red; hind tibia with long hairs ventrally; propleura bare.

This is a very little known subgenus and Lopes *et al.* (1977) and Povolny (1987) placed all the species of this subgenus under the subgenus *Liosarcophaga*. Verves (1989) placed this subgenus under the subtribe Boettcheriscina and Lopes (1989) treated it as a separate genus. Dear (1980) reported 5 species from the Afrotropical region and placed it as a subgenus under the genus *Sarcophaga*. Only 1 species has been reported from the Palaearctic region, which is also known from this area.

Very little is known regarding the biology of the species of this subgenus but most of the members are attracted to human excrement and dead bodies.

This genus is distributed in the Oriental, Palaearctic, Afrotropical and Oceanian regions.

Key to male species

1. Ventralia hook-shaped; lateral process of apical plate of paraphallus not bifurcated 2
 Ventralia elongated; lateral process of apical plate of paraphallus deeply bifurcated *scopariiformis* (Senior-White)
2. Ventralia tribranches; posterior paramere longer than anterior paramere
 *kalimpongensis* Nandi
 Ventralia bibranches; parameres almost equal in length *yunnanensis* Fan

80. *Parasarcophaga (Curranea) scopariiformis* (Senior-White)

(Figs. 508-512)

1927. *Parasarcophaga dux* Thomson var. *scopariiformis* Senior-White, *Spolia zeylan.*, **14** (2) : 82; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 269; Kano and Shinonaga, 1994, *Jap. J. sanit., Zool.*, **45** : 260.
1934. *Sarcophaga pingiana* Hsien, *Acta ent. sin.*, **8** : 80.
1965. *Parasarcophaga (Curranea) scopariiformis* : Fan, *Synan. flies China*, **15** : 276; Nandi, 1979, *Revta bras. Biol.*, **39** (2) : 459; Nandi, 1992, *J. Beng. nat. Hist. Soc.*, **11** (2) : 37.
1977. *Parasarcophaga (Liosarcophaga) scopariiformis* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 569; Verves, 1986, *Cat. Palae. Dipt.*, **12** : 168.

Male : Body length 8–10 mm.

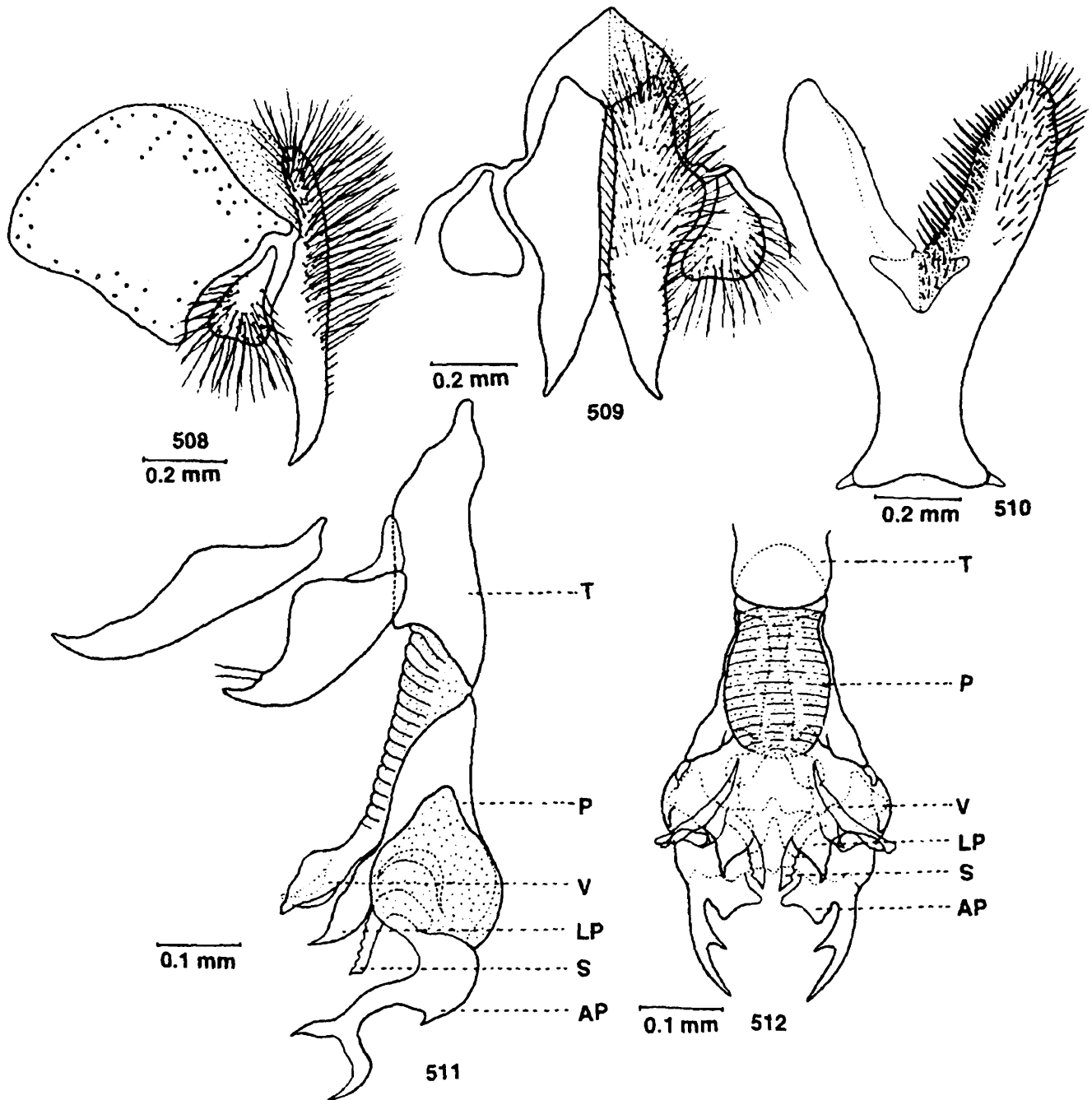
Head : Width of frons about two-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and

parafacial black with golden pollen, the former with numerous short scattered hairs, the latter with a row of about 4-5 black-brownish hairs near the eye margin; antennae blackish-brown and reaching up to about 0.85 distance to vibrissae, first and second segments black with numerous black hairs, the tip of the second slightly brown, third brown with silvery pollen and about three times that of the second; arista long, plumose along basal three-fifths; facial ridge black, bare and with silvery to golden pollen; vibrissae long, crossed, distance between vibrissae about twice that of one parafacial width; frontal bristles 10, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about half of second antennal segment, rest cruciate and directed forwards; gena and post gena black with short black hairs; ocellar triangle brownish-black with short black hairs; outer vertical bristle short, inner vertical well developed, post vertical short and shorter than inner vertical; ocellar bristles well developed, postocellar more than half of inner vertical; a pair of rows of postocular setae besides postocular cilia, first row black and regular, second row irregular with black hairs, rest of the area with brownish hairs; palpi slender and black; proboscis brownish-black.

Thorax : Brownish-black with three black longitudinal stripes; *ac* 0+1; *dc* 6+5 (posterior 2 *dc* well developed); *ia* 1+3; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 6; *hpl* 8; upper part of propleura bare, black and with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 10-11 short setae located dorsally and extending up to more than half from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment shorter than the third, the former with short spines along basal three-fifths of its anterior margin; costal spines stout; basicostal scale yellowish; squama white; halter brown.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of short bristles along posterior margin of ventral surface; fore tibia with a row of 3 short bristles along basal one-third of anterodorsal surface and 1 bristle on posterolateral surface at about one-third the distance from the distal end; mid femur with a row of 4 bristles along middle portion of anterolateral surface, a row of short setae along distal half and a row of long hairs along basal half of posteroventral surface, a row of 3 bristles along basal half and a row of short setae along distal half of anteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end; mid tibia with a row of bristles along middle portion of anterolateral surface, 1 bristle each on distal one-third of anteroventral and posterodorsal surfaces and a row of 3 bristles along posterolateral surface; hind



Figs. 508-512 : *Parasarcophaga (Curranea) scopariiformis* (Senior-White). 508, Inner and outer forceps (lateral view); 509, Inner and outer forceps (posterior view); 510, Fifth sternite; 511, Penis (lateral view); 512, Penis (ventral view).

femur with a pair of rows of bristles along anterodorsal surface, a row of bristles each along anteroventral and posteroventral surfaces and 1 bristle each on distal part of dorsal and posterodorsal surfaces; hind tibia with a row of long and several short bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-fourth the distance from the distal end and 2 bristles on middle portion of posterodorsal surface but without tuft of long hairs along posterior margin of ventral surface.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 2 lateral marginal bristles, fourth with two pairs of lateral marginal bristles, fifth with a row of 20 marginal bristles; sternites first to fourth with short hairs; fifth sternite Y-shaped with window and stout spines laterally and hairs terminally on arms; first genital segment reddish-brown with brown hairs, second black with black hairs; inner forceps pointed with hairs on basal two-thirds; outer forceps somewhat triangular with hairs on distal end; anterior paramere curved at end but without hairs; posterior paramere thicker, a little shorter than anterior paramere and with 2 short hairs on subapical end; theca shorter than paraphallus, both are sclerotised; apical part of paraphallus wide, deeply bifurcated and its lateral process curved with a short apical process; lateral process of apical plate of paraphallus well developed with leaf-like curved and pointed apex; styli of glans short and serrated anteriorly; ventralia elongated, somewhat membranous with 2 elongated curved processes.

Female : Unknown.

Material examined : India : Several male specimens from different localities of Assam, Karnataka, Kerala, Manipur, Mizoram, Nagaland, Tripura and West Bengal collected by B. C. Nandi.

Discussion on species : This species is similar to *P. (Curraea) kalimpongensis* Nandi, 1979 but differs from it by the anterior paramere which is longer than *kalimpongensis* and ventralia which is leaf-like here. This species is not placed under the subgenus *Liosarcophaga* due to peculiar structure of lateral process of apical part of paraphallus.

Biology : This species is not so abundant which was collected from bushes near human excrement.

Distribution : India ; A (Dibrugarh, Nowgong), T (Chennai), K (Walayar Forest), Kt (Chikmagalore), MnP (Imphal), Mz (Aizwal), N (Dimapur), TN (Tranquebar), T (Kanchanpur, Matabari) and WB (Diamond Harbour, Gour, Rudranagar, Sankrail); Ne (several localities); Pa (several localities); SL (Matale); China (Kwangtung); Hainan Island; Kenya; Laos; Malaysia; Singapore; Taiwan; Thailand and Vietnam.

Type deposited : *Holotype* ♂, BMNH, not studied.

81. *Parasarcophaga (Curraea) kalimpongensis* Nandi

(Figs. 513–517).

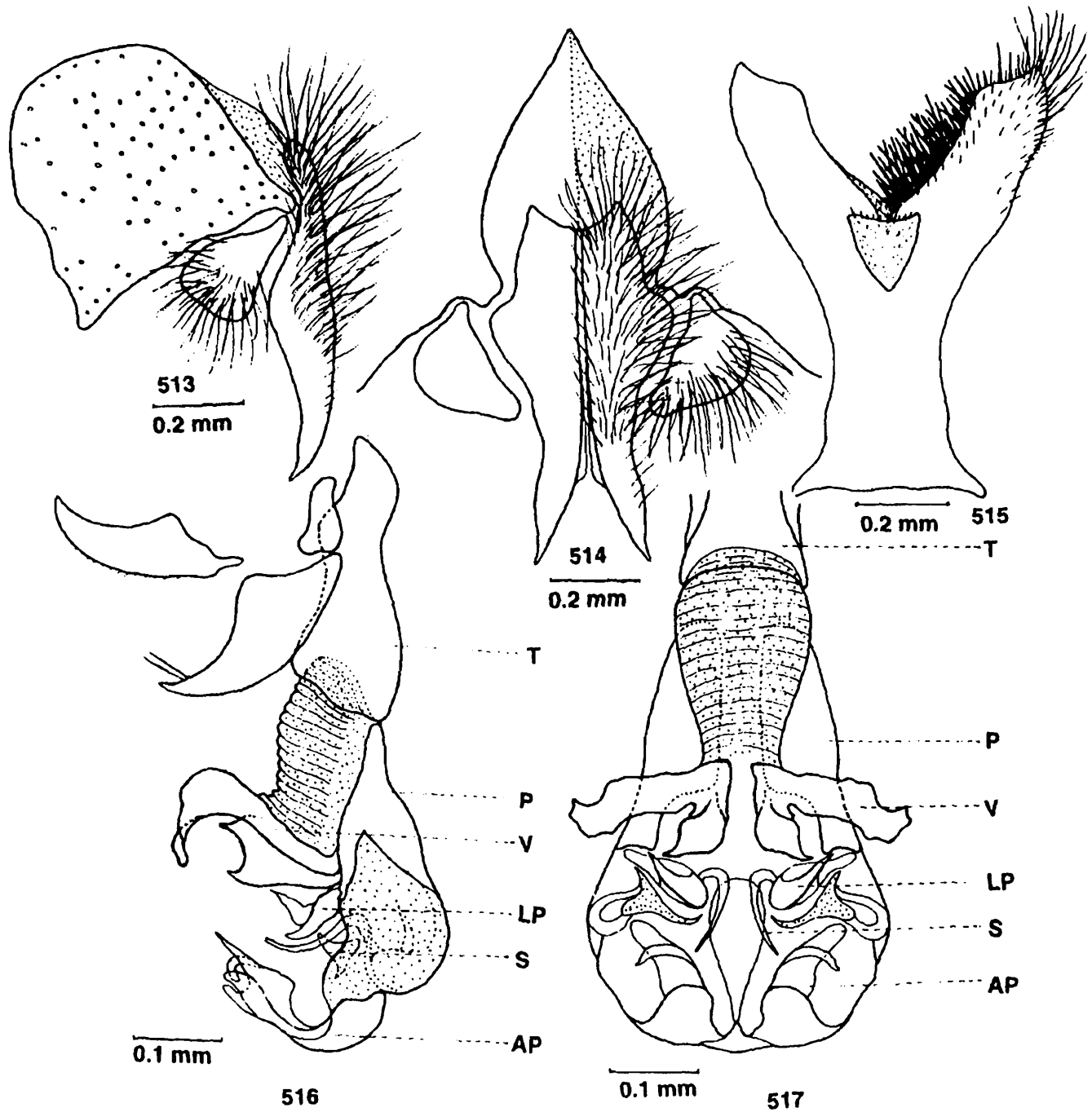
1979. *Parasarcophaga (Curraea) kalimpongensis* Nandi, *Revta bras. Biol.*, **39** (2) : 457.1988. *Parasarcophaga (Liosarcophaga) kalimpongensis* : Verves, *Vest. Zool.*, **3** : 18.*Male* : Body length 9–11 mm.

Head : Width of frons about two-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial black with golden pollen, the former with numerous short scattered hairs, the latter with a row of 8–10 long hairs near the eye margin ; antennae black and reaching up to about 0.9 distance to vibrissae, first and second segments deeply black with short black hairs, third black with black pollen and about two and half times that of the second ; arista long, plumose along basal three-fifths ; facial ridge black with golden pollen and black hairs along the basal half ; vibrissae long, crossed, distance between vibrissae about half of one parafacial width ; frontal bristles 9, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; ocellar triangle black with short black hairs ; outer vertical bristle very short, inner vertical well developed, post vertical half of the inner vertical ; ocellar bristles well developed, postocellar more than half of inner vertical ; a pair of rows of postocular setae besides postocular cilia, first row regular and second row irregular, rest of the area with black and white hairs ; palpi slender and black ; proboscis black.

Thorax : Black with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 (posterior post *dc* well developed) ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6–9 ; *hpl* 9–10 ; upper part of propleura bare and black ; prostigmatic and propleural bristles well developed and accompanied with short black hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles well developed, 1 pair each ; lateroscutellar bristles well developed, 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 4 short setae located dorsally and extending up to two-thirds from the basal node to r-m and 3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to third, the former with a row of short spines along basal two-thirds of its anterior margin ; costal spines stout ; epaulet black with short spines ; basicostal scale yellowish ; squama white ; halter brown.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 short bristles along basal one-third of anterodorsal surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end ; mid femur with a row of 3–4 bristles along middle portion of anterodorsal surface, a row



Figs. 513-517 : *Parasarcophaga (Curranea) kalimpongensis* Nandi. 513, Inner and outer forceps (lateral view); 514, Inner and outer forceps (posterior view); 515, Fifth sternite; 516, Penis (lateral view); 517, Penis (ventral view).

of 3 bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of bristles along basal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with a row of 3 long and few short bristles along posterodorsal surface and 1 bristle each on posteroventral and posterolateral surfaces at about one-third the distance from the distal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface and 1 bristle each on distal part of posterodorsal and posterolateral surfaces ; hind tibia with a row of 3 long and few short bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-fourth the distance from the distal end and 2 bristles apart on posterodorsal surface but without tuft of long hairs along posterior margin of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but second with 3 and third with 2 lateral marginal bristles, fourth with 2 median and 3 pairs of lateral marginal bristles, fifth with a row of 18 marginal bristles ; sternites first to fourth with short hairs ; fifth sternite Y-shaped with wide window and many spines laterally and few long hairs terminally on arms ; first genital segment slightly blackish, second deeply black but both without marginal bristles ; inner forceps almost straight and slightly curved at end ; outer forceps triangular with hairs on distal half ; anterior paramere curved with fine hairs on distal end ; posterior paramere thicker, curved, a little longer than anterior paramere and with 2 hairs on subapical end ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus long, curved and with one median and three lateral apical processes, median one blunt at end, anterior one of lateral process blunt and almost equal to the median one, posterior two of lateral processes less sclerotised and elongated, first one pointed and directed anteriorly, second one curved backward ; lateral plate of paraphallus short, chitinous with 2 pointed processes ; styli of glans short but without serrations ; ventralia tribranches, almost membranous and upper process with a hook-like process which is curved backwards apically, the basal process short and pointed.

Female : Unknown.

Material examined : *Holotype* ♂, India : West Bengal ; Kalimpong 1,038 m, 21.iv. 1975, B. C. Nandi ; 1 ♂, Sikkim ; Mangan, 1,189 m, 24. x. 1977, B. C. Nandi.

Discussion on species : This species is similar to *P. (Curranea) yunnanensis* Fan, 1964 but differs from it mainly by the detailed structure of ventralia. The type species of *yunnanensis* was not available for study and no definite conclusion could be drawn on the taxonomic identity of this species with *yunnanensis*. Further study and comparison of this species with the type of *yunnanensis* will reveal whether or not these two species are conspecific.

Biology : This species was collected from bushes near human excrement.

Distribution : India ; S (Mangan), WB (Kalimpong) and TN (Anamalai Hills).

Type deposited : *Holotype* ♂, ZSIC, studied.

82. *Parasarcophaga (Curraea) yunnanensis* Fan

(Figs. 518-519)

1964. *Parasarcophaga (Curraea) yunnanensis* Fan, *Acta zootax. sin.*, 1(2) : 308 ; Fan, 1965, *Synan. flies China*, 15 : 276.

1977. *Parasarcophaga (Liosarcophaga) yunnanensis* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, 3 : 570.

1988. *Sarcophaga yunnanensis* : Sigiyaama, *Jap. J. sanit. Zool.*, 40 : 123.

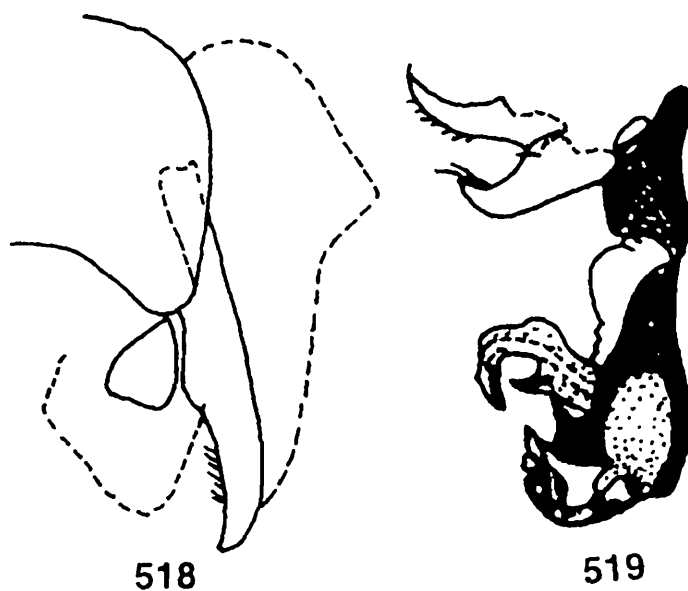
Male : Body length 9.5–11 mm.

Head : Width of frons about two-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of 8–10 hairs near the eye margin ; antennae black and reaching up to about 0.85 distance to vibrissae, first and second segments deeply black, third less black with greyish pollen and about three times that of the second ; arista long, plumose along basal three-fifths ; facial ridge black, silvery pollen and with black hairs along basal half ; vibrissae long, distance between vibrissae about one parafacial width ; frontal bristles 12, posterior 2 reclinate, anterior 4 below base of antennae and reaching up to tip of second antennal segment, rest cruciate and directed forwards ; gena black ; post gena less black with black hairs ; ocellar triangle black with short black hairs ; inner and outer vertical bristles well developed, post vertical less than half of inner vertical, postocellar half of inner vertical ; ocellar bristles moderately developed ; a pair of rows of postocular setae besides postocular cilia, rest of the area with black and white hairs ; palpi slender and black ; proboscis black.

Thorax : Black with three black longitudinal stripes ; *ac* 0+1 ; *dc* 6+5 (post 2 *dc* well developed) ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 2 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 8 ; upper part of propleura bare and black ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles less developed, 1 pair each ; lateroscutellar bristles well developed, 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 12–14 short setae located dorsally and extending up to three-fifths from the basal node to r-m and 4–5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to third, the former with short spines along basal two-thirds of its anterior margin ; costal spines stout ; epaulet black with short spines ; basicostal scale yellowish ; squama white ; halter brown.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2 bristles along basal one-third of anterodorsal surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end ; mid femur with a row of 5 bristles medially along anterodorsal surface, a row of bristles with long hairs along basal half and a row of setae each along distal half of anteroventral and posteroventral surfaces and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with 2 short bristles along posterodorsal surface on basal one-third and 1 bristle each on anterodorsal, posteroventral and posterolateral surfaces at about one-third the distance from the distal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface and 1 bristle each on distal part of posterodorsal and posterolateral surfaces ; hind tibia with 2 long and few short bristles along anterodorsal surface, 2 bristles apart medially on posterodorsal surface, few short bristles along anteroventral surface on distal end but without tuft of hairs along posterior margin of ventral surface.



Figs. 518-519 : *Parasarcophaga (Curranella) yunnanensis* Fan. 518, Inner and outer forceps (lateral view); 519, Penis (lateral view); (after Fan, 1964).

Abdomen : Black, slightly elongated and with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 3 lateral marginal bristles, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of 18 marginal bristles ; sternites first to fourth with short and few long hairs ; first genital segment slightly blackish, second dark black but both without median marginal bristles ; inner forceps almost straight ; outer forceps triangular with hairs ; anterior paramere curved with fine hairs on distal end ; posterior paramere more thicker with 2 hairs on apical end but both are

equal in length ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus long, curved and with one median and three apical lateral processes, median one blunt at end, anterior one of lateral process blunt and almost equal to the median one, posterior two of lateral process less sclerotised and elongated; first one pointed and directed anteriorly ; lateral plate of paraphallus short, chitinous, leaf-like, bending upwards and with two pointed processes ; styli of glans short without serrations ; ventralia bifurcated, almost membranous and with hook-like processes one of which is curved backwards apically and other with short basal pointed process.

Female : Unknown.

Material examined : 1♂, Thailand : Erawarw ; 500 f. Kanchan puri, 7. ix. 1975, R. Kano (det. by E. Sugiyama as *Sarcophaga yunnanensis* ; dep. in NSMT).

Discussion on species : This species is similar to *P. (Curraea) hinglungensis* Fan, 1964 but differs from it by the structures of apical plate of paraphallus and ventralia. Moreover, the parafacial and parafrontal are silvery dusted here but in *hinglungensis* they are dusted in brassy colour. This species is also quite similar to *P. (Curraea) kalimpongensis* Nandi, 1979 but differs from it by the structure of ventralia which is bibranched in *yunnanensis*. Moreover, R_{4+5} have more setae, the parameres are mostly equal in length and the posterior one is wider medially than in *kalimpongensis*. Sugiyama (1989) placed this species under the genus *Sarcophaga* due to the presence of coiled basal part of styli.

Biology : Nothing is known regarding the biology of this species.

Distribution : Sugiyama (1989) reported it for the first time from Pa (several localities). It is also recorded from China (Yunnan), Nepal, Thailand and Vietnam.

Type deposited : *Holotype* ♂, ECEIAS, not studied.

Subgenus *Pandelleisca* Rohdendorf, 1937

1937. *Pandelleisca* Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 238.

Type species : *Sarcophaga similis* Meade, 1876.

Morphology : Apical plate of paraphallus well developed, widened at middle and with one or two pairs of very long slender lateral processes ; basal plate of paraphallus very long and slender ; lateral plate of paraphallus long, pointed and sometimes 2 pairs ; styli of glans long and thin ; ventralia mostly filamentous ; genital segments without marginal bristles ; anal tergite black.

This is a rather small subgenus and Lopes (1967) described some new species from Bismarck Islands. Rohdendorf (1937) revised the species of this subgenus from USSR. Lopes *et al.* (1977) reported a total of 6 species from the Oriental region. Verves (1986) reported 5 species from the Palaearctic region. Lopes (1989) treated it as a separate genus and reported 2 species from the Australasian and Oceanian regions.

Little is known concerning the biology of the species of this subgenus but some members are attracted to human excrement and can be collected from such media. The larvae breed also in such media.

This subgenus is distributed in the Oriental, Palaearctic and Australasian and Oceanian regions.

Key to male species

1. Apical plate of paraphallus with prominent lateral process ; ventralia lobed2
 Apical plate of paraphallus without prominent lateral process ; ventralia single3
2. Lateral plate of paraphallus long and wide at end4
 Lateral plate of paraphallus short and pointed at end*kurahashii* Nandi
3. Inner forceps wide, sharply pointed at end but without spines at outer end ; ventralia with single process and curved anteriorly*curvata* Nandi
 Inner forceps narrow, gradually pointed at end but with spines at outer end ; ventralia with two processes and curved posteriorly*ballardi* (Senior-White)
4. Apical plate of paraphallus and styli of glans pointed at end5
 Apical plate of paraphallus and styli of glans blunt at end6
5. Lateral plate of paraphallus wide ; ventralia bilobed
*bainbriggei* (Senior-White)
 Lateral plate of paraphallus elongated ; ventralia trilobed*hui* (Ho)
6. Fifth sternite v-shaped with bunches of spines laterally on basal part of arms ; process of apical plate of paraphallus originates from subapical end
*assamensis* Nandi and Ray
 Fifth sternite Y-shaped but without bunches of spines laterally on basal part of arms ; process of apical plate of paraphallus originates from basal end
*iwuensis* (Ho)

83. *Parasarcophaga (Pandelleisca) kurahashii* Nandi

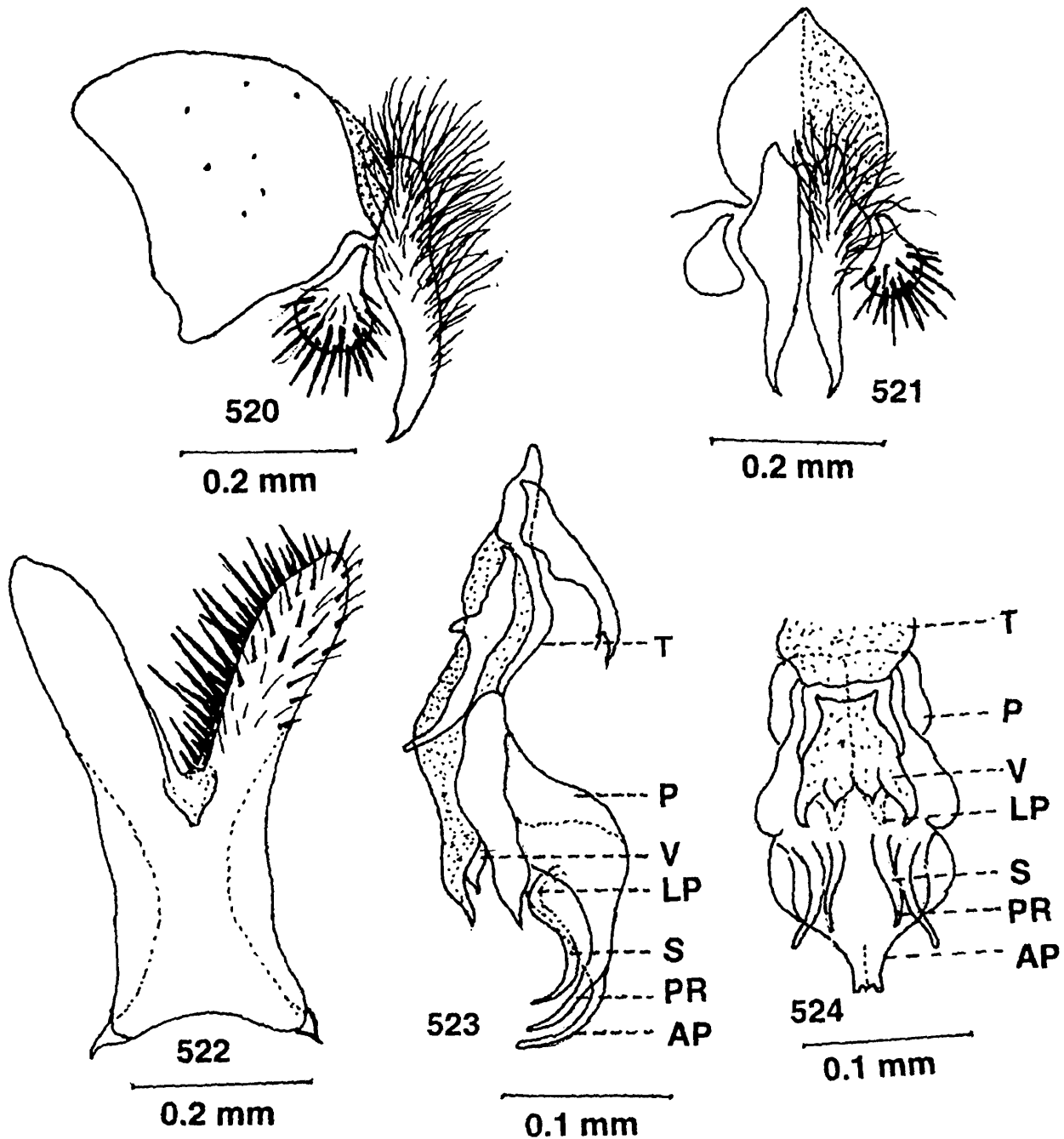
(Figs. 520–524)

1992. *Parasarcophaga (Pandelleisca) kurahashii* Nandi, *Hexapoda*, 4(1) : 71.

Male : Body length 7 mm.

Head : Width of frons about half that of one eye ; frontal vitta black , its width at narrowest point of frons about more than twice that of each parafrontal ; parafrontal and parafacial brownish with silvery pollen, the former with short scattered hairs,

the latter with a row of 4-5 short hairs near the eye margin ; antennae blackish-brown and reaching up to about 0.9 distance to vibrissae, first and second segments black, third brownish, silvery pollen and about two and half times that of the second ; arista long, plumose along more than basal half ; facial ridge brownish, silvery pollen and with short black hairs ; vibrissae long, distance between vibrissae about less than one parafacial width ; frontal bristles 10, posterior 2 reclinate, anterior 3 below



Figs. 520-524 : *Parasarcophaga (Pandelleisca) kurashii* Nandi. 520, Inner and outer forceps (lateral view); 521, Inner and outer forceps (posterior view); 522, Fifth sternite; 523, Penis (lateral view); 524, Penis (ventral view).

base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; gena black with black hairs ; post gena black ; ocellar triangle black with short black hairs ; outer vertical bristle ill-developed, inner vertical well developed, post vertical less than half of inner vertical ; ocellar bristles short, postocellar equal to the ocellar and less than half of inner vertical ; a row of regular postocular setae besides postocular cilia, rest of the area with greyish hairs ; palpi slender and black ; proboscis blackish.

Thorax : Greyish with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 6 ; upper part of propleura bare ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles well developed, 1 pair each ; lateroscutellar bristles 2 pairs, 1 bristle present in between two lateroscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 8 short setae located dorsally and extending up to about four-fifths from the basal node to r-m and 5–6 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment slightly longer than the third, the former with short spines along basal three-fourths of its anterior margin ; costal spines short ; epaulet black with short spines along basal three-fourths of its anterior margin ; costal spines short ; eqaulet black with short spines ; basicostal scale yellowish ; squama whitish ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 4 bristles along basal half of anterodorsal surface, 1 bristle on posteroventral surface at about one-third the distance from the distal end and a row of short setae along posterodorsal surface ; mid femur with 2 bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, few short setae along distal one-third of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with 2 bristles along middle portion of anterolateral surface, 1 bristle each on posterolateral surface at about one-third and two thirds the distances from basal end and 1 bristle each on posterolateral and anteroventral surfaces at about one-third the distance from distal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anterolateral surface, 1 bristle each on posterodorsal and posterolateral surfaces at about one-fifth the distance from the distal end but without tuft of long hairs along basal part of ventral surface ; hind tibia with a row of bristles along anterolateral surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end and with long hairs along ventral surface on distal half.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with 2 lateral marginal bristles,

fourth with a pair of lateral marginal bristles, fifth with a row of 12 marginal bristles ; sternites first to fourth with short hairs, fifth sternite Y-shaped, with short window and strong spines laterally on arms ; first and second genital segments brownish with short black hairs ; inner forceps slightly curved at end with slight notch at terminal end ; outer forceps almost oval with short hairs ; anterior paramere slightly curved at end with outgrowth medially ; posterior paramere almost straight with 1 short hair ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus long, curved and with prominent lateral processes ; lateral plate of paraphallus sclerotised, short and pointed at end ; styli of glans, short, curved but without serrations ; ventralia bilobed, pointed and membranous.

Female : Unknown.

Material examined : *Holotype* ♂, India : Karnataka; Mysore Zoo, 27. vi. 1990, B. C. Nandi ; *Paratype* ♂, same data as *Holotype*.

Discussion on species : This species is similar to *P. (Pandelleisca) similis* (Meade, 1876) but differs from it by the structures of apical plate of paraphallus and ventralia. This species may also be distinguished from *P. (Pandelleisca) ballardi* (Senior-White, 1924) by the structures of ventralia and styli of glans.

Biology : This is relatively rare species which was collected from bushes near animals. It might be that this species is attracted to excrement of those animals.

Distribution : India ; Kt (Mysore Zoo) and Mr (Daulatabad).

Type deposited : *Holotype* ♂, ZSIC, studied.

84. *Parasarcophaga (Pandelleisca) curvata* Nandi

(Figs. 525–528)

1989. *Parasarcophaga (Pandelleisca) curvata* Nandi. *J. Beng. nat. Hist. Soc.*, 8(1) : 25.

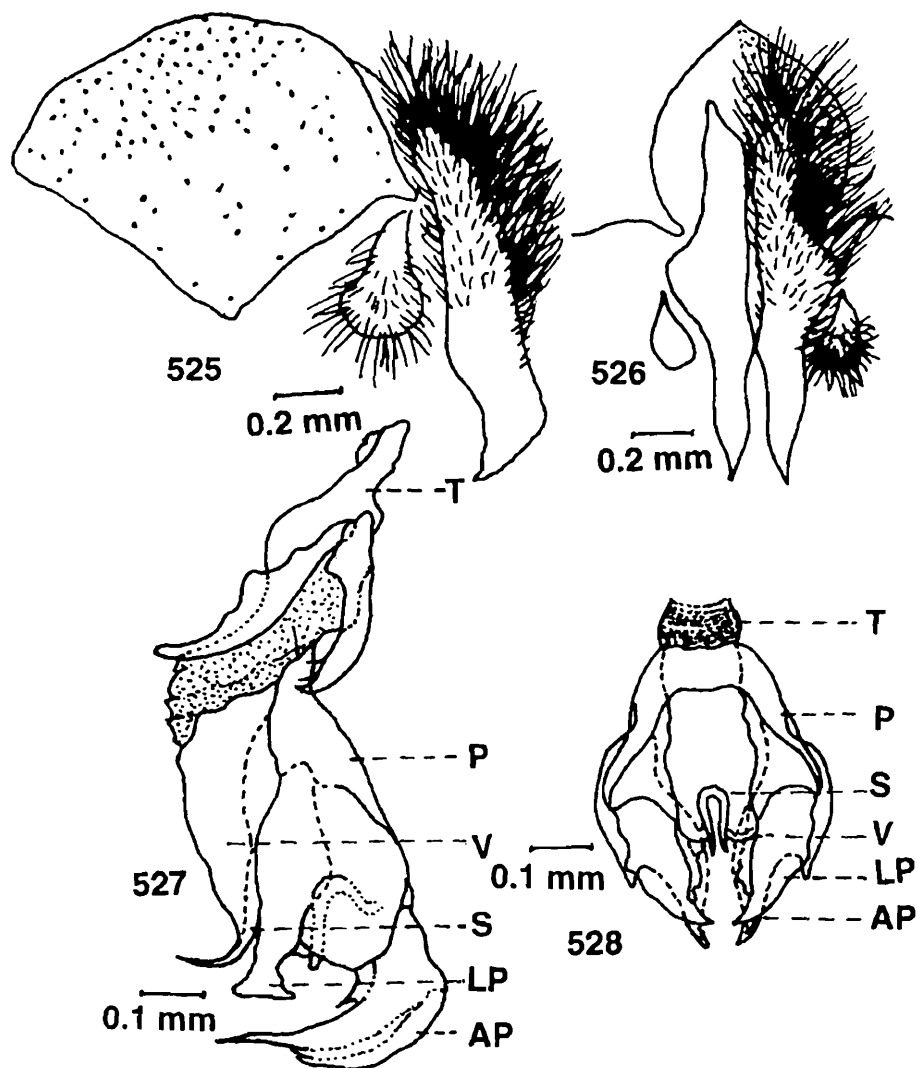
Male : Body length 8 mm.

Head : Width of frons about two-fifths that of one eye ; frontal vitta blackish, its width at narrowest point of frons about more than twice that of each parafrontal ; parafrontal brownish, silvery pollen and with short scattered hairs ; parafacial black with a row of short hairs near the eye margin ; antennae brownish-black and reaching up to about 0.85 distance to vibrissae, first and second segments blackish with numerous short black hairs, third brownish, silvery pollen and about three times that of the second ; arista long, plumose along more than basal half ; facial ridge brownish, silvery pollen and with short black hairs ; vibrissae long, crossed, distance between vibrissae about less than one parafacial width ; frontal bristles 13, posterior 2–3 reclinate, anterior 2 below base of antennae and reaching upto about half of second antennal segment, rest cruciate and directed forwards ; gena black with black hairs ; post gena black ; ocellar triangle black with short black hairs ; outer vertical bristle

absent, inner vertical well developed, post vertical about half of inner vertical ; a row of regular postocular setae besides postocular cilia, rest of the area with greyish hairs ; palpi slender ; proboscis blackish.

Thorax : Greyish with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 10 ; upper part of propleura bare ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brownish ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 8–10 short setae located dorsally and extending up to half the distance from the basal node to r-m and 5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment about



Figs. 525-528 : *Parasarcophaga (Pandelleisca) curvata* Nandi. 525, Inner and outer forceps (lateral view); 526, Inner and outer forceps (posterior view); 527, Penis (lateral view); 528, Penis (ventral view).

twice that of the third, the former with short spines along basal half of its anterior margin ; basicostal scale yellowish ; epaulet brown ; squama white ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 4 bristles along basal part of anterodorsal surface, a row of bristles along posterodorsal surface and a row of bristles along posterolateral surface at about one-third the distance from the distal end ; mid femur with a row of 4 short bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of short setae along distal one-third of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with 1 bristle on middle portion of anterolateral surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end and a row of long bristles along posterodorsal surface on distal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along posteroventral surface and short hairs along basal part of ventral surface ; hind tibia with a row of bristles along anteroventral surface, 2 bristles on posterodorsal surface and numerous long hairs along ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but second with 4 and third with 3 lateral marginal bristles, fifth with a row of 18 marginal bristles ; sternites first to fourth with short hairs ; first genital segment blackish without marginal bristles, second brownish with short hairs but without marginal bristles ; inner forceps wide, almost straight, slightly beak-like but without spines on outer end ; outer forceps almost oval with short hairs ; anterior paramere slightly curved at end ; posterior paramere shorter, slightly curved and with 2 hairs on anterior end ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus curved abruptly, pointed at end and with one feeble process ; lateral plate of paraphallus well developed and blunt at end ; styli of glans short ; ventralia single, membranous, curved and pointed anteriorly.

Female : Unknown.

Material examined : *Holotype* ♂, India : Himachal Pradesh ; Manali, 1,926m, 22. x. 1988, B. C. Nandi ; *Paratype* ♂, same data as *Holotype*.

Discussion on species : This species is distinguished from *P. (Pandelleisca) ballardi* (Senior-White, 1924) by the structures of ventralia and inner forceps. This species may also be distinguished from *P. (Pandelleisca) polystylata* (Ho, 1934) by the structures of lateral and apical plates of paraphallus.

Biology : This is a rare species which was collected from bushes.

Distribution : India ; HP (Manali).

Type deposited : *Holotype* ♂, ZSIC, studied.

85. *Parasarcophaga (Pandelleisca) ballardi* (Senior-White)

(Figs. 529–533)

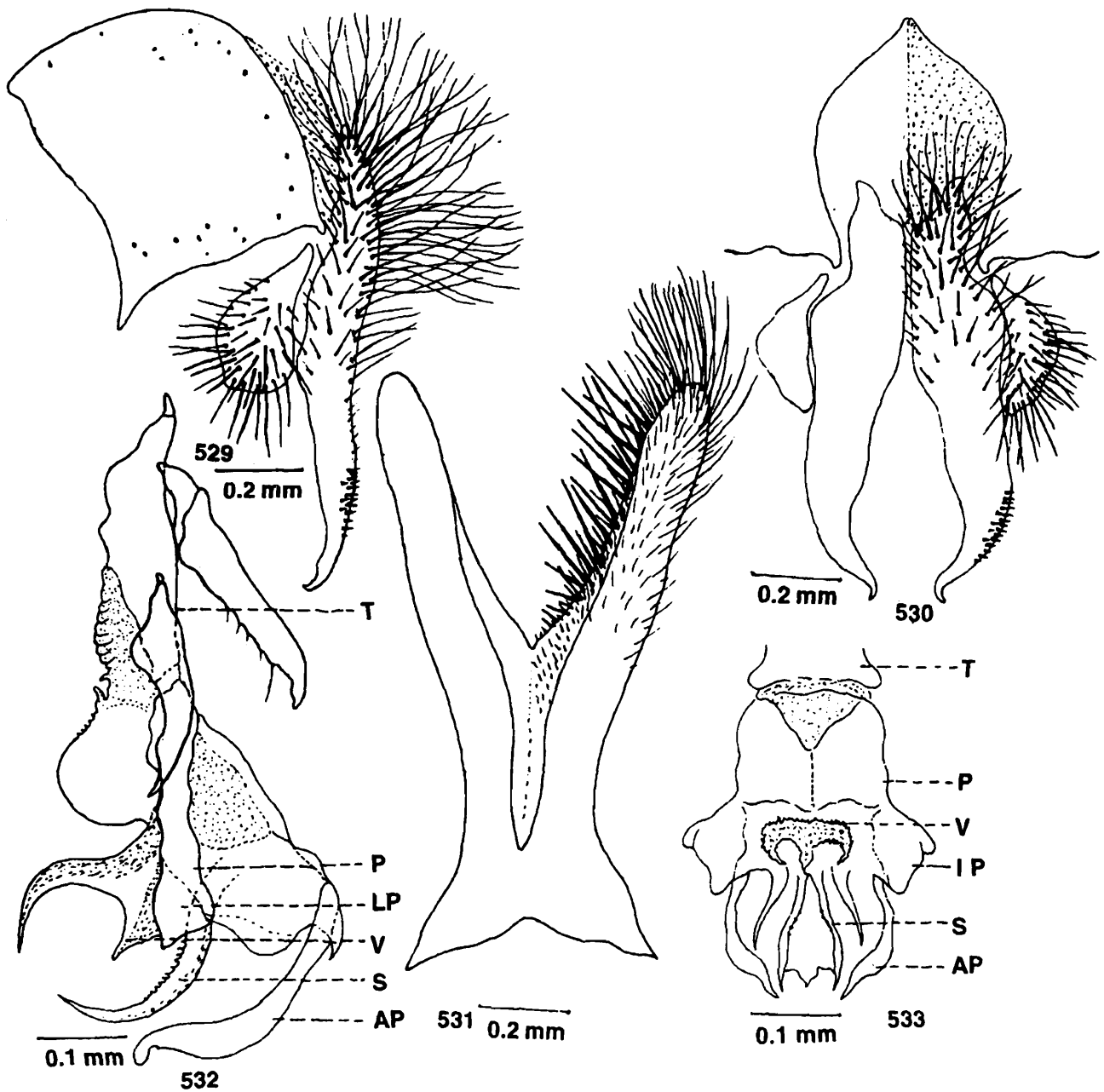
1924. *Sarcophaga ballardi* Senior-White, *Rec. Indian Mus.*, **26**(3) : 254 ; Senior-White, Aubertin and Smart, 1940. *Fauna Br. India, Dipt.*, **6** : 275.
1977. *Parasarcophaga (Pandelleisca) ballardi* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 570 ; Nandi, 1992, *Hexapoda*, **4**(1) : 69.
1991. *Ampilicercomya ballardi* : Verves, *Proc. Zool. Inst. USSR*, **240** : 132.

Male : Body length 10–11 mm.

Head : Width of frons about half of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial brownish with silvery pollen, the former with short scattered hairs, the latter with a row of about 6–7 hairs near the eye margin ; antennae brownish and reaching up to about 0.80 distance to vibrissae, first and second segments slightly blackish with numerous short black hairs, third brownish, silvery pollen and about two and half times that of the second ; arista long, plumose along basal more than two and half ; facial ridge brownish, silvery pollen and with short black hairs ; vibrissae long, distance between vibrissae about less than one parafacial width ; frontal bristles 9, posterior 2 reclinate, anterior 2 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; gena black with numerous short black hairs ; post gena blackish with silvery pollen ; ocellar triangle black with short black hairs ; outer vertical bristle not differentiated, inner vertical well developed, post vertical half of the inner vertical ; ocellar bristles short, postocellar slightly less than ocellar and more than half of inner vertical ; a row of regular postocular setae besides postocular cilia, rest of the area with greyish hairs ; palpi slender and brownish ; proboscis brownish.

Thorax : Greyish with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 9 ; upper part of propleura bare and black ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles well developed, 1 pair each ; lateroscutellar bristles 2 pairs and presence of 1 bristle in between 2 lateroscutellar bristles.

Wings : Hyaline with brown veins ; R_1 bare ; R_{R+5} with a row of short setae located dorsally and extending up to about half from the basal node to r-m and 5–6 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment slightly shorter than the third, the former with short spines along basal half of its anterior margin ; costal spines not stout ; epaulet black ; basicostal scale yellowish ; squama whitish ; halter brown.



Figs. 529-533 : *Parasarcophaga (Pandelleisca) ballardi* (Senior-White). 529, Inner and outer forceps (lateral view); 530, Inner and outer forceps (posterior view); 531, Fifth sternite; 532, Penis (lateral view); 533, Penis (ventral view).

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2 short bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of short setae along posteroventral surface at about half the distance from the distal end and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with 1 bristle on posterolateral surface at about one-third the distance from the distal end and 1 bristle each on anteroventral, posterodorsal and posteroventral surfaces at about one-third the distance from the basal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 1 bristle on posterodorsal surface at about one-fourth the distance from the distal end and long hairs along posteroventral surface ; hind tibia with a row of bristles along anterolateral surface, 1 bristle on anteroventral surface at about one-fifth the distance from the distal end, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end and long hairs along ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 3 lateral marginal bristles, fourth with a pair of median and 2 lateral marginal bristles, fifth with a row of 14 marginal bristles ; sternites first to fourth with short hairs ; fifth sternite Y-shaped, with strong bristles laterally and long hairs terminally on arms ; first and second genital segments brownish with long hairs ; inner forceps narrow, gradually pointed with short notch terminally and bearing spines at subterminal end posteriorly ; outer forceps slightly elongated with short hairs ; anterior paramere shorter, almost straight and pointed terminally ; posterior paramere longer, straight at end with 1 long and few short hairs ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus long, curved and with short apical process at end, lateral process of apical plate of paraphallus long and blunt at end ; lateral plate of paraphallus blunt ; styli of glans curved, hook-shaped and with comb-like spines anteriorly ; ventralia transparent with two processes, upper one curved posteriorly and beak-shaped, lower one straight and blunt.

Female : Unknown.

Material examined : *Holotype* ♂, India : Tamil Nadu ; Coimbatore, 14. vi. 1916, N. K. M. ; 2 ♂♂, Karnataka ; Mysore Zoo, 757 m, 27. vi. 1990, B. C. Nandi ; 1 ♂, Maharashtra ; Daulatabad, 340 m, 17. vi. 1990, B. C. Nandi.

Discussion on species : This species is similar to *P. (Pandelleisca) curvata* Nandi, 1989 but differs from it by the structures of inner forceps and ventralia. Moreover, the apical part of paraphallus is also quite distinguishable here from *curvata*.

Biology : It is a relatively rare species which was collected from bushes near Zoo animals. It seems that this species is attracted to excreta of animals.

Distribution : India ; Kt (Mysore), TN (Coimbatore) and Mr (Daulatabad).

Type deposited : *Holotype* ♂, BMNH, studied.

Discussion on type : Condition of the type is good except the mid and hind pairs of legs are missing. In my specimens studied here the inner forceps is almost blunt but in the type species it is more elongated. Genitalia and fifth sternite of the type were dissected out and mounted on a slide. Some parts of the abdomen of the type were mounted on the corner of a label.

86. *Parasarcophaga (Pandelleisca) bainbriggei* (Senior-White)

(Figs. 534–538)

1925. *Sarcophaga bainbriggei* Senior-White, *Spolia zeylan.*, **26** (3) : 212 ; Senior White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 274.

1924. *Sarcophaga fletcheri* Senior-White, *Rec. Indian Mus.*, **26** (3) : 254 (preoccupied, Aldrich, 1916).

1977. *Parasarcophaga (Pandelleisca) bainbriggei* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 570 ; Nandi, 1977, *Rec. zool. Surv. India*, **73** : 214 ; Nandi, 1989, *Mems Inst. Oswaldo Cruz*, **84**(4) : 397 ; Nandi, 1990, *Hexapoda*, **2** : 25.

Male : Body length 7–10 mm.

Head : Width of frons about one-third that of one eye ; frontal vitta black, its width at narrowest point of frons more than twice that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of hairs near the eye margin ; antennae brownish and reaching up to about 0.9 distance to vibrissae, first segment brownish-black, second brown and orange at tip, third brown, silvery pollen and about three times that of the second ; arista long, plumose along basal half ; facial ridge bare, black and with silvery pollen ; vibrissae long, distance between vibrissae about one and half times that of one parafacial width ; frontal bristles 11, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; gena black with grey or black hairs ; post gena black ; ocellar triangle black, silvery pollen and with short black hairs ; outer vertical bristle absent ; inner vertical well developed, post vertical short about one-third the inner vertical ; ocellar and postocellar bristles moderately developed ; a row of regular postocular setae besides postocular cilia, rest of the area with black and white hairs ; palpi slender and brown ; proboscis blackish-brown.

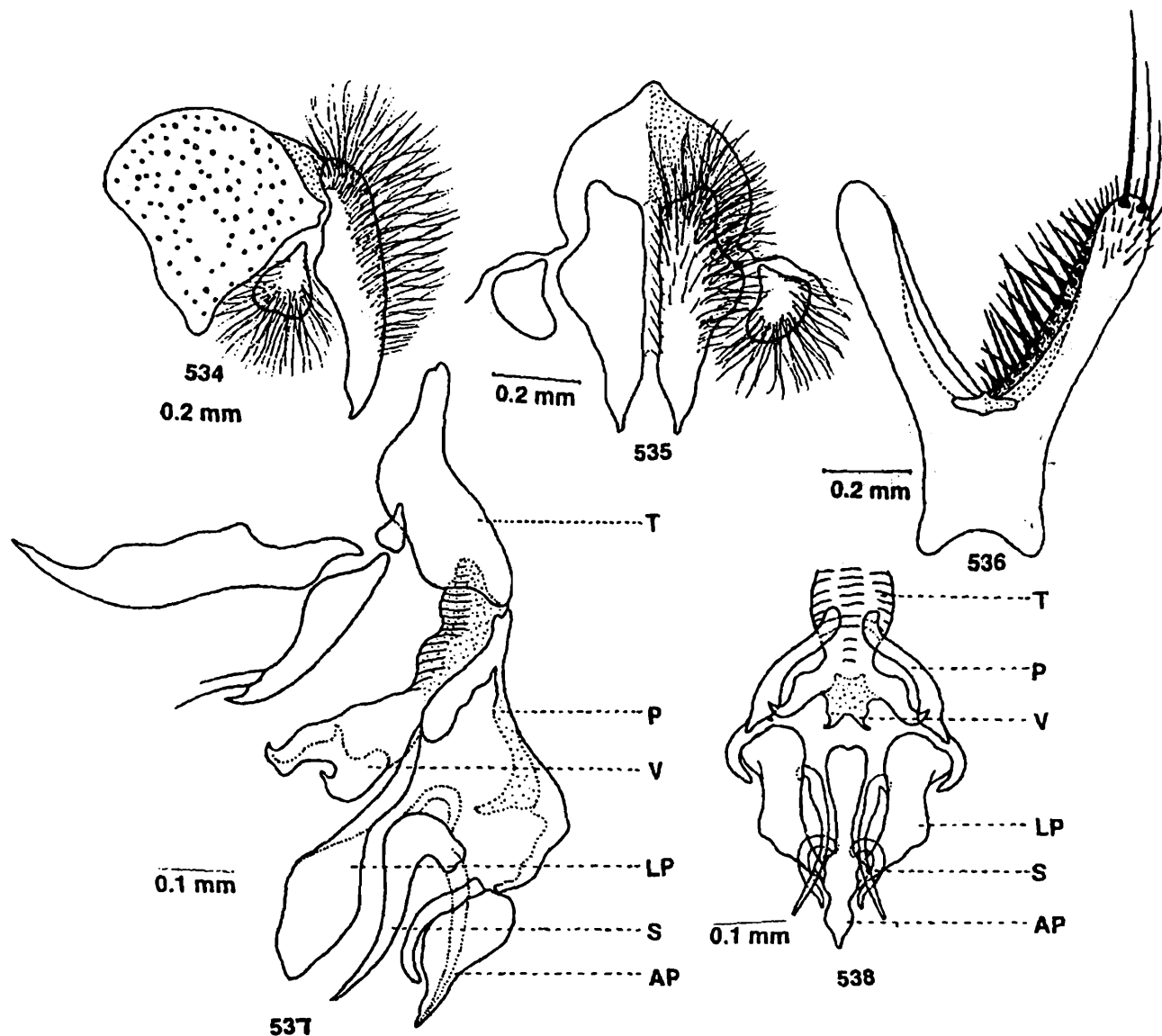
Thorax : Greyish with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 (posterior two *dc* stout) ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 8 ;

upper part of propleura bare and brownish-black ; prostigmatic and propleural bristles well developed and accompanied with short black hairs ; pro- and mesothoracic spiracles brownish with white tinge ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of short setae located dorsally and extending up to about two-thirds the distance from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment slightly greater than the third, the former with short spines along basal two-thirds of its anterior margin ; costal spines stout ; epaulet black with few long and several short spines ; basicostal scale light yellowish ; squama whitish ; halter brown.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of long bristles along posterior margin of ventral surface ; fore tibia with a row of 3 bristles along basal half of anterodorsal surface, 1 bristle on posterolateral surface at about one-third the distance from the distal end and a row of short setae along posterodorsal surface ; mid femur with a row of 3 short bristles along middle portion of anterolateral surface, a row of bristles along basal two-thirds and a row of short setae along distal one-third of anteroventral surface, a row of bristles along basal half and a row of short setae along distal one-third of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with 2 bristles on middle portion of anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end, 2 bristles on middle portion of posterodorsal surface and 1 bristle on posterolateral surface at about one-third the distance from the distal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of about 5 bristles along anteroventral surface, 2 bristles on distal part of posterodorsal surface, a row of bristles along posteroventral surface, 1 bristle on posterolateral surface at about one-fifth the distance from the distal end and short hairs along basal part of posteroventral surface ; hind tibia with a row of bristles along anterodorsal surface, 1 long and 2 short bristles along anteroventral surface at about half the distance from the distal end, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end, 1 bristle on posteroventral surface at about one-third the distance from the distal end and long hairs along ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with 2 lateral marginal bristles, fourth with a pair of median and 4 pairs of lateral marginal bristles, fifth with a row of 24 lateral marginal bristles ; first sternite with long hairs, second, third and fourth each with short hairs ; fifth sternite cup-shaped, with short window and provided with short spines laterally and 2-3 long hairs terminally on arms ; first genital segment black with long hairs, second brownish with short hairs but without median marginal



Figs. 534-538 : *Parasarcophaga (Pandelleisca) bainbriggei* (Senior-White). 534, Inner and outer forceps (lateral view); 535, Inner and outer forceps (posterior view); 536, Fifth sternite; 537, Penis (lateral view); 538, Penis (ventral view).

bristles ; inner forceps slightly curved, pointed and with slight notch at end and hairs on basal fourth ; outer forceps triangular with hairs ; anterior paramere long, curved and pointed at end ; posterior paramere shorter, pointed at end and with 2 short hairs anteriorly ; theca shorter than paraphallus, both are heavily sclerotised ; apical plate of paraphallus sclerotised, long, pointed and almost straight at end and with a pair of slender subbasal lateral processes ; lateral plate of paraphallus chitinised, very long, wide at middle and shovel-shaped ; styli of glans very long and pointed ; ventralia bifurcated at end and hook-like apically.

Female : Unknown.

Material examined : *Holotype* ♂, India : Bihar ; Pusa, 11. vii. 1907, R. Senior-White ; Several male specimens from different localities of Assam, Bihar, Himachal Pradesh, Orissa, Tripura, Tamil Nadu and West Bengal collected by B. C. Nandi.

Discussion on species : This species is similar to *P. (Pandelleisca) hui* (Ho, 1936) but differs from it by the structures of ventralia and lateral and apical plates of paraphallus. Moreover, the structure of fifth sternite in this species differs from that of *hui*.

Biology : It is relatively rare species which was collected from bushes near human excrement. This species is attracted to human excrement and breed from such media.

Distribution : India ; A (Silchar), B (Deoghar, Pusa), HP (Solan), K (Kurumbagram), O (Balugaon, Nandankanan, Taptapani), T (Trishna), TN (Coimbatore, Chennai, Tranguebar) and WB (Baharampur, Bishnupur, Calcutta, Gour, Suri).

Type deposited : *Holotype* ♂, BMNH, studied.

Discussion on type : The author studied the type of *fletcheri* Senior-White 1924 and found that the mid and hind tibia are lost. The genitalia and fifth sternite were dissected out and mounted on a separate slide. The description provided here agrees with that of *fletcheri*.

87. *Parasarcophaga (Pandelleisca) hui* (Ho)

(Figs. 539-543)

1936. *Sarcophaga hui* Ho, *Bull. Fan meml Inst. Biol.*, **6** : 207; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 260; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, **45** : 260.

1965. *Parasarcophaga (Liosarcophaga) hui* : Fan, *Synan. flies China*, **15** : 285.

1977. *Parasarcophaga (Pandelleisca) hui* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 570.

Male : Body length 7.5–11 mm.

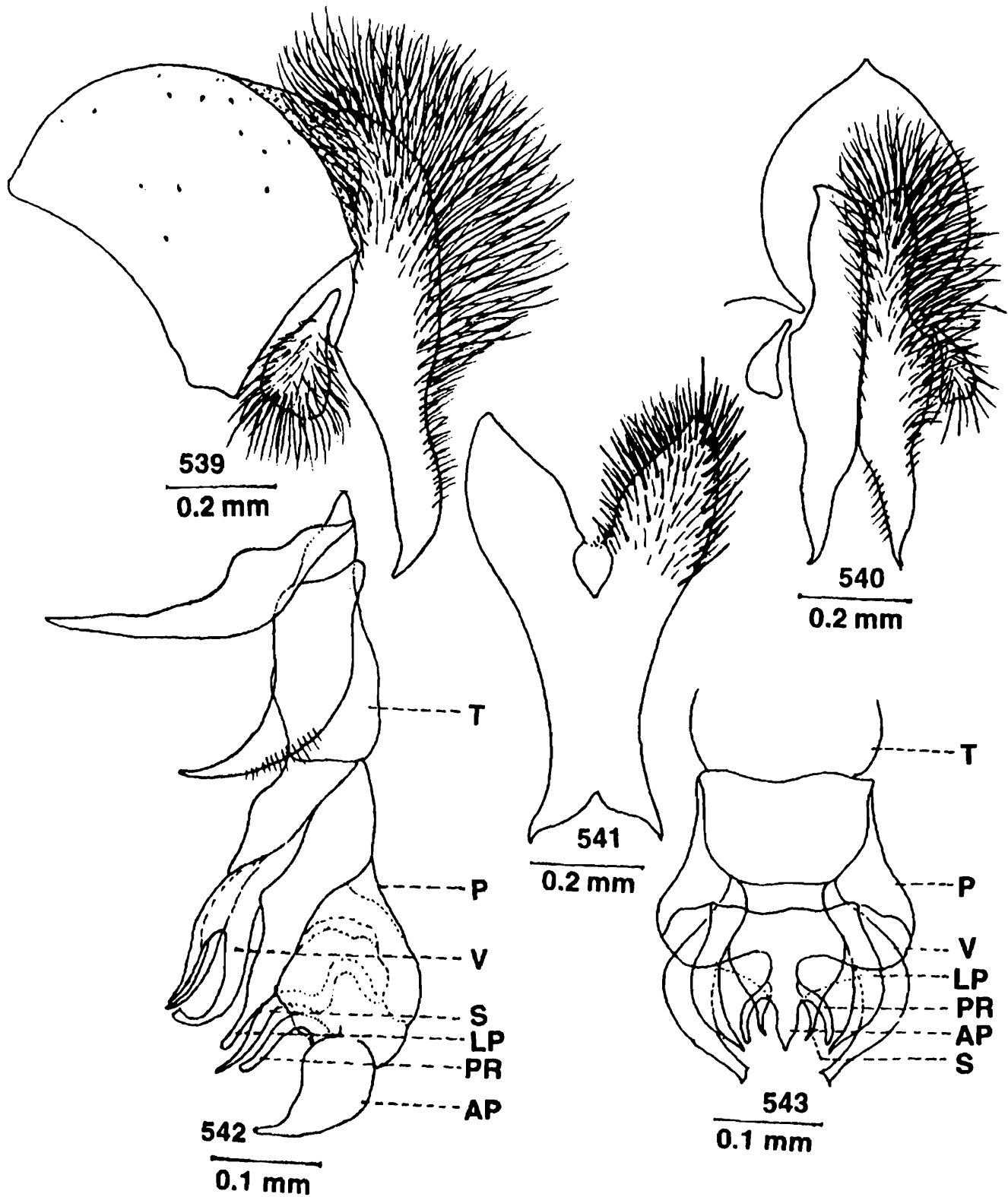
Head : Width of frons about two-thirds that of one eye; frontal vitta dark red with black edges and about twice that of each parafrenal; parafrenal and parafacial

blackish with silvery pollen, the former with short scattered hairs, the latter with a row of 8 short hairs near the eye margin; antennae blackish-brown and reaching up to about 0.82 distance to vibrissae, first and second segments black, third slightly brownish, silvery pollen and about twice that of the second; arista long, plumose along more than basal half; facial ridge brownish, silvery pollen and with short black hairs; vibrissae long, distance between vibrissae about one parafacial width; frontal bristles 9-10, posterior 2 reclinate, anterior 1 or 2 below base of antennae and reaching up to about one-third of second antennal segment, rest cruciate and directed forwards; gena black with black hairs anteriorly and yellow hairs posteriorly; post gena black; ocellar triangle black with short black hairs; outer vertical bristle absent; inner vertical well developed, post vertical less than half of inner vertical; ocellar bristles short, postocellar equal to ocellar and about less than half of inner vertical; a row of regular postocular cilia, rest of the area with indistinct row of cilia and short hairs; palpi slender and black; proboscis blackish.

Thorax : Pale yellowish-grey with three inconspicuous longitudinal stripes; *ac* 0+1; *dc* 4 or 5+5; *ia* 1+3; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 4; *hpl* 7; upper part of propleura bare; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles well developed, 1 pair each; lateroscutellar bristles 2 pairs; sometimes apicoscutellar bristle absent.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of short setae located dorsally and extending up to about basal half from the basal node to r-m and 4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment a little shorter than the third, the former with short spines along basal half of its anterior margin; costal spines short; epaulet black with short spines; basicostal scale yellowish; squama whitish; halter brown.

Legs : Black : fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 short bristles along basal half of anterodorsal surface, 1 bristle on posteroventral surface at about one-third the distance from the distal end and short setae along posterodorsal surface; mid femur with a pair of rows of bristles along middle portion of anterolateral surface, a row of bristles with long hairs each along basal half of anteroventral and posteroventral surfaces and a row of short setae each along distal half of anteroventral and posteroventral surfaces; mid tibia with 2 bristles on middle portion of anterolateral surface, 1 bristle each of posterolateral surface at about one-third and two-thirds the distances from the basal end and 1 bristle each on posterolateral and anteroventral surfaces at about one-third the distance from the distal end; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 1 bristle on posterodorsal surface at about one-third the distance from distal end and with short hairs along basal half of ventral



Figs. 539-543 : *Parasarcophaga (Pandelleisca) hui* (Ho). 539, Inner and outer forceps (lateral view); 540, Inner and outer forceps (posterior view); 541, Fifth sternite; 542, Penis (lateral view); 543, Penis (ventral view).

surface; hind tibia with long hairs along anteroventral and posteroventral surfaces on distal half, 1 bristle each on one-third and two-thirds of posterodorsal surface on distal end and with short hairs along posteroventral surface.

Abdomen : Greyish with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with 1 lateral marginal bristles, fourth with 3 lateral and 1 median marginal bristles, fifth with a row of 14 marginal bristles; sternites first to fourth with short hairs; fifth sternite Y-shaped, with short window and hairs; first and second genital segments black with grey pollen but without median marginal bristles; inner forceps slightly curved at end but without median marginal bristles; outer forceps slightly curved at end but without spines; anterior paramere slightly curved and pointed; posterior paramere deeply curved at end with few hairs on outer surface; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus curved, pointed at end and with long lateral process; lateral plate of paraphallus shorter but elongated; styli of glans short and pointed; ventralia tribranched, the branches are elongated and posterior one curved anteriorly.

Female : Unknown.

Material examined : *Paratype* ♂, China ; Hainan Exp., 11-19. 1934, Ho Chi.

Discussion on species : This species is similar to *P. (Pandelleisca) bainbriggei* (Senior-White, 1925) but differs from it by the structures of apical plate of paraphallus and ventralia. Moreover, the styli of glans is shorter in this species.

Biology : Nothing is known regarding the biology of this species.

Distribution : Ne (several localities); China and Hainan Island.

Type deposited : *Holotype* ♂, FMIBP, *Paratype* ♂, BMNH, studied.

Discussion on type : The author studied the *Paratype*. It is in good condition and the description provided here is based on only from the *Paratype*.

88. *Parasarcophaga (Pandelleisca) assamensis* Nandi and Ray

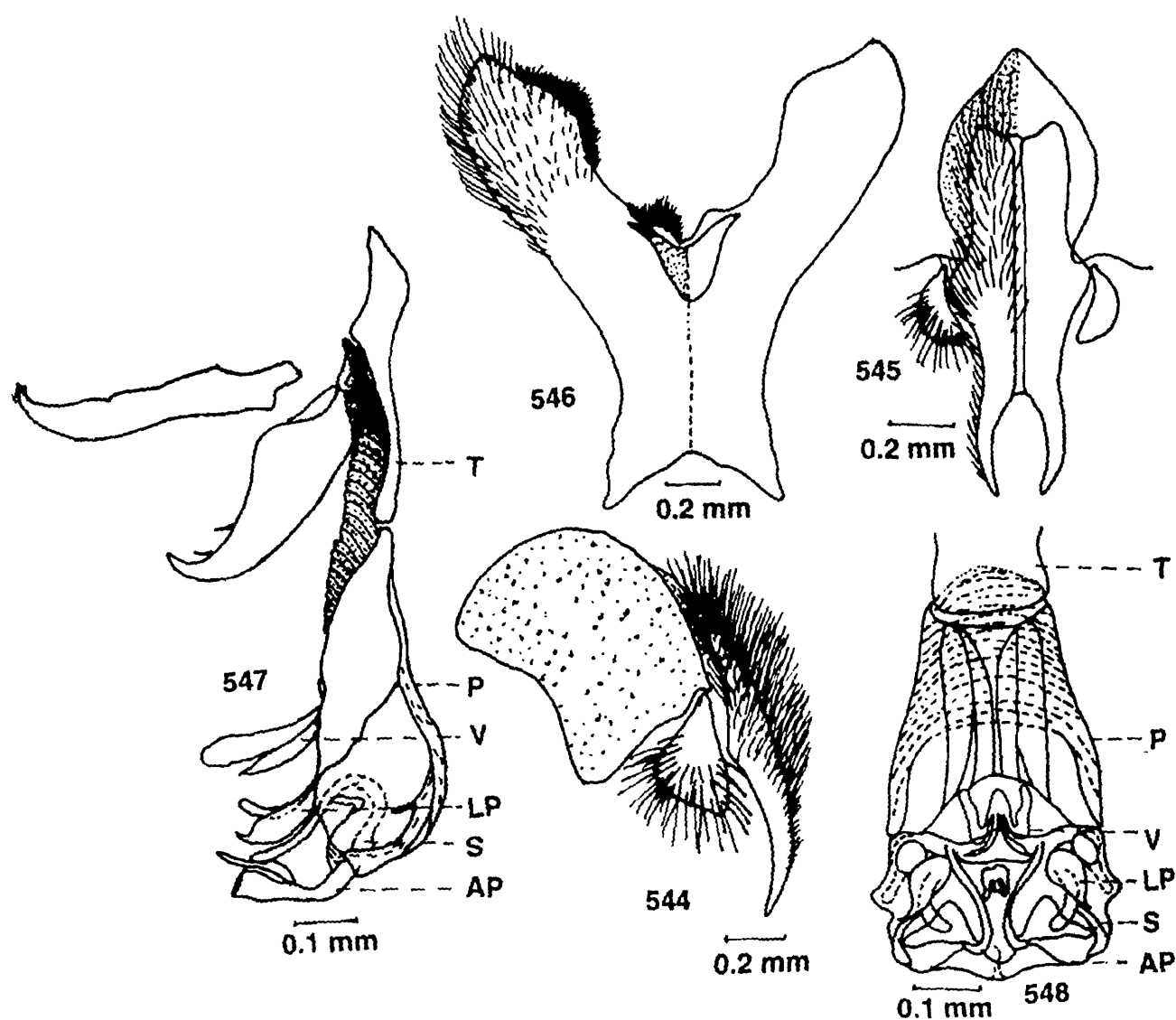
(Figs. 544-548)

1982. *Parasarcophaga (Pandelleisca) assamensis* Nandi and Ray, *Rec. zool. Surv. India*, **80** : 120; Nandi, 1986, *Orient. Zool.*, **6-7** : 41.

Male : Body length 8 mm.

Head : Width of frons about two-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of hairs near the eye margin; antennae blackish and reaching up to about 0.85 distance to vibrissae, first segment slightly brown, second black, third blackish with silvery pollen and about two and half times that of the second; arista long,

plumose along basal two-thirds; vibrissae long, crossed, distance between vibrissae about one parafacial width; frontal bristles 11, posterior 2 reclinate, anterior 4 below base of antennae and reaching up to about two-thirds of second antennal segment,



Figs. 544-548 : *Parasarcophaga (Pandelleisca) assamensis* Nandi and Ray. 544, Inner and outer forceps (lateral view); 545, Inner and outer forceps (posterior view); 546, Fifth sternite; 547, Penis (lateral view); 548, Penis (ventral view).

rest cruciate and directed forwards; gena brownish-black with silvery pollen; post gena black with black hairs; ocellar triangle black, silvery pollen and with short hairs; outer vertical bristle short, inner vertical well developed, post vertical less than two and half times that of inner vertical; ocellar and post ocellar bristles short;

a row of regular postocular setae besides postocular cilia, rest of the area with black and white hairs; palpi slender and black; proboscis black.

Thorax : Blackish-grey with three black longitudinal stripes; *ac* 0+1; *dc* 5+6; *ia* 1+2; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 6; *hpl* 7-8; upper part of propleura brownish black; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 1 pair.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 7-8 short setae located dorsally and extending up to about half the distance from the basal node to *r-m* and 4-5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than the third, the former with short spines along basal one-third of its anterior margin; costal spines stout; epaulet black with short spines; basicostal scale whitish; squama white; halter brown.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of several short bristles along middle portion of anterodorsal surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of short setae along distal half of posteroventral surface and 1 bristle on distal part of posterodorsal surface; mid tibia with a row of 3 bristles along posterodorsal surface, 2 bristles on middle portion of anteroventral surface, 1 bristle on anteroventral surface at about one-fifth the distance from the distal end and 1 bristle on posteroventral surface at about two-thirds the distance from the basal end; hind femur with a pair of rows of bristles along anterodorsal surface, 1 bristle each on anteroventral and posterodorsal surfaces at about one-fourth the distance from the distal end and numerous long hairs along ventral surface; hind tibia with a row of long bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-fifth the distance from the distal end, 2 bristles on posterodorsal surface distally but without long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second abdominal tergite absent but with 4 lateral marginal bristles, third with 2 median and 1 lateral marginal bristles, fourth with 2-3 lateral marginal bristles, fifth with a row of 16 marginal bristles; sternites first to fourth with short hairs; fifth sternite v-shaped, cup-like, with short hairs on terminal end and bunches of spines on basal projected-growth and subterminal end laterally on arms; first genital segment blackish with short spines, second shiny-black with short hairs but both without marginal bristles; inner forceps slightly curved, pointed, without notch at apex but

with hairs along basal three-fifths; outer forceps triangular with hairs; anterior paramere long, almost straight, slightly curved and pointed at end; posterior paramere curved terminally with 2 hairs on anterior end; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus sclerotised, slightly curved, blunt at end and with 2 slender membranous processes which originate from subbasal end; lateral plate of paraphallus short, wide medially, slightly chitinised and hook-like terminally; styli of glans short, blunt but without serrations; ventralia almost membranous and bifurcated terminally.

Female : Unknown.

Material examined : *Holotype* ♂ ; India : Assam; Jorhat, 22. i. 1978, B. C. Nandi; 1 ♂, Manipur; D. M. College Campus, 19. x. 1989, B. C. Nandi.

Discussions on species : This species is similar to *P. (Pandelleisca) iwuensis* (Ho, 1934) but differs from it by the structures of lateral plate of paraphallus and ventralia. Moreover, the structure of fifth sternites is also quite distinguishable here from *iwuensis*.

Biology : This is a rare species which was collected from bushes near human excrement. It seems that this species is attracted to human excrement.

Distribution : India ; A (Jorhat) and MnP (Imphal).

Type deposited : *Holotype* ♂, ZSIC, studied.

89. *Parasarcophaga (Pandelleisca) iwuensis* (Ho)

(Figs. 549-553)

1934. *Sarcophaga iwuensis* Ho, *Bull. Fan meml Inst. Biol.*, 5(1) : 34; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, 6 : 271; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, 45 : 260.

1937. *Parasarcophaga (s.str.) iwuensis* : Rohdendorf, *Fauna USSR, Dipt.*, 19 (1) : 204.

1965. *Parasarcophaga (Curranea) iwuensis* : Fan, *Synan. flies China*, 15 : 275.

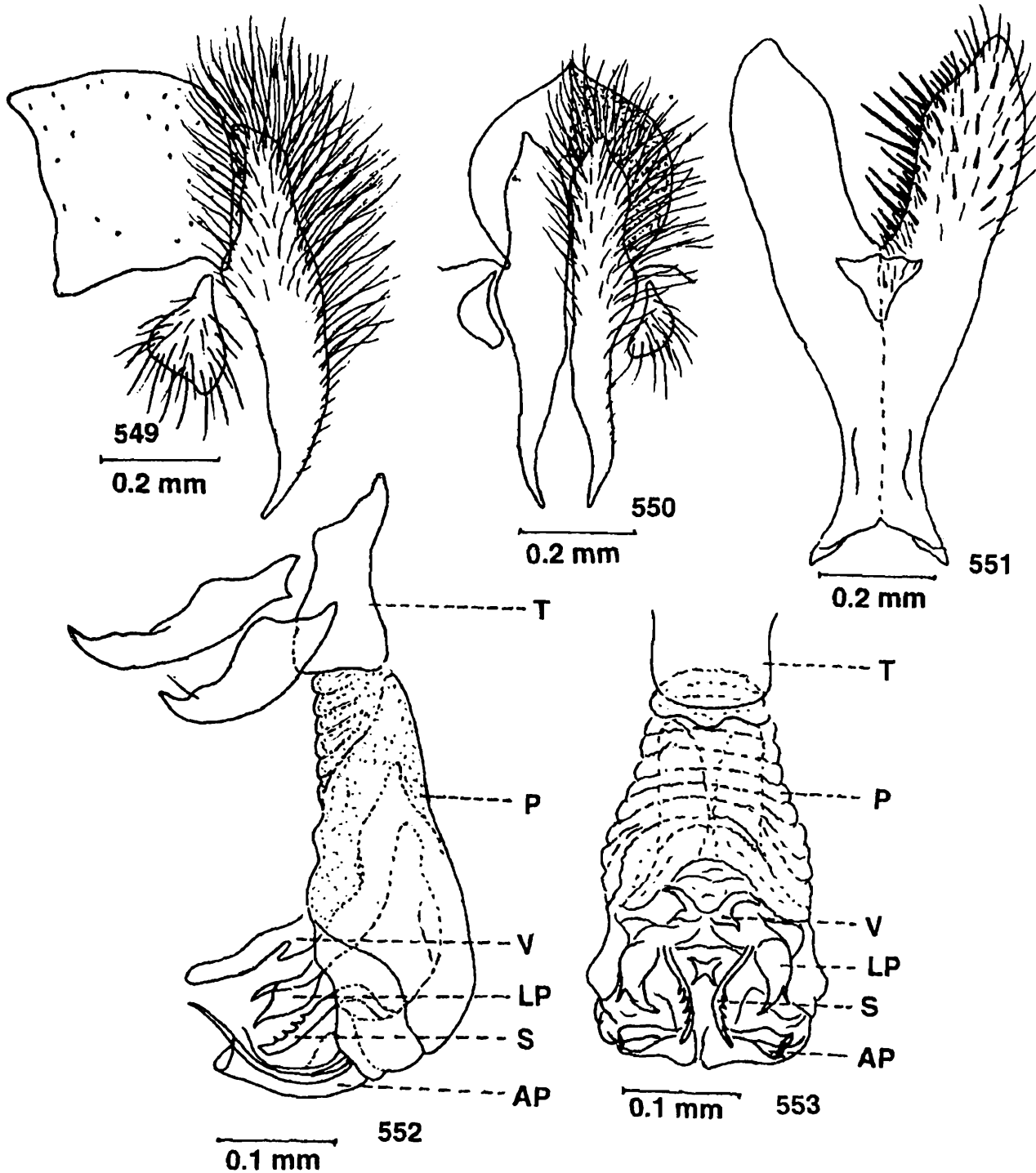
1977. *Parasarcophaga (Liosarcophaga) iwuensis* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, 3 : 369.

Parasarcophaga (Pandelleisca) iwuensis : Nandi, n. comb.

Male : Body length 7.5–11.5 mm.

Head : Width of frons about half that of one eye; frontal vitta black, its width at narrowest point of frons greater than each parafrontal; parafrontal and parafacial black with silvery tinge and strong yellow pollen, the former with short scattered hairs, the latter with a row of 6-7 hairs near the eye margin; antennae black and reaching up to about 0.80 distance to vibrissae, third segment 2.2 times that of the second; arista long, plumose along basal three-fifths; facial ridge black with short

hairs; vibrissae long, distance between vibrissae less than one parafacial width; frontal bristles 11; posterior 3 reclinate, anterior 4 below base of antennae and reaching up



Figs. 549-553 : *Parasarcophaga (Pandelleisca) iwuensis* (Ho). 549, Inner and outer forceps (lateral view); 550, Inner and outer forceps (posterior view); 551, Fifth sternite; 552, Penis (lateral view); 553, Penis (ventral view).

to about half of the second antennal segment, rest cruciate and directed forwards; gena black, silvery pollen and with short hairs; post gena black with greyish hairs;

inner vertical bristle well developed, outer vertical short about one-third the inner vertical, post vertical not developed; ocellar region black with short black hairs; a pair of rows of black postocular setae, rest of the area with black hairs; palpi black and long; proboscis short and blackish.

Thorax : Yellowish-grey; *ac* 0+1; *dc* 5+5 (anterior 3 *dc* hardly differentiated); *ps* 1; *h* 3 (1 short); *ph* 2; *np* 4; *pa* 3; *sa* 2; *st* 1+1+1; *mpl* 7; *hpl* 8; upper part of propleura bare; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brownish; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown venis; R_1 bare; R_{4+5} with a row of 6 short setae located dorsally and extending up to more than half from the basal node to r-m and 2-3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to third, the former with short spines along more than basal half of its anterior margin; costal spines short; epaulet black; basicostal scale slightly yellowish; squama whitish; halter brown.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along anterodorsal surface on basal one-third and 1 bristle on posteroventral surface on distal one-fourth; mid femur with a row of 4 bristles along middle portion of anterolateral surface, a row of bristles along anteroventral and a row of short hairs along posteroventral surfaces on basal two-thirds, a row of short setae along distal one-third of anteroventral and posteroventral surfaces and 2 bristles distally on posterodorsal surface; mid tibia with 2 bristles apart medially on anterodorsal surface, 1 bristle each on anteroventral, posterodorsal and posterolateral surfaces on distal one-third and 3 short bristles along basal one-third of posterodorsal surface; hind femur with 1 bristle on anterolateral surface, a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface and 3 bristles on posterodorsal surface on distal end; hind tibia with a row of bristles along anterolateral surface, 1 bristle each on one-third and two-thirds of anterolateral and posterodorsal surfaces, 3 short bristles on anteroventral surface on distal one-third and numerous long hairs along posterior margin on distal three-fifths.

Abdomen : Yellowish-grey with checkered pattern; second abdominal tergite with 2 lateral marginal bristles, third with 1 weak median and 1 lateral marginal bristles, fourth with 2 median and 2 lateral marginal bristles; sternites first to fourth with short hairs; fifth sternite Y-shaped, with short window but without bunches of spines laterally on arms; first genital segment dark brownish anteriorly and grey pollinose posteriorly but without marginal bristles, second segment shining black; inner forceps almost straight and pointed at end; outer forceps almost oval; anterior paramere slightly curved; posterior paramere deeply curved with 1 hair apically; apical plate

of paraphallus blunt, with slender lateral process and its apex strongly pointed which originates from basal end; lateral plate of paraphallus well developed and pointed; styli of glans slender and serrated anteriorly; ventralia well developed, bilobed and the lobes anteriorly elongated.

Female : Unknown.

Material examined : 1 ♂, Nepal : Kathmandu Valley; Balaju, 26. vii. 1992, R. Kano (det. by R. Kano as *Sarcophaga iwnensis*; dep. in NSMT); 1 ♂, Pakistan : Kot Gali; Memmingsen, 15 km. West of Balakot, 1,000 m, H. Kurahashi (det. by E. Sugiyama; dep. in NSMT); 1 ♂, Nam Buh; N. f. Prac., N. Siam, March, 1911, A. M. Memmlogesn (det. by T. Pape; dep. in ZMUC).

Discussion on species : This species is similar to *P. (Pandelleisca) assamensis* Nandi and Ray, 1982 but differs from it by the structures of ventralia and lateral plate of paraphallus. Moreover, the structure of fifth sternite is also quite distinguishable here from *assamensis*.

Biology : Nothing is known regarding the biology of this species.

Distribution : Ne (several localities); Pa (several localities); South China; Hainan Island; Taiwan and Thailand.

Type deposited : *Holotype* ♂, FMIBP, not studied.

Subgenus *Parasarcophaga* Johnston and Tiegs, 1921

1921. *Parasarcophaga* Johnston and Tiegs, *Proc. R. Soc. Qd.*, 33(4) : 86.

Type speceis : *Sarcophaga omega* Johnston and Tiegs, 1921 (= *Sarcophaga knabi* Parker, 1917 = *Sarcophaga misera* Walker, 1852).

Morphology : Penis with long stalked ventralia which is large and flower-like structure; apical plate of paraphallus with almost no median section and more or less transparent or slightly sclerotised and cleft; styli of glans short or reduced; lateral plate of paraphallus large, unpaired, with short stalked process and split at the end; R₁ bare; upper part of propleura bare; abdomen without chess-board pattern; genital segment without bristles.

This is a rather large subgenus and the term *Parasarcophaga* was first proposed by Johnston and Tiegs as subgenus under the genus *Sarcophaga* but Rohdendorf (1937) treated it as a full genus. Shewell (1987) gave the *Parasarcophaga* group tribal rank of Parasarcophagini defined by the presence of 5 or 6 postsutural dorsocentral setae and often with white or pale golden genal hairs. He placed the genus *Liopygia* Enderlein and *Bercaea* Rbineau-Desvoidy under this tribe and included all the species of *Parasarcophaga* under it. Rohdendorf (1937) described a quite large number of species under *Parasarcophaga* from USSR. Lopes (1959) reported 2 species from the Australian region and Lopes *et al.* (1977) recorded only 4 species from the Oriental

region. Verves (1986) listed 6 species from the Palaearctic region and Dear (1980) reported only 2 species from the Afrotropical region. Lopes (1989) reported only 3 species from the Australasian and Oceanian regions.

Most of the members of this subgenus are attracted to dead bodies and excrement of different animals and breed in such media. Few species are parasitic. The larvae of some species have been described by Ishijima (1967) and Nandi (1980) from the Oriental region. Some species are associated with different microorganisms (Greenberg, 1971) and make hazards to human beings.

This subgenus is distributed in the Oriental, Palaearctic, Afrotropical and Australasian and Oceanian regions.

Key to male species

1. Hind tibia with bristles on anteroventral surface in addition to long villosity ..
.....3
Hind tibia without bristles on anteroventral surface in addition to long villosity
.....2
2. Body colour greyish; apical plate of paraphallus slender and sharply pointed at end*sericea* (Walker)
Body colour brown; apical plate of paraphallus broad and blunt at end
.....*hirtipes* (Wiedemann)
3. Apical plate of paraphallus long and sharply pointed at end; inner forceps moderately stout and broad4
Apical plate of paraphallus short and almost blunt at end; inner forceps long and slender*miseria* (Walker)
4. Middle part of inner forceps without protuberance but with spines at the inner surface of subapical end*albiceps* (Meigen)
Middle part of inner forceps with large protuberance and spines at the inner surface of subapical end5
5. Inner forceps long, slender and gradually pointed*unguitigris* (Rohdendorf)
Inner forceps short, broad and abruptly pointed*macroauriculata* (Ho)

90. *Parasarcophaga* (*s. str.*) *sericea* (Walker)

(Figs. 554-560)

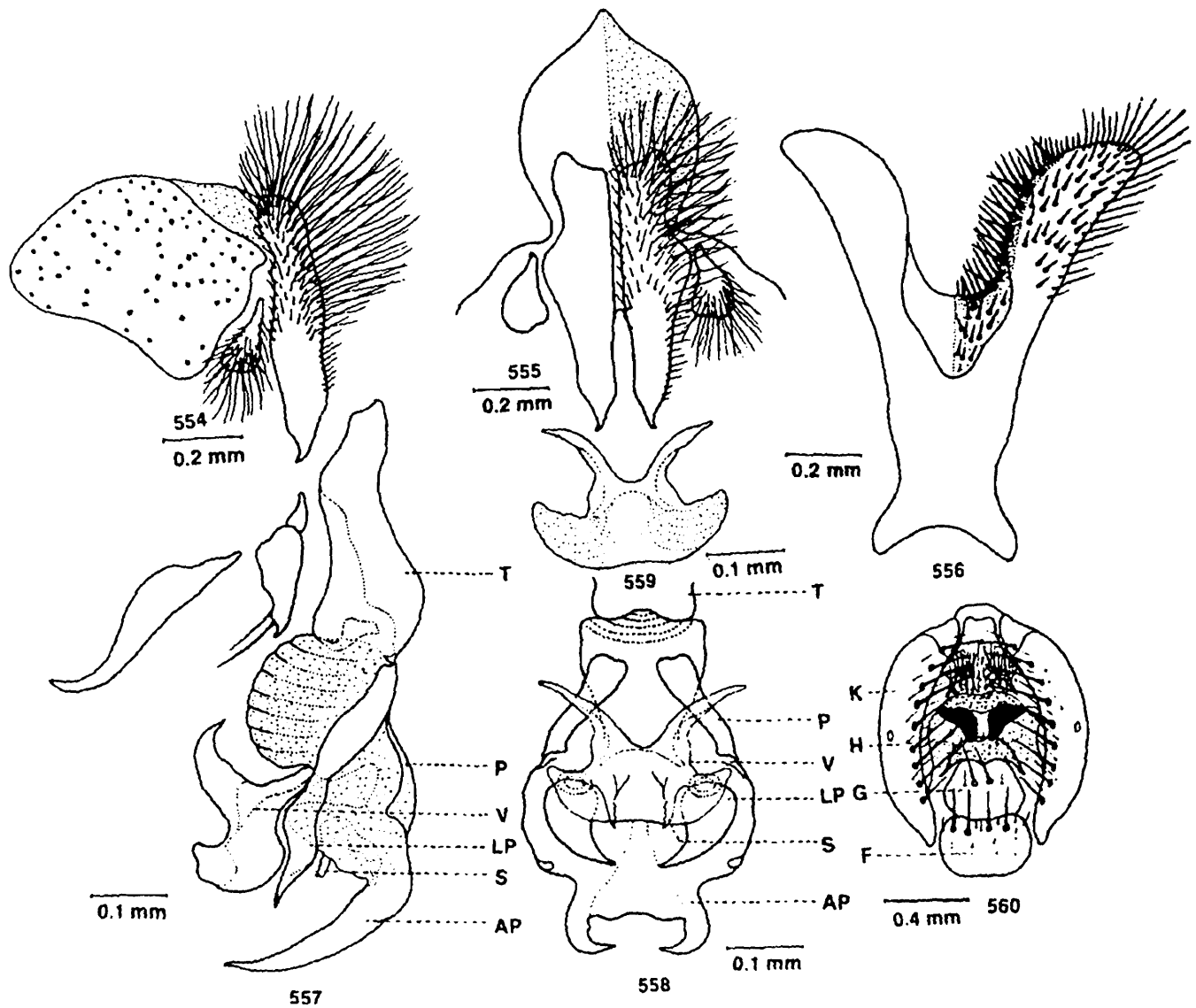
1852. *Sarcophaga sericea* Walker, *Ins. Saunders. Dipt.*, 4 : 326; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, 45 : 258.
1856. *Sarcophaga aliena* Walker, *J. Proc. Linn. Soc. Lond., Zool.*, 1 : 22.
1864. *Sarcophaga brevis* Walker, *J. Proc. Linn. Soc. Lond., Zool.*, 7 : 236.

1917. *Sarcophaga knabi* Parker, *Proc. U.S. natn. Mus.*, 54 : 96.
1921. *Sarcophaga (Parasarcophaga) omega* Johnston and Tiegs, *Proc. R. Soc. Qd.*, 33(4) : 86.
1921. *Sarcophaga froggatti* Johnston and Tiegs, *Proc. R. Soc. Qd.*, 33(4) : 73 (misidentification, not Taylor, 1917).
1923. *Sarcophaga omega* Johnston and Hardy, *Proc. Linn. Soc. N.S.W.*, 48(2) : 116.
1924. *Sarcophaga knabi* var. *flavipalpis* Senior-White, *Rec. Indian Mus.*, 26(3) : 235.
1937. *Parasarcophaga (s.str.) knabi* : Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 202, Fan, 1965, *Synan. flies China*, 15 : 270; Lopes, Kano, Shinonaga and Kurahashi, 1977, *Cat. Dipt. Orient. Region*, 3 : 571; Nandi, 1991, *J. Beng. nat. Hist. Soc.*, 10(2) : 40.
1959. *Parasarcophaga (s.str.) omega* : Lopes, *Studia Ent.*, 2(1) : 57.
1962. *Parasarcophaga knabi* : Park, *Korean J. Zool.*, 5(2) : 39; Kano, Field and Shinonaga, 1967, *Fauna Japonica, Sarcophagidae* : 42.
1979. *Parasarcophaga (s.str.) sericea* : Lopes and Kano, *Revta bras. Biol.*, 39(2) : 307, Verves, 1986, *Cat. palae. Dipt.*, 12 : 171 ; Lopes, 1989 *Cat. Dipt. Aust. and Oceanian Regions*, 86 : 728; Nandi, 1992, *J. Beng. nat. Hist. Soc.*, 11(2) : 38.

Male : Body length 9–14 mm.

Head : Width of frons about three-fourths that of one eye; frontal vitta black, its width at narrowest point of frons about less than twice that of each parafrontal; parafrontal and parafacial black with silvery to golden pollen, the former with short scattered hairs, the latter with a row of short black hairs near the eye margin; antennae black to dark brown and reaching up to about 0.8 distance to vibrissae, first and second segments black, the base of third reddish-brown and the rest greyish and about two and half times that of the second; arista long, plumose along basal half; facial ridge light brown with golden pollen; vibrissae long, distance between vibrissae about half that of one parafacial width; frontal bristles 10-11, posterior 2 reclinate, anterior 2 below base of antennae, rest cruciate and directed forwards; gena black, golden to silvery pollen and with short yellowish white hairs; post gena black with short hairs; ocellar triangle black, silvery pollen and with long hairs; outer vertical bristle absent, inner vertical well developed, post vertical short about half of the inner vertical; ocellar bristles short, postocellar less than half of inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with yellowish hairs; palpi slender; proboscis black.

Thorax : Greyish, silvery pollen and with three black longitudinal stripes; *ac* 0+1; *dc* 5+5 (posterior 1 stout); *ia* 1+3; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 6; *hpl* 7; upper part of propleura bare with white pollen; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro-and mesothoracic



Figs. 554-560 : *Parasarcophaga (s. str.) sericea* (Walker). 554, Inner and outer forceps (lateral view); 555, Inner and outer forceps (posterior view); 556, Fifth sternite; 557, Penis (lateral view); 558, Penis (ventral view); 559, Ventralia of penis (ventral view); 560, Genitalia ♀ (ventral view).

spiracles brown, the latter with whitish pollen; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of about 9 short setae located dorsally and extending up to about two-thirds from the basal node to r-m and several short setae along ventral surface on basal half of its anterior margin; costal spines stout; epaulet black with short spines; basicostal scale light brown; squama white; halter brown.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal half of anterodorsal surface, 1 bristle on posterolateral surface at about one-third the distance from the distal end and with a row of bristles along posterodorsal surface; mid femur with a row of 3—4 short bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of short setae along distal half of posteroventral surface and 1 bristle each on distal part of posterodorsal and posteroventral surfaces; mid tibia with 2 long bristles along middle portion of anterodorsal surface, 1 long and a row of short bristles along posterodorsal surface and 1 bristle each on posterolateral and posteroventral surfaces at about one-third the distance from the distal end; hind femur with a pair of rows of long bristles along anterodorsal surface, a row of bristles along anteroventral surface, 2 bristles on distal part of posterodorsal and 1 bristle on posterolateral surfaces; hind tibia with a row of 3 long and few short bristles along anterodorsal surface, 2 bristles on middle portion of posterodorsal surface and numerous long hairs along anterior and posterior margins of ventral surface at about three-fifths from the distal end.

Abdomen : Greyish with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent (in some specimens weak bristles present on third tergite) but each with well developed lateral marginal bristles, fourth with a pair of median and 2 pairs of lateral marginal bristles, fifth with a row of about 18 marginal bristles; sternites first and second with long but third and fourth with short hairs; fifth sternite Y-shaped, with conspicuous hyaline window and short hairs terminally and spines laterally on arms; first genital segment black, greyish pollen and with numerous hairs, second shiny black with long hairs; inner forceps short, stout and with hairs on basal half; outer forceps almost triangular with hairs only on posterior end; anterior paramere long, curved and pointed at end; posterior paramere short, pointed and with 2 hairs anteriorly; theca almost equal to paraphallus, both are sclerotised; apical plate of paraphallus slender, curved and sharply pointed at end; lateral plate of paraphallus broad and pointed; styli of glans short; ventralia stalked, lobed and its anterior lobe short and less curved.

Female : Body length 7–12 mm.

Head : Width of horns almost equal to that of one eye; frontal bristles 19; 2 porclinate fronto-orbital bristles present; outer vertical bristle well developed and four-sixths the inner vertical.

Thorax : Similar to that of male but for the absence of apicoscutellar bristles.

Wings : Same as in male.

Legs : Chaetotaxy same as in male but for the following differences : mid femur with short hairs along basal part of anteroventral surface; mid tibia with 1 additional short bristle on anteroventral surface at about one-third the distance from the distal end; hind tibia with a row of bristles along distal half of anteroventral surface but without tuft of hairs along anterior and posterior margins of ventral surface.

Abdomen : Sternites second, fourth and fifth each with 2 bristles and third with 4 bristles, sixth broader than the rest and with 4 stout bristles, seventh slightly concave with 2 bristles, eighth membranous with few short hairs; anal sternite covered with short hairs; seventh tergite with marginal bristles and longitudinally divided in to two plates which are joined by a membranous region.

Material examined : *Holotype* ♂, ex. coll., Sunders; Several male specimens from different localities of Andhra Pradesh, Assam, Bihar, Goa, Delhi, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Mizoram, Orissa, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal and union territories of Andaman and Nicobar Islands collected by B. C. Nandi.

Discussion on species : This species is similar to *P. (s. str.) hirtipes* (Wiedemann, 1830) but differs from it by the detailed structures of ventralia and apical plate of paraphallus, the last one is more pointed in this species. Moreover, the ventral membrane between theca and paraphallus is more bulgy here.

Biology : This is a fairly common species which is attracted to dead bodies of different animals, *Aristolochia ridicula* flowers (Aristolochiaceae) and *Achatina sp.* (Gastropoda). This species breeds in human excrement and carrion and may be reared on such media. The larvae of this species (as *knabi*) is parasitic on Oak-Tasar Silkworm-*Antheraea proylei* (Saturniidae) (Singh and Prasad, 1980, 1986) and larval stages of this species (as *knabi*) have been described by Hall and Bohart (1948) and Ferrar (1979).

Distribution : India ; Several localities of A, AnP, B, D, G, Gu, H, HP, Kt, K, MP, Mnp, Me, Mz, N, O, P, R, S, TN, T, UP, WB, union territories of AN, C, DN and Po; BD (Feni); Bh (several localities); M (several localities); Ne (several localities); Pa (several localities); SL (Matale, Peradeniya); Australia; Borneo; Caroline Islands; China (Kwangtung); East Indies; Guam; Hainan Island; Indonesia; Irian Jaya; Korea; Malaysia; Mariana Islands; Marshall Islands; Micronesia; Papua New Guinea; Philippines; Pitcairn Islands; Russia; Singapore; Society Islands; Taiwan, Thailand and Western Samoa.

Type deposited : Holotype ♀, BMNH, studied.

Discussion on type : The female genitalia have been dissected out, mounted on a triangular paper board and pinned it with the specimen. The condition of the type is good except the left wing, right and left mid and hind legs are lost.

91. *Parasarcophaga (s. str.) hirtipes* (Wiedemann)

(Figs. 561-566)

1830. *Sarcophaga hirtipes* Wiedemann, *Aussereurop. zweifl. Insekt.*, **2** : 361.
 1930. *Sarcophaga rufipes* Wiedemann, *Aussereurop. zweifl. Insekt.*, **2** : 362.
 1843. *Sarcophaga fulvipalpis* Macquart, *Mém. Soc. Sci. Agric. Lille*, **2**(3) : 255.
 1828. *Ptilocnema miniaticauda* Enderlein, *Arch. klassif. phylgen. Ent.*, **1**(1) : 43.
 1934. *Sarcophaga dura* Curran, *Am. Mus. Nov.*, **727** : 12.
 1937. *Parasarcophaga (s.str.) hirtipes* : Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 270; Nandi, 1992, *Proc. zool. Soc., Calcutta*, **45** (2) : 190.
 1963. *Parasarcophaga (s.str.) africana* Rohdendorf, *Stuttg.Beitr. Naturk.*, **124** : 15.
 1972. *Sarcophaga (Parasarcophaga) hirtipes* : Zumpt, *Explor. Parc natn. Virunga*, **101** : 79.

Male : Body length 9–14 mm.

Head : Width of frons about one-third that of one eye; frontal vitta brownish-black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with silvery to golden pollen, the former with short scattered hairs, the latter with a row of short black hairs near the eye margin; antennae brown and reaching up to about 0.8 distance to vibrissae, first segment blackish-brown, second dark brown, third brown with silvery pollen and about two and half times that of the second; arista long, plumose along basal two-thirds; vibrissae long, crossed, distance between vibrissae more than one parafacial width; frontal bristles 9–11, posterior 2 reclinate, anterior 2 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena black with golden pollen and short whitish hairs; post gena blackish with long whitish hairs; ocellar triangle brownish-black with short black hairs; outer vertical bristle well developed, inner vertical more developed than the outer one, post vertical about one-fourth the inner vertical; ocellar and postocellar bristles short; a row of regular postocular setae besides postocular cilia, rest of the area with irregular black and white hairs; palpi slender and yellowish; proboscis black.

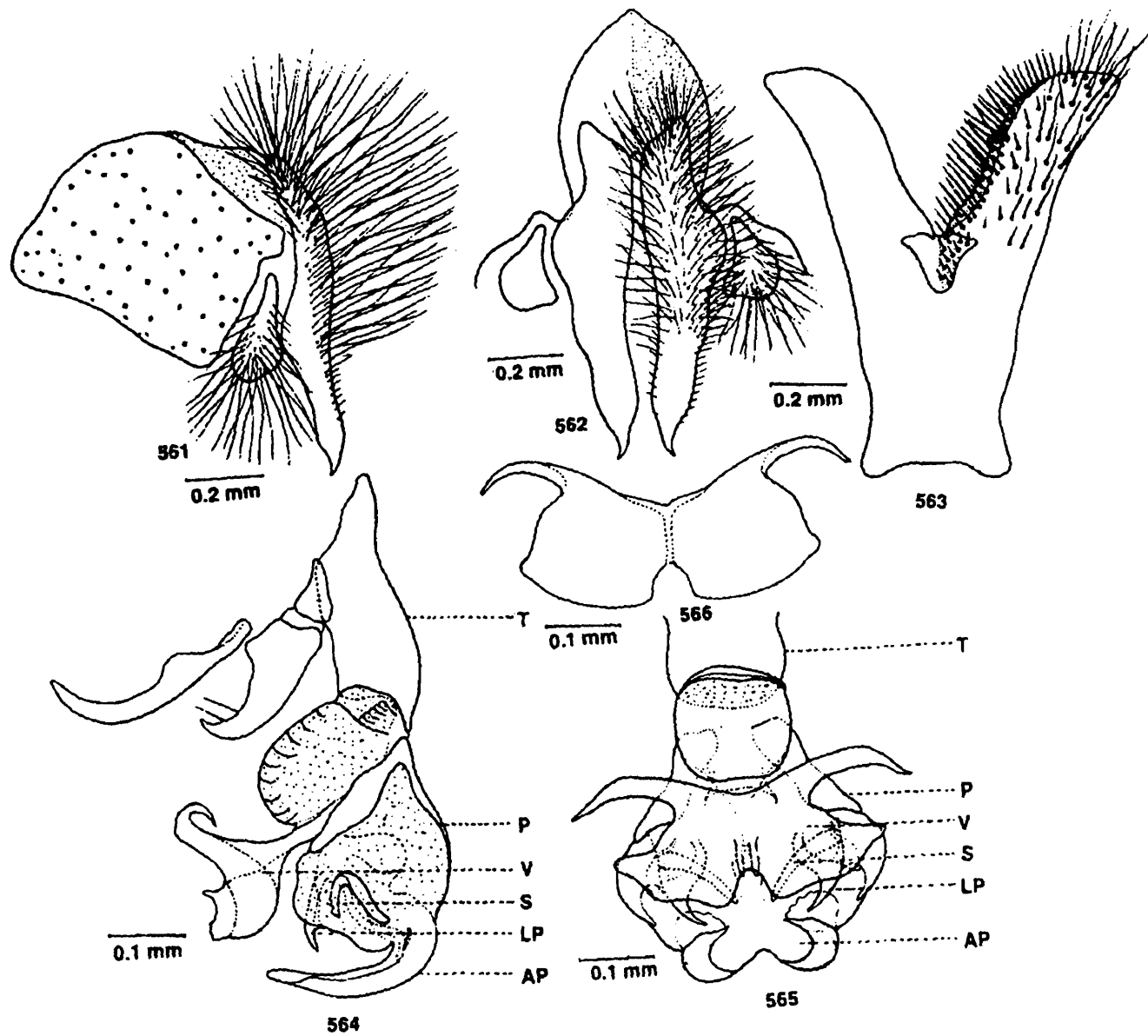
Thorax : Greyish, mostly brownish silvery pollen and with three black longitudinal stripes; *ac* 0+1 (sometimes 1 weak presutural *ac* present); *dc* 5+5 (posterior 2 *dc* stout) ; *ia* 1+3; *ps* 1; *h* 4; *ph* 2; *np* 4; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 7; *hpl* 8–11; upper part of propleura bare with silvery pollen; prostigmatic and propleural bristles well

developed and accompanied with short hairs and bristles; pro-and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs ; 1 pair of short basiscutellar bristles present.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 6 short setae located dorsally and extending up to two-thirds the distance from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment a little shorter than the third, the former with short spines along basal half of its anterior margin; costal spines stout; epaulet blackish-brown with short spines; basicostal scale brown; squama white with brownish tinge; halter brown.

Legs : Brownish-black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 short bristles along basal half of anterodorsal surface, 1 bristle on posterodorsal surface at about one-fourth the distance from distal end and a row of bristles along posterodorsal surface; mid femur with a row of 3 bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of short setae along distal half of posteroventral surface, 1 bristle each on distal part of posterodorsal and posterolateral surfaces and numerous long hairs along basal half of posteroventral surface; mid tibia with 2 long bristles on middle portion of anterodorsal surface, a row of bristles along posterodorsal surface and 1 bristle each on anteroventral and posteroventral surfaces at about one-third the distance from the distal end; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 2 bristles on distal part of posterodorsal surface, 1 bristle on anterior margin of ventral surface at about one-third the distance from the distal end and with numerous long bristly hairs along posterior margin of ventral surface; hind tibia with 2 long and a row of short bristles along anterodorsal surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end and long hairs along anterior and posterior margins of ventral surface at about three-fourths the distance from the distal end.

Abdomen : Blackish-brown with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with 1 lateral marginal bristle, fourth with 1 median and 2 lateral marginal bristles, fifth with a row of marginal bristles; sternites first and second with long hairs, third and fourth with short hairs; fifth sternite Y-shaped with short membranous window bearing spines laterally and hairs terminally on arms; first genital segment reddish-brown with short black hairs, second reddish-black or light brown but without marginal bristles; inner forceps long with tuft of long hairs along basal half; outer forceps triangular with hairs along distal end; anterior paramere long, curved and pointed at end; posterior paramere abruptly curved at end with 2 short hairs on its anterior surface apically;



Figs. 561-566 : *Parasarcophaga (s. str.) hirtipes* (Wiedemann). 561, Inner and outer forceps (lateral view); 562, Inner and outer forceps (posterior view); 563, Fifth sternite; 564, Penis (lateral view); 565, Penis (ventral view); 566, Ventralia of penis (ventral view).

apical plate of paraphallus less developed, broad but curved and blunt at end; lateral plate of paraphallus poorly developed and pointed apically; styli of glans very short; ventralia with stalked lobed, anterior lobe deeply curved and moderately developed.

Female : Unknown.

Material examined : India : Several male specimens from different localities of Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh and Maharashtra collected by B. C. Nandi.

Discussion on species : This species is similar to *P. (s.str.) sericea* (Walker, 1852) but differs from it by the structure of lateral plate of paraphallus. Moreover, the lateral plate of paraphallus is short and anterior paramere is less thickened in this species.

Biology : This is a common species which is attracted to decomposing organic matters, human excrement and animal dung. It breeds in melons (Senior-White *et al.*, 1940). Senior-White (1924) reported that this species may be bred from *Achatina fulica* (Gastropoda). Séguy (1941) described the larval stages of this species. The larvae of this species cause human intestinal myiasis. This species is also associated with *Escherichia anaerogenes*, *E. anindolica*, *E. coli* and *Aerobacter* sp. (Greenberg, 1971).

Distribution : India ; Several localities of AnP, B, D, Gu, Kt, K, MP, Mr, P, R, TN, UP, WB, AN; BD (Dacca, Kholna, Sylhet); Pa (several localities); Afghanistan; Algeria; Angola; Arabia; Azerbaijan; Botswana; Bulgaria; China; Egypt; Gambia; Guinea; Iran; Iraq; Israel; Jordan; Kazakhstan; Kenya; Kyrgyzstan; Lebanon; Liberia; Morocco; Namibia; Russia; Saudi Arabia; Senegal; South Africa; Sudan; Syria; Tajikistan; Tanzania; Turkey; Turkmenistan; Uganda; Uzbekistan; Zaire; Zambia and Zimbabwe;

Type deposited : Holotype ♂, VM, not studied.

92. *Parasarcophaga (s. str.) misera* (Walker)

(Figs. 567-573)

1849. *Sarcophaga misera* Walker, *List. dipt. Br. Mus.*, **4** : 829; Kano and Shinonaga, 1994, *Jap. J. sanit, Zool.*, **45** ; 257.
1864. *Sarcophaga innotata* Walker, *J. Proc. Linn. Soc. Lond. Zool.*, **7** : 214.
1913. *Sarcophaga orchidea* Böettcher, *Annl. hist. nat-Mus. natn. hung.*, **11** ; 375.
1921. *Sarcophaga gamma* Johnston and Tiegs, *Proc. R. Soc. Qd.*, **33**(4) : 60.
1922. *Sarcophaga brunneopalpis* Johnston and Tiegs, *Proc. R. Soc. Qd.*, **34** : 184.
1924. *Sarcophaga hirtipes* var. *orchidea* Senior-White, *Rec. Indian Mus.*, **26** (3) : 239; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 244.
1929. *Sarcophaga noumea* Curran, *Am. Mus. Nov.*, **375** : 11.

1967. *Parasarcophaga orchidea* : Kano, Field and Shinonaga, *Fauna Japonica*, Sarcophagidae : 44.

1979. *Parasarcophaga* (s. str.) *misera* : Lopes and Kano, *Revta bras. Biol.*, **39**(2) : 309; Nandi, 1992, *J. Beng. nat. Hist. Soc.*, **11**(2) : 38.

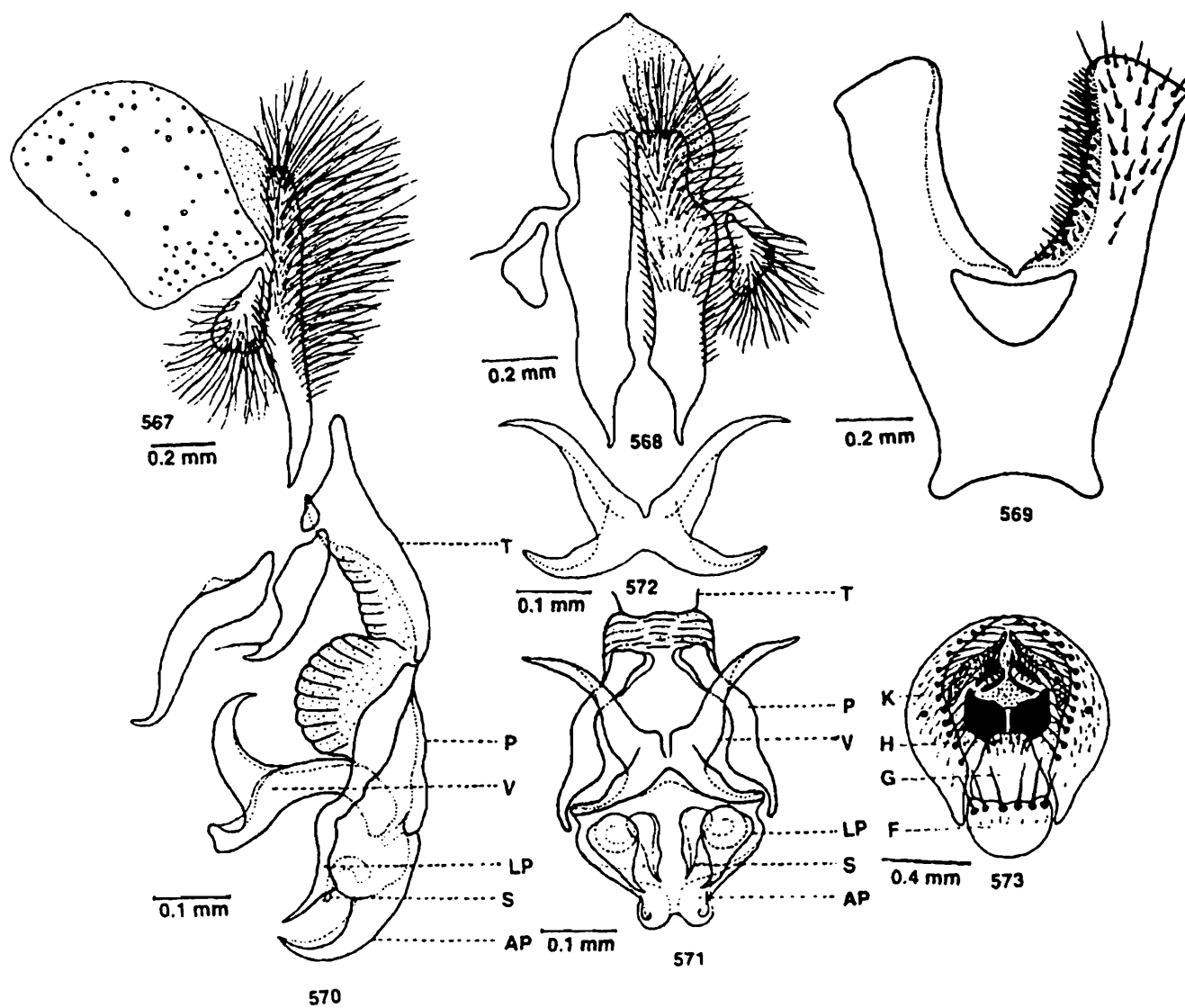
Male : Body length 9–14 mm.

Head : Width of frons about half that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of scattered hairs near the eye margin; antennae dark brown and reaching up to about 0.7 distance to vibrissae, first segment black, second brown, third brownish with silvery pollen and about two and half times that of the second; arista long, plumose along basal three-fifths; facial ridge light brown, silvery pollen and with short black spines along lower half; vibrissae long, crossed, distance between vibrissae less than one parafacial width; frontal bristles 12, posterior 3 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena black, silvery pollen and with short white hairs; post gena black with white pollen and hairs; ocellar triangle black with long black hairs; outer vertical bristle absent, inner vertical well developed, post vertical shorter than inner vertical; ocellar and postocellar bristles short; one row of regular postocular setae, rest of the area with irregular black and white hairs; palpi slender and brown; proboscis black.

Thorax : Grey, silvery pollen and with three black longitudinal stripes; *ac* 0+1; *dc* 5+5 (posterior 1 *dc* stout); *ia* 1+3; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 4; *mpl* 6; *hpl* 8; upper part of propleura bare with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short hairs; prothoracic spiracle with dense brown pile; mesothoracic spiracle chocolate coloured; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 2 short setae located dorsally and extending up to about one-third from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment shorter than the third; the former with short spines along basal half of its anterior margin; costal spines stout; basicostal scale light brown; epaulet black with short spines; squama whitish; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal half of anterodorsal surface, 1 bristle on posteroventral surface at about one-third the distance from the distal end and a row of short bristles along posterodorsal surface; mid femur with a row of 3–4 short bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short



Figs. 567-573 : *Parasarcophaga (s. str.) misera* (Walker). 567, Inner and outer forceps (lateral view); 568, Inner and outer forceps (posterior view); 569, Fifth sternite; 570, Penis (lateral view); 571, Penis (ventral view); 572, Ventralia of penis (ventral view); 573, Genitalia ♀ (ventral view).

setae along distal half of anteroventral surface, a row of long hairs along basal half and a row of short setae along distal half of posteroventral surface; mid tibia with 2 bristles on middle portion of anterolateral surface, 2 long and a row of short bristles along posterodorsal surface and 1 bristle each on anteroventral and posteroventral surfaces at about one-third the distance from the distal end; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 2 bristles on distal part of posterodorsal surface and numerous long hairs along ventral surface; hind tibia with 2 long and a row of short bristles along anterodorsal surface and numerous long hairs along posterior margin of ventral surface at about two-thirds the distance from the distal end.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with well developed lateral marginal bristles, fourth with a pair of well developed median and several pairs of lateral marginal bristles, fifth with a row of about 16—18 marginal bristles; sternites first and second with dense erect hairs, third and fourth with short hairs; fifth sternite Y-shaped, with wide window and divergent arms and the arms with many short spines laterally and few hairs terminally; first genital segment brown with short hairs, second blackish-brown, with short hairs but both without median marginal bristles; penis elongated; inner forceps long, slender and with tuft of long hairs along basal half; outer forceps triangular with short hairs only on distal end; anterior paramere long, pointed, curved at end but without hairs; posterior paramere short, blunt at end and with 1—2 short hairs terminally; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus short and almost blunt at end; lateral plate of paraphallus short and pointed; styli of glans short; ventralia with stalked lobes, anterior lobe well developed and not so curved, posterior lobe short.

Female : Body length 8–12 mm.

Head : Width of frons almost equal to that of eye; frontal bristles 10; 2 proclinate fronto-orbital bristles present; outer vertical bristle well developed and four-fifths the inner vertical.

Thorax : Similar to that of male but absence of apicoscutellar bristles.

Legs : Chaetotaxy same as in male but differs for the followings : mid femur without hairs along basal part of posteroventral surface; mid tibia with 1 additional bristle on anteroventral surface at about one-third the distance from the distal end; hind femur with 1 bristle on anterodorsal surface; hind tibia without long hairs along posterior margin of ventral surface.

Abdomen : Second, third and fourth sternites each with 4 bristles, sixth with a row of 6 long bristles and broader than the rest, seventh with 6 short marginal bristles and many hairs, eighth membranous with elongated membranous plate and hairs; anal sternite as small rounded plate and covered with short hairs; seventh tergite with two plates and provided with bristles.

Material examined : Holotype ♀, N. Holl : Hunter; Several male specimens from different localities of Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal collected by B.C. Nandi.

Discussion on species : This species is similar to *P. (s. str.) albiceps* (Meigen, 1826) and *P. (s.str.) sericea* (Walker, 1852) but may be distinguished from them by the structure of ventralia. Moreover, the inner forcep in this species is more slender and ventral portion between theca and paraphallus is not as bulgy as in other species.

Biology : This is a very common species which is attracted to human excrement and dead animals. It breeds in human excrement, meat, dead animals and dead *Achatina fulica* (Castropoda) and it has been reared on such media including beef in the laboratory. This species is attracted to *Aristolochia ridicula* flowers (Aristolochiaceae). The larvae of this species cause human intestinal myiasis and myiasis in domesticated and poultry animals. Das and Dasgupta (1986) studied some aspects of the life history of this species. Larval stages of this species (as *orchidea*) have been described by Ishijima (1967) and Nandi (1980). Adults are associated with *Entamoeba histolytica*, *Habronema megastoma*, *H. microstoma* and *H. muscae* (Greenberg, 1971).

Distribution : India ; Several localities of A, AnP, ArP, B, D, G, Gu, H, HP, Kt, K, MP, Mr, MnP, Me, Mz, N, O, P, R, S, TN, T, UP, WB, union territories of AN, C, DN, Do, Ld, and Po; BD (Dacca); Bh (Wangdiphodrong) ; M (Hopkin); Ne (several localities); Pa (several localities); SL (several localities); Afghanistan; Australia; Bonin Islands; Borneo; Caroline Islands; China; Hainan Island; Indonesia (Irian Jaya, Maluku); Iran; Japan (including Ryukyu Islands); Kiribati; Korea; Malaysia; Mariana Islands; Marshall Islands; New Caledonia, New Guinea; New Hebrides; Papua New Guinea; Philippines; Samoa; Singapore; South Korea; Sumatra; Taiwan and Thailand.

Type deposited : Holotype ♀, BMNH, studied.

Discussion on type : The female genitalia were dissected out by H. de Souza Lopes, mounted on a triangular board and attached along with the pin of the specimen. The condition of the type is otherwise good.

93. *Parasarcophaga (s. str.) macroauriculata* (Ho)

(Figs. 574-579)

1932. *Sarcophaga macroauriculata* Ho, *Bull. Fan meml Inst. Biol.*, **3**(1) : 347; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, **45** : 259.
1937. *Parasarcophaga (s.str.) macroauriculata* : Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 202; Nandi, 1990, *J. Beng. nat. Hist. Soc.*, **9**(1) : 20.

1967. *Parasarcophaga macroauriculata* : Kano, Field and Shinonaga, *Fauna Japonica*, Sarcophagidae : 45.

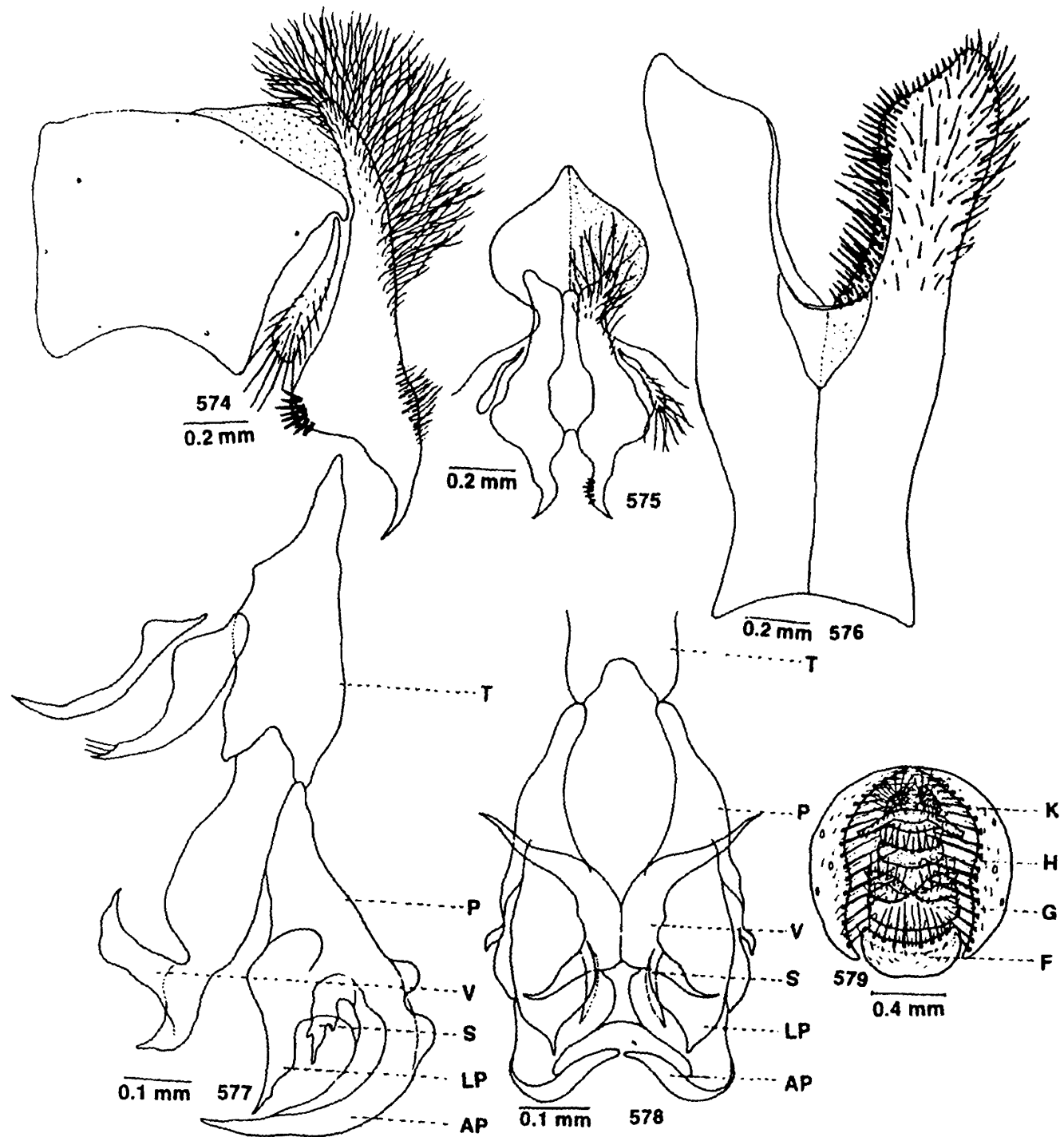
Male : Body length 8–13 mm.

Head : Width of frons about two-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with silvery pollen, the former with short hairs, the latter with a row of short hairs near the eye margin; antennae blackish-brown and reaching up to about 0.8 distance to vibrissae, first segment black, second light black with silvery pollen, third brown with silvery pollen and about three times that of the second; arista long, plumose along basal two-thirds; facial ridge blackish-brown with silvery pollen; vibrissae long, crossed, distance between vibrissae greater than one parafacial width; frontal bristles 12—13, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena black, silvery pollen and with short hairs; post gena blackish with whitish hairs; ocellar triangle black with short hairs; outer vertical bristle short, inner vertical well developed, post vertical half of inner vertical; ocellar bristles short, postocellar equal to the ocellar and less than half of inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with brownish hairs; plapi brown and slender; proboscis dark brown.

Thorax : Grey, silvery pollen and with three black longitudinal stripes; *ac* 0+1; *dc* 5+5 (posterior 1 *dc* stout); *ia* 1+3; *ps* 1; *h* 3; *ph* 3; *np* 4; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 6—7; *hpl* 8—9; upper part of propleura bare, black with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 3 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of short setae located dorsally and extending up to more than half from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than the third, the former with short spines along basal half of its anterior margin; costal spines not stout; epaulet black with short spines; basicostal scale brown; squama white; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterior margin of ventral surface; fore tibia with a row of 3—4 short bristles along basal half of anterodorsal surface, 1 bristle on posterodorsal surface at about one-third the distance from the distal end and a row of short bristles along posterodorsal surface; mid femur with a row of 3 short bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of short hairs along basal half and a row of short setae along distal half of posteroventral surface; mid tibia with 1 long and a row of short bristles along



Figs. 574-579 : *Parasarcophaga* (*s. str.*) *macroauriculata* (Ho). 574, Inner and outer forceps (lateral view); 575, Inner and outer forceps (posterior view); 576, Fifth sternite; 577, Penis (lateral view); 578, Penis (ventral view); 579, Genitalia ♀ (ventral view).

anterodorsal surface, 2 long bristles on middle portion of posterolateral surface and 1 bristle each on anterolateral and anteroventral surfaces at about one-third the distance from the distal end; hind femur with a pair of rows of long bristles along anteroventral surface, 1 bristle each on dorsal and posterodorsal surfaces and numerous long hairs along posterior margin of ventral surface; hind tibia with a row of 3—4 short bristles along anterolateral surface, 1 bristle on anteroventral surface at about one-fourth the distance from the distal end, 1 bristle on posterolateral surface at about one-third the distance from the basal end and numerous long hairs along anterior end posterior margins of ventral surface.

Abdomen : Black with silvery grey checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 3 lateral marginal bristles, fourth with a pair of median and 4—5 lateral marginal bristles, fifth with a row of 18 marginal bristles; sternites first to fourth with long hairs but without differentiated bristles; fifth sternite Y-shaped with membranous window and stout spines laterally and long hairs terminally on arms; first and second genital segments brownish with short hairs; inner forceps moderately broad, stout, slightly curved at end, with large protuberance at mid posterior portion and short hairs on outer surface and few spines on inner surface of subapical end; outer forceps elongated with few hairs; anterior paramere sickle-shaped and curved at end; posterior paramere elongated with few hairs; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus long, sharply pointed, curved at end and with 2 slight knob-like projections at outer subterminal end; lateral plate of paraphallus long and pointed; styli of glans short; ventralia stalked, lobed and anterior portion more developed and slightly curved.

Female : Body length 9—13 mm.

Head : Frons almost equal to the width of one eye; presence of 2 proclinate fronto-orbital bristles; outer vertical bristle well developed.

Thorax : Similar to that of male except mid tibia with 2 bristles on anterodorsal surface; hind femur with a row of bristles along anterodorsal surface; mid femur with several bristles along basal half of posteroventral surface; hind femur with several bristles along basal half of posteroventral surface; hind tibia with 2 bristles on anteroventral surface.

Abdomen : Sixth sternite cup-shaped with 8 long marginal bristles, seventh more wider with numerous marginal hairs, eighth membranous with many short hairs; anal sternite as oval plate with numerous hairs.

Material examined : India : Several male specimens from different localities of Manipur, Nagaland, Sikkim, Uttar Pradesh and West Bengal collected by B. C. Nandi.

Discussion on species : This species is similar to *P. (s. str.) albiceps* (Meigen, 1826) but may be differentiated from it by the structures of ventralia and apical portion of

paraphallus. Moreover, the inner forceps is with a large protuberance and spines at its inner surface of subapical end and short hairs on outer surface.

Biology : This species is not common which was collected from bushes near human excrement and dead carcasses and it is attracted to such media. The larvae of this species cause intestinal myiasis in man and leopard (Roy and Dasgupta, 1970; Dasgupta *et al*, 1972). *Sarcophaga microperitromata* described by Khan (1974) from Karachi on the basis of third instar larva might be the synonyme of this species.

Distribution : India ; MnP (Churachandpur, Imphal, Mao), Me (Cherapunji), N (Dimapur), S (Dentam, Gangtok, Kabi Chulung, Phensang, Swistik Camp), UP (Kaushani) and WB (Darjeeling); Ne (several localities); Pa (several localities); China; Japan; Korea and Russia.

Type deposited : Holotype ♂, FMIBP, not studied.

94. *Parasarcophaga (s. str.) albiceps* (Meigen)

(Figs. 580—586)

1826. *Sarcophaga albiceps* Meigen, *Syst. Besch. zweifl. Insekt.*, **5** : 22, Kano and Shinonga, 1994, *Jap. J. sanit. Zool.*, **45** : 256.
1860. *Sarcophaga privigna* Rondani, *Atti Soc. ital. Sci. nat.*, **3** : 387.
1896. *Sarcophaga cyathisans* Pandellé, *Revue Ent.*, **15** : 191.
1905. *Sarcophaga pauciseta* Karmner, *Z. syst. Hymenopt. Dipterol.*, **5** : 331.
1928. *Thyrsocnema albiceps* : Enderlien, *Arch. klassif. phylogen Ent.*, **1**(1) : 43.
1934. *Sarcophaga hypopygium* Malloch, *Mém. Mus. Nat. Hist. Belg.*, **4**(10) : 22.
1936. *Sarcophaga zethus* Curran, *Proc. Calif. Acad. Sci.*, (4) **22** : 60.
1937. *Parasarcophaga albiceps* : Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 199; Darber-Mónko, 1973, *Fragm. faun. Warsz.*, **19**(7) : 200; Kano, Field and Shinonaga, 1967, *Fauna Japonica, Sarcophagidae* : 39; Pape, 1987, *Notul. ent.*, **67** : 45.
1992. *Parasarcophaga (s. str.) albiceps* : Nandi, *J. Beng. nat. Hist. Soc.*, **11**(2) : 38.

Male : Body length 11–17 mm.

Head : Width of frons about three-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of short hairs near the eye margin; antennae dark brown and reaching up to about 0.8 distance to vibrissae, first segment blackish-brown, second black, third brown with whitish pollen and about three times that of the second; arista long, plumose along basal two-thirds; facial ridge blackish-brown, silvery pollen and with short spines along basal half; vibrissae long, crossed, distance between vibrissae about half that of one parafacial width; frontal bristles 12, posterior 2

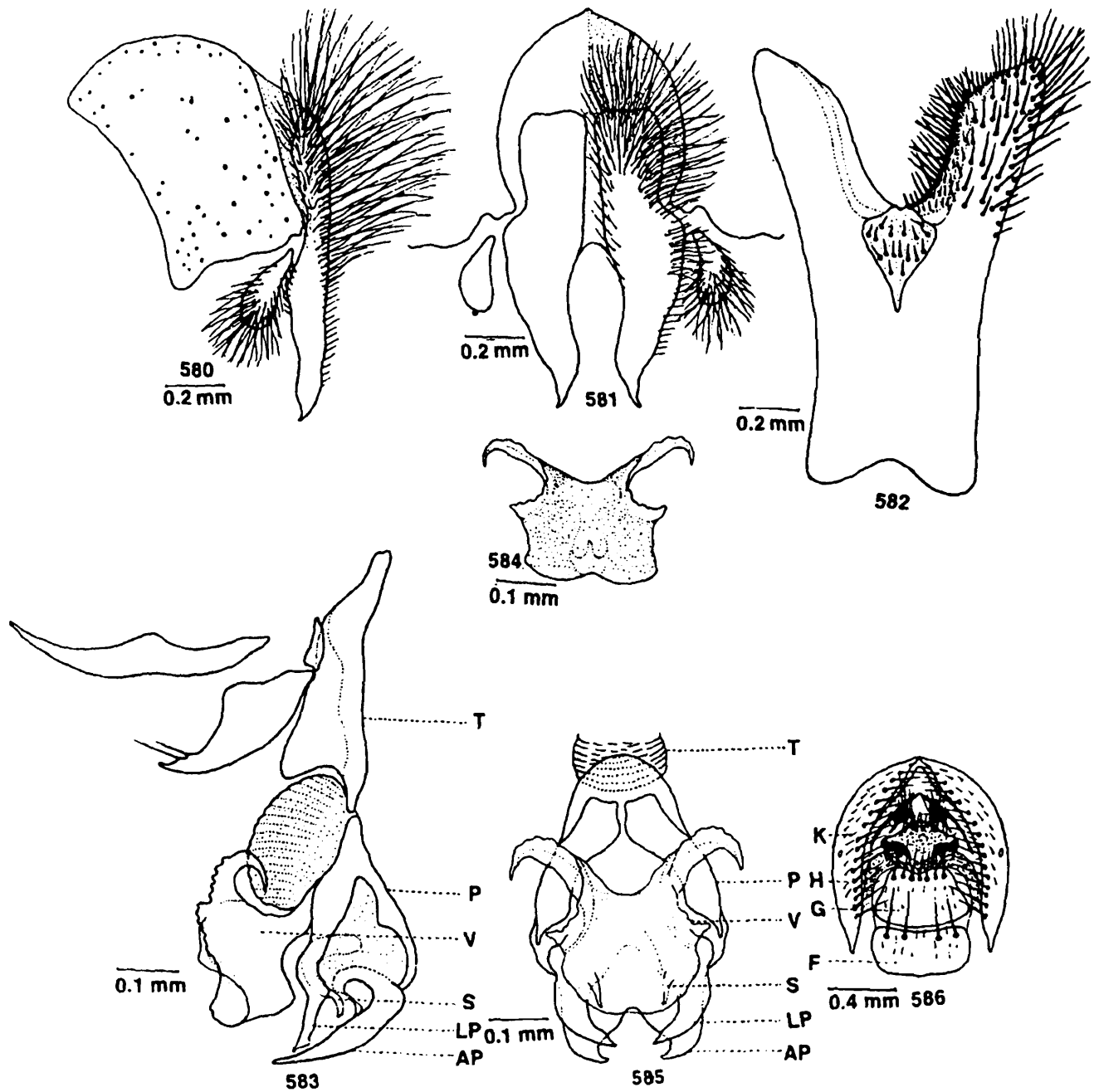
reclinate, anterior 2 below base of antennae and reaching up to about half of second antennal segment, rest cruciate and directed forwards; gena black, silvery pollen and with numerous black hairs; post gena black with whitish pollen; ocellar triangle black with many divergent black hairs; outer vertical bristle absent; inner vertical well developed, post vertical shorter than inner vertical; ocellar and postocellar bristles short; a row of regular postocular setae besides postocular cilia, rest of the area with irregular black and white hairs; palpi brown; proboscis black.

Thorax : Grey, silvery pollen and with three black longitudinal stripes; *ac* 0+1; *dc* 5+5 (posterior 1 *dc* stout); *ia* 1+3; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 4; *st* 1+1+1; *mpl* 6; *hpl* 8; upper part of propleura bare; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 3 pairs of which the basal 1 weak.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of about 9 short setae located dorsally and extending up to about more than half from the basal node to *r-m* and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment a little shorter than the third, the former with short spines along basal half of its anterior margin; costal spines stout; epaulet black with short spines; basicostal scale brown; squama white; halter brown.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 2—3 short bristles along basal half of anterodorsal surface, 1 bristle on posterolateral surface at about one-third the distance from the distal end and a row of short bristles along posterodorsal surface; mid femur with a row of 3 bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of short hairs along basal half and a row of short setae along distal half of posteroventral surface and 1 bristle each on distal part of posterodorsal and posterolateral surfaces; mid tibia with 1 long and a row of short bristles along anterodorsal surface, 2 long bristles on middle portion of anterolateral surface and 1 bristle each on posterolateral and posteroventral surfaces at about one-third the distance from the distal end; hind femur with a pair of rows of long bristles along anterodorsal surface, a row of bristles along anteroventral surface, 1 bristle each on dorsal and posterodorsal surfaces and numerous long hairs along posterior margin of ventral surface; hind tibia with 2 bristles on middle portion of posterodorsal surface, 1 long bristle on anteroventral surface at about one-fourth the distance from the distal end and numerous long hairs along anterior and posterior margins of ventral surface at about three-fourths the distance from the distal end.

Abdomen : Black with silvery grey checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 2—3



Figs. 580-586 : *Parasarcophaga (s. str.) albiceps* (Meigen). 580, Inner and outer forceps (lateral view); 581, Inner and outer forceps (posterior view); 582, Fifth sternite; 583, Penis (lateral view); 584, Penis (ventral view) 585, Ventralia of penis (ventral view); 586, Genitalia ♀ (ventral view).

well developed lateral marginal bristles, fourth with a pair of stout and several pairs of ordinary lateral marginal bristles, fifth with a row of 18 marginal bristles; sternites first and second with long hairs, third and fourth with short sparse hairs but without differentiated bristles; fifth sternite Y-shaped with stout spines laterally and long hairs terminally on arms; first genital segment blackish with short hairs, second black with numerous black hairs but without marginal bristles; inner forceps stout, elongated, without protuberance and spines at the inner surface of subapical part but with tuft of long hairs along basal half; outer forceps elongated, somewhat kidney-shaped with hairs along distal half; anterior paramere long and curved in the middle; posterior paramere flat in the middle with several hairs at the apical part; theca and paraphallus long, curved and pointed at end; lateral plate of paraphallus moderately long and pointed; styli of glans short; ventralia with long stalked wide lobe and the anterior portion deeply curved.

Female : Body length 7–12 mm.

Head : Width of frons almost equal to that of one eye; frontal bristles 11–12; 2 proclinate fronto-orbital bristles present; outer vertical bristle well developed about three-fifths that of inner vertical.

Thorax : Similar to that of male but absence of apicoscutellar bristles.

Wings : Same as in male.

Legs : Chaetotaxy same as in male but differs for the followings; mid femur without hairs along basal part of posteroventral surfaces at about one-third the distance from the distal end; hind tibia with 2 bristles on anteroventral surface at about one-third the distance from the distal end but without long hairs along anterior and posterior margins of ventral surface.

Abdomen : Second and third sternites each with 4 bristles, fourth and fifth with 2 long bristles, sixth broader than the rest, seventh without hairs but with a row of stout marginal bristles, eighth bare, membranous and slightly concave; anal sternite with short hairs; seventh tergite with long bristles.

Material examined : India : Several male specimens from different localities of Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal and union territories of Andaman and Nicobar Islands and Lakshadweep, collected by B. C. Nandi.

Discussion on species : This species is similar to *P. (s. str.) sericea* (Walker, 1852) and *P. (s. str.) hirtipes* (Wiedemann, 1830) by the structure of apical plate of paraphallus but may be distinguished from *sericea* by detailed structure of ventralia and from *hirtipes* by elongated styli of glans. Moreover, the inner forcep is more slender here.

This species may be distinguished from *P. (s.str.) macroauriculata* (Ho, 1932) by the structure of inner forcep and the absence of spines on it.

Biology : This is a fairly common species which is attracted to excrement and dead bodies of different animals, coconut husks, *Aristolochia ridicula* flowers (Aristolochiaceae) and other flowers, and *Achatina* sp. (Gastropoda). The larvae breed from meat, beef, animal dung, human excrement, dead rabbit, human carcasses and garbage. This species is preying on ant pupae (Senior-White, 1924) and is parasitic on *Nonagria* sp. (Noctuidae, Lepidoptera) and other lepidopterous and coleopteran larvae (Blackith and Blackith, 1994). The larvae of this species cause myiasis in bulls. The larvae have been reared on faeces and meat (Mihályi, 1965) and the larval stages have been described by Kano, Sato and Tange (1951), Ishijima (1967) and Nandi (1980).

Distribution : India ; Several localities of AnP, ArP, A, B, D, G, Gu, H, HP, Kt, K, MP, Mr, MnP, Me, Mz, N, O, P, R, S, TN, T, UP, WB, AN, C, DD, DN, Ld and Po; BD (Dacca); Bh (Phuntsholing) ; M (Mergui); Ne (several localities); Pa (several localities); SL (Matale, Peradeniya); Albania; Armenia; Australia; Austria; Azerbaijan; Belgium; Borneo; Bulgaria; Byelorussia; Czech Republic; China (including Kwangtung); Finland; France; Germany; Great Britain; Greece; Gruzia; Hawaiian Islands; Hungary; Indonesia (Java); Ireland; Israel; Italy; Japan; Kazakhstan; Korea; Latvia; Malaysia; Moldova; New Britain; New Guinea; Norway; Papua New Guinea; Philippines; Poland; Romania; Russia; Serbia; Singapore; Slovakia; Solomon Islands; Sweden; Switzerland; Taiwan; Thailand; Turkey; Ukraine and United Kingdom.

Type deposited : Holotype ♂, MNHN, not studied.

95. *Parasarcophaga (s. str.) unguitigris* Rohdendorf

(Figs. 587-590)

1938. *Parasarcophaga unguitigris* Rohdendorf, *Trans. Sikhote-Alin St. Res.*, **2** : 104; Kano, Field and Shinonaga, 1967, *Fauna Japonica*, Sarcophagidae : 40.

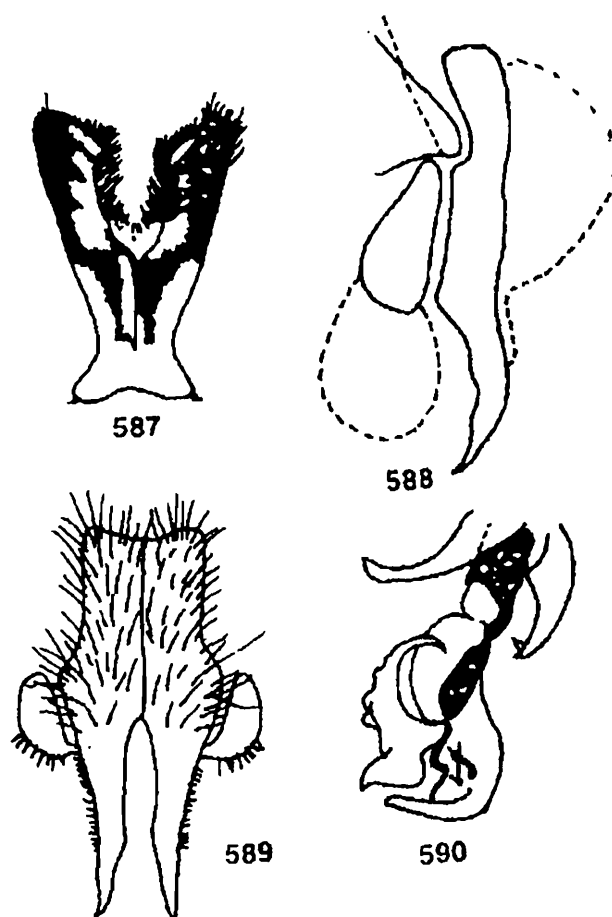
1986. *Parasarcophaga (s. str.) unguitigris* : Verves, *Cat. Palae. Dipt.*, **12** : 171.

1994. *Sarcophaga unguitigris* : Kano and Shinonaga, *Jap. J. sanit. Zool.*, **45** : 257.

Male : Body length 12–16 mm.

Head : Width of frons about half that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with golden pollen, the former with short scattered hairs, the latter with a row of short hairs near the eye margin; antennae dark brown and reaching up to about 0.8 distance to vibrissae, first segment blackish-brown, second slightly brown, third brownish with whitish pollen and about twice that of the second; arista long, plumose along basal three-fifths; facial ridge blackish-brown, silvery pollen and with short spines along basal half; vibrissae long, crossed, distance between vibrissae about less

than one parafacial width; frontal bristles 10—12, posterior 2 reclinate, anterior 2—3 below base of antennae and reaching up to about half of second antennal segment, rest cruciate and directed forwards; gena black, silvery to golden pollen and with numerous black hairs; post gena black with white hairs and pollen; ocellar triangle black with many divergent black hairs; outer vertical bristle short, inner vertical well developed; post vertical shorter than inner vertical; ocellar and postocellar bristles short; a row of regular postocular setae besides postocular cilia, rest of the area with irregular black and white hairs; palpi black; proboscis blackish.



Figs. 587-590 : *Parasarcophaga* (*s. str.*) *unguitigris* Rohdendorf. 587, Fifth sternite (after Kano, Field and Shinonaga, 1967); 588, Inner and outer forceps (lateral view); 589, Penis (lateral view); (after Rohdendorf, 1938); 590, Inner and outer forceps (posterior view).

Thorax : Grey, silvery to golden pollen and with three black longitudinal stripes; *ac* 0-1+1; *dc* 5+5-6; *ia* 1+3; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 4; *st* 1+1+1; *mpl* 7-8; *hpl* 8-10; upper part of propleura bare; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 3 pairs of which the basal 1 weak.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 10 short setae located dorsally and extending up to about more than half from the basal node to $r-m$ and several short setae along ventral surface of basal node to R_{4+5} ; fifth costal segment a little shorter than the third, the former with short spines along basal one-third of its anterior margin; costal spines stout; epaulet black with short spines; basicostal scale light brown; squama creamy white; halter brown.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal half of anterodorsal surface, 1 bristle on posterolateral surface at about one-third the distance from the distal end and a row of short and 1 long bristles along posterodorsal surface; mid femur with a pair of rows of bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of short hairs along basal half and a row of short setae along distal half of posteroventral surface and 3 bristles on distal part of posterolateral surface; mid tibia with 2 bristles on anterodorsal surface, 1 long and a row of short bristles along posterodorsal surface, 1 bristle on posteroventral surface at about one-third the distance from the distal end and 2 bristles on posterolateral surface on distal one-third; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 1 bristle each on dorsal, posterodorsal and posterolateral surfaces and numerous long hairs along posterior margin of ventral surface; hind tibia with 3 long and a row of short bristles along anterodorsal surface, 2 long and a row of short bristles along posteroventral surface, 1 bristle on anteroventral surface at about one-fifth the distance from the distal end and numerous long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery grey checkered pattern; median marginal bristles on second and third abdominal tegites absent, but third, fourth and fifth each with several pairs of lateral marginal bristles, fifth with a row of 18 marginal bristles; sternites first and second with numerous black hairs, third and fourth with sparse short hairs; fifth sternite v-shaped with wide window and stout spines laterally and long hairs terminally on arms; first genital segment black with greyish pollen, second shiny black with numerous black hairs but each without marginal bristles; inner forceps long, slender gradually pointed, middle part of its with curved depression and few short spines anteriorly; outer forceps slightly elongated with long hairs terminally; anterior paramere slightly curved; posterior paramere almost straight with long hairs anteriorly; theca and paraphallus almost equal and heavily sclerotised; apical plate of paraphallus long, curved but its apical end slightly bent posteriorly; lateral plate of paraphallus short and pointed; styli of glans short; ventralia with long stalked wide lobe and the posterior part plough-shaped and the anterior part slender and curved posteriorly.

Female : Unknown.

Material examined : 1 ♂, Nepal; Kathmandu, 22.vii.1992, H. Kurahashi (dep. in NSMT).

Discussion on species : This species is similar to *P. (s. str.) albiceps* (Meigen) but differs from it by the structures of inner forceps and ventralia and from *P. (s. str.) macroauriculata* (Ho) by the structures of ventralia and paraphallus.

Biology : Nothing is known regarding the biology of the species but Artamonov (1980) reported that the larvae of this species live in the excrement of *Ursus* sp.

Distribution : Ne (Kathmandu, Solukhumbu Dist.) ; China ; Far East ; Japan and Korea.

Type deposited : *Holotype* ♂, probably in the collection of Prof. B. B. Rohdendorf, not studied.

Subgenus *Thomsonea* Rohdendorf, 1937

1937. *Thomsonea* Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 247 ; Rohdendorf, 1965, *Ént, Obozr.*, 44(3) : 680.

Type species : *Sarcophaga barbata* Thomson, 1869 (= *Myophora argyrostoma* Robineau-Desvoidy, 1830).

Morphology : Ventralia well developed ; acrostichal bristles absent ; posterior part of paraphallus more or less sclerotised ; apical plate of paraphallus with clearly separate median portion and a pair of lateral processes ; lateral plate of paraphallus large, lamellate and with sharp apical tooth ; ventral process of basal part of paraphallus large with a terminal hook.

This is a very small subgenus and Rohdendorf (1937) recorded 3 species from USSR. Lopes *et al.* (1977) and Verves (1986) reported only 1 valid species each from the Oriental and Palaearctic regions which is also available in India. Lopes (1989) gave it as a separate generic status and reported 1 species from the Australasian and Oceanian regions.

Members of the group are attracted to meat, reared on such media and are also carrier of microorganisms.

This subgenus is mostly distributed in the Oriental, Palaearctic, Neotropical and Australasian and Oceanian regions.

96. *Parasarcophaga (Thomsonea) argyrostoma* (Robineau-Desvoidy)

(Figs. 591-596)

1830. *Myophora argyrostoma* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. Sci. Inst. Fr.*, (2) 2 : 340.

1860. *Sarcophaga nurus* Rondani, *Atti Soc. ital. Sci. nat.*, **3** : 392.
1869. *Sarcophaga barbata* Thomson, *K. svenska Vetensk Akad. fregatten Eugenie resa omkring jorden.*, **2**(1) : 533.
1896. *Sarcophaga ferculata* Pandellé, *Revta Ent.*, **15** : 185.
1916. *Sarcophaga argentina* Bréthes, *An. Mus. nac. Hist-nat.*, **28** : 142.
1924. *Sarcophaga ferculata persicae* Senior-White, *Rec. Indian Mus.*, **26**(3) : 288.
1928. *Mesothysia henschiana* Enderlein, *Konowia*, **7** : 152.
1937. *Sarcophaga (Thomsonia) barbata* : Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 247.
1941. *Sarcophaga argyrostoma* : Séguy, *Encycl. ent. (A)*, **21** : 77 ; Downes, 1965, *Cat. Dipt. Am.*, **276** : 957.
1958. *Parasarcophaga (Thomsonia) argyrostoma* : Lopes, *Ins. Micro.*, **13**(2) : 45 ; Nandi, 1992, *Proc. zool. Soc., Calcutta*, **45**(2) : 191.
1978. *Parasarcophaga argyrostoma* : Draber-Mónko, *Fragm. faun. Warsz.*, **19**(7) : 201 ; Mihályi, 1979, *Fauna Hung. Dipt.*, **15**(16) : 129.

Male : Body length 8–15 mm.

Head : Width of frons about half that of one eye ; frontal vitta black, its width at narrowest point of frons about less than each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of short hairs near the eye margin ; antennae black, dark brown, silvery pollen and reaching up to about 0.80 distance to vibrissae, first and second segments reddish-brown, third brownish-black and about two and half times that of the second ; arista long, plumose along basal two-thirds ; facial ridge brownish with silvery pollen and short hairs ; vibrissae long, crossed, distance between vibrissae less than one parafacial width ; frontal bristles 10-12, posterior 3 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; gena black with black hairs ; post gena black with greyish hairs ; ocellar triangle black with short black hairs ; outer vertical bristle short, inner vertical well developed, post vertical half of inner vertical ; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with short white hairs ; palpi slender and black ; proboscis black.

Thorax : Grey black with three black longitudinal stripes ; *ac* 0+1 ; *dc* 1+4 ; *ia* 0+3 ; *ps* 1 ; *h* 4 ; *ph* 2 ; *np* 3 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6-7 ; *hpl* 10 ; upper part of propleura bare, black with silvery pollen ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 10 short setae located dorsally and extending up to about two-thirds from the basal node to r-m and

5-6 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment greater than the third, the former with short spines along basal two-thirds of its anterior margin ; costal spines not so stout ; epaulet black ; basicostal scale light brown ; squama white ; halter brown.

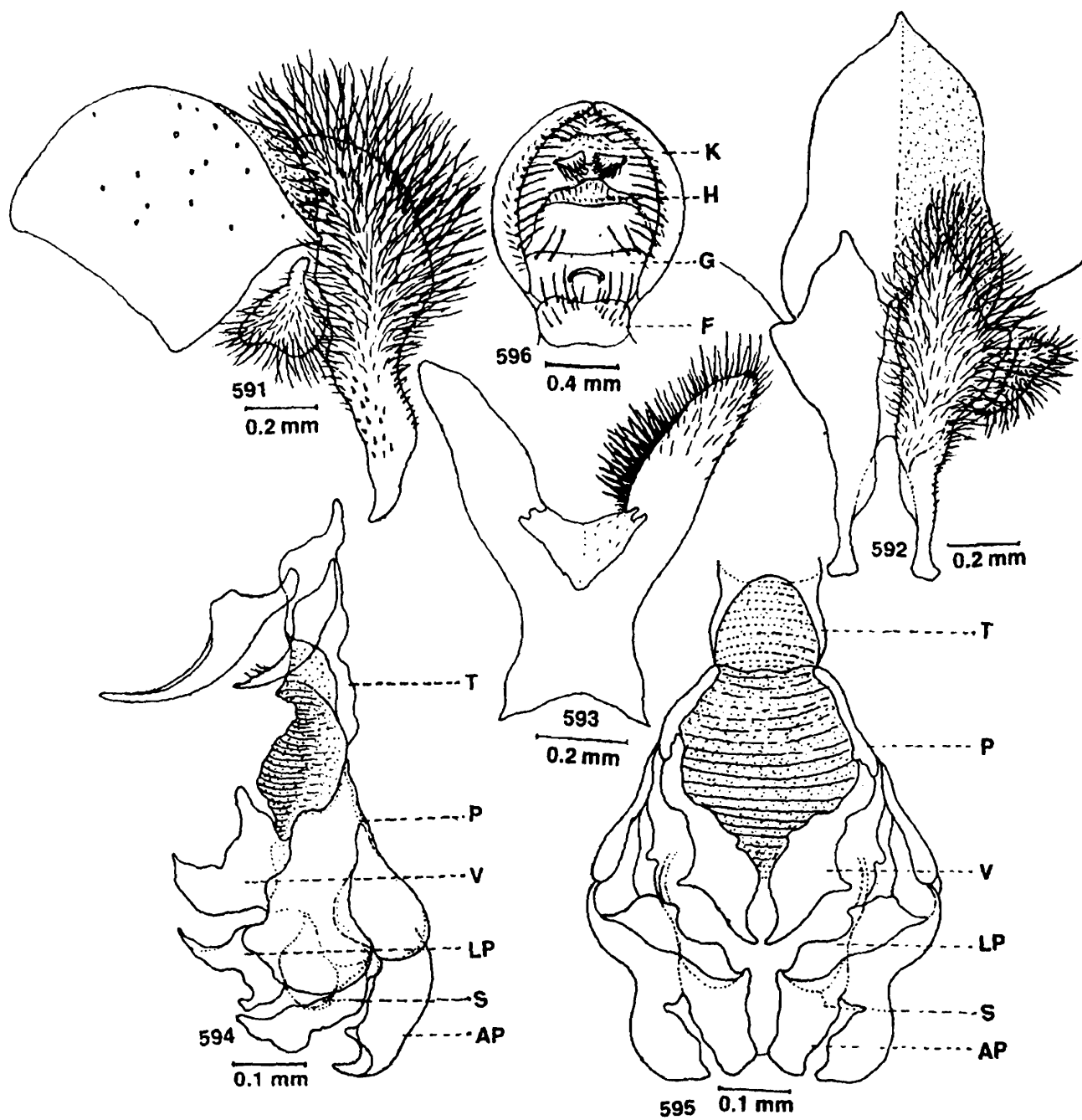
Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2-3 bristles along basal half of anterodorsal surface, 1 bristle on posterolateral surface at about two-fifths the distance from the distal end ; mid femur with a pair of rows of bristles along anterolateral surface, a row of bristles along basal half and a row of short comb-like setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with 2 bristles on middle portion of anterolateral surface, a row of bristles along basal half of posterolateral surface and 1 bristle each on anterolateral, anteroventral and posterodorsal surfaces on distal one-third ; hind femur with a pair of rows of bristles along anterodorsal surface and a row of bristles each along anteroventral and posteroventral surfaces ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end, 1 bristle on anteroventral surface at about two-thirds the distance from the basal end and tuft of long hairs along anteroventral and posteroventral surfaces.

Abdomen : Black with grey checkered pattern ; median marginal bristles on second and third abdominal tergites absent, but second with 2 and third with 1 lateral marginal bristles, fourth with a pair of median and 1 lateral marginal bristles, fifth with a row of 14-16 marginal bristles ; sternite second with long hairs, third to fourth with short hairs ; fifth sternite Y-shaped with wide transparent window and strong marginal spines laterally and short hairs terminally on arms ; first and second genital segments black with short hairs but without marginal bristles ; inner forceps almost straight and more wider on basal end ; outer forceps almost oval with long hairs ; anterior paramere less curved ; posterior paramere more curved with 3 short hairs apically ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus membranous with a clearly separate median portion and a pair of long projecting lateral processes ; lateral plate of paraphallus curved with two projections ; styli of glans wide with a pair of strongly chitinous lateral processes ; ventralia bilobed and well developed.

Female : Body length 11-15 mm.

Head : Similar to that of male except frons two-thirds that of one eye ; presence of 2 proclinate fronto-orbital bristles ; outer vertical bristles well developed ; ocellar bristles well differentiated.

Thorax : Similar to that of male except apicoscutellar bristles absent.



Figs. 591-596 : *Parasarcophaga (Thomsonia) argyrostoma* (Robineau -Desvoidy). 591, Inner and outer forceps (lateral view); 592, Inner and outer forceps (posterior view); 593, Fifth sternite; 594, Penis (lateral view); 595, Penis (ventral view); 596, Genitalia ♀ (ventral view).

Abdomen : Genital segments red; sixth sternite red with 2 pairs of strong marginal bristles and a median protuberance, seventh without pits, eighth membranous with a pair of long delicate hairs on hind margin ; anal sternite transparent with short hairs.

Material examined : India : Several male specimens from different localities of Gujarat, Haryana, Rajasthan and Uttar Pradesh collected by B. C. Nandi.

Discussion on species : This species has its specific characters of wide, well developed lateral and apical plate of paraphallus, with wide groove anteriorly and wide inner forceps on basal end.

Biology : This species is not so abundant and can be collected from bushes. The larvae breed on decaying meat and snails (Lundbeck, 1927) and has been reared on *Lachnosterna* sp. (Scarabaeidae, Coleoptera). The larvae are predatory on beetles, lepidopterous larvae and egg pods of acridid grasshoppers. Séguy (1932), Knipling (1936) and Sanjean (1957) described the larval stages of this species (as *barbata*). This species is associated with *Escherichia coli*, *Mycobacterium laprae*, *M. phlei*, *M. tuberculosis* and *Neisseria catarrhalis* (Greenberg, 1971). Aldrich (1916) reported it as parasitic on *Phyllophaga* sp. (Scarabaeidae, Coleoptera) and Marchionatto and Blanchard (1933) as parasite of the large grasshopper- *Schistocerca paranensis* (Acrididae, Orthoptera). The larvae have also been recorded from cases of myiasis in human beings (Sacca, 1945 ; James, 1947 ; Burgess, 1966) and also from a secondary myiasis in a sheep (Baranov and Jezic, 1928).

Distribution : India ; Gu (Girner Hills, Junagadh), H (Ambala), R (Jaipur) and UP (Mussoorie) ; Pa (Kalash Valley) ; Afghanistan ; Albania ; Argentina ; Armenia ; Australia ; Austria ; Azerbaijan ; Azores ; Belgium ; Bermuda ; Brazil ; Bulgaria ; California ; Canada ; China ; Cuba ; Cyprus ; Czech Republic ; Denmark ; Egypt ; France ; Germany ; Great Britain ; Greece ; Gruzia ; Hawaiian Islands ; Hungary ; Iran ; Iraq ; Israel ; Italy ; Kazakhstan ; Kyrgyzstan ; Marshall Islands ; Moldova ; Mongolia ; Poland ; Portugal ; Romania ; Russia ; Saudi Arabia ; Serbia ; Slovakia ; South Africa ; Spain ; St. Helena ; Syria ; Tajikistan ; Texas ; Tunisia ; Turkey ; Turkmenistan ; Ukraine ; United Kingdom ; USA ; Uzbekistan and Wake Island.

Type deposited : Type MHNH, probably lost.

Genus 31. *Phallosphaera* Rohdendorf, 1938

1938. *Phallosphaera* Rohdendorf, *Trans. Sikhote-Alin St. Res.*, 2 : 107.

Type species : *Phallosphaera konakovi* Rohdendorf, 1938.

1964. *Yunnanomyia* Fan, *Acta zootax. sin.*, 1(2) : 305.

Type species : *Sarcophaga gravelyi* Senior-White, 1924.

Morphology : Third antennal segment about three times that of the second ; arista long, plumose along basal two-thirds or more ; acrostichal bristles 5+1 and distinct;

dorsocentral bristles 5+4 ; third abdominal segment usually with a pair of median marginal bristles ; fifth sternite with chitinous protuberance on middle part of ventral surface ; inner forceps wide and almost straight ; first genital segment without median marginal bristles ; posterior paramere strongly curved, with several bristles along basal half and denticles on distal part ; anterior paramere slender and apically blunt or bifurcated ; paraphallus long and its apical part well differentiated but without lateral processes ; styli of glans large, their rounded apices curved with numerous strong spines.

Discussion : This genus has been divided into two subgenera : *Phallosphaera* Rohdendorf, 1938, and *Yunnanomyia* Fan, 1964, but Lopes *et al.* (1977) synonymized these two subgenera. Verves (1989c) placed this genus under the subtribe Boettcheriscina. Kano and Lopes (1981) and Verves (1989c) revised this genus and it is now represented by 2 species in the Oriental region and 4 species in the Palaearctic region.

Biology : Members of the genus were collected from bushes. A few species are parasites on Lepidoptera (Kano *et al.*, 1967).

Distribution : This genus is distributed in the Oriental and Palaearctic regions.

97. *Phallosphaera gravelyi* (Senior-White)

(Figs. 597-502)

1924. *Sarcophaga gravelyi* Senior-White, *Rec. Indian Mus.*, **26**(3) : 229 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 224 ; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, **45** : 263.
1912. *Sarcophaga longicornis* Böettcher, *Ent. Mitt.*, **1** : 166.
1924. *Sarcophaga formosana* Senior-White, *Rec. Indian Mus.*, **26**(3) : 243 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 250.
1954. *Sarcophaga kinoshitai* Hori, *Scient. Rep. Kanazawa Univ.*, **2**(2) : 45.
1965. *Phallosphaera kinoshitai* : Fan, *Synan. flies China*, **15** : 253.
1965. *Phallosphaera gravelyi* : Fan, *Synan. flies China*, **15** : 252 ; Kano, Field and Shinonaga, 1967, *Fauna Japonica, Sarcophagidae* : 91 ; Verves, 1989, *Mems Inst. Oswaldo Cruz*, **84**(4) : 542.

Male : Body length 10–15 mm.

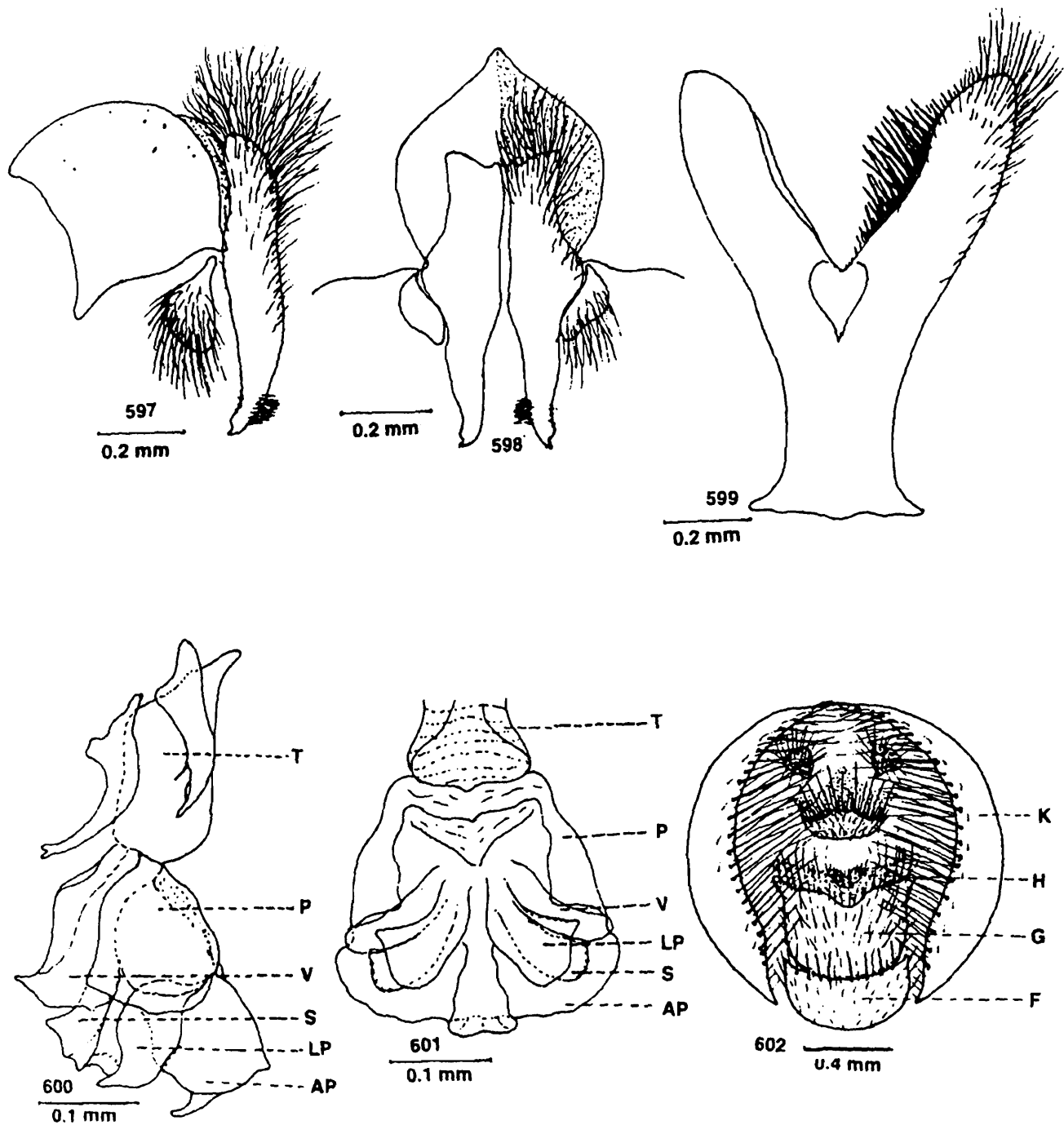
Head : Width of frons about half that of one eye ; frontal vitta black, its width at narrowest point of frons about more than twice that of each parafrontal; parafrontal and parafacial blackish-brown with golden pollen, the former with short scattered hairs, the latter with a row of 9 short hairs near the eye margin ; antennae dark brown and reaching up to about 0.9 distance to vibrissae, first and second segments

blackish-brown, third slightly brown, silvery pollen and about three and half times that of the second ; arista long, plumose along basal two-thirds ; facial ridge black with silvery pollen ; vibrissae long, crossed, distance between vibrissae less than one parafacial width ; frontal bristles 10-14, posterior 4 reclinate, anterior 3 below base of antennae and reaching up to about more than half of second antennal segment, rest cruciate and directed forwards ; gena black with numerous yellowish hairs ; post gena blackish with short hairs ; ocellar triangle black with short black hairs ; outer vertical bristle poorly developed, inner vertical well developed, post vertical short and less than inner vertical ; ocellar bristles short, postocellar less than half of inner vertical ; a row of regular postocular setae besides postocular cilia, rest of the area with irregular short greyish hairs ; palpi black ; proboscis blackish-brown.

Thorax : Greyish, silvery pollen and with three black longitudinal stripes, *ac* 5+1; *dc* 5+4 ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 7 ; *npl* 8 ; upper part of propleura bare ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of about 10 short setae located dorsally and extending up to more than half from the basal node to *r-m* and 5-6 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than the third, the former with short spines along basal one-third of its anterior margin ; costal spines stout ; basicostal scale light brown ; epaulet black ; squama creamy white ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of long bristles along posterior margin of ventral surface ; fore tibia with 2 short bristles on basal part of anterodorsal surface, 1 bristle on posteroventral surface at about one-third the distance from the distal end ; mid femur with a row of bristles along middle portion of anterolateral surface, 1 bristle each on posterolateral and posteroventral surfaces on distal end and a row of bristles along distal one-third of posterior margin of ventral surface ; mid tibia with 1 bristle on distal end, 2-3 long along with a row of short bristles along posterodorsal surface and 1 bristle on posterolateral surface at about one-third the distance from the distal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, a row of 3-4 bristles along distal part of posterodorsal surface, 1 bristle on distal part of posteroventral surface and numerous long hairs along ventral surface ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end and numerous long hairs along anterior and posterior margins of ventral surface.



Figs. 597-602 : *Phallosphaera gravelyi* (Senior-White). 597, Inner and outer forceps (lateral view); 598, Inner and outer forceps (posterior view); 599, Fifth sternite; 600, Penis (lateral view); 601, Penis (ventral view); 602, Genitalia ♀ (ventral view).

Abdomen : Black with silvery grey checkered pattern ; median marginal bristles on second abdominal tergite absent but third with a pair of median marginal bristles, second and third each with 2 lateral marginal bristles, fourth with a pair of median and 4 lateral marginal bristles, fifth with a row of 16 marginal bristles ; sternites first to third with short hairs, fourth with long hairs ; fifth sternite Y-shaped with short window and strong bristles laterally and long hairs terminally on arms ; first genital segment black, second slightly black but both without marginal bristles ; inner forceps elongated with long hairs at the subterminal end on outer surface ; outer forceps slightly elongated with long hairs ; anterior paramere curved and slightly bifurcated at end ; posterior paramere almost straight with slight knob subterminally ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus wide with short and pointed projection at end ; lateral plate of paraphallus membranous and broad at end ; styli of glans wide and pointed at end ; ventralia membranous, wide and slightly recurved.

Female : Body length 8–12 mm.

Head : Similar to that of male except frons about two-thirds that of one eye ; presence of 2 proclinate fronto-orbital bristles.

Thorax : Apicoscutellar bristles absent.

Legs : Hind tibia with tuft of long hairs.

Abdomen : Sixth sternite wide, cup-shaped and with many bristles, seventh more wide and slightly grooved, eighth less wide, membranous and terminally grooved ; seventh tergite with many hairs and bristles.

Material examined : *Holotype* ♂, India : Tamil Nadu ; Nilgiri Hills (Kallar), 17.v.1920, Major Patton ; 1 ♂, Mt. Sanbe : Shinane Pref., 12.viii.1964, S. Shinonaga (det. by E. Sugiyama).

In spite of extensive survey since 1973, this species was not again available from this region.

Discussion on species : This species is unique in having a wide apical plate of paraphallus and terminally beak-like hook-shaped ventralia. Moreover, the styli of glans wide at end and sickle-shaped and the inner forcep is equipped with few short hairs terminally.

Biology : This is a relatively rare species which was collected from bush-sweeping.

Distribution : India ; AnP (Godavari Dist.), TN (Kallar) ; Ne (several localities) ; Japan (including Ryukyu Islands) ; Far East ; Korea ; South China ; Taiwan and Thailand.

Type deposited : *Holotype* ♂, BMNH, examined.

Discussion on type : The condition of the *Holotype* is good. The genitalia are dissected out and mounted on a separate slide.

Genus 32. *Robineauella* Enderlein, 1928

1828. *Robineauella* Enderlein, *Arch. klassif. phylogen. Ent.*, **1**(1) : 23 ; Rohdendorf, 1965, *Ént. Obozr.*, **44**(3) : 689.

Type species : *Sarcophaga scoparia* Pandellé, 1896.

Morphology : Third antennal segment about three times that of the second ; upper part of propleura usually bare ; acrostichal bistles 0+0 or 0+1 ; postsutural dorsocentral bristles 4 or 5, posterior 2 strong ; hind tibia of male with tuft of long hairs ; third abdominal segment without median marginal bristles ; genital segments without median marginal bristles ; forceps black ; apical plate of paraphallus pigmented with a pair of long stout processes forming nearly perfect ring or straight ; lateral process of apical part of paraphallus generally with two pairs of short sharp hooks ; styli of glans short and slender ; ventralia generally ill-developed.

Discussion : This is a comparatively poorly known genus. Verves (1986) divided this genus into three subgenera : *Robineauella* Enderlein, 1928, *Digitiventra* Fan, 1964 and *Jantiella* Rohdendorf, 1937 and all the subgenera are present in India. This genus is distributed by 3 species in the Oriental region and by 10 species in the Palaearctic region.

Biology : Very little is known regarding the biology of the species but some are attracted to different types of dead bodies and carcasses and are reared on such media.

Distribution : This genus is distributed in the Oriental, Nearctic and Palaearctic regions.

Key to subgenera

1. Apical plate of paraphallus without bifurcated process at end
.....*Robineauella* Enderlein
Apical plate of paraphallus with a short but distinct bifurcated process at end
.....2
2. Ventralia ill-developed ; absence of digit-like process on basal part of inner side
of arms of fifth sternite*Jantiella* Rohdendorf
Ventralia well developed ; presence of digit-like process on basal part of inner
side of arms of fifth sternite*Digitiventra* Fan

Subgenus *Robineauella* Enderlein, 1928

1928. *Robineauella* Enderlein, *Arch. klassif. phylogen. Ent.*, **1**(1) : 23 (as distinct genus) ; Rohdendorf, 1937, *Fauna USSR, Dipt.*, **19**(1) : 234.

Type species : *Sarcophaga scoparia* Pandellé, 1896.

Morphology : Apical part of paraphallus less sclerotised which is without bifurcated process at end but in type species has the bifurcated process ; lateral plate of paraphallus long and curved ; ventralia strong and single.

This is very poorly known subgenus. Out of 3 Oriental species of this subgenus only 1 species is present in this area. Verves (1986) reported 5 species under it from the Palaearctic region.

This species of this subgenus are attracted to different types of animal carcasses, meat and fish and are reared on such media in the laboratory.

This subgenus is distributed in the Oriental and Palaearctic regions.

98. *Robineauella* (*s. str.*) *walayari* (Senior-White)

(Figs. 603-607)

1924. *Sarcophaga walayari* Senior-White, *Rec. Indian Mus.*, 26(3) : 231 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, 6 : 230.

1977. *Robineauella walayari* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, 3 : 573 ; Nandi, 1992, *Hexapoda*, 4(1) : 74.

1979. *Robineauella (Digitiventra) walayari* : Verves, *Trudy. russk. ent. Obshch.*, 61 : 215.

Male : Body length 9-10 mm.

Head : Width of frons about half that of one eye ; frontal vitta blackish, its width at narrowest point of frons about more than twice that of each parafrontal ; parafrontal and parafacial brownish with silvery pollen, the former with short scattered hairs, the latter with a row of 8-9 short hairs near the eye margin ; antennae blackish-brown and reaching up to about 0.9 distance to vibrissae, first and second segments black with short black hairs, third brownish, silvery pollen and about two and half times that of the second ; arista long, plumose along basal three-fifths ; facial ridge brownish with silvery pollen ; vibrissae long, distance between vibrissae about one parafacial width ; frontal bristles 9, posterior 2 reclinate, anterior 2 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; gena brownish with silvery pollen ; post gena black with greyish hairs ; ocellar triangle black with short black hairs ; outer vertical bristle not differentiated, inner vertical well developed, post vertical more than half of inner vertical ; ocellar bristles short, post ocellar longer than the ocellar ; 3 rows of regular postocular setae besides postocular cilia, rest of the area with greyish hairs ; palpi slender and blackish; proboscis black.

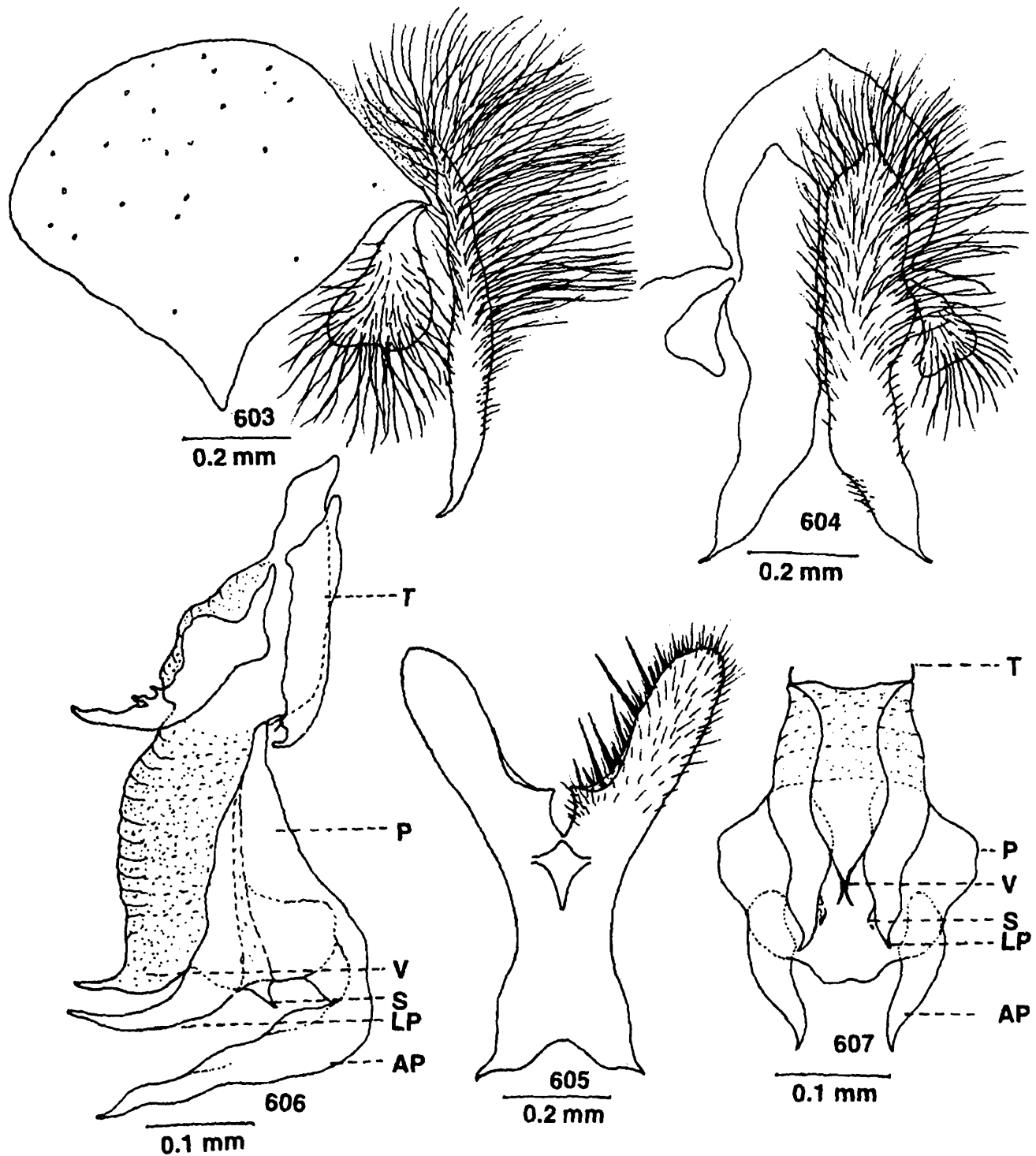
Thorax : Greyish black with three black longitudinal stripes ; *ac* 0+1 ; *dc* 4+4 ; *ia* 1+3 ; *ps* 2 ; *h* 2 ; *ph* 2 ; *np* 3 ; *pa* 2 ; *sa* 2 ; *st* 1+1+1 ; *mpl* 6-7 ; *hpl* 7 ; upper part of propleura bare, brownish with brownish pollen ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; apicoscutellar and discoscutellar bristles well developed, 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of short setae located dorsally and extending up to two-thirds from the basal node to r-m and 3-4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment shorter than the third, the former with short spines along basal half of its anterior margin ; costal spines not so stout ; basicostal scale brownish ; epaulet blackish-brown ; squama white; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2 bristles on basal one-third of anterodorsal surface and 1 bristle on posterolateral surface at about one-third the distance from the distal end ; mid femur with a row of 3 bristles along middle portion of anterodorsal surface, a row of bristles along anteroventral surface, a row of long hairs along basal half and a row of short comb-like setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces at about one-fifth the distance from the distal end ; mid tibia with 2 bristles along middle portion of anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 1 bristle each on posterodorsal and posterolateral surfaces on distal end and tuft of long hairs along ventral surface ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end and tuft of long hairs along ventral surface.

Abdomen : Greyish-black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with 1 lateral marginal bristle, fourth with a pair of median and 4 lateral marginal bristles ; sternites first and second each with few short and 2 long hairs, third and fourth with short hairs; fifth sternite Y-shaped with short window and strong bristles laterally on arms ; first and second genital segments brownish but without marginal bristles ; inner forceps elongated, almost straight, slightly curved at end and with long hairs ; outer forceps slightly elongated with long hairs terminally ; anterior paramere curved, slightly swelling at the base and with 2 short processes on two-thirds of its anterior margin ; posterior paramere straight with notch terminally and 2 hairs ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus well developed, curved and pointed ; lateral plate of paraphallus well developed, curved and with only pointed process apically ; styli of glans short and pointed ; ventralia membranous and beak-like terminally.

Female : Unknown.



Figs. 603-607 : *Robineauella (s. str.) walayari* (Senior-White). 603, Inner and outer forceps (lateral view); 604, Inner and outer forceps (posterior view); 605, Fifth sternite; 606, Penis (lateral view); 607, Penis (ventral view).

Material examined : *Holotype* ♂, India : Kerala ; Walayar Forests, 29-30.xi.1909, Ramakrishna ; 1♂, Karnataka ; Nandi Hills, 1, 330 m, 30.vi.1990, B. C. Nandi.

Discussion on species : This species has its specific character in the elongated straight lateral plate of paraphallus and beak-shaped ventralia. Moreover, the anterior paramere is with 2 short processes on anterior margin and fifth sternite with 2 pointed processes at the base of arms.

Biology : This species is not so abundant which was collected from bushes.

Distribution : India ; B (Pasoita), Kt (Nandi Hills), K (Karikal, Palghat, Walayar Forests) and Philippines.

Type deposited : *Holotype* ♂, BMNH, studied.

Discussion on type : The condition of the *Holotype* is good except the right mid and right and left hind legs are missing.

Subgenus *Jantiella* Rohdendorf, 1937

1937. *Jantiella* Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 233 ; Rohdendorf, 1965, *Ént. Obozr.*, 44(3) : 689.

Type species : *Parasarcophaga djakonovi* Rohdendorf, 1937.

Morphology : Apical part of paraphallus strongly sclerotised with bifurcated processes at end ; lateral plate of paraphallus short and pointed at end ; styli of glans moderately short ; ventralia ill-developed ; digit-like process on distal part of each arm of fifth sternite absent.

This is a very small subgenus which is distributed by 2 species in the Oriental region and 1 species in the Palaearctic region. Both the Oriental species are reported from this area.

Members of this subgenus are attracted to meat and fish.

This subgenus is distributed in the Oriental and Palaearctic regions.

Key to male species

1. Ventralia single ; apical plate of paraphallus with median prominent process ; inner forceps curved and swelling at subapical part 2
 Ventralia trilobed ; apical plate of paraphallus without median process ; inner forceps straight, tapering and pointed at end *kanoi* Nandi
2. Lateral process of apical plate of paraphallus grooved at end and curved ; anterior paramere pointed at end *deleschalli* (Johnston and Tieg)
 Lateral process of apical plate of paraphallus straight at end and blunt ; anterior paramere rounded at end *djakonovi* Rohdendorf

99. *Robineauella (Jantiella) kanoi* Nandi

(Figs. 608-613)

1976. *Robineauella (Jantiella) kanoi* Nandi, *Revta bras. Biol.*, **36**(4) : 920 ; Nandi, 1990, *J. Beng. nat. Hist. Soc.*, **9**(2) : 19.

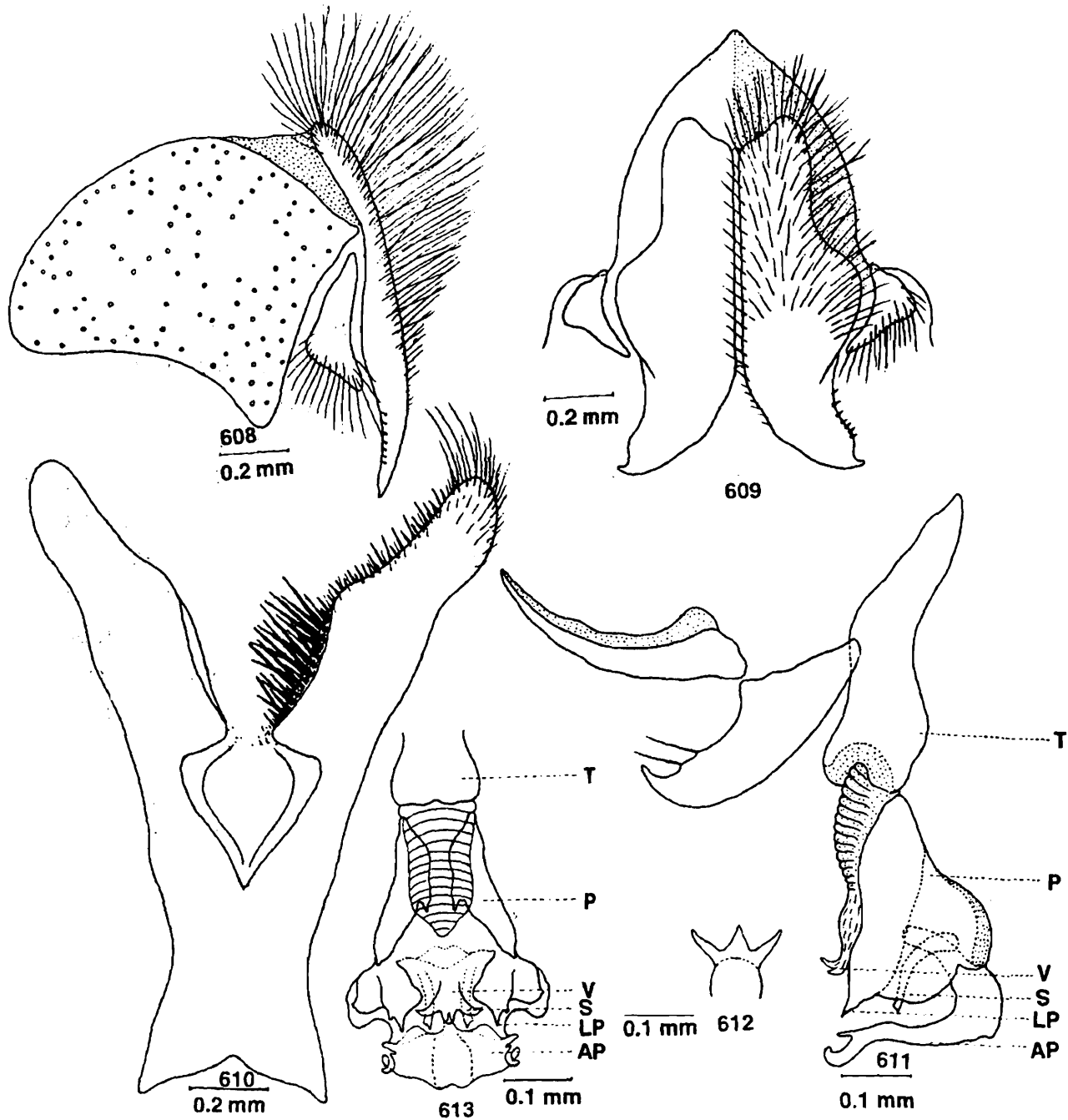
Male : Body length 9-13 mm.

Head : Width of frons about two-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons more than twice that of each parafrenal ; parafrenal and parafacial blackish with golden pollen, the former with short scattered hairs, the latter with a row of long hairs near the eye margin ; antennae black and reaching up to about 0.85 distance to vibrissae, first and second segments black, third blackish with golden pollen and about three times that of the second ; arista long, plumose along basal two-thirds ; facial ridge black with white pollen ; vibrissae long, distance between vibrissae about one parafacial width ; frontal bristles 12, posterior 2 reclinate, anterior 4 below base of antennae and reaching up to about three-fourths of second antennal segment, rest cruciate and directed forwards ; gena black with numerous black hairs ; post gena black ; ocellar triangle black with black hairs ; outer vertical bristles not differentiated, inner vertical well developed, post vertical short and about half of the inner vertical ; ocellar and post ocellar bristles moderately developed ; a pair of rows of postocular setae besides postocular cilia, rest of the area with irregular black and white hairs ; palpi slender and somewhat blackish-brown ; proboscis black.

Thorax : Dark with three black longitudinal stripes ; *ac* 0+0 ; *dc* 5+4 ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 5 ; *hpl* 8 ; upper part of propleura blackish, bare with white pollen ; prostigmatic and propleural bristles well developed with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 9-11 short setae located dorsally and extending up to more than half from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to the third, the former with short spines along basal half of its anterior margin ; costal spines not so stout ; epaulet blackish with many short spines ; basicostal scale yellowish ; squama white with slight brownish tinge ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2 short bristles along basal half of anterodorsal surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end ; mid femur with a row of bristles along anterolateral surface, a row of long bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of long hairs along



Figs. 608-613 : *Robineauella (Jantiella) kanoi* Nandi. 608, Inner and outer forceps (lateral view); 609, Inner and outer forceps (posterior view); 610, Fifth sternite; 611, Penis (lateral view); 612, Ventralia of penis (ventral view); 613, Penis (lateral view).

basal half and a row of short setae along distal half of posteroventral surface, 2 bristles on posterodorsal surface and 1 bristle on posterolateral surface distally ; mid tibia with 2 bristles on middle portion of anterolateral surface, 1 bristle on anteroventral surface on distal end, 1 bristle each on posterodorsal and posterolateral surfaces at about one-third the distance from the basal end ; hind femur with a pair of rows of long bristles along anterodorsal surface, a row of bristles along anteroventral surface and tuft of long hairs along ventral surface ; hind tibia with a row of short bristles along anterodorsal surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end and tuft of long hairs along anterior and posterior margins of ventral surface at about four-fifths the distance from the distal end.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent, but each with 2 well developed lateral marginal bristles, fourth with long hairs ; fifth sternite Y-shaped with wide window and strong spines laterally at the base and long hairs terminally on arms, the arms are wide at the middle ; first and second genital segments black with black hairs but without marginal bristles ; inner forceps almost straight, pointed at end and with slight notch at end and bears a row of 7 very short setae anteriorly ; outer forceps elongated; anterior paramere long, curved and pointed at end ; posterior paramere more wide, deeply curved at end and with 2 short hairs ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus without median process but with a pair of cylindrical lateral processes which are incised anteriorly before end; lateral plate of paraphallus pointed at end ; styli of glans short ; ventralia short, membranous and trilobed.

Female : Unknown.

Material examined : *Holotype*, India : West Bengal ; Darjeeling Padmaja Naidu Himalayan Zoological Park, 15.iv. 1975, B. C. Nandi. In spite of extensive survey from this region this species was not available further.

Discussion on species : This species is similar to *R. (Jantiella) doleschalli* (Johnston and Tiegs) but differs from it by the structures of apical plate of paraphallus and ventralia. Moreover, the inner forceps of this species has a slight notch subapically.

Biology : This is a rare species and the *Holotype* was collected from bushes near a meat shop. This species is attracted to meat and fish.

Distribution : India ; WB (Darjeeling).

Type deposited : *Holotype* ♂, ZSIC, examined.

100. *Robineauella (Jantiella) doleschalli* (Johnston and Tiegs)

(Figs. 614-619)

1921. *Sarcophaga doleschalli* Johnston and Tiegs, *Proc. R. Soc. Qd.*, **33**(4) : 73 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 231.
1858. *Sarcophaga aurifrons* Doleschall, *Naturkd. Tijdschr. Ned. Indië*, **17** : 109 (nec Macquart, 1846).
1966. *Robineauella (Jantiella) coei* Rohdendorf, *Bull. Br. Mus. nat. Hist. (Ent.)*, B, **17**(10) : 458; Nandi, 1976, *Revta bras. Biol.*, **36**(4) : 920.
1992. *Robineauella (Jantiella) doleschalli* : Nandi, *J. Beng. nat. Hist. Soc.*, **11**(2) : 39.

Male : Body length 10–13 mm.

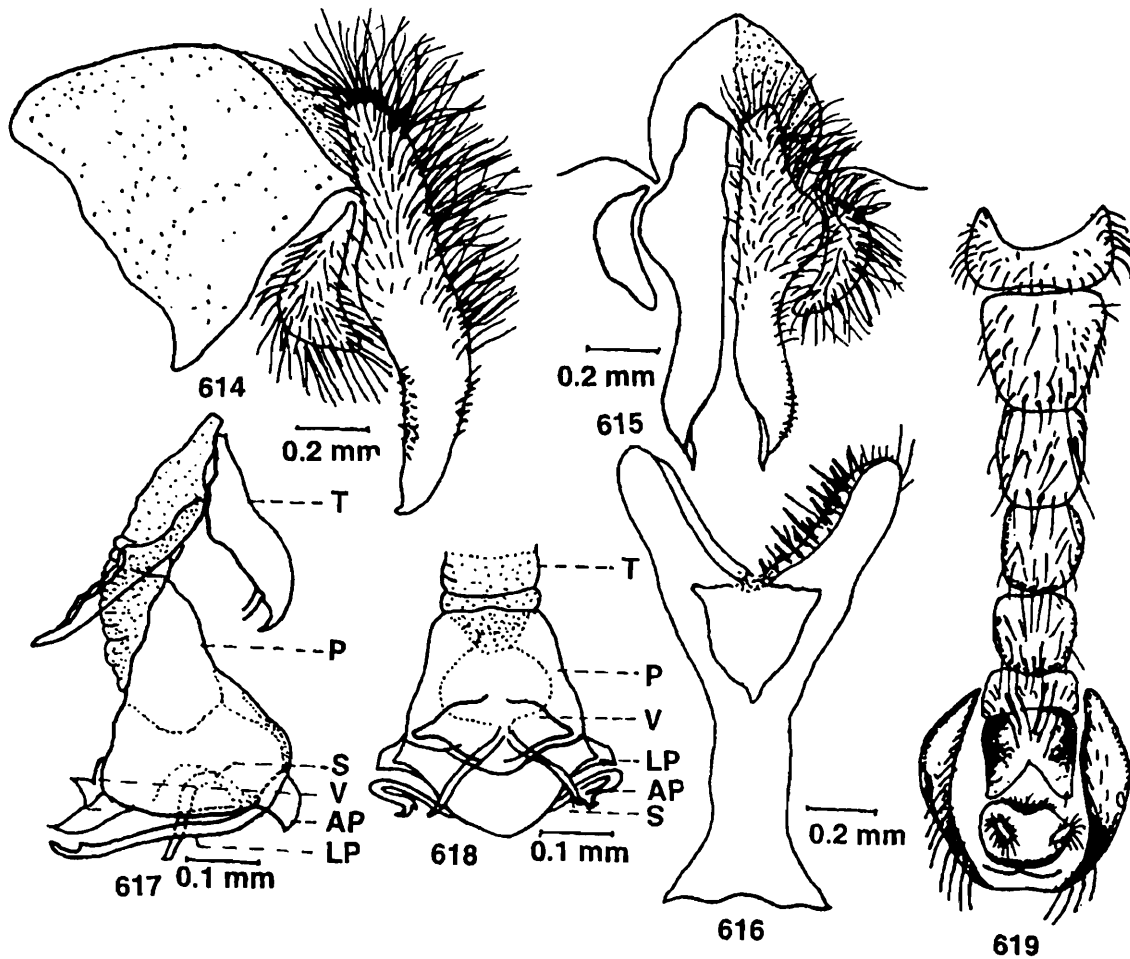
Head : Width of frons about two-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about more than twice that of each parafrontal ; parafrontal and parafacial blackish with golden pollen and numerous short hairs ; antennae blackish-brown and reaching up to about 0.80 distance to vibrissae, first and second segments black with short hairs, third brownish with silvery pollen and about 3 times that of the second ; arista long, plumose along basal two-thirds ; facial ridge black with white pollen and short black hairs ; vibrissae long, distance between vibrissae about twice that of one parafacial width ; frontal bristles 12, posterior 2 reclinate, anterior 4 below base of antennae and reaching up to about half of second antennal segment, rest cruciate and directed forwards ; gena black ; post gena black with long hairs ; ocellar triangle black with many short hairs ; outer vertical bristles not differentiated, inner vertical well developed, post vertical short and about half of inner vertical ; ocellar and postocellar bristles moderately developed, the latter about half of inner vertical ; a pair of rows of postocular setae besides postocular cilia, rest of the area with greyish hairs ; palpi slender and blackish ; proboscis black.

Thorax : Brown with three black longitudinal stripes ; *ac* 0+0 ; *dc* 4+4 ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 7 ; *hpl* 8 ; upper part of propleura bare and black ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro-and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles well developed, 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 9-10 short setae located dorsally and extending up to more than half from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to the third, the former with short spines along more than basal half of its anterior margin ; costal spines not so stout ; epaulet black with many short spines ; basicostal scale yellowish ; squama white ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row

of 3 short bristles along basal half of anterodorsal surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end ; mid femur with a row of bristles along basal half of anterolateral surface, a row of long bristles along anteroventral surface, a row of long hairs along distal half of posteroventral surface, 1 bristle on posterolateral surface distally and tuft of long hairs along basal half of ventral surface ; mid tibia with 2 bristles on middle portion of anterolateral surface, 1 bristle on posteroventral surface on distal end, 1 bristle each on posterodorsal



Figs. 614-619 : *Robineauella (Jantiella) doleschalli* (Johnston and Tiegs). 614, Inner and outer forceps (lateral view); 615, Inner and outer forceps (posterior view); 616, Fifth sternite; 617, Penis (lateral view); 618, Penis (ventral view); 619, Genitalia ♀ (ventral view, after, Kano and Shinonaga, 1994).

and posterolateral surfaces at about one-third the distance from the distal end and 1 bristle on posterodorsal surface at about two-thirds the distance from the basal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface and tuft of long hairs along ventral surface ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle each on posterodorsal

surface at about one-third and two-thirds the distances from the basal end and tuft of long hairs along anterior and posterior margins of ventral surface at about four-fifths the distance from the distal end.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with 2 lateral marginal bristles, fourth with a pair of median and 2 lateral marginal bristles, fifth with a row of 16 marginal bristles ; sternites first to fourth with long hairs ; fifth sternite Y-shaped with wide window and few spines laterally ; first and second genital segments without marginal bristles ; inner forceps slightly curved, notched at subterminal end and bears setae on anterior marginal end ; outer forceps slightly curved ; anterior paramere almost straight ; posterior paramere slightly curved at end with 2 subapical hairs ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus with a prominent triangular median, a pair of cylindrical lateral processes which are notched anteriorly but without bifurcation ; lateral plate of paraphallus short and membranous ; styli of glans short but without serrations ; ventralia short, membranous and single.

Female : Kano and Shinonaga (1994) drew the figure of female genitalia but they did not described it.

Material examined : India : Several male specimens from different localities of Arunachal Pradesh, Manipur, Mizoram, Nagaland, Sikkim and West Bengal collected by B.C. Nandi in different seasons.

Discussion on species : This species is similar to *R. (Jantiella) kanoi* Nandi, 1976 but differs from it by the structure of apical plate of paraphallus which is with triangular point at end and inner forcep which is with spines on inner surface. Moreover, the structure of ventralia is quite distinguishable here from *kanoi*.

Biology : This is relatively rare species which was collected from bushes and mixed vegetations near dead fish and meat. This species is attracted to such media and the larvae are reared on fish and meat in the laboratory.

Distribution : India ; ArP (Pasighat), MnP (Ukhrul), Mz (Aizawl, Bonkon), N (Mokokchung), S (Gangtok, Kabi Chulung) and WB (Happy Valley Tea Estate, Kurseong, Lebong) ; Pa (several localities) ; Ne (several localities) ; China ; Indonesia (Java, Maluku) ; Malaysia ; Moluccas Islands ; Thailand and Vietnam.

Type deposited : *Holotype* ♂, VM, not examined.

101. *Robineauella (Jantiella) djakonovi* Rohdendorf

(Figs. 620-621)

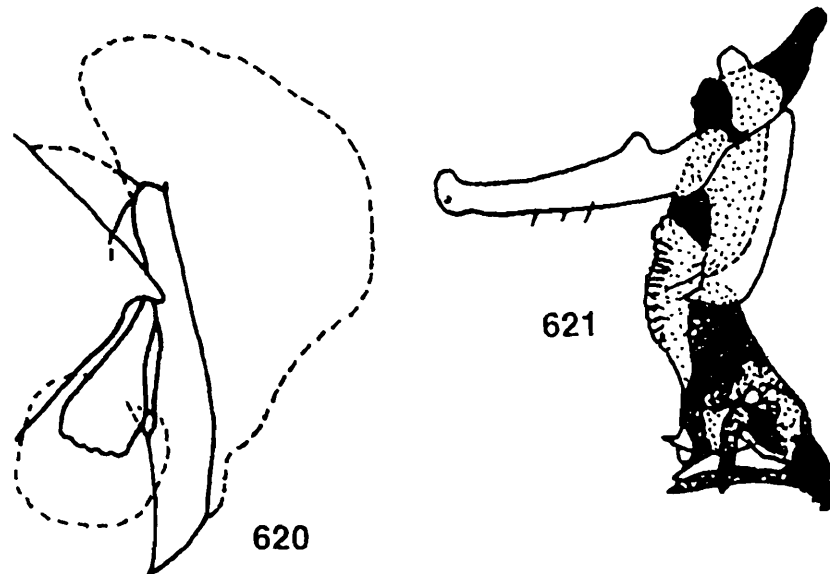
1937. *Parasarcophaga (Jantiella) djakonovi* Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 233.

1986. *Robineauella (Jantiella) djakonovi* : Verves, *Cat. Palae, Dipt.*, 12 : 175.

Male : Body length 11.5–13 mm.

Head : Width of frons about half that of one eye ; frontal vitta black, its width at narrowest point of frons less than twice that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with few short scattered hairs, the latter with a row of short black hairs near the eye margin ; antennae long, black and reaching up to about 0.80 distance to vibrissae, first and second segments deep black with short hairs, third light black and about two to two and half times that of the second ; arista long, plumose along basal three-fifths ; facial ridge black, silvery pollen and with numerous short black hairs ; vibrissae long, crossed, distance between vibrissae greater than one parafacial width ; frontal bristles 10-12, posterior 2.reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; gena black with short black hairs ; post gena black with light black hairs ; ocellar triangle black with many short black hairs ; outer vertical bristle short, inner vertical well developed and more than twice that of outer vertical, post vertical short and shorter than outer vertical ; ocellar and postocellar bristles moderately developed ; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with short black hairs ; palpi slender and black ; proboscis black.

Thorax : Black with three black longitudinal stripes ; *ac* 0+1 ; *dc* 4+4 ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 7-8 ; upper part of propleura



Figs. 620-621 : *Robineauella (Jantiella) djakonovi* Rohdendorf. 620, Inner and outer forceps (lateral view); 621, Penis (lateral view); (after Rohdendorf, 1937).

bare and black ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and

discoscutellar bristles short, 1 pair each ; lateroscutellar bristles well developed, 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 10 short setae located dorsally and extending up to about two-thirds from the basal node to r-m and 4-5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment shorter than the third, the former with short spines along basal half of its anterior margin; costal spines not so stout ; epaulet black with many short spines ; basicostal scale yellowish ; squama white ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 short bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row of 4 short bristles along middle portion of anterolateral surface, a row of bristles along basal one-third of anteroventral surface, a row of long hairs along basal one-third of posteroventral surface and a row of short setae each along distal one-third of anteroventral and posterolateral surfaces, mid tibia with 1 bristle on basal three-fifths of anterolateral surface, 1 bristle on one-third of posterolateral surface and 1 bristle on distal one-third of anteroventral surface ; hind femur with a pair of rows of long bristles along anterodorsal surface, a row of bristles along anteroventral surface and tuft of long hairs along anteroventral and posteroventral surfaces ; hind tibia with a row of long bristles along anterolateral surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end and a row of long hairs along posteroventral surface at about four-fifths the distance from the distal end.

Abdomen : Deep black with chees-marked and clear dark stripes ; median marginal bristles on second and third abdominal tergites absent but each with 1 lateral marginal bristle, fourth with a pair of median and 4 lateral marginal bristles, fifth with a row of 20 marginal bristles ; fifth sternite Y-shaped, splited up to basal third and covered with strong but not long bristles ; first genital segment brownish-black, second slightly black but both without marginal bristles ; inner forceps straight with short apical fork and its frontal edge concave ; outer forceps elongated ; anterior paramere almost straight, pointed at end and with 1 hair ; apical plate of paraphallus short, somewhat beak-shaped, curved and its lateral process blunt at end ; lateral plate of paraphallus very short and curved anteriorly ; styli of glans straight but without serrations ; ventralia single and curved anteriorly.

Female : Unknown.

Material examined : 1 ♂, India : Kashmir ; Gulmarg, 2,600-3,000 m, 17.viii.1978, Copenhagen Zoological Expedition (det. by Pape ; dep. in ZMUC).

Discussion on species : This species is similar to *R. (Jantiella) doleschalli* (Johnston and Tiegs, 1921), but differs from it by the structures of apical plate of paraphallus and ventralia. Moreover, the anterior paramere of this species is quite distinguishable from *doleschalli*.

Biology : Nothing is known regarding the biology of the species.

Distribution : India ; JK (Gulmarg) ; Far East; Tajikistan ; Turkmenistan and Uzbekistan.

Type deposited : *Holotype* ♂, ZISP, not examined.

Subgenus *Digitiventra* Fan, 1964

1964. *Digitiventra* Fan, *Acta zootax. sin.*, 1(2) : 306.

Type species : *Sarcophaga pseudoscoparia* Kramer, 1911.

Morphology : Presutural *ac* absent ; anterior part of gena with black hairs ; presence of digit-like process at basal part on inner sides of each arm of fifth sternite; apical process of apical part of paraphallus is triangular instead of quadrate ; ventralia well developed with two pairs of membranous processes, of which one pair is palp-like ; paraphallus more elongated.

This is a very little known subgenus and only 3 species have been reported from the Palaearctic region, out of which only 1 species is reported for the first time from this region.

So far the literature is concerned nothing is known regarding the biology of the members of this subgenus.

This subgenus is distributed in the Palaearctic and Oriental regions.

102. *Robineauella (Digitiventra) kopetdaghica* Verves

(Figs. 622-628)

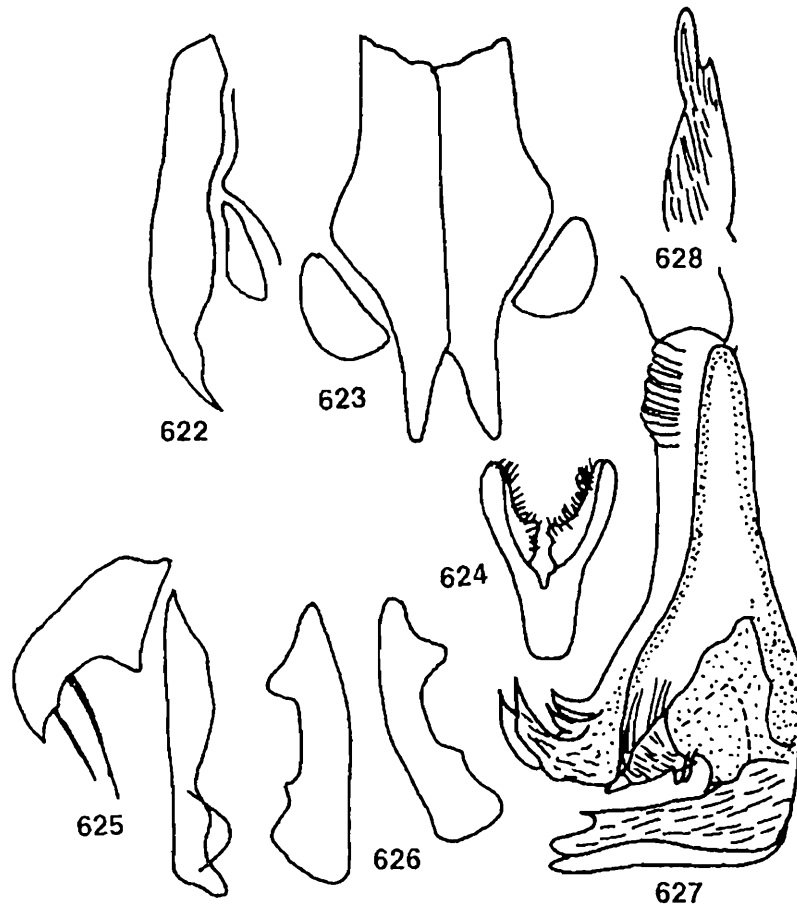
1979. *Robineauella (Digitiventra) kopetdaghica* Verves, *Trudy, russk. ent. Obshch.*, 61 : 213; Verves, 1986, *Cat. Palae. Dipt.*, 12 ; 174.

1988. *Sarcophaga kopetdaghica* : Sugiyama, *Jap. J. sanit. Zool.*, 40 : 115.

Male : Body length 10-16 mm.

Head : Width of frons about twice that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of 3 long and few short hairs near the eye margin and its width at base of antennae is equal to 0.23 to 0.40 the height of jaws 0.30 to 0.35 the height of eye; antennae dull black and reaching up to 0.85 distance to vibrissae, third segment usually brown and about 2.1 to 3.0 times that of the second ; arista long, plumose

along basal half ; frontal bristles 9-12, posterior 3 proclinate, anterior 3 below base of antennae and reaching up to about half of second antennal segment, rest cruciate and directed forwards ; outer vertical bristle ill-developed, inner vertical strongly developed, post vertical one-third the inner vertical ; ocellar and post ocellar bristles



Figs. 622-628 : *Robineauella (Digitiventra) kopetdaghica* Verves. 622, Inner and outer forceps (lateral view); 623, Inner and outer forceps (posterior view); 624, Fifth sternite; 625, Anterior and posterior parameres (ventral view); 626, Anterior and posterior parameres (lateral view); 627, Penis (lateral view); 628, Ventralia of penis (ventral view); (after Verves, 1979).

moderately developed ; anterior part of gena with black hairs ; post gena with white hairs ; a pair of rows of short bristles above the angle of vibrissae which extend up to its one-third to two-thirds ; a row of regular postocular cilia, rest of the area with white hairs ; palpi dull black ; proboscis blackish.

Thorax : Black with grey coating and three black longitudinal stripes ; *ac* 0+1 ; *dc* 2-3+4 ; *ia* 2 ; *ps* 1 ; *h* 3 ; *ph* 3 ; *np* 4 ; *pa* 3 ; *sa* 2 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 11-12 ; upper part of propleura bare, black with grey pollen ; prostigmatic and propleural

bristles well developed and with short hairs ; apicoscutellar and discoscutellar bristles well developed, 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 7-12 short setae located dorsally and extending up to middle of basal node to r-m and 4-5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment 1-3 to 1-9 times that of the third, the former with short spines along basal half of its anterior margin ; costal spines stout ; epaulet black with short hairs ; basicostal scale almost whitish ; squama white ; halter slightly brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posteroventral surface ; fore tibia with a row of 3 bristles along basal one-third of anterodorsal surface and 1 bristles on posterodorsal surface on distal one-fourth ; mid femur with a row of short bristles along anteroventral surface, a row of long hairs along basal two-thirds, a row of short setae along distal one-third of posteroventral surface and 2 strong bristle on distal end of posterodorsal surface ; mid tibia with 2 bristles apart on anterodorsal surface, 1 bristle each on anteroventral, posterodorsal and posteroventral surfaces on distal one-third ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of 10-12 bristles with long hairs along anteroventral surface and 1 bristle on distal part of posterodorsal surface ; hind tibia with a row of 2 long and few short bristles along anterodorsal surface, 2 bristles apart on posterodorsal surface and long hairs along anteroventral and posteroventral surfaces.

Abdomen : Bright grey coloured with silvery coating ; second and third abdominal tergites without median marginal bristles, fourth with thick protruding bristle-like hairs, second with 2 and third with 1 lateral marginal bristles ; sternites first to fourth with thick long hairs ; fifth sternite Y-shaped, splitted at the two-thirds of its length and with well developed bristle-like hairs at the anterior border and digit-like process at the basal part of lateral sides of arms ; first genital segment dull black, second with black shining but both without marginal bristles ; inner forceps elongated, thick, slightly coloured at end and with more or less noticeable short hooks ; outer forceps slightly elongated ; anterior paramere straight at end, with finger-like protuberance and lateral triangular outgrowth ; posterior paramere with wide base, hook-shaped with 2 hairs apically ; theca shorter than paraphallus and its length 0.3 to 2.7 times that of the theca ; apical process of paraphallus with three hook-shaped processes which are strongly sclerotised, the internal process shorter than the outer process ; lateral plate of paraphallus elongated and blunt at end ; styli of glans short ; ventralia well developed with two pairs of hook-shaped membranous processes, the anterior pair short but the posterior pair long and elongated.

Female : Unknown.

Material examined : 1 ♂, Pakistan : Baluchistan; Ziarat, 18.ix.1988, M. Iwasa (det. by E. Sugiyama; dep. in NSMT).

Discussion on species : This species has its specific character of having trilobed apical plate of paraphallus and anteriorly curved two pairs of hook-shaped ventralia. This species is almost similar to *R. (s. str.) walayari* (Senior-White, 1924) but differs from it by the structures of anterior paramere, ventralia and apical plate of paraphallus. Moreover, the body of this species is clearly silvery white in colour.

Biology : Nothing is known regarding the biology of this species.

Distribution : Pa (Ziarat) ; Tajikistan ; Turkmenistan and Uzbekistan.

Type deposited : *Holotype* ♂ and *Paratype* ♂, ZISP, not examined.

Genus 33. *Rosellea* Rohdendorf, 1937

1937. *Rosellea* Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 242 (as subgenus of *Parasarcophaga*).

Type species : *Sarcophaga aratrix* Pandellé, 1896.

1966. *Coisca* Rohdendorf, *Bull. Br. Mus. nat. Hist. (Ent.)*, **B**, **17** (10) : 459 (as subgenus of *Boettcherisca*).

Type species : *Sarcophaga khasiensis* Senior-White, 1924.

1977. *Rosellea* Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 573 (as distinct genus).

Morphology : Presutural *ac* absent ; penis with distinct recurved process ; apical part of paraphallus strongly sclerotised with poorly distinguishable median section consisting of broad moderately sclerotised lateral process ; lateral plate of paraphallus with two pairs of sclerotised and lamellate processes ; styli of glans short, thick, irregular in form but without spines ; genital segments without marginal bristles ; post abdomen dark ; ventralia without lamellate but hook-shaped and curved with spines ; fifth sternite with a distinct median tubercle.

Discussion : This is a very small genus and Verves (1986) treated it as subgenus of the genus *Parasarcophaga*. Lopes *et al.* (1977) and Verves (1989) gave it separate generic status. Verves (1989c) placed this genus under the subtribe *Boettcheriscina* Verves, 1989 and reported a total of 5 species under this genus. This genus is represented by 1 species in the Oriental region which is also present in India.

Biology : Nothing is known regarding the biology of the Indian species.

Distribution : This genus is distributed in the Oriental and Palaearctic regions.

103. *Rosellea khasiensis* (Senior-White)

(Figs. 629-634)

1924. *Sarcophaga khasiensis* Senior-White, *Rec. Indian Mus.*, **26**(3) : 246 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 255 ; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, **45** : 261.

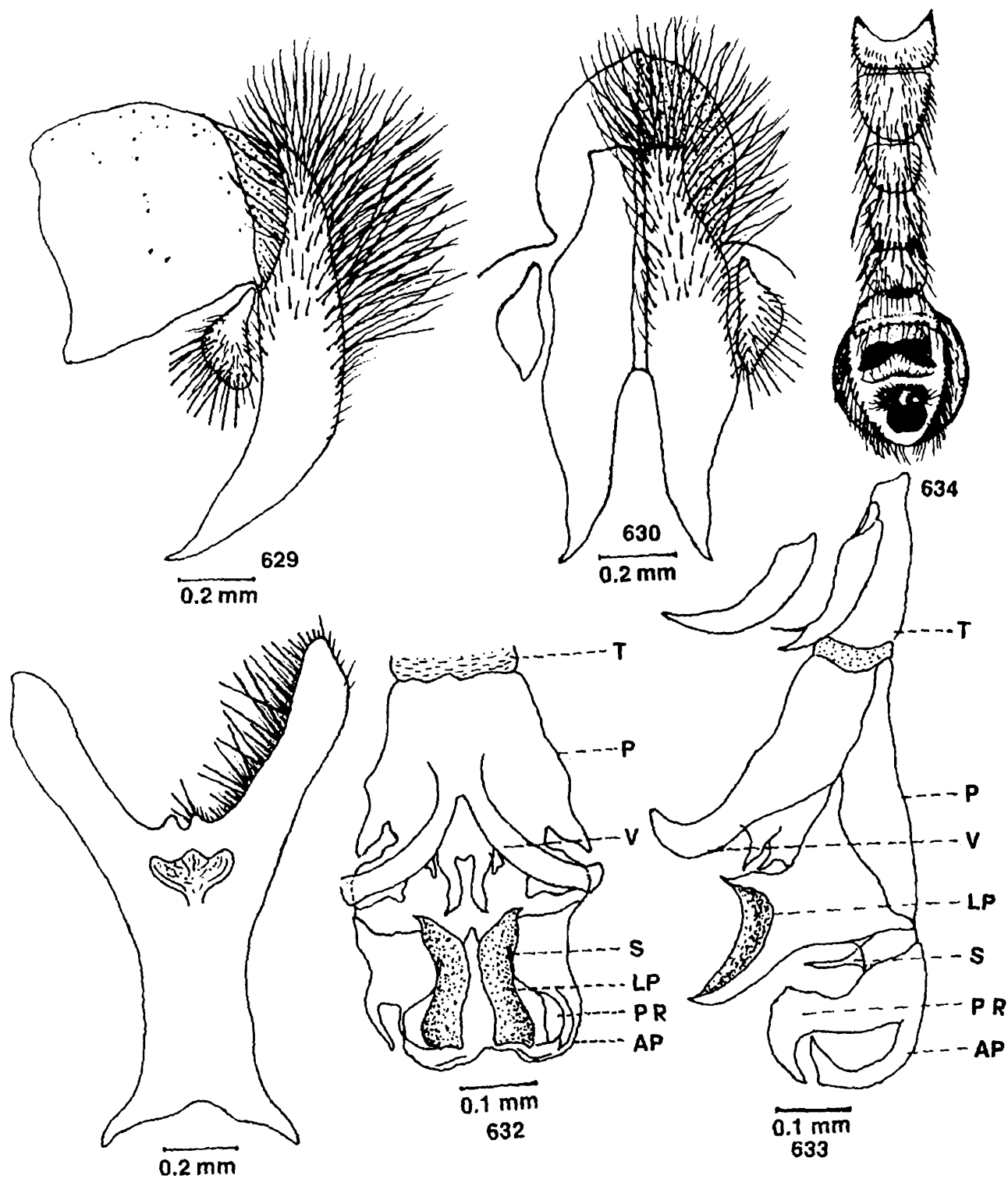
1954. *Tricholioproctia khasiensis* : Lopes, *Anais Acad. bras. Cienc.*, **26**(2) : 274.
1965. *Parasarcophaga (Rosellea) khasiensis* : Fan, *Synan. flies China*, **15** : 281.
1966. *Boettcherisca (Coeisca) khasiensis* : Rohdendorf, *Bull. Br. Mus. nat. Hist. (Ent.)*, **B**, **17**(10) : 459 ; Nandi, 1990, *Rec. zool. Surv. India*, **88**(1-4) : 1.
1967. *Parasarcophaga khasiensis* : Kano, Field and Shinonaga, *Fauna Japonica, Sarcophagidae* : 70.
1977. *Rosellea khasiensis* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 574 ; Verves, 1989, *Mems Inst. Oswaldo Cruz*, **84**(4) : 542 ; Nandi, 1991, *J. Beng. nat. Hist. Soc.*, **10**(2) : 40.

Male : Body length 9–14 mm.

Head : Frons about three-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about more than twice that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered black hairs, the latter with a row of 6-8 black hairs near the eye margin ; antennae blackish and reaching up to about 0.8 distance to vibrissae, first and second segments black with short black hairs, third slightly brownish with brown pollen and about more than twice that of the second ; arista long, plumose along basal two-thirds ; facial ridge brownish with yellowish pollen ; vibrissae long, distance between vibrissae greater than one parafacial width ; frontal bristles 12-13, posterior 3 reclinate, anterior 4 below base of antennae and reaching up to about two-thirds of second antennal segment, rest cruciate and directed forwards ; gena blackish with black hairs ; post gena black ; outer vertical bristle short, inner vertical well developed, post vertical half of inner vertical ; ocellar bristles short, postocellar equal to ocellar and less than half of inner vertical ; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with brownish hairs ; palpi long, slender and black ; proboscis brownish.

Thorax : Dark black with three black longitudinal stripes ; *ac* 0+3 ; *dc* 5+5 ; *ia* 1+2 ; *ps* 1 ; *h* 4 ; *ph* 2 ; *np* 3 ; *pa* 2 ; *sa* 2 ; *st* 1+1+1 ; *mpl* 6-7 ; *hpl* 8-9 ; upper part of propleura hairy, brown and with brownish pollen ; prostigmatic and propleural bristles well developed and accompanied with short black hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 3 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of short setae located dorsally and extending up to more than half from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment shorter than the third, the former with short spines along basal half of its anterior margin ; costal spines not stout ; epaulet black with short spines ; basicostal scale and squama yellowish ; halter brown.



Figs. 629-634 : *Rosellea khasiensis* (Senior-White). 629, Inner and outer forceps (lateral view); 630, Inner and outer forceps (posterior view); 631, Fifth sternite; 632, Penis (lateral view); 633, Penis (ventral view); 634, Genitalia ♀ (ventral view, after Kano and Shinonaga, 1994).

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3-4 bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row of 3-4 bristles along middle portion of anterolateral surface, a row of bristles along basal two-thirds and a row of short setae along distal one-third of anteroventral surface, a row of long hairs along basal half and a row of short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal, posterolateral and posteroventral surfaces on distal end ; mid tibia with 2 bristles on posterolateral surface at about one-third the distance from the basal end, 2 bristles on middle portion of anterodorsal surface and 1 bristle each on anteroventral and posteroventral surfaces at about one-third the distance from the distal end ; hind femur with a row of bristles along anterodorsal surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-fourth the distance from the distal end and long hairs along anteroventral and posteroventral surfaces at about two-thirds the distance from the distal end.

Abdomen : Dark black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 1 lateral marginal bristles, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of 16 marginal bristles ; sternites first to fourth with short hairs ; fifth sternite Y-shaped with short window and few marginal bristles laterally on arms ; first and second genital segments black but without marginal bristles ; inner forceps elongated, curved at end and pointed terminally ; outer forceps almost oval ; anterior paramere slightly curved at end ; posterior paramere elongated with 1 subbasal hair ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus curved, pointed at end and with well developed recurved lateral process ; lateral plate of paraphallus broad, pointed on both sides and membranous medially ; styli of glans large and funnel-shaped ; ventralia elongated, curved terminally and slightly membranous.

Female : Kano and Shinonaga (1994) drew the figure of female genitalia but they did not describe it.

Material examined : India : Several male specimens from different localities of Manipur, Meghalaya, Nagaland and Sikkim collected by B. C. Nandi.

Discussion on species : This species is very characteristic by its peculiar features of ventralia and lateral and apical plates of paraphallus.

Biology : This is not common which was collected from bushes and mixed forests in hilly area.

Distribution : India ; JK (Kashmir), MnP (Churachandpur, Imphal, Mao), Me (Cherrapunji, Singimari), N (Kohima), S (Gangtok, Kabi Chulung, Swistik Camp) ; Ne (several localities) ; Bh (Thimpu) and Thailand.

Type deposited : *Holotype* ♂, BMNH, not examined.

Genus 34. *Sarcorohdendorfia* Baranov, 1938

1938. *Sarcorohdendorfia* Baranov, *Zagreb Vet. Arch.*, **8**(4) : 173.

Type species : *Sarcorohdendorfia adiscalis* Baranov, 1938 (= *Notochaeta indusa* Curran, 1936).

1938. *Tricholioproctia* Baranov, *Bull. ent. Res.*, **29**(4) : 414.

Type species : *Sarcophaga antilope* Böettcher, 1913.

1937. *Chrysosarcophaga* Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 277 (not Townsend 1933, misidentification).

Type species : *Chrysosarcophaga superba* Townsend, 1933.

1975. *Hamimembrana* Chen, *Acta ent. sin.*, **18**(1) : 115.

Type species : *Sarcophaga basalis* Walker, 1859 (= *Sarcophaga aurata* Walker, 1860), (misidentification, *Sarcorohdendorfia seniorwhitei* Ho, 1938).

Morphology : Third antennal segment three to four times that of the second ; upper part of propleura covered with densely black hairs ; postsutural dorsocentral bristles 4 and distinct ; presutural acrostichal bristles well differentiated ; first genital segment without marginal bristles ; parafacial with a row of delicate short bristles ; fourth abdominal sternite of male with dark spot and dense short black bristles ; anterior paramere apically bidentate ; paraphallus long and its apical part well differentiated ; apical part of paraphallus small but clearly demarcated, extending forwards but without lateral process in most cases ; ventralia large and well developed ; inner forceps slender and geniculate ; lateral plate of paraphallus with a very large lateral forward process.

Discussion : This is a large genus which is well represented by 8 species in the Oriental region and 4 species in the Palearctic region. Lopes (1954) revised this genus as *Tricholioproctia* Baranov, 1938 from the Australian region. Kano and Lopes (1979b) and Lopes and Kano (1979) also made revisionary notes on this genus. Lopes (1989) reported a quite large number of species from the Australasian and Oceanian regions.

Biology : Members of the genus breed in small birds, carbs and carrion and some of them are internal parasites of lepidopterous insects. Larval stages of a few species have been described by different authors.

Distribution : Mostly distributed in the Oriental, Palaearctic and Australasian and Oceanian regions.

Key to male species

1. Inner forceps curved apically, pointed and with spines on posterior end ; ventralia wide with large membranous lobe2
 Inner forceps almost straight but without spines on posterior end ; ventralia narrow but without large membranous lobe3
2. Apical plate of paraphallus blunt at end4
 Apical plate of paraphallus pointed at end5
3. Styli of glans short and shorter than apical plate of paraphallus ; lateral plate of paraphallus wide and sickle-shaped*mysorensis* Nandi
 Styli of glans long and longer than apical plate of paraphallus ; lateral plate of paraphallus square-shaped*ghaiae* (Nandi)
4. Ventralia with serrations anteriorly ; anterior paramere bifurcated at end
*desaii* (Nandi)
 Ventralia without serrations anteriorly ; anterior paramere single and pointed
*gracilior* (Chen)
5. Apical plate of paraphallus with wide lateral process*seniorwhitei* (Ho)
 Apical plate of paraphallus without lateral process6
6. Ventralia well developed7
 Ventralia ill-developed*henryi* (Senior-White)
7. Upper part of propleura with whitish hairs ; inner forceps without spines apically on inner side ; posterior paramere pointed apically*inextricata* (Walker)
 Upper part of propleura with black hairs ; inner forceps with spines apically on inner side ; posterior paramere blunt apically8
8. Inner forceps pointed terminally ; fifth sternite Y-shaped but without grooved
*hiromui* (Kano)
 Inner forceps blunt terminally ; fifth sternite v-shaped with deeply grooved
*pusana* (Senior-White)

104. *Sarcorohdendorfia mysorensis* Nandi

(Figs. 635-639)

1988. *Sarcorohdendorfia mysorensis* Nandi, *J. Beng. nat. Hist. Soc.*, 7(2) : 14 ; Nandi, 1989, *Mems Inst. Oswaldo Cruz.*, 84(4) : 398 ; Nandi, 1992, *Hexapoda*, 4(1) : 75.

Male : Body length 8 mm.

Head : Width of frons about half that of one eye ; frontal vitta brownish, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial brownish with silvery pollen, the former with short scattered hairs, the latter with a row of short black hairs near the eye margin ; antennae brownish-black and reaching up to about 0.9 distance to vibrissae, first and second segments brownish-black, third brownish with numerous brown pollen and about four and half times that of the second ; arista long, plumose along basal three-fifths ; facial ridge blackish with silvery pollen ; vibrissae long, distance between vibrissae twice that of one parafacial width ; frontal bristles 10, posterior 3 reclinate, anterior 3 below base of antennae and reaching up to about one-third of second antennal segment, rest cruciate and directed forwards ; gena blackish with black hairs ; post gena black ; ocellar triangle black with short black hairs ; outer vertical bristle short, inner vertical well developed, post vertical one-third the inner vertical ; ocellar bristles short, postocellar longer than ocellar, almost one-fifth the inner vertical ; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with brownish hairs and short setae ; palpi slender ; proboscis brownish.

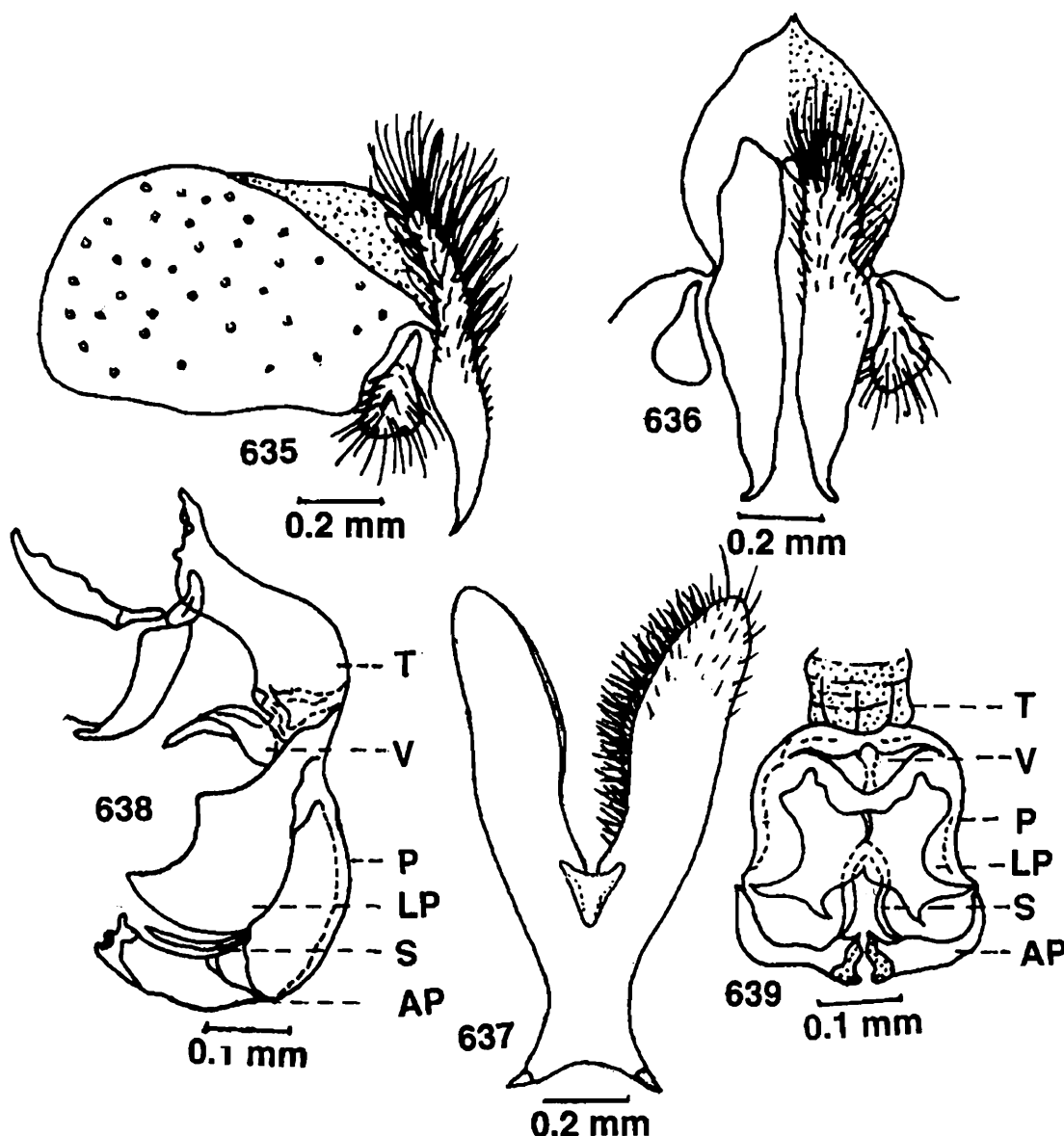
Thorax : Blackish with three black longitudinal stripes ; *ac* 1+2 ; *dc* 3+4 ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 2 ; *st* 1+1+1 ; *mpl* 7 ; *hpl* 8 ; upper part of propleura hairy ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of about 5-6 short setae located dorsally and extending up to half from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment about half of the third, the former with short spines along basal half of its anterior margin ; costal spines short ; epaulet black with short spines ; basicostal scale yellowish ; squama white ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row of 4 bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of short setae along distal half of posteroventral surface, 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with a row of bristles along anterodorsal surface, 1 short bristle each on posterodorsal and posterolateral surfaces at about one-third the distance from the basal end and long hairs along posteroventral surface at about one-third the distance from the distal end ; hind femur with a pair

of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 1 bristle each on posterodorsal and posterolateral surfaces at about one-fifth the distance from the distal end and a row of bristles along posteroventral surface ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle each on anteroventral and posterodorsal surfaces at about one-third and two-thirds the distances from the distal end but without long hairs along ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with 2 lateral marginal bristles, fourth with a pair of median and 4 lateral marginal bristles; fifth sternite Y-shaped



Figs. 635-639 : *Sarcorohdendorfia mysorensis* Nandi. 635, Inner and outer forceps (lateral view); 636, Inner and outer forceps (posterior view); 637, Fifth sternite; 638, Penis (lateral view); 639, Penis (ventral view).

with short window and spines laterally on arms ; first and second genital segments without maginal bristles ; inner forceps elongated, almost straight, without spines at posterior end but curved apically ; outer forceps almost oval with hairs ; anterior paramere more elongated, pointed and slightly curved at end ; posterior paramere elongated with single hair at end; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus long, strongly curved, blunt at end and membranous apically ; lateral plate of paraphallus wide and well developed ; styli of glans elongated but without serrations, shorter than apical plate of paraphallus and reaching up to about subterminal end of apical plate of paraphallus ; ventralia curved posteriorly and membranous at end.

Female : Unknown.

Material examined : *Holotype* ♂, India : Karnataka ; Mysore, 10 miles North of Belur, 1,025 m, 20.iii.1963, E. S. Ross and D. O. Cavangare ; 2 ♂, Tripura ; Melaghar, 30.vi.1989, B. C. Nandi.

Discussion on species : This species is similar to *S. ghaiae* (Nandi, 1979) but differs from it by the structures of lateral plate of paraphallus and styli of glans. Moreover, the penis is more curved in this species than in *ghaiae*.

Biology : This species is not common which was collected from bushes.

Distribution : India ; Kt (Belur, Chikmagalore) and T (Melaghar).

Type deposited : *Holotype* ♂, ZSIC, studied.

105. *Sarcorohdendorfia ghaiae* (Nandi)

(Figs. 640-644)

1979. *Tricholioproctia ghaiae* Nandi, *Orient. Insects*, **13** (1-2) : 197.

1988. *Sarcorohdendorfia ghaiae* : Nandi, *J. Beng. nat. Hist. Soc.*, **7** (2) : 16; Nandi, 1992, *J. Beng. nat. Hist. Soc.*, **11**(2) : 41.

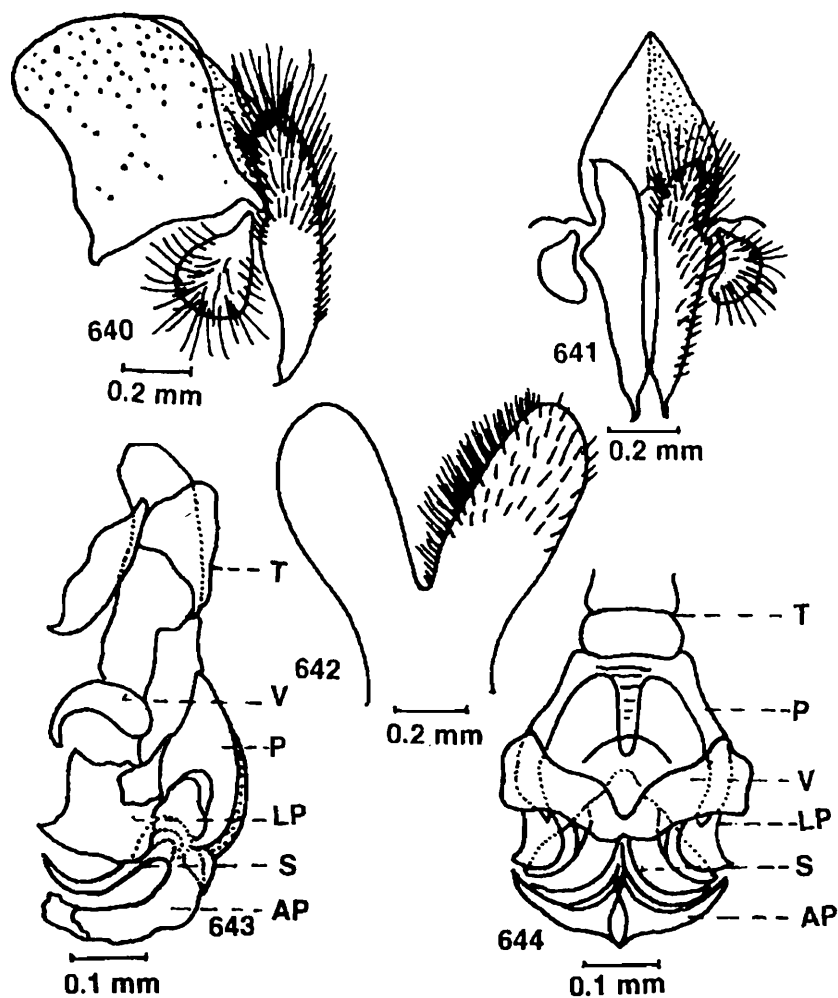
Male : Body length 8 mm.

Head : Width of frons greater than half that of one eye; frontal vitta black, its width at narrowest point of frons greater than half of each parafrontal; parafrontal and parafacial black with golden pollen, the former with short scattered hairs, the latter with a row of short hairs near the eye margin; antennae black and reaching up to about 0.85 distance to vibrissae, first and second segments brownish, third black with blackish pollen and about two and half times that of the second; arista long, plumose along basal half; facial ridge black with silvery pollen; vibrissae long, distance between vibrissae more than one parafacial width; frontal bristles 11, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena black with silvery

pollen; post gena black with black hairs; outer vertical bristle very short, inner vertical well developed, post vertical half of inner vertical; a pair of rows of postocular setae besides postocular cilia, first row regular, second row irregular, rest of the area with brownish hairs; palpi long; proboscis brownish.

Thorax : Black with three black longitudinal stripes; *ac* 1+0; *dc* 5+5; *ia* 1+3; *ps* 1; *h* 3; *ph* 3; *np* 4; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 7; *hpl* 4; upper part of propleura brownish; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 1 pair; a pair of additional short setae present before lateroscutellar bristles.

Wings : Brownish with brown veins; R_1 bare; R_{4+5} with a row of about 7 short setae located dorsally and extending up to about three-fifths from the basal node to r-m



Figs. 640-644 : *Sarcorohdendorfia ghaiiae* (Nandi). 640, Inner and outer forceps (lateral view); 641, Inner and outer forceps (posterior view); 642, Fifth sternite; 643, Penis (lateral view); 644, Penis (ventral view).

and 3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment twice that of the third, the former with a row of short spines along most of its anterior margin; costal spines not so stout; epaulet black with short spines; basicostal scale yellow; squama whitish; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a pair of rows of bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of 4 bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of short hairs along basal half and a row of short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal, posteroventral and posterolateral surfaces on distal end; mid tibia with 2 bristles on basal half of posterodorsal surface, 1 bristle each on posterolateral and posteroventral surfaces at about one-fourth the distance from the distal end and a row of 4 bristles along anterolateral surface at about half the distance from the basal end; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 2 bristles on distal part of posterodorsal surface and a row of about 5 hairs along posteroventral surface; hind tibia with a row of short and 2 long bristles along anterodorsal surface, a row of 3 short bristles along anteroventral surface on distal half, 2 bristles on posterodorsal surface medially but without hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with slightly grey checkered pattern; median marginal bristles on second abdominal tergite absent but with 2 lateral marginal bristles, third with a pair of median and 3 lateral marginal bristles, fourth with 3 lateral marginal bristles, fifth with a row of 18 marginal bristles; sternites first to fourth with short hairs; fifth sternite almost Y-shaped without window but with short closely placed setae laterally on arms; first genital segment blackish with short hairs but without marginal bristles; second slightly blackish with short hairs; inner forceps almost straight, without spines on posterior end but with slight notch at the end; outer forceps almost round with short hairs distally; anterior paramere almost straight and curved apically; posterior paramere wide at base, curved and pointed at end; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus curved, blunt at end and membranous apically; lateral plate of paraphallus broadly expanded with pointed hook apically; styli of glans elongated, longer than apical plate of paraphallus but without serrations; ventralia thin, curved posteriorly and pointed at end.

Female : Unknown.

Material examined : *Holotype* ♂, Bangladesh; Dacca, xii. 1911, S. K. S; 1 ♂, India : Mizoram; Kolasib, 800 m, 17.vi.1989, B. C. Nandi.

Discussion on species : This species is similar to *S. mysorensis* Nandi, 1988 but can be differentiated from it by the structures of posterior paramere and ventralia. Moreover, the structure of fifth sternite is also quite distinguishable here from *mysorensis*.

Biology : This species is not abundant which was collected from bushes in hill area.

Distribution : India ; Mz (Kolasib) and BD (Dacca).

Type deposited : *Holotype* ♂, IARI, studied.

106. *Sarcorohdendorfia desaii* (Nandi)

(Figs. 645-649)

1978. *Tricholioproctia desaii* Nandi, *Orient. Insects*, **12** (3) : 363.

1996. *Sarcorohdendorfia desaii* : Nandi, n. comb.

Male : Body length 7 mm.

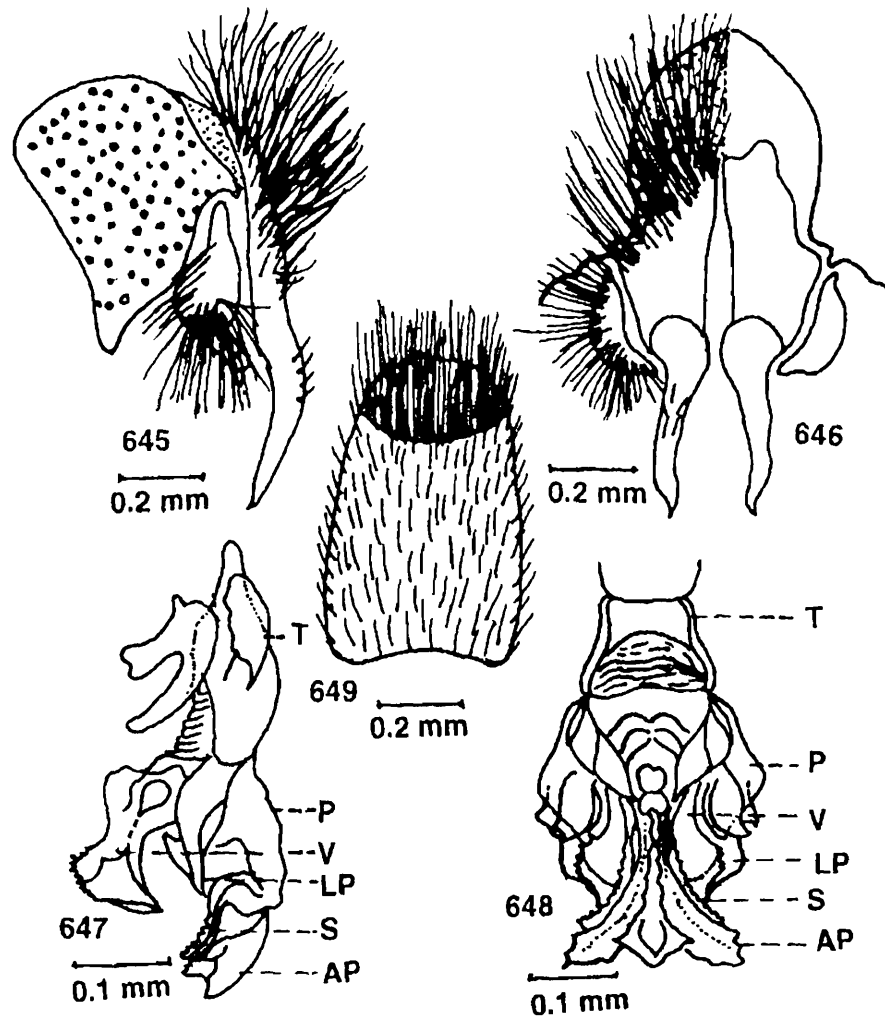
Head : Width of frons about one-third that of one eye; frontal vitta brown, its width at narrowest point of frons greater than each parafrontal; parafrontal and parafacial brownish with silvery pollen, the former with short scattered hairs, the latter with a row of 4-5 short black hairs near the eye margin; antennae brownish and reaching up to about 0.9 distance to vibrissae, first and second segments slightly blackish with black hairs, third brown with numerous white pollen and about three times that of the second; arista long, plumose along basal three-fourths; facial ridge brown, silvery pollen and with short black hairs; vibrissae long, distance between vibrissae greater than one parafacial width; frontal bristles 10, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena black with long hairs; ocellar triangle black with short hairs; outer vertical bristle not differentiated, inner vertical well developed, post vertical half of the inner vertical; one row of irregular postocular setae besides postocular cilia, rest of the area with black and white hairs; palpi long; proboscis short and brownish.

Thorax : Black with three black longitudinal stripes; *ac* 5+5; *dc* 5+4 (posterior 2 *dc* short); *ia* 1+2; *ps* 1; *h* 3; *ph* 3; *np* 4; *pa* 2; *sa* 4; *mpl* 6; *hpl* 8; upper part of propleura black with silvery pollen and hairs ; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 8 short setae located dorsally and extending up to about three-fifths from the basal node to r-m and

several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to third, the former with short spines along basal two-fifths of its anterior margin; costal spines not stout; epaulet black with short spines; basicostal scale and squama white; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of short bristles along basal one-third of anterodorsal surface and 1 bristle on



Figs. 645-649 : *Sarcrohndendorfia desaii* (Nandi). 645, Inner and outer forceps (lateral view); 646, Inner and outer forceps (posterior view); 647, Penis (lateral view); 648, Penis (ventral view); 649, Fourth sternite.

posterodorsal surface at about one-third the distance from the distal end; mid femur with 2 bristles along middle portion of anterolateral surface, a row of bristles along basal half of anteroventral surface and a row of 5-6 bristles along basal half of posteroventral surface; mid tibia with 2 long and a row of short bristles along posterodorsal surface at about one-third the distance from the distal end; hind femur

with a pair of rows of bristles along anterodorsal surface and a row of bristles along anteroventral surface, 1 bristle on posterodorsal surface at about one-fourth the distance from the distal end and a row of long hairs along posteroventral surface; hind tibia with 2 long bristles on anterodorsal surface at about one-third the distance from the basal end, 1 long bristle on posteroventral surface, a row of 3 bristles along posterodorsal surface medially and a row of long hairs along posterior margin of ventral surface at about four-fifths the distance from the distal end.

Abdomen : Grey with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of median and 3 pairs of lateral marginal bristles, fifth with a row of 20 marginal bristles; sternites first to third with short hairs, fourth with long black hairs forming a round patch on hind margin; first genital segment brown without marginal bristles, second blackish-brown; inner forceps elongated, curved, pointed at end and with 4 spines at subapical end; outer forceps slightly elongated and triangular in shape; anterior paramere bifurcated but without spines; posterior paramere elongated, curved, pointed at end and with 1 subapical short hair; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus almost blunt at end with groove terminally; lateral plate of paraphallus short and pointed; styli of glans long, serrated at end and reaching up to about the apical plate of paraphallus; ventralia long, without hook at end, serrated anteriorly but with chitinous lobe.

Female : Unknown.

Material examined : *Holotype* ♂, Myanmar; Gamon Reserve Forest, 8. ix. 1938, M. H. Desai; 1 ♂, India : Manipur; Ukhrul Circuit House, 2,000 m, 14. x. 1989, B. C. Nandi.

Discussion on species : This species is similar to *S. gracilior* (Chen, 1975) but is differentiated from it by the structure of anterior paramere, shape of ventralia and number of spines on inner forceps.

Biology : This is a rare species which was collected from bushes. This species is parasitic on the larvae of *Hyblaea pueria* (Hyblaedae, Lepidoptera).

Distribution : India ; MnP (Ukhrul) and M (Gamon Reserve Forest).

Type deposited : *Holotype* ♂, FRID, examined.

107. *Sarcorohdendorfia gracilior* (Chen)

(Figs. 650-655)

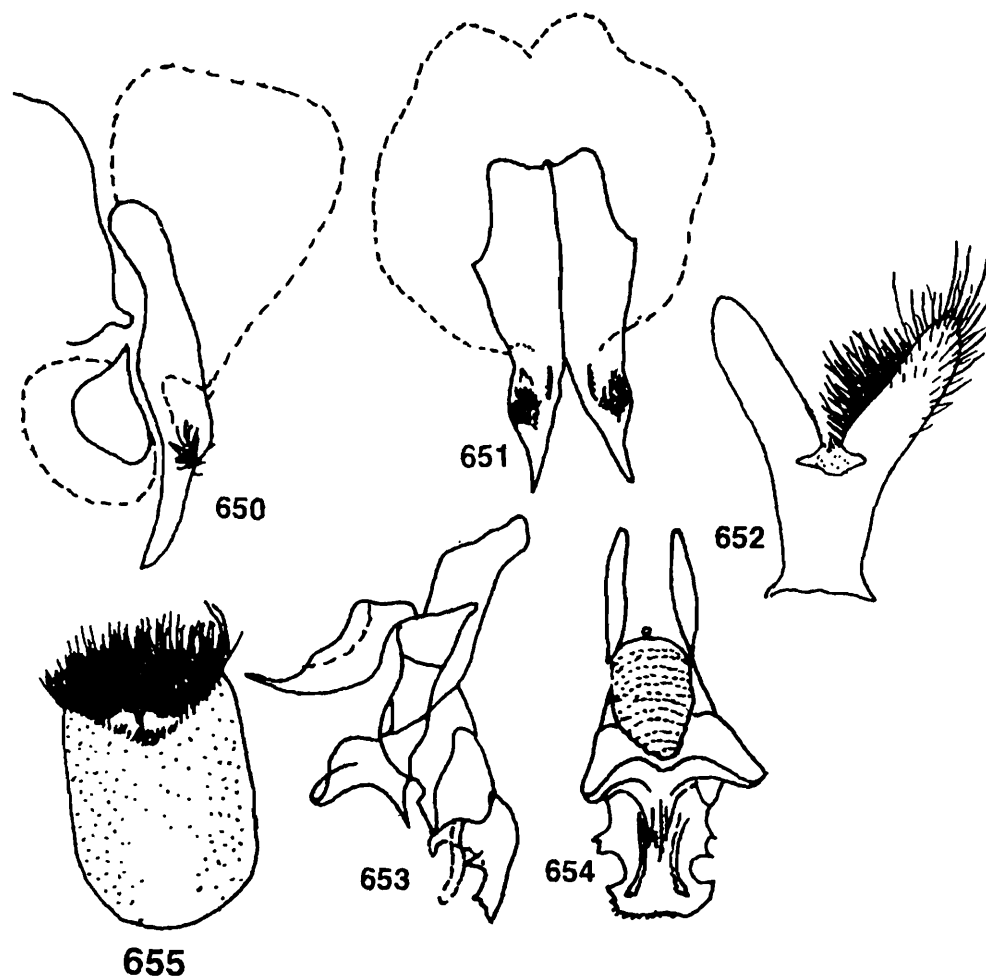
1975. *Tricholioproctia (Hamimembrana) gracilior* Chen, *Acta ent. sin.*, **18**(1) : 115.

1986. *Sarcorohdendorfia gracilior* : Verves, *Cat. Palae. Dipt.*, **12** : 176.

1994. *Sarcophaga gracilior* : Kano and Shinonaga, *Jap. J. sanit. Zool.*, **45** : 264.

Male : Body length 17 mm.

Head : Greyish; width of frons about one-third that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with golden yellow pollen, the former with moderately long hairs; the latter with a row of 13-15 short hairs near the eye margin; antennae slightly blackish-brown, reaching up to about 0.85 distance to vibrissae, first and second segments black, third greyish-black with silvery pollen and about three times that of the second; arista long, plumose along basal two-thirds; facial ridge greyish with slightly yellowish pollen; vibrissae long, distance between vibrissae slightly less than one parafacial width; frontal bristles 12-13, posterior 2 reclinate, anterior 3 below base of antennae, rest cruciate and directed forwards; gena black with yellow pollen; post gena black with yellow silvery pollen and short black hairs; ocellar triangle black with short black hairs; outer vertical bristle short, inner vertical well



Figs. 650-655 : *Sarcorohdendorfia gracilior* (Chen). 650, Inner and outer forceps (lateral view); 651, Inner and outer forceps (posterior view); 652, Fifth sternite; 653, Penis (lateral view); 654, Penis (ventral view); 655, Fourth sternite; (after Chen, 1975).

developed, the former one-third that of the latter, post vertical short and slightly greater than half of inner vertical, post ocellar greater than post vertical; one row of regular postocular setae, rest of the area with blackish hairs; palpi black; proboscis brownish.

Thorax : Greyish with yellowish pollen and three black longitudinal stripes; *ac* 5+1; *dc* 4-5; *ia* 1+3; *ps* 1; *h* 3; *ph* 1; *np* 4; *pa* 2 ; *sa* 2; *st* 1+1+1; *mpl* 7-8; *hpl* 8; upper part of propleura hairy and black; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles short, 1 pair each; lateroscutellar bristles 4 pairs (1 pair short).

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of short setae located dorsally and extending up to more than half from basal node to r-m and 4-5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than one and half times that of the second, the former with short spines along basal half of its anterior margin; costal spines not to stout; epaulet black; basicostal scale brown; squama whitish; halter brown.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of long bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal half of anterodorsal surface and 1 bristle on distal half of posteroventral surface; mid femur with a row of 3 bristles along middle portion of anterolateral surface and a row of bristles each along basal half of anteroventral and posteroventral surfaces; mid tibia with 2 bristles along basal one-sixth of posterodorsal surface and 1 bristle each on anterodorsal, anteroventral, posterodorsal and posteroventral surfaces on distal one-third; hind femur with a row of bristles along anterodorsal surface, a row of short hairs each along anteroventral and posteroventral surfaces; hind tibia with a row of bristles along anterodorsal surface, 1 bristle each on anteroventral and posterodorsal surfaces on distal one-fourth but with long hairs along posterior margin of ventral surface on distal two-thirds.

Abdomen : Greyish with silvery checkered pattern; median marginal bristles on second abdominal tergite absent but with 4 lateral marginal bristles, third with a short median and 1 lateral marginal bristles, fourth with a pair of median and 4-5 lateral marginal bristles, fifth with a row of 22-24 marginal bristles; sternites first to third with short hairs; fourth with tuft of hairs posteriorly; fifth sternite Y-shaped with short window and brush of spines laterally and few long hairs terminally on arms; genital segments with marginal bristles, first slightly black, second deeply black; inner forceps elongated, slightly curved and pointed at end with few short spines at posterior end and long hairs on basal part; outer forceps almost triangular; anterior paramere curved and pointed terminally; posterior paramere wide at middle

and almost blunt; theca shorter than paraphallus; apical plate of paraphallus almost straight and blunt at end, lateral projection of apical plate of paraphallus slightly curved, bidentate and pointed; lateral plate of paraphallus short and thin; styli of glans long; ventralia wide basally with serrations and large membranous lobe.

Female : Sugiyama, Shinonaga and Kano (1988) reported the female from Nepal but the description was not given.

Material examined : 1 ♂, Nepal; Mount Sivapuri, 1,600–1,700 m, 5. viii. 1990, S. Shinonaga (det. R. Kano as *Sarcophaga gracilior* = *Tricholioproctia gracilior*; dep. in NSMT).

Discussion on species : Chen (1975) reported that this species is similar to *T. (Hamimembrana) mimobasalis* Ma, 1964, but differs from it by the colour of calyptra, structures of anal cercus, outer forceps and lateral plate of paraphallus. Sugiyama and Kano (1984) placed this species under the genus *Sarcophaga* due to presence of coiled basal part of styli of glans. This species also differs from *S. desaii* (Nandi, 1978) by the structures of anterior paramere, ventralia and spiny plate of paraphallus.

Biology : Nothing is known regarding the biology of this species.

Distribution : Sugiyama, Shinonaga and Kano (1988) reported this species from Ne (several localities) and it is now also distributed in China and Taiwan.

Type deposited : *Holotype* and *Paratype*, ♂, SIES, not examined.

108. *Sarcorohdendorfia seniorwhitei* (Ho)

(Figs. 656–662)

1938. *Sarcophaga seniorwhitei* Ho, *Ann. trop. Med. Parasit.*, **32** (2) : 117 ; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, **45** : 265.
1859. *Sarcophaga basalis* Walker, *J. Proc. Linn. Soc. Lond., Zool.*, **4** : 129 (misidentification, not Walker, 1853) ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 223.
1860. *Sarcophaga aurata* Walker, *J. Proc. Linn. Soc. Lond., Zool.*, **5** : 158 (preoccupied, Macquart, 1851).
1924. *Sarcophaga flavinervis* Senior-White, *Rec. Indian Mus.*, **26**(3) : 229 (preoccupied, Robineau-Desvoidy, 1830).
1954. *Tricholioproctia flavinervis* : Lopes, *Anais Acad. bras. Cienc.*, **26**(2) : 251 ; Kano, Field and Shinonaga, 1967, *Fauna Japonica, Sarcophagidae* : 126.
1965. *Tricholioproctia basalis* : Fan, *Synan. flies China*, **15** : 244 (misidentification, not Walker, 1859).

1977. *Sarcorohdendorfia flavinervis* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 574 ; Nandi, 1990, *Hexapoda*, **2** : 25.
1979. *Sarcorohdendorfia aurata* : Lopes and Kano, *Revta bras. Biol.*, **39**(2) : 313 ; Verves, 1986, *Cat. Palae, Dipt.*, **12** : 176.
1989. *Sarcorohdendorfia seniorwhitei* : Lopes, *Cat. Dipt. Aust. and Oceanian Regions*, **86** : 729.

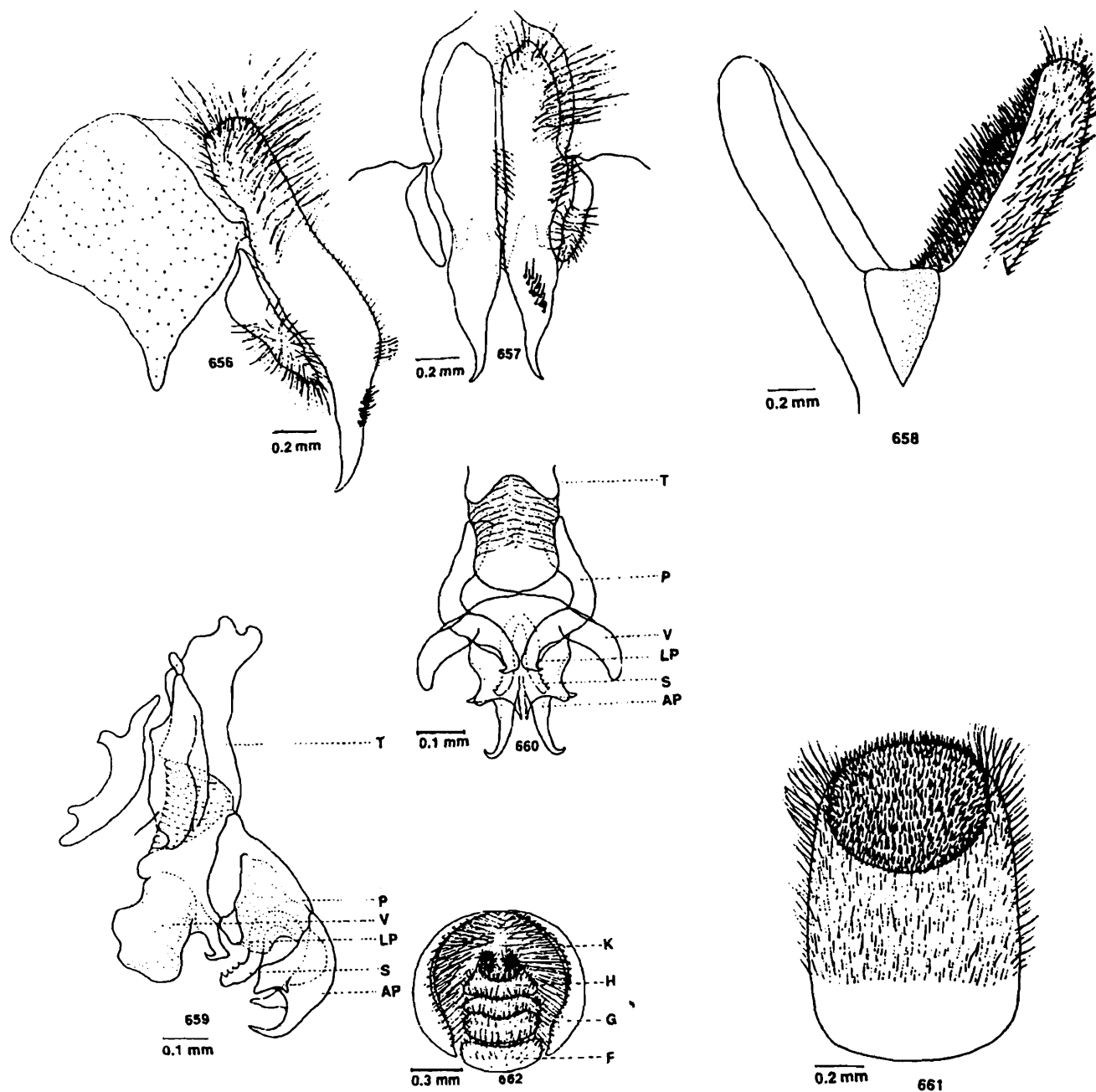
Male : Body length 12–14 mm.

Head : Width of frons about half that of one eye ; frontal vitta black, its width at narrowest point of frons less than half that of each parafrontal ; parafrontal and parafacial black with golden pollen, the former with short scattered black hairs, the latter with a row of black hairs near the eye margin ; antennae black and reaching up to about 0.9 distance to vibrissae, first and second segments black, third black with silvery pollen and about four times that of the second ; arista long, plumose along basal three-fifths ; facial ridge black with golden pollen ; vibrissae long, distance between vibrissae about twice that of one parafacial width ; frontal bristles 13, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about the apical end of second antennal segment, rest cruciate and directed forwards ; gena black with short black hairs ; post gena black with black and white hairs ; outer vertical bristle not differentiated, inner vertical well developed, post vertical half of the inner vertical ; ocellar bristles short, post ocellar stout, about half of the inner vertical ; a pair of rows of postocular setae besides postocular cilia, first row regular and second row irregular, rest of the area with brownish hairs ; palpi long ; proboscis blackish.

Thorax : Yellowish-grey with three black longitudinal stripes and yellow pollen at their sides ; *ac* 5+1 ; *dc* 5+4 (posterior 2 *dc* stout) ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 4 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 9 ; upper part of propleura black with black hairs ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 3 pairs.

Wings : Base of wings yellowish with yellow veins ; R_1 bare ; R_{4+5} with a row of about 8 short setae located dorsally and extending up to about half from the basal node to r-m and 4–5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than half of the third, the former with short spines along basal one-third of its anterior margin ; costal spines not so stout ; epaulet black with short spines ; basicostal scale yellow ; squama yellowish ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row



Figs. 656-662 : *Sarcorohdendorfia seniorwhitei* (Ho). 656, Inner and outer forceps (lateral view); 657, Inner and outer forceps (posterior view); 658, Fifth sternite; 659, Penis (lateral view); 660, Penis (ventral view); 661, Fourth sternite; 662, Genitalia ♀ (ventral view).

of 4 bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of few short hairs along basal half and a row of short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with 1 bristle on anterodorsal surface at about one-third the distance from the distal end, a row of bristles along posterodorsal surface and 1 bristle each on anteroventral and posteroventral surfaces at about one-fourth the distance from the distal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles each along anteroventral and posteroventral surfaces on distal half, 1 bristle on posterolateral surface on distal end and few short hairs along basal half of ventral surface ; hind tibia with 2 long and a row of short bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-fifth the distance from the distal end, 2 bristles on posterodorsal surface medially and a row of long hairs along anterior and posterior margins of ventral surface.

Abdomen : Grey with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with a pair of short median and 2 pairs of lateral marginal bristles, fifth with a row of 20 marginal bristles ; sternites first and second with long hairs, third with short black hairs, fourth with a brush of spines almost the whole length of its apical half ; fifth sternite v-shaped, with window and long bristles laterally and short hairs terminally on arms ; first genital segment reddish-black with long hairs, second somewhat blackish with short hairs but without bristles ; inner forceps curved, pointed at apex and with short spines at subapical end posteriorly and long hairs distally ; outer forceps elongated with short hairs ; anterior paramere slightly curved, blunt and bifurcated at end ; posterior paramere nut-shaped, curved, pointed apically and with 1 stout spine at anterior end ; theca almost equal to paraphallus, both are sclerotised ; apical plate of paraphallus not so sclerotised, curved, hook-like with wide and blunt lateral processes ; lateral plate of paraphallus short ; styli of glans short, curved and serrated anteriorly ; ventralia with chitinous hook and large membranous lobe but non serrate.

Female : Body length 9–13 mm.

Head : Similar to that of male except that frons is about three-fourths that of one eye ; ocellar bristles well developed ; presence of 2 proclinate fronto-orbital bristles ; outer vertical bristle well developed.

Thorax : Similar to that of male except apicoscutellar bristles absent.

Legs : Hind femur with a row of bristles along anterodorsal surface ; mid tibia with 2 bristles on anteroventral surface ; hind tibia without long hairs.

Abdomen : Similar to that of male except posterior margin of sixth tergite reddish-brown ; first genital segment red ; sternites sixth and seventh broader than fifth and

concave on posterior margin, eighth membranous ; seventh tergite with many bristles.

Material examined : 1 ♂, India : West Bengal ; Jayanti Forest, 20.x.1974, B. C. Nandi ; 1♂, Bihar ; Netarhat Agricultural Farm, 1,250 m, 26. vi. 1988, B. C. Nandi.

Discussion on species : This species is similar to *S. inextricata* (Walker, 1861) but differs from it by the structures of apical plate of paraphallus and ventralia. This species is also differentiated from *S. gracilior* (Chen, 1975) by the structures of ventralia and anterior paramere.

Biology : This is a relatively common species which was collected from forest bushes. The larvae of this species breed in dead fish, birds, mammals and sometimes become internal parasites of lepidopterous insects. They are reared on such media in the laboratory. Third stage larva of this species (as *flavinervis*) was described by Lopes (1954) and Ishijima (1967).

Distribution : India ; ArP (Deeban, Namdhapa), A (Sadiya), B (Netarhat, Sarandha Forests) and WB (Jayanti Forest, Kalimpong) ; Ne (several localities) ; Australia ; China ; Indonesia (Java) ; Japan (Ryukyu Islands) ; Kei Islands ; Papua New Guinea ; South Korea ; Taiwan and Thailand.

Type deposited : *Holotype* ♂, FMIBP, not studied.

Discussion on type : The author studied the type of *S. flavinervis* Senior-White and found that the condition of the type is good except for the right wing, right mid and hind legs and left hind leg are lost. The types of *Sarcorohdendorfia seniorwhitei* (Ho) were not available for study. The type of *S. aurata* (Walker) is deposited in the British Museum (Natural History), London and has been studied by Lopes and Kano (1979b) who synonymized with *S. seniorwhitei*.

109. *Sarcorohdendorfia henryi* (Senior-White)

(Figs. 663-664)

1924. *Sarcophaga henryi* Senior-White, *Rec. Indian Mus.*, **26** (3) : 232 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 223.

1954. *Tricholioproctia henryi* : Lopes, *Anais Acad. bras. Cienc.*, **26**(2) : 274.

1977. *Sarcorohdendorfia henryi* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 574.

Male : Body length 13 mm.

Head : Width of frons equal to half that of one eye ; frontal vitta black ; outer vertical bristles abundant ; frontal bristle diverging ; facial bristle strong ; genal bristle

white and weak, anteriorly placed and with few black hairs ; a pair of rows of irregular postocular black cilia ; face silvery with dark reflections ; antennae black and third segment three and half times that of the second ; parafacial rather together wider and with silvery black reflections ; palpi black.

Thorax : Elongated and clearly grey ; propleura hairy ; *ac* 4+1 ; posterior *dc* 4.

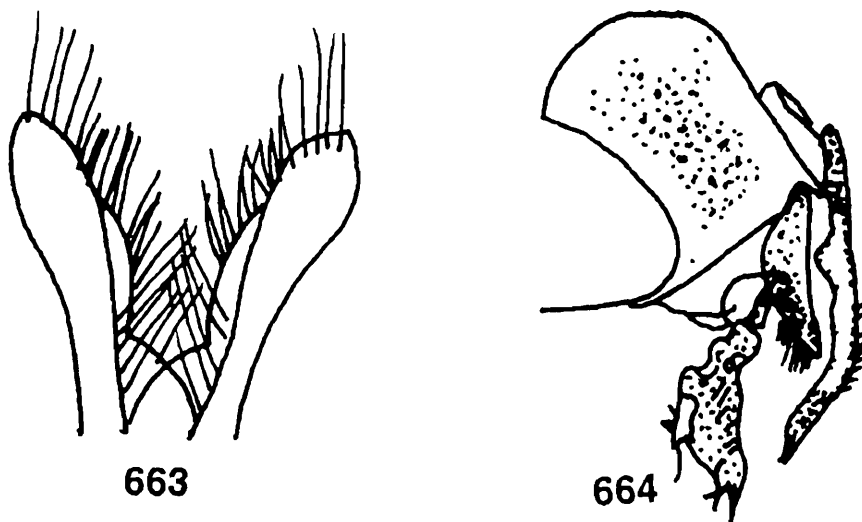
Wings : R_1 bare ; costal bristles absent ; fifth costal segment shorter than third.

Legs : Mid femur with comb and weak fringe ; mid tibia bare ; hind femur with lower hind macrochaetal row and fringe ; hind tibia fringed.

Abdomen : Very elongated ; second abdominal tergite bare ; second genital segment red ; fifth sternite Y-shaped with long bristles laterally and few hairs terminally on arms ; apical plate of paraphallus without lateral process ; inner forceps curved with few spines ; ventralia ill-developed.

Female : Unknown.

Material examined : No material was available for examination and the description provided here is mainly based on Senior-White *et al.* (1940).



Figs. 663-664 : *Sarcorohdendorfia henryi* (Senior-White). 663, Fifth sternite; 664, Penis (lateral view); (after Senior-White, 1924).

Discussion on species : This species is similar to *S. seniorwhitei* (Ho) but differs from it by the structures of apical plate of paraphallus, ventralia and anterior paramere.

Biology : Nothing is known regarding the biology of this species.

Distribution : SL (Colombo).

Type deposited : Holotype ♂, CM, not examined.

110. *Sarcorohdendorfia inextricata* (Walker)

(Figs. 665–671)

1859. *Sarcophaga inextricata* Walker, *J. Proc. Linn. Soc. Lond., Zool.*, **4** : 132.
1913. *Sarcophaga antilope* Boettcher, *Annls hist-nat. Mus. natn. hung.*, **11** : 380 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 235 ; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, **45** : 267.
1923. *Sarcophaga howensis* Johnston and Hardy, *Rec. Austr. Mus.*, **14**(1) : 65.
1927. *Sarcophaga antilopoides* Hardy, *Proc. Linn. Soc. N. S. W.*, **52** : 448.
1936. *Lioproctia antilope* : Baranov, *Ann. Mag. nat. Hist.*, **10**(17) : 102.
1937. *Chrysosarcophaga antilope* : Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 279.
1938. *Tricholioproctia antilope* : Baranov, *Bull. ent. Res.*, **29**(4) : 414 ; Kano, Shinonaga and Kurahashi, 1967, *Fauna Japonica, Sarcophagidae* : 124.
1952. *Sarcophaga piva* Roback, *J. Wash. Acad. Sci.*, **42**(2) : 45.
1958. *Tricholioproctia variabilis* Lopes, *Ins. Micro.*, **13**(2) : 34.
1979. *Sarcorohdendorfia inextricata* : Lopes and Kano, *Revta bras. Biol*, **39**(2) : 312.
1986. *Sarcorohdendorfia antilope* : Verves, *Cat. Palae. Dipt.*, **12** : 176.
1989. *Sarcorohdendorfia inextricata* : Lopes, *Cat. Dipt. Aust. and Oceanian Regions*, **86** : 729.

Male : Body length 13–16 mm.

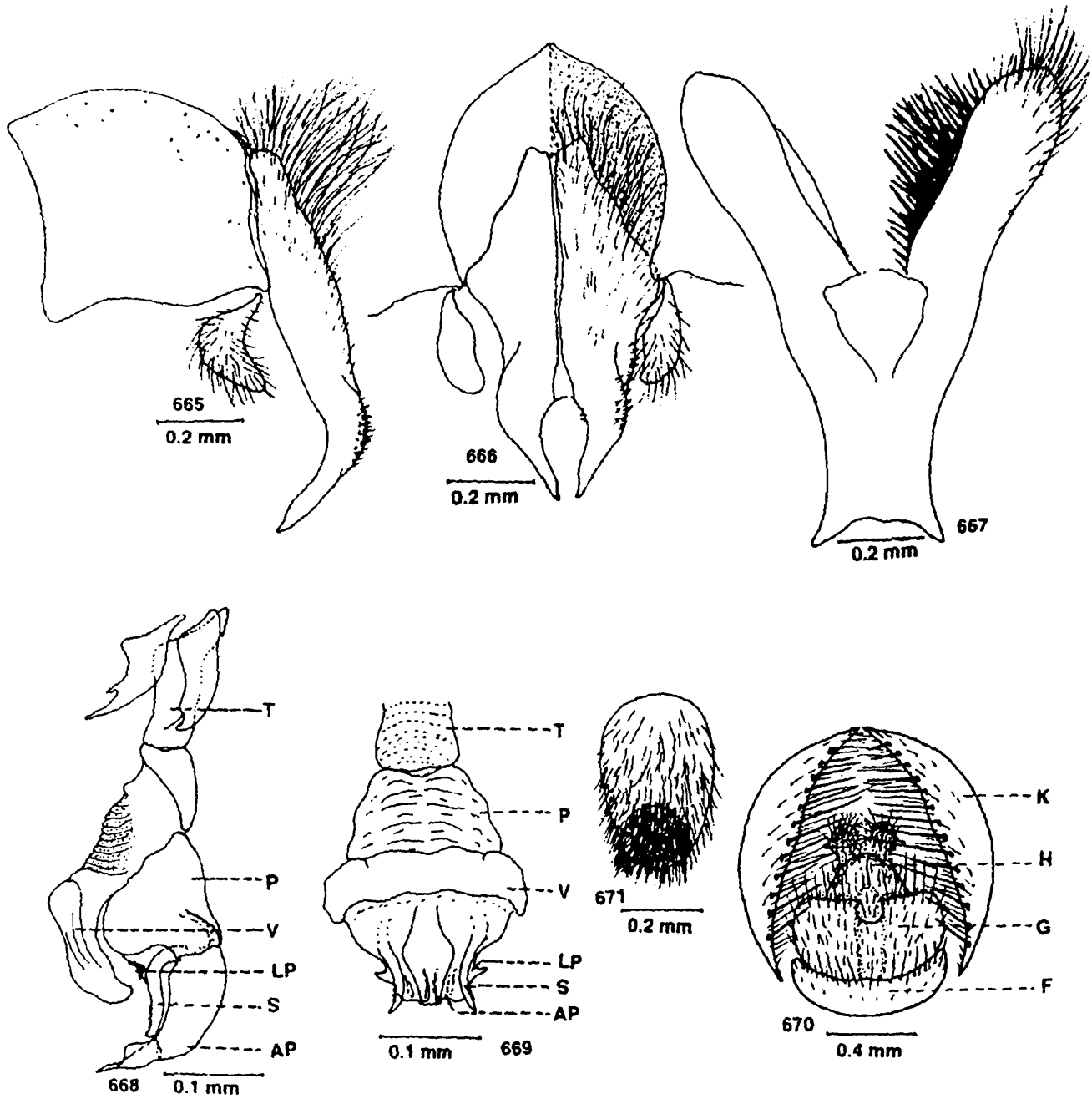
Head : Greyish black ; width of frons about three-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial black with golden pollen, the former with short scattered hairs, the latter with a row of 9–10 short hairs near the eye margin ; antennae dark brown and reaching up to about 0.80 distance to vibrissae, first and second segments brownish, third brown with silvery pollen and about three times that of the second ; arista long, plumose along basal three-fourths ; facial ridge black with golden pollen ; vibrissae long, distance between vibrissae about one parafacial width ; frontal bristles, 13–14, posterior 3 reclinate, anterior 4 below base of antennae and reaching up to about tip of second antennal segment, rest cruciate and directed forwards ; gena black with silvery pollen ; post gena black with silvery pollen and black hairs ; ocellar triangle black with short black hairs ; outer vertical bristle very weak, inner vertical well developed, post vertical one-third the inner vertical ; ocellar bristles short, postocellar less than one-third the inner vertical ; a row of regular postocular setae besides postocular cilia, rest of the area with irregular setae and silvery hairs ; palpi black ; proboscis brownish.

Thorax : Greyish-black with yellowish pollen and three black longitudinal stripes ; *ac* 4+5-1+2 ; *dc* 6+4-5 ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 1 or 3 ; *np* 4 ; *pa* 2 ; *sa* 4 ; *st* 1+1+1 ; *mpl* 7-8 ; *hpl* 6-7 ; upper part of propleura bare with few whitish hairs ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles dense brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 4 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 10 short setae located dorsally and extending up to more than half from the basal node to r-m and 6-7 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than the third, the former with short spines along basal one-fourth of its anterior margin ; costal spines not stout ; basicostal scale light brown ; epaulet black ; squama creamy white ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 bristles along middle portion of anterodorsal surface and a row of bristles along posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row of 3 bristles along middle portion of anterolateral surface, 3 bristles along distal part of posterolateral surface and a row of short bristles each along distal two-thirds of anteroventral and posteroventral surfaces ; mid tibia with 1 bristle on anterolateral surface at about one-third the distance from the distal end, 1 bristle each on distal one-third of anteroventral and posteroventral surfaces and a row of few short and 3 long bristles along posterodorsal surface ; hind femur with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-fifth the distance from the distal end, a pair of rows of bristles along posterodorsal surface, numerous long hairs along ventral surface and 2-3 bristles along distal part of posterodorsal and posterolateral surfaces ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end, 1 bristle each on posteroventral surface at about one-third and two-thirds the distances from the basal end and numerous long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second abdominal tergite weak but third with strong median marginal bristles, second with 1 and third with 3 lateral marginal bristles, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of 16 marginal bristles ; sternites first to third with long hairs, fourth with tuft of hairs terminally ; fifth sternite Y-shaped with many bristles laterally and terminally on arms ; first genital segment reddish-brown, second shiny reddish-brown and both with long hairs but without marginal bristles ; inner forceps strongly curved but without spines apically ; outer forceps



Figs. 665-671 : *Sarcorohdendorfia inextricata* (Walker). 665, Inner and outer forceps (lateral view); 666, Inner and outer forceps (posterior view); 667, Fifth sternite; 668, Penis (lateral view); 669, Penis (ventral view); 670, Genitalia ♀ (ventral view); 671, Fourth sternite.

nearly triangular with short hairs on anterior surface ; anterior paramere broad and bifurcated at subterminal end ; posterior paramere wide with 1 hair ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus curved and pointed terminally ; lateral plate of paraphallus very short with spines ; ventralia well developed, wide, curved posteriorly and with spines on anterior margin.

Female : Body length 11–14 mm.

Head : Similar to that of male except frons two-thirds that of one eye ; ocellar bristles well developed ; proclinate fronto-orbital bristless 2; outer vertical bristle well developed and about half the length of inner vertical.

Thorax : Similar to that of male except absence of apicoscutellar bristles.

Legs : Mid femur with a row of bristles along anterodorsal surface ; hind tibia with 2 bristles on anteroventral surface.

Abdomen : Similar to that of male except sixth tergite reddish-brown on posterior margin ; sixth and seventh sternites broader than fifth, seventh concave on posterior end, eighth short and rounded posteriorly ; seventh tergite wide.

Material examined : *Holotype* ♂, Makassar ; Celebes (= Sulawesi), A. R. Wallace ; 1 ♂, Mt. Yuman ; Amani-Shnig, 19.ix.1962, S. Shinonaga (det. by E. Sugiyama ; dep. in NSMT). In spite of extensive survey since 1973, this species was not recorded from this area and the description provided here is based on *Holotype* and Japanese specimen.

Discussion on species : This species is similar to *S. seniorwhitei* (Ho, 1938) but differs from it by the structures of ventralia and anterior and posterior parameres. This species is also distinguished from *S. pusana* (Senior-White, 1924) by the structures of fifth sternite and ventralia.

Biology : This is a rare species which is attracted to light. The larvae of this species were reported as an internal parasite of moths-*Attacus atlas* (Saturniidae, Lepidoptera) and the larvae can be reared on flesh in the laboratory. Third instar larva of this species (as *antilope*) has been described by Ishijima (1967).

Distribution : India ; A (Margherita, Sadiya) ; Ne (several localities) ; SL (Matale); Australia ; Borneo ; Caroline Islands ; China ; Hainan Island ; Indonesia (Sulawesi); Japan (including Ryukyu Islands) ; Lord Howe Island ; Malayasia; Papua New Guinea; Philippines ; Russia ; Singapore ; Solomon Islands ; South Korea ; Taiwan; Thailand and Truk Islands.

Type deposited : *Holotype* ♂, BMNH, examined.

Discussion on type : Lopes and Kano (1979a) studied the *Holotype* ♂ and made it a synonyme of *S. antilope* (Böettcher, 1913). The type is good except for the right leg

which is lost. In *Holotype*, parafrontal and parafacial plates are slightly yellowish and antennae are reddish-grey.

111. *Sarcorohdendorfia pusana* (Senior-White)

(Figs. 672-677)

1924. *Sarcophaga pusana* Senior-White, *Rec. Indian Mus.*, **26**(3) : 245; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 233.

1954. *Tricholioproctia pusana* : Lopes, *Anais. Acad. bras. Cienc.*, **26**(2) : 274.

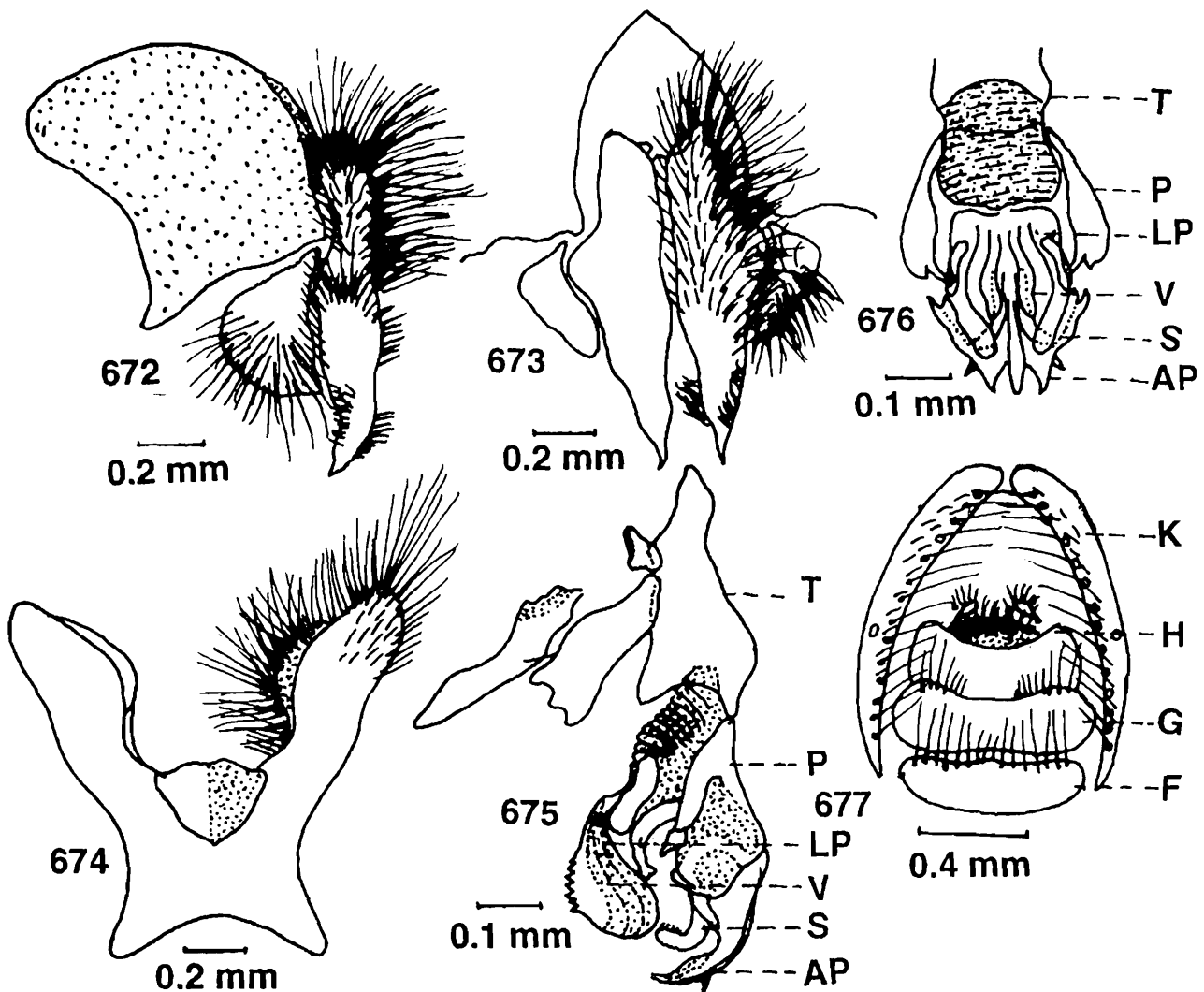
1977. *Sarcorohdendorfia pusana* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 574; Nandi, 1990, *Hexapoda*, **2** : 26.

Male : Body length 12 mm.

Head : Width of frons about one-third that of one eye ; frontal vitta greyish-black, its width at narrowest point of frons about less than twice that of each parafrontal; parafrontal and parafacial black with silvery pollen, the former with numerous short scattered black hairs, the latter with a row of black hairs near the eye margin; antennae blackish-brown and reaching up to about 0.9 distance to vibrissae, first and second segments black, third brownish, silvery pollen and about three times that of the second; arista long, plumose along basal half; facial ridge black with silvery pollen; vibrissae long, distance between vibrissae less than twice that of one parafacial width; frontal bristles 12, posterior 3 reclinate, anterior 4 below base of antennae and reaching up to about the apical end of second antennal segment, rest cruciate and directed forwards; gena black, silvery pollen and with long greyish hairs; post gena black; ocellar triangle black with short hairs; outer vertical bristle not differentiated, inner vertical well developed, post vertical half the inner vertical ; ocellar bristles short, postocellar about three-fifths the inner vertical; a row of irregular postocular setae besides postocular cilia, rest of the area with white and black hairs; palpi long and black; proboscis short and black.

Thorax : Greyish with silvery pollen and three black longitudinal stripes ; *ac* 5+1 ; *dc* 5+4 ; (posterior 2 *dc* stout); *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 3 ; *np* 4 ; *pa* 2 ; *sa* 4 ; *st* 1+1+1 ; *mpl* 7-8 ; *hpl* 11 ; upper part of propleura bare with silvery pollen and black hairs; prostigmatic and propleural bristles well developed and accompanied with long hairs; pro-and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of about 8 short setae located dorsally and extending up to about half the distance from the basal node to r-m and 3-4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment shorter than the third, the former with a row of short setae along basal two-



Figs. 672-677 : *Sarcorohdendorfia pusana* (Senior-White). 672, Inner and outer forceps (lateral view); 673, Inner and outer forceps (posterior view); 674, Fifth sternite; 675, Penis (lateral view); 676, Penis (ventral view); 677, Genitalia ♀ (ventral view).

fifths of its anterior margin; costal spines not so stout; epaulet black with black spines; basicostal scale yellowish; squama white; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3-4 bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with 2 bristles along middle portion of anterolateral surface, a row of about 5 bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of bristles along basal half and a row of short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end; mid tibia with 1 bristle each on anterodorsal and posterodorsal surfaces

at about one-third the distance from the distal end, a row of 3 long and several short bristles along posterodorsal surface and moderately long hairs along anterior and posterior margins of ventral surface on distal half; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 1 bristle on posterodorsal surface at about one-fifth the distance from the distal end and a row of long hairs along anterior margin of ventral surface ; hind tibia with 3 long and a row of short bristles along anterodorsal surface, 1 long bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end, 1 bristle on anteroventral surface at about one-fifth the distance from the distal end and a row of long hairs along anterior and posterior margins of ventral surface at about three-fifths the distance from the distal end.

Abdomen : Grey with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent, but each with a pair of lateral marginal bristles, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of 24 marginal bristles; sternites first to third with short greyish hairs on basal end and black hairs on distal end, fourth without bristles but with tuft of black hairs on distal end; fifth sternite v-shaped, cup-like short with and bristles and hairs laterally and long hairs terminally on arms; first genital segment reddish, second red but both without median marginal bristles; inner forceps almost straight, slightly pointed, curved at end and with spines apically on inner side and short hair-like spines at subapical end posteriorly; outer forceps almost triangular on distal half; anterior paramere elongated and almost straight; posterior paramere blunt apically, wide at end, posteriorly bare but with 1 hair anteriorly; theca almost equal to paraphallus, both are sclerotised; apical plate of paraphallus long, curved, pointed at end with pointed lateral out-growth and stout and pointed spines at the distal end posteriorly; lateral plate of paraphallus poorly developed; styli of glans short, curved, serrated anteriorly and shorter than apical plate of paraphallus; ventralia well developed, curved posteriorly and with median serrations anteriorly and a slender process basally.

Female : Body length 9–11 mm.

Head : Width of frons slightly less than that of one eye; outer vertical bristles well developed, about three-fourths the inner vertical; 2 proclinate fronto-orbital bristles; frontal bristles 10–11.

Thorax : Similar to that of male but presence of only 3 scutellar bristles.

Wings : Same as in male.

Legs : Chaetotaxy same as in male but for the following differences; mid femur with 2–3 bristles along basal half of ventral surface, but without hairs along posteroventral surface; mid tibia with 2 stout bristles on middle portion of anterolateral surface, 1 bristle on anteroventral surface at about one-third the distance from the

distal end but without long hairs along anterior and posterior margins of ventral surface on distal half; hind femur with a row of bristles along anterodorsal surface; hind tibia without long hairs along anterior and posterior margins of ventral surface but with 2 bristles on anteroventral surface on distal end.

Abdomen : Second and third abdominal sternites without marginal bristles but with long hairs, fourth with 4 stout bristles, fifth with a row of bristles, sixth with a row 16 bristles, seventh longer than sixth but with hairs at the slightly concave distal end, eighth bare, membranous and concave distally; anal sternite with tuft of long hairs; seventh tergite medially bifurcated with stout marginal bristles and hairs.

Material examined : 1♂, India : West Bengal; Ranaghat Hijuli Forest, 20. x. 1976, B.C. Nandi ; 5 ♂♂, Calcutta Zoo. Garden, 3. iii. 1975, B. C. Nandi; 1 ♂, Bihar; Rajgir Joy Prakash Narayan Park, 450 m, 19. vi. 1988, B.C. Nandi ; 2 ♂♂, Nagaland; Kohima War Cemetery Campus, 1, 490 m, 22. x. 1989, B.C. Nandi.

Discussion on species : This species is similar to *S. inextricata* (Walker, 1861) but differs from it by the structures of ventralia, fifth sternite and anterior and posterior parameres. Moreover, the shape of inner forceps is quite distinguishable here from *inextricata*.

Biology : This species is not common which was collected from bushes.

Distribution : India ; B (Pusa, Rajgir), N (Kohima), WB (Calcutta, Ranaghat Hijuli Forest) and SL (Matale).

Type deposited : Holotype ♂, BMNH, not examined.

112. *Sarcorohdendorfia hiromui* (Kano)

(Figs. 678—680)

1994. *Sarcophaga hiromui* Kano, *Jap. J. sanit. Zool.*, 45 : 265.

1996. *Sarcorohdendorfia hiromui* : Nandi, n. comb.

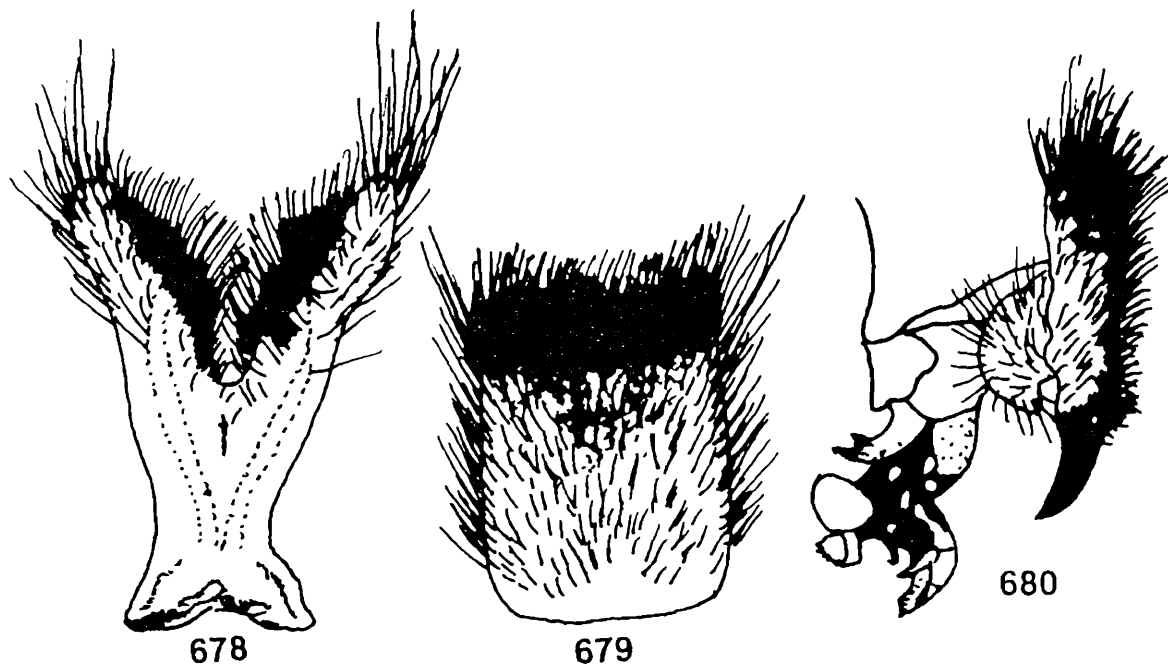
Male : Body length 11–12 mm.

Head : Greyish-black; width of frons about three-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about equal to each parafrontal; parafrontal and parafacial black with golden pollen, the former with short scattered hairs, the latter with a row of 7–8 short hairs near the eye margin; antennae blackish-brown and reaching up to about 0.85 distance to vibrissae, first and second segments blackish-brown, third slightly greyish with silvery pollen and about four times that of the second; arista long, plumose along basal two-thirds; facial ridge black with golden pollen; vibrissae long, distance between vibrissae about equal to one parafacial width; frontal bristles 10–14, posterior 2–3 reclinate, anterior 3–4 below base of antennae and reaching up to about half of second antennal segment, rest cruciate and directed forwards; gena black with silvery pollen; post gena black with silvery

pollen and yellowish hairs ; ocellar triangle black with short black hairs; outer vertical bristle very short, inner vertical well developed, post vertical less than half of inner vertical ; ocellar bristle short, post ocellar less than one-third the inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with irregular setae and silvery hairs ; palpi black ; proboscis brownish.

Thorax : Greyish, silvery to golden pollen and with three black longitudinal stripes; *ac* 6-7+2; *dc* 5+4; *ia* 1+2; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 4; *st* 1+1+1; *mpl* 7; *hpl* 6-7; upper part of propleura densely covered with black hairs; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles with dense brown pile; apicoscutellar and discoscutellar bristles not detectable due to damaged.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 10 short setae located dorsally and extending up to about more than half from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment shorter than the third, the former with short spines along basal one-fourth of its anterior margin; costal spines not stout; basicostal scale light brown; epaulet black ; squama creamy white ; halter brown.



Figs. 678-680 : *Sarcorohdendorfia hiromui* (Kano). 678, Fifth sternite; 679, Fourth sternite; 680, Penis with anterior and posterior parameres and inner and outer forceps (lateral view); (after Kano and Shinonaga, 1994).

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface, a row of long bristles along posteroventral surface and numerous long hairs along basal half of anteroventral surface ; fore tibia with a row of short bristles along

posterodorsal surface, 1 bristle on posterolateral surface at about one-third the distance from the distal end and 3 bristles along basal half and several bristles along distal half of anterodorsal surface; mid femur with a row of 4 or 5 bristles along middle portion of anterolateral surface, a row of bristles along anteroventral surface, a row of short bristles along distal one-third of posteroventral surface and 2 or 3 bristles along distal part of posterolateral surface; mid tibia with 1 bristle on anterodorsal surface at about one-third the distance from the distal end, 1 bristle each on distal one-third of anteroventral and posteroventral surfaces, several bristles along distal part of anteroventral surface and a row of short bristles along posterodorsal surface; hind femur with a pair of rows of long bristles along anterodorsal surface, a row of bristles along anteroventral surface, 3 bristles on distal half of posterodorsal surface, 1 bristle on distal part of posterolateral surface and numerous long hairs along ventral surface; hind tibia with a row of long bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end, 2 long bristles on posterodorsal surface medially, several bristles along distal half of anteroventral and numerous long hairs along distal two-thirds of posteroventral surfaces.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second abdominal tergite weak but second and third each with 1 lateral marginal bristle, fourth with a pair of median and 1—2 lateral marginal bristles, fifth with a row of 22 marginal bristles; sternites first to third with long hairs, fourth with a large patch of spine-like bristles posteriorly; fifth sternite Y-shaped with many bristles laterally and long hairs terminally on arms; first genital segment reddish-brown with yellowish pollen, second shiny reddish-brown without marginal bristles but both with long hairs; inner forceps black without spines; outer forceps brown nearly triangular in shape and with short hairs; anterior paramere bifurcated at end; posterior paramere wide apically, pointed and with 1 hair subterminally; theca shorter than paraphallus, both are sclerotised; apical part of paraphallus curved and blunt at end; lateral plate of paraphallus curved and elongated terminally; styli of glans short; ventralia well developed with strong wide anterior lobe.

Female : Unknown.

Material examined : Paratype ♂, Nepal : Biratnagar Forest, 100 m, 9. viii. 1992, H. Kurahashi (dep. in NSMT).

Discussion on species : This species is closely related to *S. inextricata* (Walker) but differs from it by the structures of inner forceps, ventralia and apical plate of paraphallus. Moreover, the anterior paramere is also quite distinguishable here from *inextricata*.

Biology : Nothing is known regarding the biology of the species.

Distribution : Ne (Biratnagar, Hetauda, Nijgarh).

Type deposited : Holotype ♂, NSMT, 2♂♂, Paratype, NHMK.

Discussion on type : The author studied the Paratype ♂ which is in good condition but the apicoscutellar and discoscutellar bristles damaged in this specimen.

Genus 35. *Rohdendorfsca* Grunin, 1964

1964. *Rohdendorfsca* Grunin, *Ént. Obozr.*, **43**(1) : 77.

Type species : *Rohdendorfsca flagellifera* Grunin, 1964.

Morphology : Third antennal segment three times that of the second; R_1 with a row of short setae above; R_{4+5} open; chaetotaxy comparatively poorly developed; abdomen narrow, ovoid and the colour light brown with yellowish sheen; third abdominal tergite without median marginal bristles; genital segments reddish-brown, first genital segment with marginal bristles; styli of glans very long, spirally curved and projecting far beyond the apical plate of paraphallus; apical plate of paraphallus intricately constructed with slender apical processes; lateral plate of paraphallus with unpaired erect sclerotised straight process; ventralia well developed.

Discussion : This is a very little known genus and only 1 species is reported here.

Biology : So far as the literature is concerned nothing is known regarding the biology of the species but the type species on this genus was collected on horse dung.

Distribution : This genus is distributed in the Oriental and Palaearctic regions.

113. *Rohdendorfsca flagellifera* Grunin

(Figs. 681—684)

1964. *Rohdendorfsca flagellifera* Grunin, *Ént. Obozr.*, **43**(1) : 77; Verves, 1986, *Cat. Palae. Dipt.*, **12** : 176.

1988. *Sarcophaga flagellifera* : Sugiyama, *Jap. J. sanit. Zool.*, **40** : 118.

Male : Body length 14 mm.

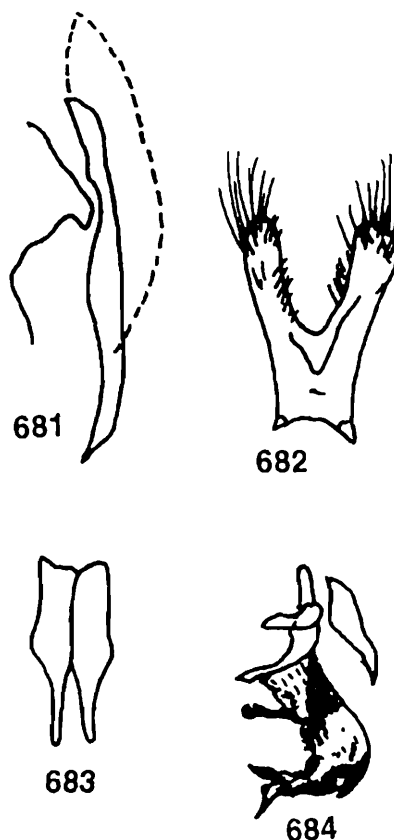
Head : Width of frons one-fourth that of head; frontal vitta at narrowest point of frons twice as broad as orbit; second antennal segment reddish, third reddish with silvery sheen and three times that of the second; checks one-third the height of eye and covered only by light hairs; venae with some hairs below; lower part of orbits, buccae, genae, median area and antennal socket have a silvery hue; upper part of orbits and frontal band with golden sheen.

Thorax : Blackish; *ac* 0+1; *dc* 1+5, very short and fine; only 2 posterior setae comparatively sturdy; hairs on mesonotum short; mesonotum and scutellum with light brownish longitudinal bands and intervening spaces with golden sheen.

Wings : Third costal segment less than one and half times that of the fifth; R_{4+5} open.

Legs : Fore tarsus basally and fore tibia on anterior surface of apical half each bears a dense tuft of very short setae having a brownish hue.

Abdomen : With iridescent maculae and light brown to yellowish; third and fourth sternites with dark hairs but without marginal bristles; fifth sternite Y-shaped with wide window and long hairs terminally; genital and anal segments dark brown, shining but without bloom; first genital segment short with 2 median marginal bristles on posterior end and sparse short hairs at the top, a narrow longitudinal band of long hairs running laterally on each side; inner forceps narrow, brownish and cleft to half their length; apical plate of paraphallus pointed downwards with elongated and two characteristic slender apical processes; styli of glans very long, narrowing and curving apically; ventralia well developed and blunt at end.



Figs. 681-684 : *Rohdendorfisca flagellifera* Grunin. 681, Inner and outer forceps (lateral view); 682, Inner and outer forceps (posterior view); 683, Fifth sternite; 684, Penis (lateral view); (after Grunin, 1964).

Female : Grunin (1964) had collected few female specimens but those had not been investigated and descriptions were not given.

Material examined : No material was available for examination and the description provided here is mainly based on Grunin (1964).

Discussion on species : This species has its specific diagnostic features of dumb-bell-shaped ventralia, apical plate of paraphallus with two long apical processes, inner forcep very slender and fifth sternite with wide window. Moreover, the genital segments are reddish or dark brown in this species.

Biology : This species was collected from horse dung.

Distribution : Pa (Chilas); Afghanistan and Turkmenistan.

Type deposited : *Holotype* ♂, ZISP, not examined.

Genus 36. *Sarcosolomon* Baranov, 1938

1938. *Sarcosolomon* Baranov, *Zagreb Vet. Arch.*, **8**(4) : 173.

Type species : *Sarcosolomon tulagiensis* Baranov, 1938.

1958. *Bezziola* Lopes, *Ins. Micro.*, **13**(2) : 24.

Type species : *Sarcophaga stricklandi* Hall and Bohart, 1948.

Morphology : Frontal bristles divergent anteriorly ; parafacial hairy or with bristles; propleura bare ; presutural and postsutural acrostichal bristles differentiated, the latter sometimes short; abdominal sternites with distinct bristles in both sexes; penis very slender and claw-shaped ; paraphallus and ventralia completely united and strongly sclerotised ; apical plate of paraphallus curved ; lateral plate of paraphallus short and extending towards each other ; styli of glans short, elongated, slender and with lateral process which is protected by the apical projection of paraphallus; ventralia well developed and membranous.

Discussion : This is a quite large genus and a good number of species have been described from different regions. Lopes and Kano (1969) revised this genus from the Oriental region and divided it into two subgenera : *Sarcosolomon* Baranov, 1938 and *Parkerimyia* Lopes and Kano, 1969. Lopes (1958) revised the Australian species under the genus *Bezziola*. Only the subgenus *Parkerimyia* has been reported from the Oriental region which is also present in India. This genus is represented by 1 species in the Palaearctic region and 2 species in the Australasian and Oceanian regions. 8 species are reported in the region under study.

Biology : Not much is known but most of the species frequent bushes near carcasses, faeces and flowering plants.

Distribution : This genus is distributed in the Oriental, Palaearctic and Australasian and Oceanian regions.

Subgenus *Parkerimyia* Lopes and Kano, 1969

1969. *Parkerimyia* Lopes and Kano, *Pacif. Insects*, **11**(1) : 181.

Type species : *Sarcophaga crinita* Parker, 1917.

Morphology : Median marginal bristles on third abdominal tergite absent; R₁ may be with or without hairs; ventralia very much sclerotised; inner forceps with bifid apices but without subapical spines; styli of glans long.

This is a rather large subgenus and only 3 species have been reported earlier from the Oriental region, of which 1 species occurs in India. Lopes and Kano (1969) revised this subgenus from the Oriental region and reported only 3 species. A total of 8 species are represented in this area.

Most of the species visit flowers.

Key to male species

1. R₁ hairy2
 R₁ bare 3
2. Lobes of ventralia ill-developed ; posterior paramere without projection
 *rohdendorfi* Nandi
 Lobes of ventralia well developed ; posterior paramere with projection
 *harinasutai* Kano and Sooksri
3. Ventralia square-shaped and single 4
 Ventralia elongated and trilobed 5
4. Ventralia with grooved at the posterior end; apical plate of paraphallus wide at subapical end*kaushanensis* Nandi
 Ventralia without groove at the posterior end; apical plate of paraphallus narrowed at subapical end*chambaensis* Nandi
5. Styli of glans shorter than apical plate of paraphallus6
 Styli of glans longer than apical plate of paraphallus*indica* Nandi
6. Apical plate of paraphallus gradually pointed with long subapical process7
 Apical plate of paraphallus abruptly pointed with short pointed subapical process*nathani* Lopes and Kano
7. Lateral plate of paraphallus with well developed wide process; the bifid apices of inner forceps not so marked*andamanensis* Nandi
 Lateral plate of paraphallus with ill-developed pointed process; the bifid apices of inner forceps well marked 8
8. Ventralia short; styli of glans not well marked
 *shresthai* Kano and Shinonaga
 Ventralia long; styli of glans well marked*crinita* (Parker)

114. *Sarcosolomonina (Parkerimyia) rohdendorfi* Nandi

(Figs. 685—689)

1976. *Sarcosolomonina (Parkerimyia) rohdendorfi* Nandi, *Orient. Insects*, **10** (1) : 12; Nandi, 1977, *Rec. zool. Surv. India*, **73** : 214; Nandi, 1979, *Orient. Insects*, **13** (1—2) : 193.

Male : Body length 8–10 mm.

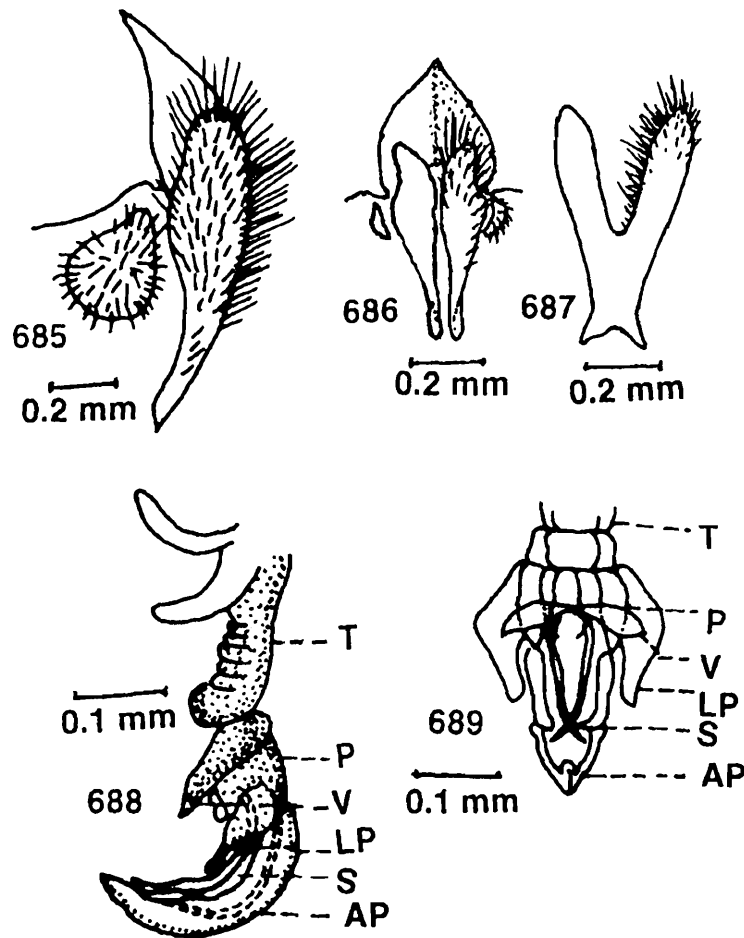
Head : Width of frons about one-third that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial light black with silvery pollen, the former with scanty black hairs, the latter with a row of several black hairs near the eye margin; antennae brown and reaching up to about 0.9 distance to vibrissae, first segment blackish, second brownish-black with black hairs, third brownish with silvery pollen and about three times that of the second; arista long, plumose along basal three-fifths; facial ridge brownish with silvery pollen; vibrissae long, crossed, distance between vibrissae slightly less than one parafacial width; frontal bristles 9–11, posterior 3 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena black; post gena blackish with silvery pollen; ocellar triangle black with many divergent black hairs; outer vertical bristle very weak, inner vertical well developed, post vertical weak and about one-third the inner vertical; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with white hairs; palpi long and blackish-brown; proboscis short and black.

Thorax : Grey, silvery pollen and with three black longitudinal stripes; *ac* 5+1; *dc* 4+4; *ia* 1+3; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 7; *hpl* 8; upper part of propleura white and bare; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brownish-black; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 with hairs; R_{4+5} with a row of short setae located dorsally and extending up to three-fifths from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment slightly greater than the third, the former with short spines along basal three-fifths of its anterior margin; costal spines stout; epaulet black; basicostal scale yellowish-brown; squama whitish; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 short bristles along basal half of anterodorsal surface and 1 bristle on posterolateral surface at about two-thirds the distance from the basal end; mid femur with a row of 4 short bristles along middle portion of anterolateral surface, a row of 3 bristles each along basal half of anteroventral and posteroventral surfaces and 2 bristles on posterodorsal surface at about one-third the distance from the distal end; mid tibia with 2 bristles along middle portion of anterodorsal surface, 2 bristles on posterodorsal

surface at about one-third and 1 bristle at two-thirds the distances from the basal end and 1 bristle on posteroventral surface at about two-thirds the distance from the distal end; hind femur with a pair of rows of bristles along anterodorsal surface, 1 bristle each on distal part of posterodorsal and posterolateral surfaces and a row of several long bristles along anterior and posterior margins of ventral surface; hind tibia with a row of 2 long and several short bristles along posterodorsal surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end, 3 bristles on anteroventral surface at about one-third the distance from the distal end but without tuft of hairs on ventral surface.



Figs. 685-689 : *Sarcosolomonina (Parkerimyia) rohdendorfi* Nandi. 685, Inner and outer forceps (lateral view); 686, Inner and outer forceps (posterior view); 687, Fifth sternite; 688, Penis (lateral view); 689, Penis (ventral view).

Abdomen : Black with silvery checkered pattern; several pairs of median marginal bristles on third, fourth and fifth abdominal tergites but second, third and fourth each with well developed lateral marginal bristles; sternites first to third with short hairs, fourth with numerous long black hairs; first and second genital segments blackish-brown but each without marginal bristles; fifth sternite Y-shaped with

3–4 bristles terminally and short spines and hairs laterally on arms; inner forceps almost straight and very slightly bifid at end; outer forceps almost oval; anterior paramere blunt at end and deeply curved; posterior paramere slightly curved but without projection and hairs; apical plate of paraphallus long, nearly pointed apically and with subbasal membranous process; lateral plate of paraphallus short and gradually pointed; styli of glans long, slender and approaches to the subapical end of apical plate of paraphallus; ventralia very much sclerotised and its lobes not well developed.

Female : Unknown.

Material examined : *Holotype* ♂, India : West Bengal; Ranaghat Hijuli Forest, 28. ix. 1974, B. C. Nandi; *Paratype* ♂, Ranaghat Hijuli Forest, 28. ix. 1974, B.C. Nandi; 1 ♂, Andhra Pradesh; Araku, 918 m, 30. xii. 1985, B.C. Nandi; 2 ♂♂, Orissa; Taptapani, 15. iii. 1974, B. C. Nandi.

Discussion on species : This species is similar to *S. (Parkerimyia) harinasutai* Kano and Sooksri, 1977 but differs from it by the structure of ventralia and anterior paramere. Moreover, the colour of antennae, parafrontal and parafacial are different here from *harinasutai*.

Biology : This species was collected from flowering plants and the bushes near flowering plants.

Distribution : India ; AnP (Araku), O (Taptapani) and WB (Ranaghat Hijuli Forest).

Type deposited : *Holotype* ♂, ZSIC, examined.

115. ***Sarcosolomonina (Parkerimyia) harinasutai*** Kano and Sooksri
(Figs. 690)

1977. *Sarcosolomonina (Parkerimyia) harinasutai* Kano and Sooksri, *Pacif. Insects*, **17**(2–3) : 233.

1988. *Sarcophaga harinasutai* : Sugiyama, *Jap. J. sanit. Zool.*, **40** : 119.

Male : Body length 8–9 mm.

Head : Width of frons about one and half times that of one eye; frontal vitta black, its width at narrowest point of frons about more than twice that of each parafrontal; parafrontal and parafacial black with silvery pollen, the former with few short scattered hairs, the latter with a row of 8 short hairs near the eye margin; antennae black brown and reaching up to about 0.80 distance to vibrissae, first and second segments black, third brown and about two and half times that of the second; arista long, plumose along basal three-fifths; vibrissae long, crossed, distance between vibrissae equal to one parafacial width; facial ridge reddish-brown but face light brown with silvery pollen; frontal bristles 8–10, posterior 2 reclinate, anterior 2 divergent and reaching up to about tip of the second antennal segment, rest cruciate and directed

forwards ; gena black, silvery pollen with black hairs anteriorly and white hairs posteriorly and about one-fourth the height of one eye; post gena black with black and greyish hairs ; ocellar region black with short black hairs; inner vertical bristle well developed, outer vertical ill- developed, post vertical short and about one-third the inner vertical; post ocellar longer than post vertical; 3 rows of postocular setae, rest of the area with grey hairs ; metacephalon with numerous white and few black hairs; palpi dark brown and slender ; proboscis brownish.

Thorax : Silvery pollen with three black longitudinal stripes; *ac* 4+1; *dc* 4+4; *ia* 1+3 (anterior 1 very fine); *ps* 1; *h* 3; *ph* 2; *np* 4 (2 strong and 2 weak); *sa* 3; *pa* 2; *st* 1+1+1; *mpl* 7; *hpl* 9; upper part of propleura bare; prosternum hairy posteriorly; apicoscutellar and discoscutellar bristles short, 1 pair each; lateroscutellar bristles long, 2 pairs.

Wings : Hyaline with brown veins; R_1 with hairs; R_{4+5} with a row of about 10 short setae located dorsally and extending up to about more than half from the basal node to r-m and 3 short setae on ventral surface of basal node of R_{4+5} ; fifth costal segment a little longer than the third, the former with short spines along basal two-thirds of its anterior margin; basicostal scale yellowish-white; costal spines not so stout; epaulet black; squama creamy-white; halter brown.

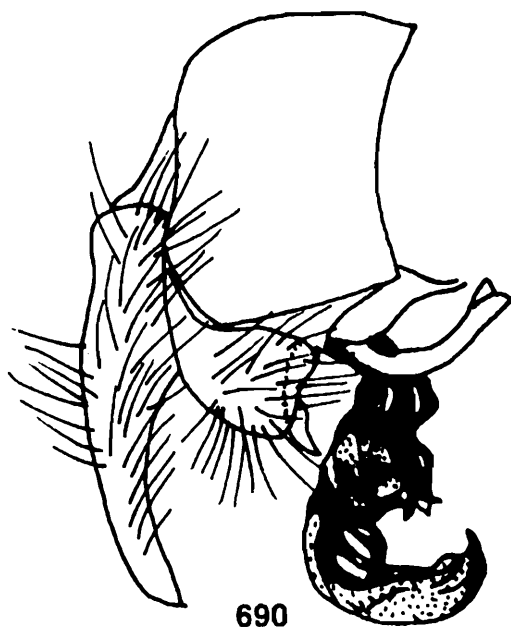


Fig. 690 : *Sarcosolomonina (Parkerimyia) harinasutai* Kano and Sooksri. 690, Penis and Inner and outer forceps (lateral view); (after Kano and Sooksri, 1977).

Legs : Blackish to brown; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with 2 to 3 short bristles along basal one-third of anterodorsal surface, 1

bristle on posteroventral surface at about one-third the distance from the distal end; mid femur with a row of 3 short bristles along anterodorsal surface, 2 short bristles on distal part of posterolateral surface, a row of long hairs along basal half of posterior margin of ventral surface and few comb-like setae on distal one-fourth of anteroventral and posteroventral surfaces; mid tibia with 1 strong bristle on middle portion of anterolateral surface, 2 bristles on basal one-third of posterolateral surface, 1 bristle each on distal one-third of posteroventral and posterodorsal surfaces and 1 strong bristle on distal two-fifths of ventral surface; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anterior margin of ventral surface, a row of long hairs with bristles along posterior margin of ventral surface but only long hairs along basal half of ventral surface; hind tibia with a row of 2 long and several short bristles along anterodorsal surface, 2 bristles apart on posterodorsal surface, 2 bristles on anteroventral surface on distal half but without tuft of long hairs along ventral surface.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but second and third each with 2 lateral marginal bristles, fourth with 1 and fifth with 3 well developed lateral marginal bristles, fifth with a row of 20 marginal bristles and several additional long hairs along posterior margin; second to fourth sternites with numerous short hairs; fifth sternite Y-shaped with 4–5 strong bristles laterally on arms; first genital segment dark brown with greyish pollen but without marginal bristles; second segment shiny blackish-brown with numerous long hairs; inner forceps slightly curved and pointed apically; outer forceps slightly elongated and wide at end; anterior paramere short and elongated; posterior paramere elongated, curved apically and with knob-like projection but without hairs; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus long, curved, pointed apically and with short lateral process; lateral plate of paraphallus short; stylli of glans short and not crosses the apical plate of paraphallus; ventralia trilobed and well developed.

Female : Unknown.

Material examined : 1♂, Pakistan : NWF Province; Nathia Gali, 2, 200 m, 25–30. vii. 1988, H. Kurahashi (det. by E. Sugiyama as *Sarcophaga harinasutai*) ; 1 ♂, Thailand : Wood and Grass Id.; Ayutthaya, 1. ix. 1975, R. Kano (det. by E. Sugiyama; dep. in NSMT).

Discussion on species : This species is closely related to *S. (Parkerimyia) crinita* (Parker, 1917) but differs from it by the shape of penis. This species is also quite distinguishable form *S. (Parkerimyia) rohdendorfi* Nandi, 1976 by the detailed structures of ventralia and posterior paramere.

Biology : This species was collected from bushes near a river bank. Kano and Sooksri (1977) reported that it might not be attracted to animal carcasses and faeces.

Distribution : Pa (Nathia Gali, Tandani, Abbottabad) and Thailand.

Type deposited : *Holotype* ♂, NSMT, not examined.

116. *Sarcosolomonina* (*Parkerimyia*) *kaushanensis* Nandi
(Figs. 691—695)

1990. *Sarcosolomonina* (*Parkerimyia*) *kaushanensis* Nandi, *J. Beng. nat. Hist. Soc.*, **9** (1) : 22.

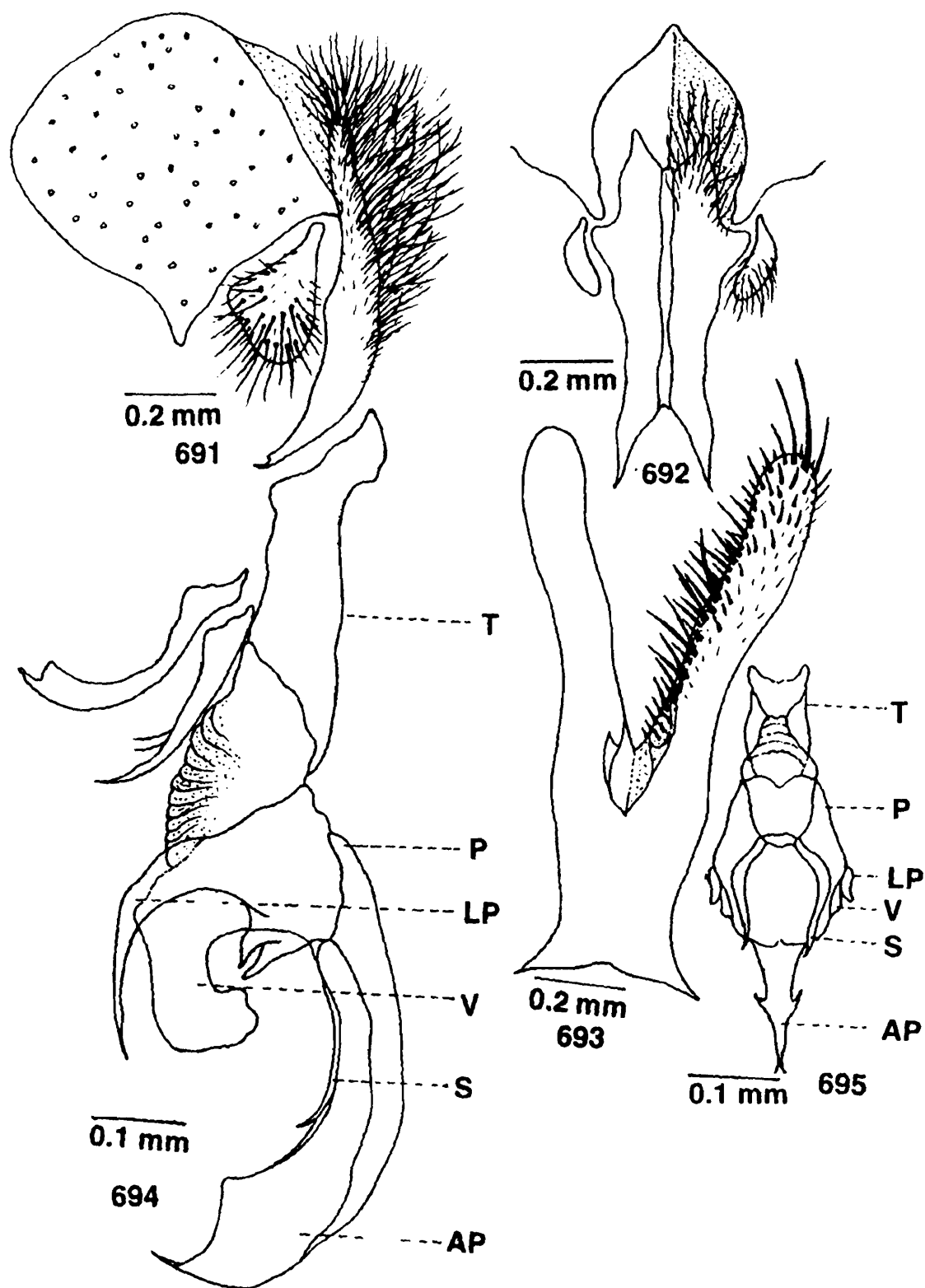
Male : Body length 7–9 mm.

Head : Width of frons about less than half that of one eye; frontal vitta blackish, its width at narrowest point of frons about less than that of each parafrontal; parafrontal and parafacial brownish with silvery pollen, the former with short scattered hairs, the latter with a row of 4–5 short black hairs near the eye margin; antennae brownish-black and reaching up to about 0.8 distance to vibrissae; first and second segments black with numerous short black hairs, third brownish-black, silvery pollen and about three times that of the second; arista long, plumose along basal two-thirds; facial ridge brownish with silvery pollen; vibrissae long, distance between vibrissae about twice that of each parafacial width; frontal bristles 10–11, posterior 3 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena blackish with black hairs; post gena black; outer vertical bristle short, inner vertical well developed; ocellar region black with short black hairs; postocellar equal to ocellar and one-third that of inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with brownish hairs; palpi slender; proboscis brownish.

Thorax : Blackish with three black longitudinal stripes; *ac* 5+3; *dc* 3+4; *ia* 1+2; *ps* 1; *h* 3; *ph* 3; *np* 3; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 6–8; *hpl* 6–7; upper part of propleura bare; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of short setae located dorsally and extending up to three-fifths from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to third, the former with short spines along basal half of its anterior margin; costal spines short; epaulet brownish with short spines; basicostal scale yellowish; squama white; halter brownish.

Legs : Black; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 short bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of bristles along middle portion of anterodorsal surface, a row of bristles along basal



Figs. 691-695 : *Sarcosolomonina (Parkerimyia) kaushanensis* Nandi. 691, Inner and outer forceps (lateral view); 692, Inner and outer forceps (posterior view); 693, Fifth sternite; 694, Penis (lateral view); 695, Penis (ventral view).

half and a row of short setae along distal half of anteroventral surface, a row of bristles along basal half and a row of short setae along distal half of posterodorsal surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end; mid tibia with 2 short bristles medially on anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end and a row of bristles along posterodorsal surface; hind femur with a row of bristles along anterodorsal surface, a row of bristles each along anteroventral and posteroventral surfaces and 2 bristles on posterodorsal surface at about one-third the distance from the distal end; hind tibia with a row of bristles along anterodorsal surface, 1 bristle each on one-third and two-thirds the distances from the basal end, 1 bristle on anteroventral surface at about one-third the distance from the distal end but without tuft of long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 3 lateral marginal bristles, fourth with 3 pairs of median and 3 lateral marginal bristles, fifth with a row of 16 marginal bristles; first to fourth sternites with short hairs; fifth sternite Y-shaped with lateral and few terminal bristles on arms; first and second genital segments brownish with short hairs but without marginal bristles; inner forceps elongated, curved at end with slight notch terminally; outer forceps almost oval with short hairs; anterior paramere elongated, curved and pointed at end; posterior paramere elongated, pointed at end and with 2 hairs at anterior end; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus blade-like, wide at subapical end, pointed terminally and curved; lateral plate of paraphallus short and elongated; styli of glans short but without serrations; ventralia broad, square-shaped, blade-like, membranous and with groove medially at the posterior end.

Female : Unknown.

Material examined : *Holotype* ♂, India : Uttar Pradesh; Kaushani, 890 m, 7. x. 1986, B. C. Nandi; 2 ♂♂, *Paratype*, same data as *Holotype*.

Discussion on species : This species is easily recognized by its peculiar character of apical plate of paraphallus, ventralia and very slender form of anterior and posterior parameres for which it might be placed in a separate group. This species is almost similar to *S. (Parkerimyia) chambaensis* Nandi, 1989 but differs from it by the structures of apical plate of paraphallus and ventralia. Moreover, the width of frons is shorter in this species.

Biology : This is a relatively rare species which was collected from bush-sweeping on rocks.

Distribution : India ; UP (Kaushani).

Type deposited : *Holotype* ♂, ZSIC, examined.

117. *Sarcosolomonina* (*Parkerimyia*) *chambaensis* Nandi

(Figs. 696—699)

1989. *Sarcosolomonina* (*Parkerimyia*) *chambaensis* Nandi, *J. Beng. nat. Hist. Soc.*, 8(1) : 27.*Male* : Body length 7 mm.

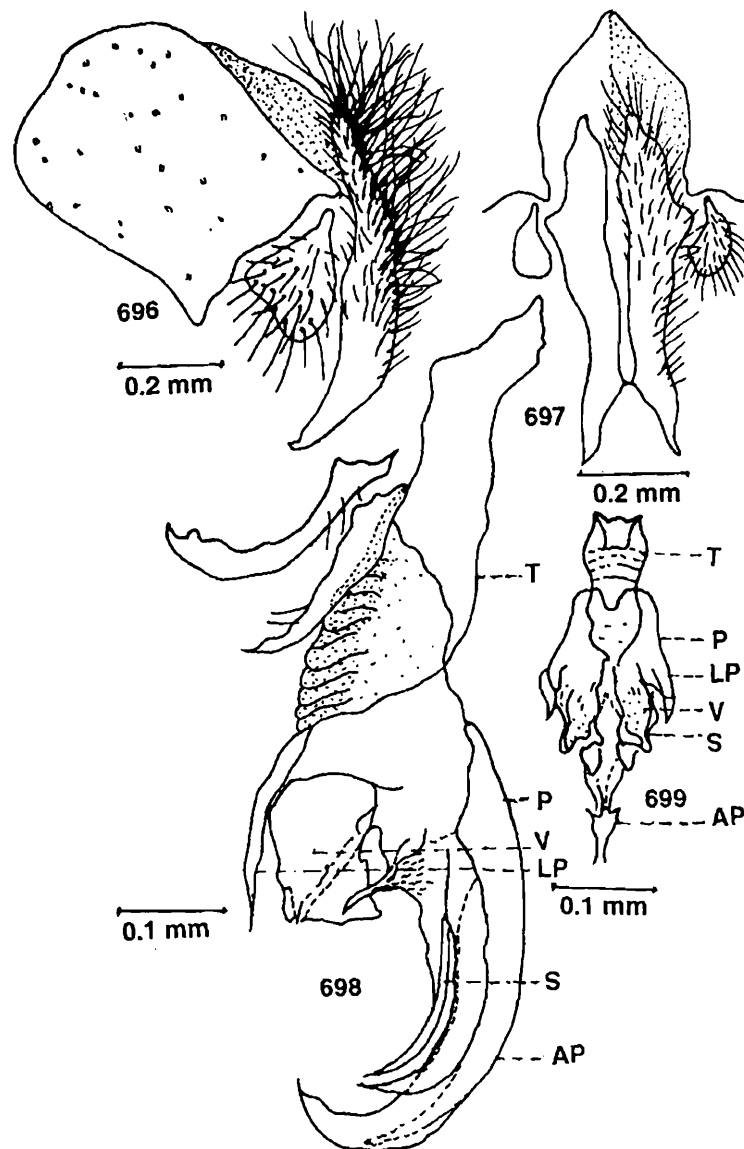
Head : Width of frons about equal to that of one eye; frontal vitta black, its width at narrowest point of frons about more than twice that of each parafrontal; parafrontal and parafacial brownish with silvery pollen, the former with short scattered hairs, the latter with a row of 9 short hairs near the eye margin ; antennae brownish black and about 0.80 distance to vibrissae, first and second segments brownish-black with numerous black hairs, third brownish, silvery pollen and about three times that of the second; facial ridge brownish with silvery pollen; vibrissae long, crossed, distance between vibrissae less than twice that of one parafacial width; frontal bristles 10, posterior 4 reclinate, anterior 4 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena blackish with short black hairs; post gena black; ocellar triangle black with short black hairs; outer vertical bristle short, inner vertical well developed, post vertical one-fourth the inner vertical ; ocellar bristles short, postocellar equal to ocellar and about one-third the inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with brownish hairs; palpi slender; proboscis brownish.

Thorax : Blackish with three black longitudinal stripes; *ac* 5+3; *dc* 3+4; *ia* 2+2; *ps* 1; *h* 3; *ph* 3; *np* 3; *pa* 2; *sa* 2; *st* 1+1+1; *mpl* 9; *hpl* 5; upper part of propleura bare; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of short setae located dorsally and extending up to one-third the distance from the basal node to r-m and 3–4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to third, the former with short spines along more than basal half of its anterior margin; costal spines short; epaulet brownish with short spines; basicostal scale yellowish; squama white; halter brownish.

Legs : Black; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of bristles along basal half and a row of short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end; mid tibia with

2 long bristles medially on anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end and 1 bristle each on posterodorsal and posterolateral surfaces at about two-thirds the distance from the basal end; hind femur with a row of bristles along anterodorsal surface, a row of bristles along anteroventral surface and a row of bristles along posterodorsal surface at about one-fourth the distance from the distal end; hind tibia with a row of bristles along anterodorsal surface, 2 bristles on posterodorsal surface medially but without tuft of long hairs along ventral surface.



Figs. 696-699 : *Sarcosolomonina (Parkerimyia) chambaensis* Nandi. 696, Inner and outer forceps (lateral view); 697, Inner and outer forceps (posterior view); 698, Penis (lateral view); 699, Penis (ventral view).

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third andominal tergites absent but second with 1 and third with 2 lateral marginal bristles, fifth with a row of 16 marginal bristles; sternites first to fourth with short hairs; first and second genital segments brownish with short hairs but without marginal bristle; inner forceps elongated, strongly curved at end and with slight notch terminally; outer forceps almost oval with short hairs; anterior paramere elongated, curved and pointed terminally; posterior paramere almost straight, pointed terminally and with 2 short hairs at anterior end; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus gradually narrowed with slight notch terminally and bears subbasal membranous porcesses; lateral plate of paraphallus short and pointed; styli of glans short but without serrations; ventralia broad, square-shaped, membranous but without groove posteriorly.

Female : Unknown.

Material examined : *Holotype* ♂, India : Himachal Pradesh; Chamba, 1,000 m, 25.x. 1988, B.C. Nandi.

Discussion on species : The species has an isolated position due to its peculiar character of apical plate of paraphallus and ventralia. This species is similar to *S. (Parkerimyia) kaushanensis* Nandi, 1990 but differs from it by the structures of ventralia and apical plate of paraphallus. Moreover, the styli of glans are more elongated in this species and apical plate of paraphallus has lateral processes.

Biology : This is a relatively rare species which was collected near gardening plants.

Distribution : India ; HP (Chamba).

Type deposited : *Holotype* ♂, ZSIC, examined.

118. *Sarcosolomonina (Parkerimyia) indica* Nandi

(Figs. 700—702)

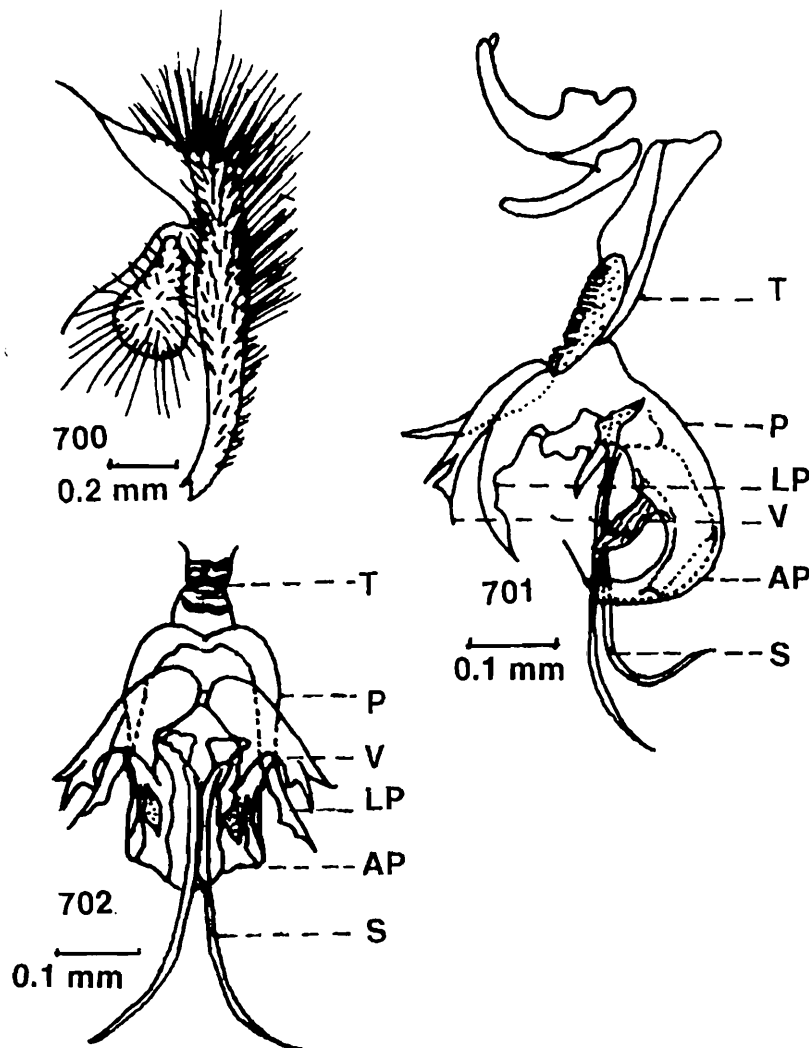
1976. *Sarcosolomonina (Parkerimyia) indica* Nandi, *Orient. Insects*, 10(1) : 14; Nandi, 1992, *Hexapoda*, 4(1) : 76.

Male : Body length 10 mm.

Head : Width of frons about one-third that of one eye; frontal vitta blackish-brown, its width at narrowest point of frons about half that of each parafrontal; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of short hairs near the eye margin; antennae brownish-black and reaching up to about 0.80 distance to vibrissae, first and second segments black, third brownish-black, silvery pollen and about two and half times that of the second; arista long, plumose along basal half; facial ridge black with golden pollen; vibrissae long, distance between vibrissae about twice that of one parafacial width; frontal bristles

11, posterior 2 reclinate, anterior 4 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena black; post gena blackish with silvery pollen; outer vertical bristle absent, inner vertical well developed, post vertical about half of the inner vertical; a pair of rows of postocular setae besides postocular cilia, rest of the area with black hairs; palpi slender and black; proboscis blackish.

Thorax : Shiny greyish-black, silvery pollen and with three black longitudinal stripes; *ac* 5+1; *dc* 4+4; *ia* 1+3; *ps* 3; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 3; *st* 1+1+1 (middle 1 short); *mpl* 7; *hpl* 10; upper part of propleura bare and whitish; prostigmatic and



Figs. 700-702 : *Sarcosolomonina (Parkerimyia) indica* Nandi. 700, Inner and outer forceps (lateral view); 701, Penis (lateral view); 702, Penis (ventral view).

propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles black; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 9 short setae located dorsally and extending up to three-fifths from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment greater than the third, the former with short spines along basal half of its anterior margin; costal spines stout; epaulet black; basicostal scale yellow; squama white; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with 2 short bristles along basal half of anterodorsal surface and 2 bristles on posterodorsal surface on two-thirds the distance from the distal end; mid femur with a row of 4 bristles along middle portion of anterolateral surface, a row of 4 bristles along basal half of anteroventral surface, a row of bristles along basal half of posteroventral surface and 2 bristles on distal part of posterolateral surface; mid tibia with a row of about 12 bristles on middle portion of anterolateral surface, 1 bristle each on one-third and two-thirds the distances from the basal end on posterodorsal surface and 1 bristle each on two-thirds the distance from the basal end on anteroventral and posteroventral surfaces; hind femur with a pair of rows of bristles along anterodorsal surface, several long bristles along anterior and posterior margins of ventral surface and 1 long bristle each on distal part of posterodorsal and posterolateral surfaces; hind tibia with a row of 3 long and several short bristles along middle portion of anteroventral surface, 2 bristles each on one-third and two-thirds the distances from the basal end on posterodorsal surface but without tuft of long hairs.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 3 lateral marginal bristles, fifth with a row of 18 marginal bristles; sternites first to fourth with long black hairs; fifth sternite v-shaped with 2 long bristles terminally and stout spines laterally on arms; inner forceps almost straight, bifurcated at end and with long hairs; outer forceps almost oval with long hairs; anterior paramere thick, without hairs but with a projection at apex; posterior paramere thin with 1 long hair basally; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus long, pointed at apex and with subbasal membranous processes; lateral plate of paraphallus long and pointed; styli of glans very long, longer than apical plate of paraphallus and whip-like; ventralia much sclerotised, elongated and with 3 lobes.

Female : Unknown.

Material examined : *Holotype* ♂, India : West Bengal; Midnapore (Arabari Forest), 26.xi. 1974, B. C. Nandi.

Discussion on species : This species is similar to *S. (Parkerimyia) nathani* Lopes and Kano, 1969 but differs from it by the structures of ventralia and lateral plate of paraphallus. Moreover, the longer whip-like styli of glans and colour of antennae in this species are very differ from *nathani*.

Biology : This is a relatively rare species which was collected from bushes in forest area.

Distribution : India ; WB (Arabari Forest).

Type deposited : *Holotype* ♂, ZSIC, examined.

119. *Sarcosolomonina (Parkerimyia) nathani* Lopes and Kano
(Figs. 703—707)

1969. *Sarcosolomonina (Parkerimyia) nathani* Lopes and Kano, *Pacif. Insects*, **11**(1) : 184; Lopes, Kano, Shinonaga and Kurahashi, 1977, *Cat. Dipt. Orient. Region*, **3** : 575; Nandi, 1990, *J. Beng. nat. Hist. Soc.*, **9**(1) : 24.

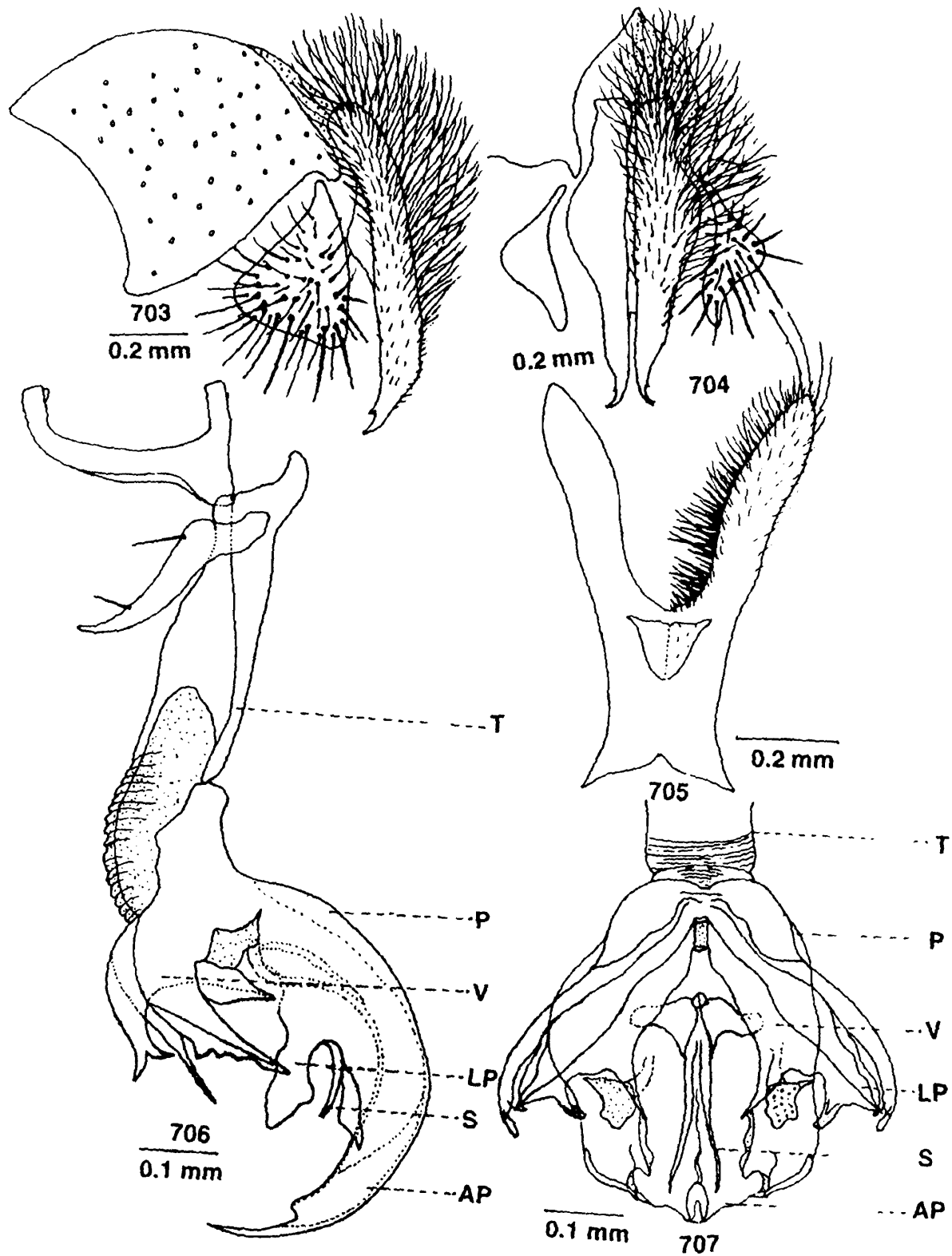
1984. *Sarcophaga nathani* : Sugiyama and Kano, *Jap. J. sanit. Zool.*, **35** (4) : 350.

Male : Body length 8–10 mm.

Head : Width of frons less than half of one eye; frontal vitta black, its width at narrowest point of frons about more than twice that of each parafrenal; parafrenal and parafacial black with silvery pollen, the former with short scattered black hairs, the latter with a row of 7—9 short hairs near the eye margin; antennae brownish and reaching up to about 0.85 distance to vibrissae, first segment black, second blackish with black hairs, third brownish, silvery pollen and about three times that of the second; arista long, plumose along more than basal half; facial ridge brownish with silvery pollen; vibrissae long, distance between vibrissae greater than one parafacial width; frontal bristles 11, posterior 3 reclinate, anterior 3 below base of antennae and reaching up to about the tip of second antennal segment, rest cruciate and directed forwards; gena black with golden pollen; post gena black, silvery pollen and with long hairs; outer vertical bristle ill-developed, inner vertical well developed, post vertical less than half of inner vertical; ocellar and postocellar bristles not so developed; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with greyish hairs; palpi slender and black; proboscis long and black.

Thorax : Greyish, silvery pollen and with three black longitudinal stripes; *ac* 5+1; *dc* 3+4; *ia* 1+3; *ps* 3; *h* 3; *ph* 2; *np* 3; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 7; *hpl* 10; upper part of propleura bare; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles blackish; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 8—9 short setae located dorsally and extending up to two-thirds from the basal node to r-m and 3—4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment greater than the third, the former with short spines along basal half of its anterior margin; costal spines not stout; epaulet black; basicostal scale yellowish; squama whitish; halter brown.



Figs. 703-707 : *Sarcosolomonina (Parkerimyia) nathani* Lopes and Kano. 703, Inner and outer forceps (lateral view); 704, Inner and outer forceps (posterior view); 705, Fifth sternite; 706, Penis (lateral view); 707, Penis (ventral view).

Legs : Black ; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 short bristles along basal one-third of anterodorsal surface, a row of 3 short bristles along basal one-third of posterodorsal surface, a row of 3–4 bristles along posterodorsal surface at about one-third the distance from the distal end and 1 bristle on posteroventral surface at about two-thirds the distance from the basal end; mid femur with a row of 3–4 short bristles along middle portion of anterodorsal surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of bristles along basal half and a row of short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with 1 bristle on anterodorsal surface at about two-thirds the distance from the basal end, 1 bristle on anteroventral surface at about two-fifths the distance from the basal end, a row of short bristles along posterodorsal surface at about three-fourths the distance from the basal end and 1 bristle on posteroventral surface at about two-thirds the distance from the basal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles each along anteroventral and posteroventral surfaces and 1 bristle each on distal part of posterodorsal, posterolateral and posteroventral surfaces ; hind tibia with a row of long and few short bristles along anteroventral surface, 1 bristle each on anteroventral surface at about one-third and two-thirds the distance from basal end and 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end.

Abdomen : Grey with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 1 lateral marginal bristles, fourth with a pair of median and 2 lateral marginal bristles, fifth with a row of 14 marginal bristles; sternites first to fourth with long hairs; fifth sternite Y-shaped with marginal bristles laterally and long hairs terminally on arms; first genital segment brownish but without marginal bristles, second blackish with long hairs; inner forceps elongated, almost straight, grooved at end and curved apically; outer forceps almost oval with short hairs and few spines ; anterior paramere slightly curved, blunt at end and with basal projection and few hairs posteriorly ; posterior paramere pointed at end with 2 hairs apart along anterior end ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus abruptly pointed with short pointed subapical process, a pair of subbasal membranous processes and another pair of small subapical lobes ; lateral plate of paraphallus long and partially membranous; styli of glans short and shorter than apical plate of paraphallus ; ventralia very much sclerotised, elongated and with a pair of trilobed arms, the median process long, slender and pointed.

Female : Unknown.

Material examined : 1 ♂, India : Madhya Pradesh ; Indore Nehru Park, 520 m, 15. x. 1990, B. C. Nandi ; 2 ♂♂, Khajuraho, 480 m, 20.x. 1990, B. C. Nandi ; 1 ♂, Tamil Nadu; Coonoor, 1, 700 m, 29. x. 1985, B. C. Nandi; 1 ♂, Uttar Pradesh ; Rishikesh, 335 m, 18. xii. 1986, B. C. Nandi ; 3 ♂♂, West Bengal; Birbhum Chandrapur Forest, 9. xi. 1974, B.C. Nandi.

Discussion on species : This species is similar to *S. (Parkerimyia) indica* Nandi, 1976 but differs from it by the detailed structures of ventralia, anterior paramere and apical plate of paraphallus. Moreover, the colour of antennae in this species differs from *indica*.

Biology : This species is a relatively rare species which was collected from bush-sweeping in forest area.

Distribution : India ; MP (Indore, Khajuraho), O (Balangir, Balugaon), TN (Gaudaluer, Coonoor, Nilgiri Hills), UP (Rishikesh) and WB (Chandrapur Forest).

Type deposited : *Holotype* ♂, IOC, not examined.

120. *Sarcosolomonina (Parkerimyia) andamanensis* Nandi

(Figs. 708—713)

1989. *Sarcosolomonina (Parkerimyia) andamanensis* Nandi, *J. Andaman Sci. Assoc.*, 5(2) : 118
Nandi, 1992, *Hexapoda*, 4(1) : 76.

Male : Body length 7–10 mm.

Head : Width of frons about two-fifths that of one eye; frontal vitta blackish, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial blackish with silvery pollen, the former with short scattered hairs, the latter with a row of few short hairs near the eye margin; antennae brownish-black and reaching up to about 0.90 distance to vibrissae, first and second segments black with black hairs, third brownish with silvery pollen and about three times that of the second; arista long, plumose along basal half; facial ridge brownish with silvery pollen; vibrissae long, distance between vibrissae greater than one parafacial width; frontal bristles 10–11, posterior 3 reclinate, anterior 3 below base of antennae and reaching up to about more than half of second antennal segment, rest cruciate and directed forwards; gena black with long hairs; post gena blackish with silvery pollen; ocellar triangle black with short black hairs ; outer vertical bristle weak, inner vertical well developed, post vertical half the length of inner vertical; ocellar bristles short, postocellar half the inner vertical ; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with brownish hairs; palpi slender and black; proboscis black.

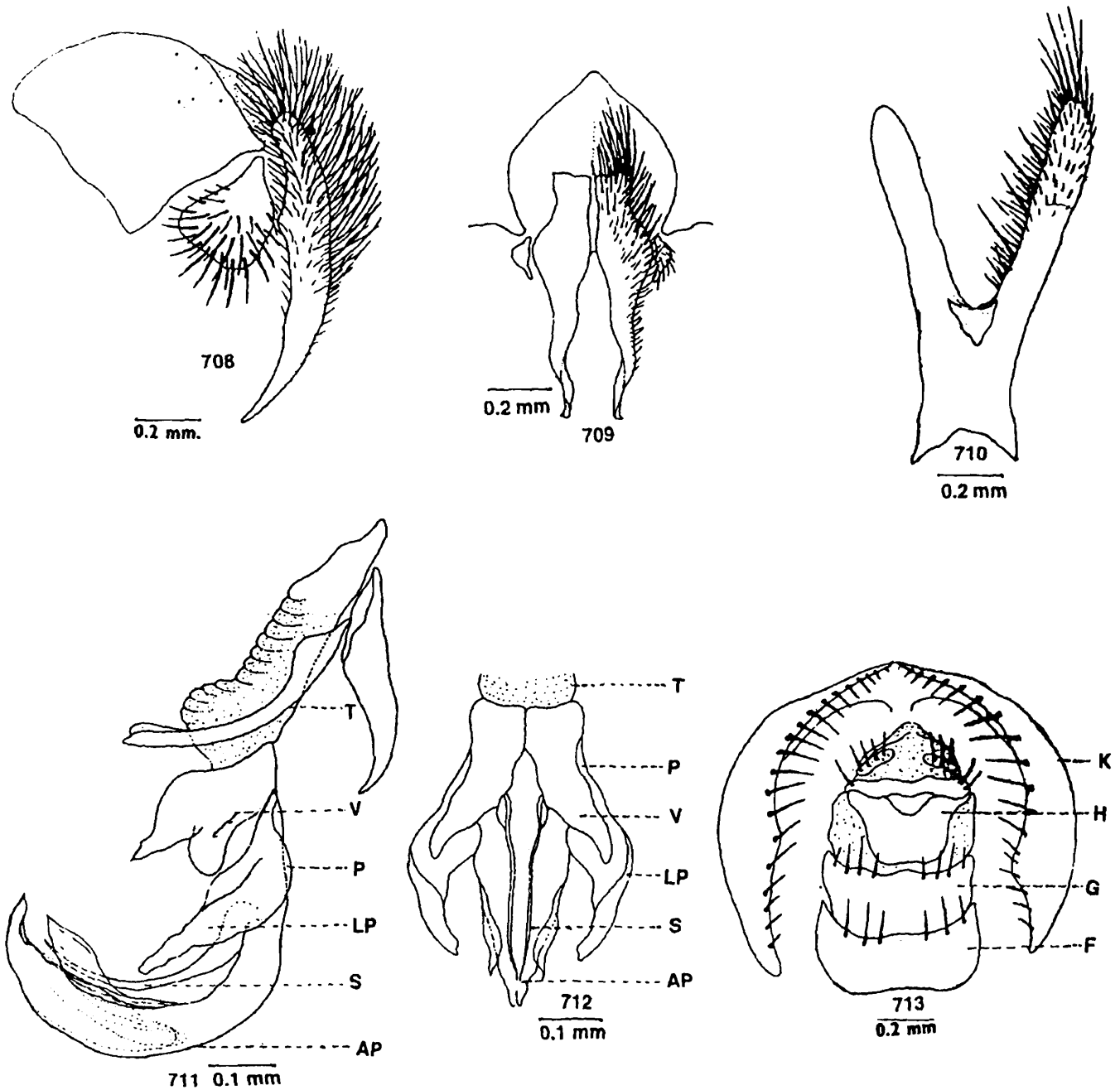
Thorax : Black with three black longitudinal stripes; *ac* 5+1; *dc* 4+4; *ia* 1+2; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 9; *hpl* 7; upper part of propleura bare,

blackish and with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro-and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of short setae located dorsally and extending up to about two-thirds the distance from the basal node to r-m and 4–5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than the third, the former with short spines along more than basal half of its anterior margin; costal spines not stout; epaulet blackish with short spines; basicostal scale yellowish; squama silvery white; halter brown.

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3–4 short bristles along basal half of anterodorsal surface, 2 bristles on posterodorsal surface on distal end and 1 bristle on posteroventral surface at about two-thirds the distance from the basal end; mid femur with 3 short bristles along middle portion of anterolateral surface, a row of short setae along distal half of anteroventral surface, a row of bristles along basal half and a row of short setae along distal half of posteroventral surface; mid tibia with 2 bristles along middle portion of anterodorsal surface, a row of bristles along anteroventral surface at about one-third the distance from the basal end, a row of bristles along posterodorsal surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles with long hairs along anteroventral surface and long hairs along posteroventral surface; hind tibia with a row of bristles along anterodorsal surface, 2 bristles apart along posteroventral surface at about one-third the distance from the distal end but with tuft of long hairs along ventral surface.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 4 lateral marginal bristles, fourth with a pair of median and 3 pairs of lateral marginal bristles, fifth with a row of 16 marginal bristles; sternites first to fourth with numerous bristles and hairs on terminal end; fifth sternite v-shaped with short spines laterally and long hairs terminally on arms; first genital segment dark-brown but without marginal bristles, second black with numerous long hairs at subapical end; inner forceps slightly curved medially; outer forceps almost oval with short hairs; outer anterior paramere elongated, slightly curved and blunt at end with slight projection terminally; posterior paramere almost straight, without hairs but pointed terminally; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus elongated gradually, pointed, curved and bearing notch at end and with long blunt lateral chitinous process; styli of glans well marked but without serration and reaching up to about subterminal end of apical plate of paraphallus; ventralia reduced to two small and one pointed lobes.



Figs. 708-713 : *Sarcosolomonina (Parkerimyia) andamanensis* Nandi. 708, Inner and outer forceps (lateral view); 709, Inner and outer forceps (posterior view); 710, Fifth sternite; 711, Penis (lateral view); 712, Penis (ventral view); 713, Genitalia ♀ (ventral view).

Female : Body length 7–9 mm.

Head : 8 proclinate frontal bristles; 2 postorbital bristles; outer vertical bristle well developed and greater than inner vertical.

Thorax : Wings and legs similar to that of male.

Abdomen : Sixth sternite almost cup-shaped with 6 marginal bristles, seventh with 8 marginal bristles, eighth membranous but with short hairs and grooved posteriorly; anal sternite with short bristles.

Material examined : *Holotype* ♂, India : South Andaman Islands; Siphighat Agricultural Farm area, 29. xii. 1988, B.C. Nandi; 2♂♂ *Paratypes*, same data as *Holotype*; several male specimens from Andaman Islands, 29.xii. 1988, B.C. Nandi.

Discussion on species : This species is similar to *S. (Parkerimyia) shresthai* Kano and Shinonaga, 1959 but differs from it by the structures of ventralia, apical and lateral plates of paraphallus. Moreover, the apical plate of paraphallus is with elongated lateral process in this species.

Biology : This species is sparsely available which was collected from bushes near gardening plants.

Distribution : India ; Kt (Kaimara) and AN (Mini Zoo, Netaji Nagar, Ramkrishnapur, Sabani Plantation area, Siphighat, Vivekanandapur).

Type deposited : *Holotype* ♂, ZSIC, studied.

121. *Sarcosolomonina (Parkerimyia) shresthai* Kano and Shinonaga
(Figs. 714—718)

1969. *Sarcosolomonina (Parkerimyia) shresthai* Kano and Shinonaga, *Pacif. Insects*, 11(2) : 194; Lopes, Kano, Shinonaga and Kurahashi, 1977, *Cat. Dipt. Orient. Region*, 3 : 575; Verves, 1986, *Cat. Palae. Dipt.*, 12 : 177.

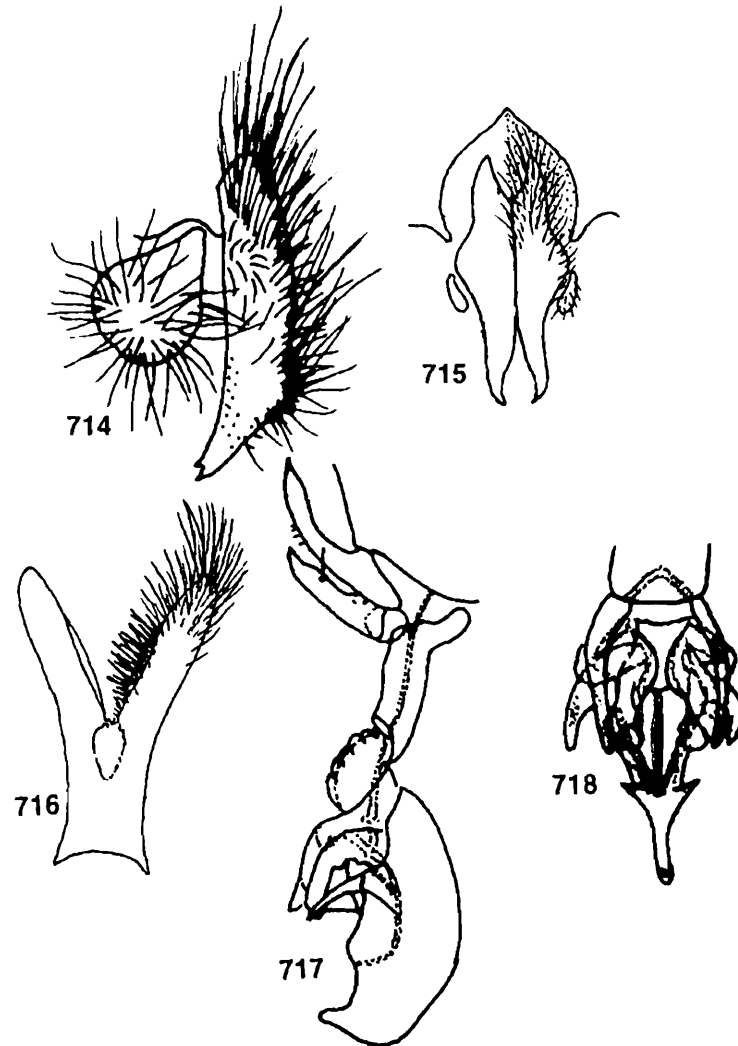
1994. *Sarcophaga shresthai* : Kano and Shinonaga, *Jap. J. sanit. Zool.*, 45 : 268.

Male : Body length 6–9 mm.

Head : Blackish; width of frons about two-thirds that of one eye; frontal vitta black, its width at narrowest point of frons slightly greater than each parafrenal; parafrenal and parafacial with golden to silvery pollen, the former with few short scattered hairs, the latter with a row of 8–9 short hairs near the eye margin; antennae dark brown and reaching up to about 0.85 distance to vibrissae. second segment whitish-black, third with silvery pollen and about twice that of the second; arista long, plumose along basal three-fifths; facial ridge with silvery pollen; vibrissae long, distance between vibrissae about one parafacial width; frontal bristles 10–11, posterior 1 or 2 reclinate, anterior 5 proclinate and reaching up to tip of second antennal segment, rest cruciate and directed forwards; gena black, silvery pollen and with

numerous black hairs and about one-third the height that of one eye; ocellar triangle black with short black hairs; ocellar bristles greater than postocellar; inner vertical bristle well developed, outer vertical ill-developed about one-fourth that of inner vertical, post vertical slightly longer than inner vertical; postocellar equal to post vertical; a pair of rows of black postocular setae, first row regular, second row irregular; metacephalon and posterior part of gena with numerous yellowish hairs; palpi slender and black; proboscis long and black.

Thorax : Silvery to golden pollen with three black longitudinal stripes; *ac* 4—5+1; *dc* 3 or 4; *ia* 0 or 1 (fine) +2 or 3; *h* 3; *ph* 2; *ps* 3; *np* 4; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 7; *hpl* 8; upper part of propleura bare; prosternum hairy; prostigmatic and propleural bristles well developed and accompanied with short hairs; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.



Figs. 714-718 : *Sarcosolomonina* (*Parkerimyia*) *shresthai* Kano and Shinonaga. 714, Inner and outer forceps (lateral view); 715, Inner and outer forceps (posterior view); 716, Fifth sternite; 717, Penis (lateral view); 718, Penis (ventral view); (after Kano and Shinonaga, 1969).

Wings : Hyaline : R_1 bare; R_{4+5} with a row of about 10 short setae located dorsally and extending up to more than one and half times from the basal node to r-m and 3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment more than the third, the former with short spines along about basal half of its anterior margin; basicostal scale light brown; epaulet black; squama creamy white; halter brown.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of long bristles along posterior margin of ventral surface; fore tibia with 2 or 3 short bristles on basal part of anterodorsal surface and 1 bristle on distal one-third of posterolateral surface; mid femur with a row of 4–5 short bristles along middle portion of anterolateral surface, a row of short setae along distal one-third of anterior and posterior margins of ventral surface, 3 bristles on basal half of anteroventral surface, a row of bristles along basal half of posteroventral surface and 2 bristles on distal part of posterolateral surface ; mid tibia with 2 bristles on middle portion of anterodorsal surface, 1 bristle each on distal one-third and two-thirds of posterolateral surface and 1 bristle each on distal one-third of anteroventral and posteroventral surfaces; hind femur with a pair of rows of bristles along anterodorsal surface (first row with long and second row with short bristles), several long bristles along anterior and posterior margins of ventral surface, 1 bristle each on distal part of posterodorsal and posterolateral surfaces and moderate long hairs along ventral surface; hind tibia with a row of 2 long and several short bristles along anterodorsal surface, 2 bristles apart of posterodorsal surface and 2 bristles on anteroventral surface on distal one-third but without tuft of long hairs.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 4 and third with 3 lateral marginal bristles, fourth with a pair of median and 4 lateral marginal bristles; fifth with a row of 22 marginal bristles; second to fourth sternites with numerous short hairs but without bristles and long hairs; fifth sternite v-shaped with short window and 3 or 4 long and many short bristles on lateral sides of arms; first genital segment black with greyish pollen but without marginal bristles, second shiny black but both with numerous hairs; inner forceps almost straight, slightly curved at end and with groove at the terminal end; outer forceps almost oval with many hairs; anterior paramere curved with few short hairs on outer surface; posterior paramere with 1 long hair terminally; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus long, massive, gradually pointed and curved apically; lateral plate of paraphallus with ill-developed pointed process; styli of glans not marked; ventralia trilobed and all the processes almost equal.

Female : Unknown.

Material examined : 1 ♂, Nepal : Khare; Syauli Bazar, 1, 745 m, 29. vii. 1990, S. Shinonaga (det. by R. Kano as *Sarcophaga shresthai* = *Sarcosolomonina shresthai*;

dep. in NSMT); 1♂, Pakistan : Mohasharif; 50 km South of Dir., 12. viii. 1987, H. Kurahashi (det. by E. Sugiyama as *Sarcophaga shresthai*; dep. in NSMT).

Discussion on species : This is similar to *S. (Parkerimyia) nathani* Lopes and Kano, 1969 but differs from it by the structures of apical plate of paraphallus and ventralia. This species is also distinguished from *andamanensis* by the structures of apical plate of paraphallus and inner forceps.

Biology : This species was collected from bushes and stones along a mountain stream. It might be attracted to animal carcasses and human faeces.

Distribution : Ne (several localities) and Pa (several localities).

Type deposited : Holotype ♂, TMDU, not studied.

122. *Sarcosolomonina (Parkerimyia) crinita* (Parker)

(Figs. 719—723)

1917. *Sarcophaga crinita* Parker, *Proc. U. S. natn. Mus.*, **54** : 92; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, **45** : 268.

1923. *Sarcophaga synia* Johnston and Hardy, *Proc. Linn. Soc. N.S.W.*, **48** (2) : 127.

1931. *Sarcophaga kankauensis* Baranov, *Konowia*, (2) **10** : 113.

1959. *Bezziola kankauensis* : Lopes, *Studia Ent.*, **2** (1) : 44.

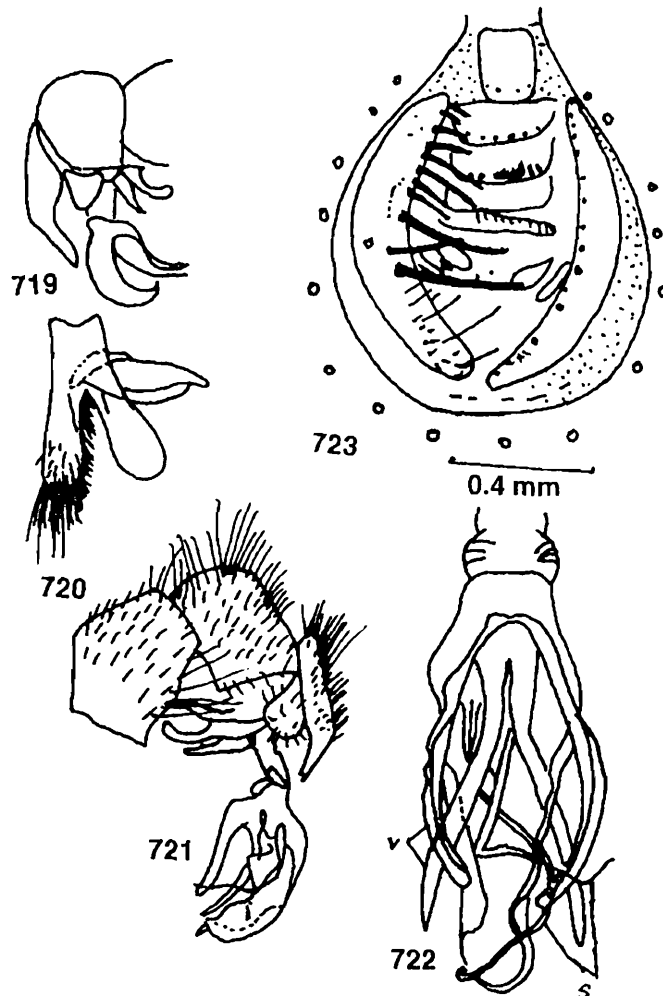
1967. *Bezziola crinita* : Lopes, *Ent. Meddr.* **35** : 151.

1977. *Sarcosolomonina (Parkerimyia) crinita* : Nandi, 1976, *Orient. Insects*, **10**(1) : 12; Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 575; Lopes, 1989, *Cat. Dipt. Aust. and Oceanian Regions*, **86** : 730.

Male : Body length 9–10 mm.

Head : Width of frons half that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs and the latter with a row of short hairs near the eye margin; antennae dark grey and reaching up to about 0.9 distance to vibrissae; first segment black, second dark, third grey and about three times that of the second; arista long, plumose along basal half or slightly more; facial ridge black, silvery pollen and with short spines along basal half; vibrissae long, distance between vibrissae about half that of one parafacial width; frontal bristles 10–11, posterior 2 reclinate, anterior 3 or 4 below base of antennae and reaching up to about two-thirds of second antennal segment, rest cruciate and directed forwards; gena black with black hairs; post gena black with white scattered hairs; outer vertical bristle absent, inner vertical well developed, post vertical shorter than inner vertical; ocellar and postocellar bristles short; a row of regular postocular setae besides postocular cilia, rest of the area with silvery white hairs; palpi dark; proboscis blackish.

Thorax : Grey, silvery pollen and with three black longitudinal stripes; *ac* 6+1; *dc* 3+4; *ia* 1+3; *ps* 3; *h* 3; *ph* 2; *np* 3; *pa* 2; *sa* 2; *st* 1+1+1; *mpl* 5; *hpl* 8-9; upper part of propleura bare; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles well developed, 1 pair each; lateroscutellar bristles 2 pairs.



Figs. 719-723 : *Sarcosolomonina (Parkerimyia) crinita* (Parker). 719, Penis with anterior and posterior parameres and outer and inner forceps (lateral view); (after Parker, 1917); 720, Fifth sternite; 721, Penis with anterior and posterior parameres and inner and outer forceps (lateral view); 722, Penis (ventral view); 723, Genitalia ♀ (ventral view); (after Lopes, 1967).

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of short setae located dorsally and extending up to about two-thirds from the basal node to r-m and 4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal or slightly shorter than the third, the former with short spines along basal half of its anterior margin; costal spines very short; epaulet black; basicostal scale light brown; squama white; halter brown.

Legs : Black; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of bristles along basal one-third of anterodorsal surface, a row of 3–4 short bristles along posterodorsal surface at about one-third the distance from the basal end and 1 bristle on posterolateral surface at about one-third the distance from the distal end; mid femur with a row of 3–4 bristles along middle portion of anterodorsal surface, a row of bristles each along basal half of anterodorsal and anteroventral surfaces and a row of bristles along distal half of anteroventral surface; mid tibia with 1 bristle on anterodorsal surface at about three-fifths the distance from the basal end, 1 bristle on anteroventral surface at about two-thirds the distance from the basal end, 1 bristle on posteroventral surface at about two-fifths the distance from basal end, a row of short setae along posterodorsal surface at about one-third the distance on distal end and 2 bristles on posterodorsal surface on distal end; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles each along anteroventral and posteroventral surfaces and 1 bristle each on distal part of posterodorsal, posteroventral and posterolateral surfaces; hind tibia with a row of bristles along anteroventral surface, 1 bristle each on anteroventral surface at about one-third and two-thirds the distances from the basal end and 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end.

Abdomen : Grey with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent, but second with 1 and third with 3 lateral marginal bristles, fourth with 2 median and 3 lateral marginal bristles, fifth with a row of 16 marginal bristles; first and second sternites with long black hairs, third and fourth with small and some long hairs on the margin, fifth with a row of 16 marginal bristles; fifth sternite v-shaped with marginal bristles laterally and long hairs terminally on arms; genital segments brownish-black but without median marginal bristles, second with long and dense hairs; inner forceps long with bifid at apex; outer forceps almost oval with long hairs; anterior paramere slightly curved and expanded at the base; posterior paramere short but elongated; theca very short, shorter than paraphallus, both are sclerotised; apical plate of paraphallus membranous with small lobes; styli of glans very long, slender and surpassing the apical plate of paraphallus; ventralia with two long and a slender pair of apophyses.

Female : Body length 8–9 mm.

Head : Frons at narrowest part slightly greater than half that of one eye width; frontal vitta equal or slightly wider than each parafrontal.

Legs : Bristles on hind femur few and weak.

Abdomen : Oval with reclinate bristles; genital segments black or blackish with more or less greyish pollen.

Material examined : 1 ♂, Nepal: Hetauda, 24. vii 1990, S. Shinonaga (dep. in NSMT).

Discussion on species : Lopes (1959) synonymized this species with *Bezziola kankauensis* (Baranov, 1931) and remarked that for certainty the *Holotype* must be examined. Later on, Lopes, Kano and Shinonaga (1977) also synonymized it with *kankauensis*. This species is similar to *S. (Parkerimyia) indica* Nandi but differs from it by the structures of lateral plate of paraphallus and styli of glans. Moreover, the apical plate of paraphallus is not so much pointed here.

Biology : Nothing is known regarding its biology.

Distribution : India ; WB (Baruipur); Ne (Chitwan Natinal Park, Kathmandu, Hetauda) ; Australia; Admiralty Islands; China; Indonesia; Malaysia ; New Britain; Papua New Guinea; Phillipines; Solomon Island ; Taiwan and Thailand.

Type deposited : *Holotype* ♂, USNM, not examined.

Genus 37. *Sinonipponia* Rohdendorf, 1965

1965. *Sinonipponia* Rohdendorf, *Ént. Obozr.*, **44**(3) : 690.

Type species : *Sarcophaaga hervebazini* Séguy, 1934.

Morphology : Presutural acrostichal bristles not differentiated; postsutural dorsocentral bristles 4, sometimes 3 and stout; propleura usually bare, rarely with few hairs; median marginal bristles on third abdominal tergite absent; hind tibia with several long hairs along posterior margin of ventral surface; first and second abdominal sternites with numerous long hairs; anterior paramere slender but without branch; inner forceps almost straight and sharply notched at end; theca shorter; paraphallus large with a pair of very large membranous lateral lobes which are pointed or widened apically; lateral process of apical plate of paraphallus generally with a pair of small reclinate spines at the terminal end.

Discussion : This is a comparatively little known genus and Lopes *et al.* (1977) reported 4 species under this genus from the Oriental region. Nandi (1977a, 1988, 1989b) described 3 new species from India. A total of 5 species are now known from this area. Only 2 valid species in the Palaeartic region and 1 species in the Australasian and Oceanian regions are present.

Biology : Most of the species occur on bushes and in grasses. Some of the species breed in dead fish, birds and mammals.

Distribution : This genus is distributed in the Oriental, Palaeartic and Australasian and Oceanian regions.

Key to male species

1. Apical plate of paraphallus with backward projections; ventralia chitinous and hook-shaped4
 Apical plate of paraphallus without backward projections; ventralia membranous, almost flat and elongated in shape2
2. Lateral plate of paraphallus elongated and rod-shaped.....*smarti* Nandi
 Lateral plate of paraphallus wide at end and curved sharply3
3. Ventralia widened medially; posterior paramere almost straight
 *baruai* (Sugiyama)
 Ventralia widened medially; posterior paramere curved.....*papaii* Nandi
4. Ventralia elongated and pointed at end; styli of glans longer.....
 *bengalensis* Nandi
 Ventralia widened apically and bifurcated at end; styli of glans shorter.....
 *concreata* (Séguy)

123. *Sinonipponia smarti* Nandi

(Figs. 724—728)

1989. *Sinonipponia smarti* Nandi, *Mems Inst. Oswaldo Cruz*, **84** (4) : 398.

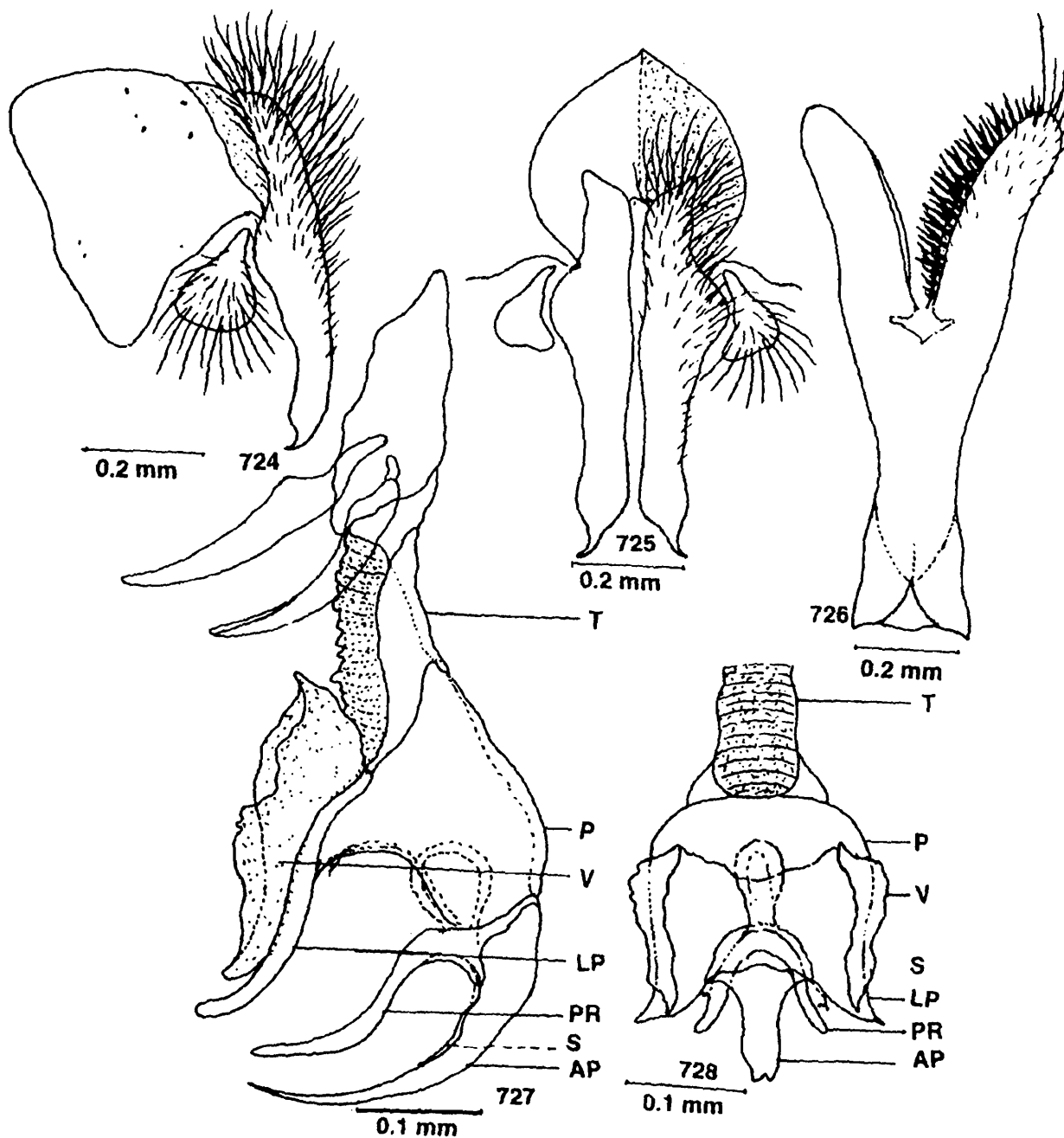
Male : Body length about 5–7 mm.

Head : Width of frons about half that of one eye; frontal vitta brown, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial brown with silvery pollen, the former with short scattered hairs, the latter with a row of 4—6 short hairs near the eye margin; antennae brownish and reaching up to about 0.85 distance to vibrissae, first and second segments brownish-black with short black hairs, third light brown with silvery pollen and about two and half times that of the second; arista long, plumose along basal three-fifths; facial ridge brownish, silvery pollen and with short black hairs; vibrissae long, distance between vibrissae about twice that of one parafacial width; frontal bristles 8–9, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena blackish with black hairs; post gena black with greyish hairs; ocellar triangle brownish with short hairs; outer vertical bristle moderately long, inner vertical well developed, post vertical short about one-third the inner vertical; ocellar bristles short, postocellar half the inner vertical; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with white and brown hairs; palpi slender and black; proboscis blackish.

Thorax : Brownish-black with three black longitudinal stripes; *ac* 2+3; *dc* 3+4; *ia* 1+2; *ps* 1; *h* 3; *ph* 2; *np* 3; *pa* 2; *sa* 2; *st* 1+1+1; *mpl* 4–5; *hpl* 7–8; upper part of propleura bare, blackish-brown with silvery pollen; prostigmatic and propleural bristles

well developed and accompanied with few short hairs; pro- and mesothoracic spiracles brownish; apicoscutellar and discoscutellar bristles well developed, 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 8–9 short setae located dorsally and extending up to about four-fifths from the basal node to r-m and 3–4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal



Figs. 724-728 : *Sinonipponia smarti* Nandi. 724, Inner and outer forceps (lateral view); 725, Inner and outer forceps (posterior view); 726, Fifth sternite; 727, Penis (lateral view); 728, Penis (ventral view).

to the third, the former with short spines along basal four-fifths of its anterior margin; costal spines not so stout; epaulet brownish with spines; basicostal scale yellowish; squama white; halter brown.

Legs : Black; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3–4 short bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of 4–5 bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral and posterolateral surfaces and 1 bristle each on posterodorsal and posterolateral surfaces at about one-fifth the distance from the distal end; mid tibia with 2 bristles on middle portion of anterodorsal surface, 1 bristle on posterodorsal surface at about one-third the distance from the distal end and 2 bristles on middle portion of posteroventral surface; hind femur with a pair of rows of bristles along anterodorsal surface and a row of bristles along posteroventral surface; hind tibia with 1 bristle each on posterodorsal surface at about one-fifth and two-fifths the distances from the distal end, a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about two-thirds the distance from the basal end and 1 bristle on posterolateral surface medially.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 3 lateral marginal bristles, fourth with 2 median and 3 lateral marginal bristles, fifth with a row of 16 marginal bristles; sternites first to third with long hairs, fourth with short hairs; fifth sternite Y-shaped with long spines laterally and 3–4 long hairs terminally on arms; first and second genital segments brownish but without marginal bristles; inner forceps elongated with slight notch apically but curved at end; outer forceps almost oval with long hairs; anterior paramere longer than posterior paramere and almost straight at end; posterior paramere elongated and slightly curved at end; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus curved, gradually pointed at end and with one anteriorly long curved process but without backward projection; lateral plate of paraphallus elongated and rod-like; styli of glans feeble; ventralia membranous, elongated, flat, wide medially and slightly pointed at posterior end.

Female : Unknown.

Material examined : *Holotype* ♂, India : Tripura; Sipahijala, 23. vi. 1989, B. C. Nandi; *Paratype* ♂, Paratia Forest, 25. vi. 1989, B. C. Nandi.

Discussion on species : This species is similar to *S. papaii* Nandi, 1988 but differs from it by the structures of lateral plate of paraphallus and ventralia. Moreover, the parameres are mostly curved in *papaii*. This species is also distinguished from *S.*

baruai by the structures of ventralia and lateral plate of paraphallus. *S. papaii*, *S. baruai* and *S. smarti* may be placed in separate group due to their peculiar shapes of lateral and apical plates of paraphallus and ventralia.

Biology : This species is not abundant which was collected from bushes and herbs of a forest area.

Distribution : India ; T (Paratia Forest, Sipahijala).

Type deposited : *Holotype* ♂, ZSIC, examined.

124. *Sinonipponia baruai* (Sugiyama)

(Figs. 729—732)

1988. *Sarcophaga baruai* Sugiyama *et al.*, *Jap. J. sanit. Zool.*, **39** (4) : 357.

1996. *Sinonipponia baruai* : Nandi, n. comb.

Male : Body length 4.8–6.0 mm.

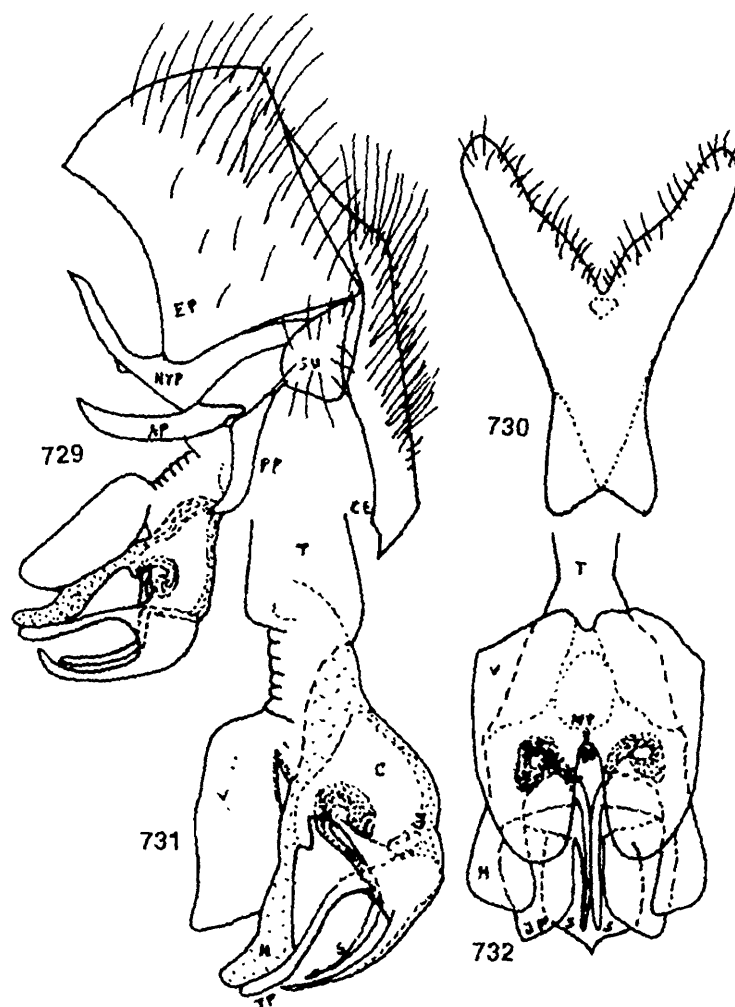
Head : Width of frons at narrowest point of frons is slightly greater than half of one eye; frontal vitta black, its width at narrowest point of frons greater than each parafrontal; parafrontal and parafacial with silvery pollen, the latter with 2-3 short hairs near the eye margin; antennae blackish-brown, reaching up to 0.85 distance to vibrissae, third segment 2.0–2.1 times that of the second; arista long, brown and feathered along basal two-thirds, vibrissae inserted at vibrissal angle; frontal bristles 6–7, upper 1 reclinate, lower 2 divergent below; inner vertical bristle well developed, outer vertical not traceable, post vertical short and half of inner vertical; ocellar and postocellar bristles very short; gena with only black hairs; metacephalon and occiput with white hairs; three rows of black postocular setae; palpi slender and its apex light brown; proboscis black.

Thorax : Greyish pollen with three black longitudinal stripes; *ac* 0+1; *dc* 4+4—5 (posterior 2 postsutural *dc* strong); *ia* 1+2; *pa* 2; *ps* 1; *h* 3; *ph* 2; *np* 4 (2 weak); *sa* 3; *st* 1+1+1; *mpl* 6; *hpl* 6; propleura with a few black hairs in case of three specimens and bare in case of two specimens; prostigmatic and propleural bristles well developed; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline; R_1 bare; R_{4+5} with a row of 9–12 setae located dorsally and extending up to more than half from the basal node to r-m and 2 short setae on ventral surface of basal node of R_{4+5} ; fifth costal segment slightly greater than the third, the former with short spines throughout its length; epaulet black; basicostal scale yellowish white; squama creamy white; halter brown.

Legs : Black; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 2–3 bristles along anterodorsal surface and 1 bristle each of posterolateral and anteroventral surfaces; mid femur with a row of 3 bristles along middle portion on

anterodorsal surface, few bristles along basal half of anteroventral surface and 2 bristles on distal half of posterodorsal surface; mid tibia with 2 bristles on anterodorsal surface and a row of 2-3 bristles along posterodorsal surface, 1 bristle each on posterolateral and ventral surfaces; hind femur with a row of bristles along anterodorsal surface, a row of bristles along anteroventral surface and 3 bristles along distal part of posterodorsal surface; hind tibia with a row of 4-5 bristles along anterodorsal surface, 1-2 bristles along anteroventral surface and a row of 2-3 bristles along posterodorsal surface.



Figs. 729-732 : *Sinonipponia baruai* (Sugiyama). 729, Penis with anterior and posterior parameres and inner and outer forceps (lateral view); 730, Fifth sternite; 731, Penis (lateral view); 732, Penis (ventral view); (after Sugiyama, 1988).

Abdomen : Black with silvery checkered pattern; median marginal bristles on third abdominal tergite absent; first to fourth sternites without long hairs; fifth sternite Y-shaped with many spines laterally on arms; first and second genital segments shiny black; apex of inner forceps pointed; anterior and posterior parameres

almost straight ; theca shorter than paraphallus; apical plate of paraphallus separated, curved apically and with long and spoon-like process; lateral plate of paraphallus large, wide at end, spoon-like and curved sharply ; styli of glans elongated and slightly serrated anteriorly ; ventralia large, uniformly wide and membranous.

Female : Unknown.

Material examined : *Paratype* ♂, Nepal : Nipane; 50 km. West of Kathmandu, 1,000 m, 21.viii. 1987, H. Kurahashi.

Discussion on species : This species is similar to *S. papaii* Nandi, 1988 but differs from it by the structures of ventralia and process of apical plate of paraphallus. Moreover, the structure of inner forceps in this species differs slightly from *papaii*. This species may be distinguished from *S. smarti* Nandi, 1989 by the shape of ventralia and lateral plate of paraphallus.

Biology : Nothing is known regarding the biology of this species.

Distribution : Ne (Nipane, Narayani).

Type deposited : *Holotype* ♂, NSMT, not studied.

125. *Sinonipponia papaii* Nandi

(Figs. 733—736)

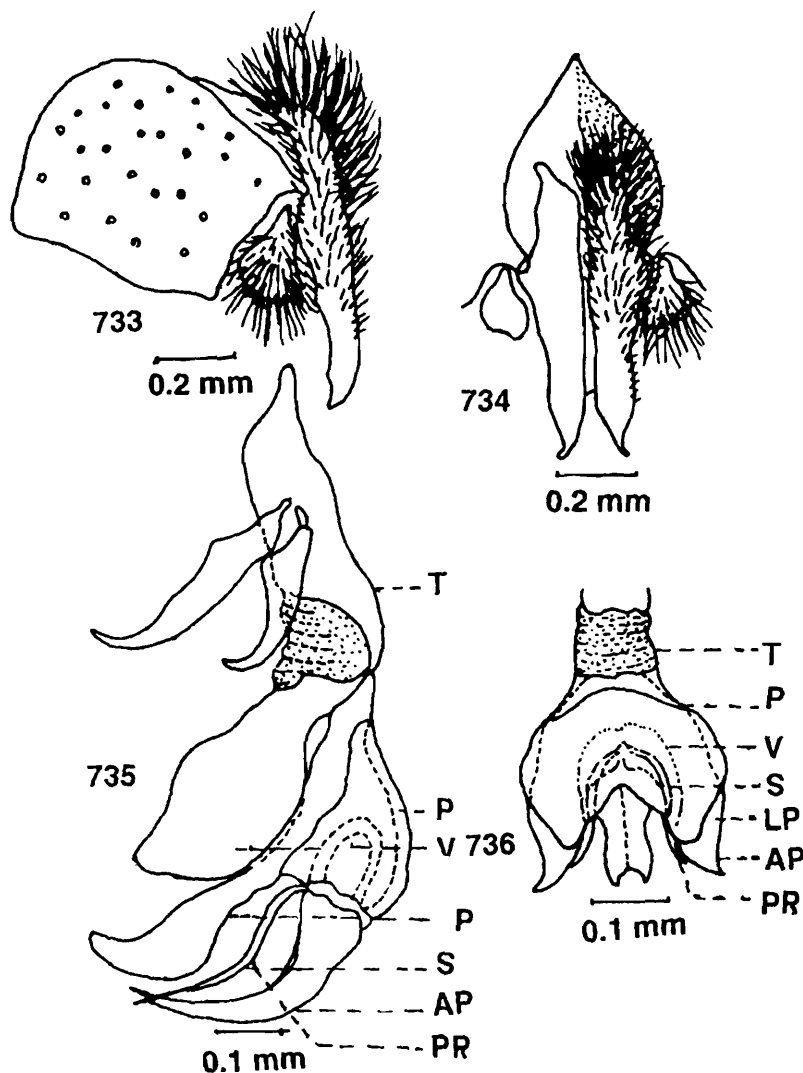
1988. *Sinonipponia papaii* Nandi, *J. Beng. nat. Hist. Soc.*, 7 (2) : 16.

Male : Body length 6.5 mm.

Head : Width of frons about half that of one eye; frontal vitta brown, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial blackish with silvery pollen, the former with short scattered hairs, the latter with a row of 4 short black hairs near the eye margin; antennae black and reaching up to about 0.85 distance to vibrissae, first and second segments brownish-black with short black hairs, third brownish with numerous silvery pollen and about two and half times that of the second; arista long, plumose along basal three-fifths; facial ridge brownish, silvery pollen and with short black hairs; vibrissae long, distance between vibrissae twice that of one parafacial width; frontal bristles 8, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena blackish with long black hairs; post gena black with greyish hairs; ocellar triangle brownish with short hairs; outer vertical bristle long, inner vertical well developed, post vertical short about one-third the inner vertical; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with white and brown hairs; palpi slender and black; proboscis blackish.

Thorax : Brownish-black with three black longitudinal stripes; *ac* 2+3; *dc* 3+4; *ia* 1+2; *ps* 1; *h* 3; *ph* 2; *np* 3; *pa* 2; *sa* 2; *st* 1+1+1; *mpl* 4; *hpl* 6; upper part of propleura

bare, black with and silvery pollen; prostigmatic and propleural bristles well developed and accompanied with few short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.



Figs. 733-736 : *Sinonipponia papaii* Nandi. 733, Inner and outer forceps (lateral view); 734, Inner and outer forceps (posterior view); 735, Penis (lateral view); 736, Penis (ventral view).

Wings : Hyaline with brown venis; R_1 bare; R_{4+5} with a row of 8 short setae located dorsally and extending up to about four-fifths from the basal node to r-m and 2-3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment greater than the third, the former with short spines along basal four-fifths of its anterior margin; costal spines not so stout; epaulet black with short spines; basicostal scale yellowish; squama white; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of short bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces at about one-fifth the distance from the distal end; mid tibia with 2 short bristles along middle portion of anterolateral surface, a row of short bristles along posterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end and 1 bristle on middle portion of posteroventral surface; hind femur with 2 rows of bristles along anterodorsal surface, few bristles along anteroventral surface and a row of bristles along posteroventral surface; hind tibia with 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end, 1 bristle on anterodorsal surface at about one-fifth the distance from the distal end and with tuft of hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 4 and third with 3 lateral marginal bristles, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of 16 marginal bristles; sternites first to third with long hairs, fourth with short hairs; first and second genital segments brownish-black but without marginal bristles ; inner forceps elongated and slightly curved at end; outer forceps slightly elongated with hairs; anterior paramere longer than the posterior paramere and slightly curved at end, posterior paramere deeply curved but without hairs; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus curved at end, pointed terminally and with one anteriorly long and pointed process but without backward projection; lateral plate of paraphallus membranous, wide at end, slightly blunt and curved sharply; styli of glans feeble; ventralia membranous, well developed and widened medially.

Female : Unknown.

Material examined : *Holotype* ♂, Bangladesh; Baraiyadhala Forest Res., 60 m, 21. ix. 1962, E.S. Ross and D.O. Cavangare.

Discussion on species : This species is similar to *S. smarti* Nandi, 1989 but differs from it by the structures of ventralia and parameres. Moreover, the lateral plate of paraphallus is quite distinguishable in this species. This species is also similar to *S. baruai* (Sugiyama, 1988) but may be distinguished from it by the detailed structures of ventralia and anterior paramere.

Biology : This is rare species which was collected from bushes in a forest area.

Distribution : BD (Baraiyadhala Forest).

Type deposited : *Holotype* ♂, ZSIC, studied.

126. *Sinonipponia bengalensis* Nandi

(Figs. 737—741)

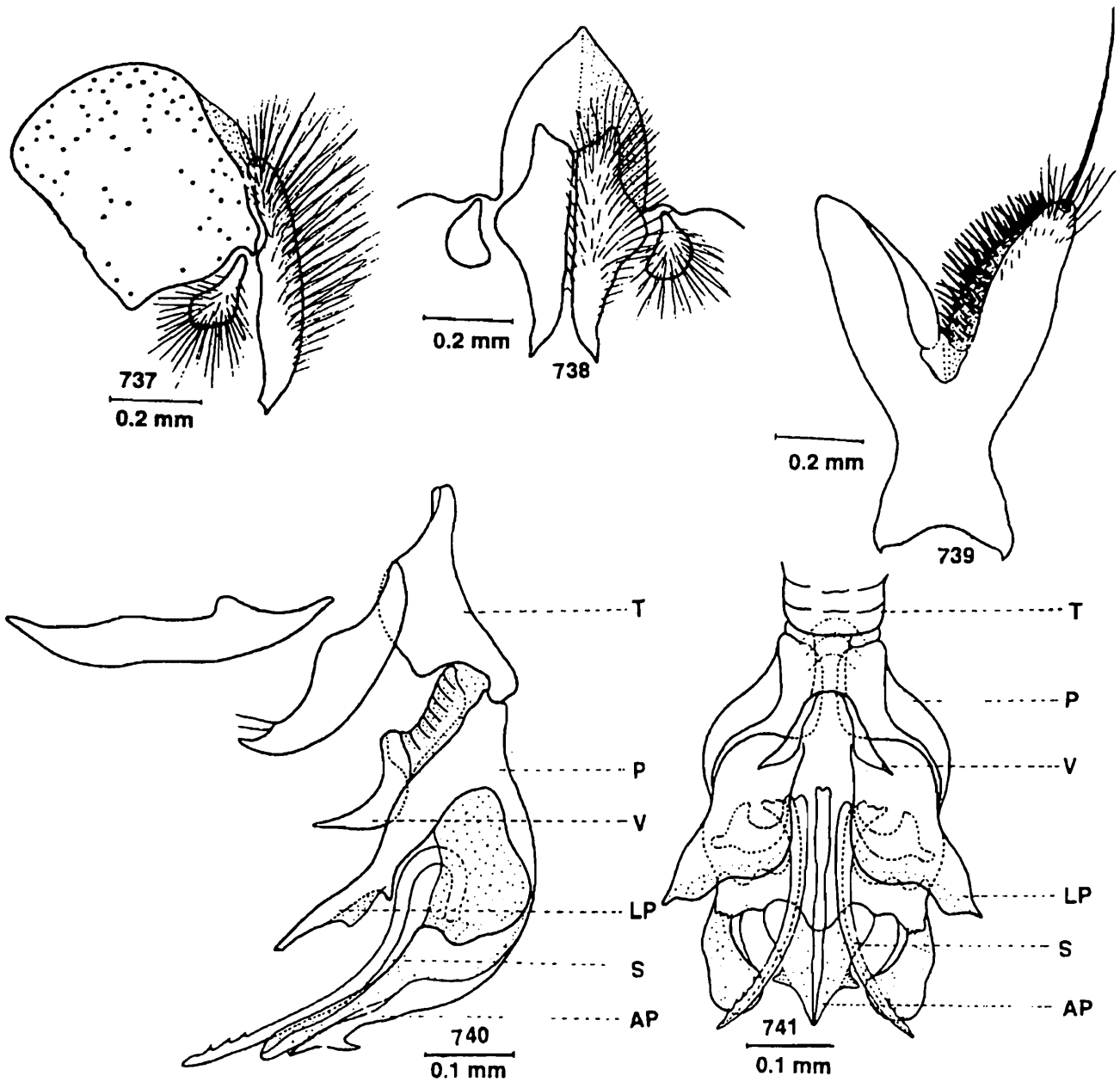
1977. *Sinonipponia bengalensis* Nandi, *Revta bras. Biol.*, **37** (1) : 79; Nandi and Ray, 1982, *Rec. zool. Surv. India*, **80** : 124.

Male : Body length 6–9 mm.

Head : Width of frons about two-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with silvery pollen, the former with short scattered black hairs, the latter with a row of black hairs near the eye margin; antennae black and reaching up to about 0.85 distance to vibrissae, first and second segments black with short black hairs, tip of the second brownish-black with long bristles, third blackish-brown, silvery pollen and about two and half times that of the second; arista long, plumose along basal half; facial ridge blackish-brown with spines; vibrissae long, distance between vibrissae less than twice that of one parafacial width; frontal bristles 10, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about two-thirds of second antennal segment, rest cruciate and directed forwards; gena black with short black hairs; post gena black with long greyish hairs; ocellar triangle black with short hairs; outer vertical bristle not differentiated, inner vertical well developed, post vertical about one-third the inner vertical; ocellar and postocellar short, the latter about one-third the inner vertical; a pair of rows of postocular setae besides postocular cilia, rest of the area with irregular whitish hairs; palpi slender and black; proboscis blackish-brown and moderately developed.

Thorax : Blackish with three black longitudinal stripes; *ac* 0+1; *dc* 5+4 (posterior 2 *dc* very stout); *ia* 1+3; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 4; *st* 1+1+1; *mpl* 6; *hpl* 8–9; upper part of propleura bare and black; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles short, 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 8–10 short setae located dorsally and extending up to more than two-thirds from the basal node to r-m and 3–4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment almost equal to third, the former with short spines along basal two-thirds of its anterior margin; costal spines stout; epaulet black; basicostal scale yellowish; squama whitish; halter brown.



Figs. 737-741 : *Sinonipponia bengalensis* Nandi. 737, Inner and outer forceps (lateral view); 738, Inner and outer forceps (posterior view); 739, Fifth sternite; 740, Penis (lateral view); 741, Penis (ventral view).

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of 3–4 bristles along basal half of anteroventral surface, a row of about 6 long bristles along basal half and a row of short setae along distal half of posteroventral surface, 1 bristle on posterodorsal surface and 2 bristles on anterodorsal surface on distal end; mid tibia with 2 long and a row of short bristles along posterodorsal surface, 1 bristle each on anteroventral and posteroventral surfaces at about one-third the distance from the distal end; hind femur with a pair of rows of short bristles along anterodorsal surface, 3 long and a row of bristles along anterodorsal surface, 3 long and a row of short bristles along anteroventral surface, 2 bristles on distal part of posterodorsal surface; hind tibia with a row of few short and 2 long bristles along anterodorsal surface, 1 bristle on posterodorsal surface medially, 1 bristle on anteroventral surface at about one-fourth the distance from the distal end and a row of long hairs along anterior and posterior margins of ventral surface on distal half.

Abdomen : Black with silvery grey checkered pattern; median marginal bristles on second abdominal tergite absent but with 2 lateral marginal bristles, third with a pair of weak median and 1 lateral marginal bristles, fourth with a pair of strong median and 3 lateral marginal bristles, fifth with a row of about 18 marginal bristles; sternites first to third with long hairs, fourth with short hairs; fifth sternite Y-shaped with short spines laterally and 1 long and several short hairs terminally on arms; first genital segment brownish-black with long hairs but without marginal bristles, second black with long hairs; inner forceps almost straight, slightly curved and with notch at end; outer forceps dumb-bell shaped with hairs on distal end; anterior paramere slender, almost straight but not so pointed apically; posterior paramere curved, pointed at end and with 2 short hairs on anterior margin; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus pointed at end with backward projection, its lateral process membranous which crosses the apical end of paraphallus; lateral plate of paraphallus almost pointed, sclerotised and with basal membranous outgrowth; styli of glans long and cross the apical part of paraphallus which is serrated anteriorly; ventralia black, pointed, hook-like and curved anteriorly.

Female : Unknown.

Material examined : *Holotype* ♂, India : West Bengal; Bankura (Panchubaga), 22. xi. 1974, B.C. Nandi; *Paratypes* 3 ♂♂, same data as *Holotype*; 1 ♂, Midnapore; Arabari Forest, 26. xii. 1974, B.C. Nandi; 3 ♂♂, 24-Parganas; Diamond Harbour, 25.iii. 1975, B. C. Nandi; 1 ♂, Assam; Jorhat College Campus, 21.i. 1978, B.C. Nandi.

Discussion on species : This species is similar to *S. concreata* (Séguy, 1934) but differs from it by the detailed structure of ventralia and shortness of styli of glans. This species may be distinguished from *Sarcophaga hainanensis* (Ho, 1936) by the colour of antennae, possession of white pollen on sides of thorax and by the chaetotaxy of fore femur, mid and hind tibia. The author studied the *Paratype* of *S. hainanensis* which is in good condition in the Natural History Museum, London and observed that the antennae greyish, second segment slightly black and its tips slightly reddish. Moreover, styli of glans is short here and not crosses the apical plate of paraphallus and lateral plate of paraphallus with lateral projections.

Biology : This species was collected from bushes.

Distribution : India ; A (Jorhat), O (Balugan, Hatisalpara) and WB (Arabari Forest, Diamond Harbour ; Panchubaga).

Type deposited : *Holotype* ♂, ZSIC, studied.

127. *Sinonipponia concreata* (Séguy)

(Fig. 742)

1934. *Sarcophaga concreata* Séguy, *Encycl. ent.*, (BII), 7 : 27; Sugiyama, Shinonaga and Kurahashi, 1988, *Jap. J. sanit. Zool.*, 39 (4) : 359.

1967. *Sinonipponia concreata* : Kano, Field and Shinonaga, *Fauna Japonica*, Sarcophagidae : 84.

Male : Body length 10–11 mm.

Head : Frontal vitta longer than one eye; gena and post gena large and three times that of antennae; outer vertical bristles weak but distinct; third antennal segment three times that of the second.

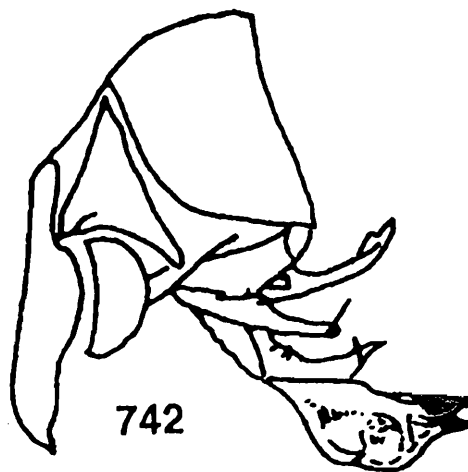


Fig. 742 : *Sinonipponia concreata* (Séguy). 742, Penis with anterior and posterior parameres and inner and outer forceps (lateral view); (after Séguy, 1934).

Abdomen : Inner forceps elongated, pointed apically and slightly curved at end; outer forceps slightly oval; anterior paramere bifurcated at end, slightly curved but with subbasal pointed outgrowth; posterior paramere long, straight with one hair at subapical end; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus wide, bifurcated anteriorly; anterior process straight, pointed apically and approaches to the apical plate of paraphallus, posterior process short, pointed and curved backward; styli of glans short; ventralia widened at end and bifurcated terminally.

Female : Unknown.

Material examined : No material was available for examination and the description provided here is mainly based on Séguy, 1934.

Discussion on species : This species is similar to *S. bengalensis* Nandi, 1977 but differs from it by the structures of ventralia and apical plate of paraphallus. Moreover, the styli of glans in this species is shorter and median marginal bristle on fourth abdominal tergite is more stronger than *bengalensis*.

Biology : Nothing is known regarding the biology of this species.

Distribution : Ne (Biratnagar); China (Zi-ka-wei) and Taiwan.

Type deposited : *Holotype* ♂, MNHN, not studied.

Genus 38. *Stackelbergeola* Rohdendorf, 1937

1937. *Stackelbergeola* Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 257.

Type species : *Sarcophaga mehadiensis* Böettcher, 1912.

Morphology : Presence of one pair of postsutural *dc* bristles before scutellum; abdomen with bright silvery white pollen and median longitudinal black stripe on second, third and fourth abdominal tergites present; genital segments broad; outer forceps subdivided into narrow distal and broad basal divisions and usually separated by a transverse ridge; paraphallus longer than theca and the theca short and slender; apical plate of paraphallus clearly demarcated; styli of glans short, rather slender and adjacent to the apical part of paraphallus; anterior paramere slender with a longitudinal fold; posterior paramere with a broad base and apically recurved; lateral plate of paraphallus wide and doubled.

Discussion : This is a small genus and Rohdendorf (1937) described 4 new species from USSR who placed this genus under the subtribe Parasarcophagina in 1965. Verves (1986) reported 5 species from the Palaearctic region. This genus has not been earlier reported from the Oriental region and this is the first record of this genus from India.

Biology : So far the literature is concerned nothing is known regarding the biology of this genus.

Distribution : This genus is distributed in the Palaearctic and the Oriental regions.

128. *Stackelbergeola papei* Nandi

(Figs. 743—747)

1994. *Stackelbergeola papei* Nandi. *Proc. zool. Soc., Calcutta*, **47** (1) : 57.

Male : Body length 8 mm.

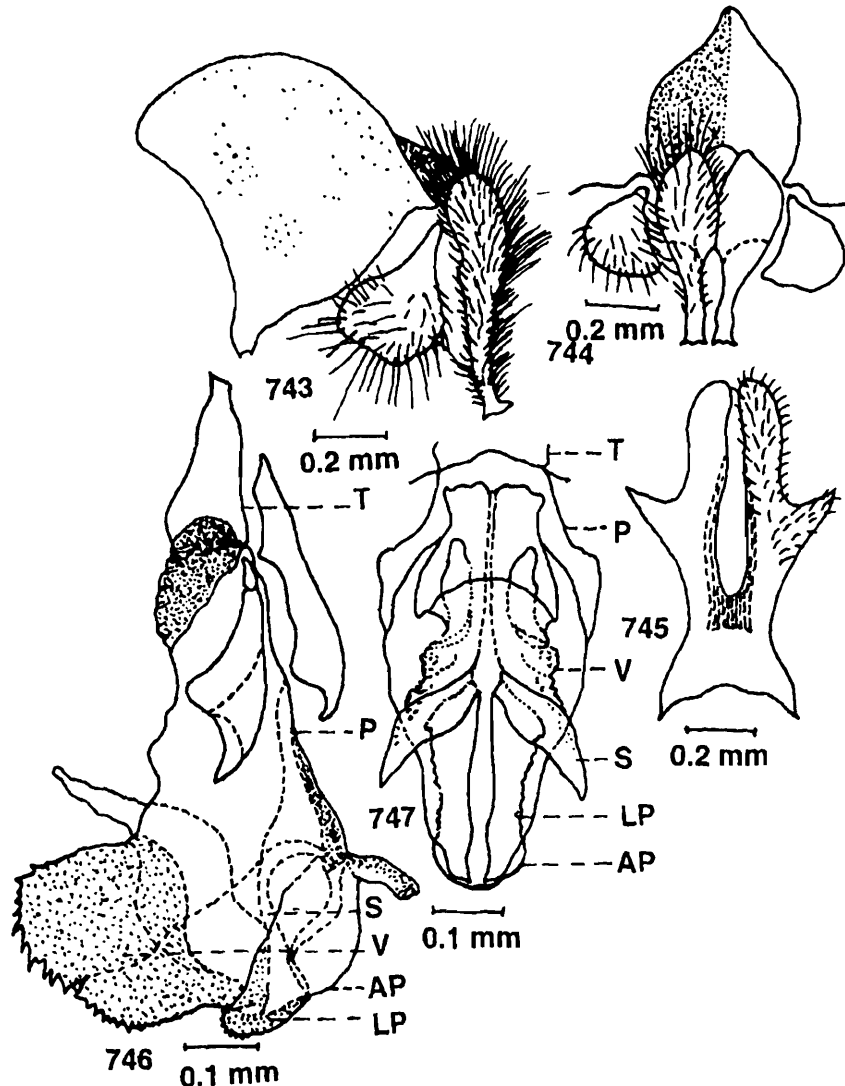
Head : Width of frons about twice that of one eye; frontal vitta black, its width at narrowest point of frons is slightly greater than each parafrontal; parafrontal and parafacial blackish with golden pollen, the former with short scattered hairs and the latter with short hairs near the eye margin; antennae black, reaching up to about 0.90 distance to vibrissae, first and second segments black with short black hairs, third greyish and about three times that of the second; arista long, plumose along basal two-thirds; facial ridge slightly black with few short hairs; vibrissae long, crossed, distance between vibrissae slightly shorter than one parafacial width; frontal bristles 10, posterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena slightly brownish with yellow pollen; post gena black with black hairs; outer vertical bristle short, inner vertical well developed, post vertical short and about two and half times that of inner vertical; post ocellar slightly longer than ocellar and about one-third the inner vertical; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with blackish hairs; palpi black; proboscis blackish.

Thorax : Black with three indistinct black longitudinal stripes; upper part of propleura bare ; *ac* 0+1; *dc* 2+3; *ia* 1+7; *ps* 1; *h* 2; *ph* 1; *np* 3; *pa* 2; *sa* 2; *st* 1+1+1; *mpl* 6; *hpl* 8; upper part of propleura bare ; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro-and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs..

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 10 strong setae located dorsally and extending up to more than basal half from the basal node to *r-m* and 4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment about equal to third, the former with short spines along basal two-thirds of its anterior margin; costal spines not so developed; epaulet black with short spines; basicostal scale yellowish; squama white; halter brown.

Legs : Black; fore femur with a row of long bristles along posterodorsal surface and a row of short bristles along posterior margin of ventral surface; fore tibia with a row of 4 bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal surface on distal one-third; mid femur with a row of bristles along middle portion of

anterolateral surface and a row of bristles each along basal half of anteroventral and posteroventral surfaces and a row of setae each on anteroventral and posteroventral surfaces on distal end; mid tibia with 1 bristle each on anterodorsal and posterodorsal surfaces at about two-thirds on basal end; hind femur with a pair of rows of bristles



Figs. 743-747 : *Stackelbergeola papei* Nandi. 743, Inner and outer forceps (lateral view); 744, Inner and outer forceps (posterior view); 745, Fifth sternite; 746, Penis (lateral view); 747, Penis (ventral view).

along anterodorsal surface, a row of bristles along anteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface on two-thirds of distal end, 1 bristle on posterodorsal surface each on one-third and two-thirds the distances from the basal end but without long hairs along ventral surface.

Abdomen : Blackish-brown with slightly silvery pollen; median marginal bristles on second abdominal tergite absent but with 2 lateral marginal bristles, second with a row of 6 median and a pair of lateral marginal bristles, fourth with few lateral marginal bristles, fifth with a row of 14 marginal bristles; sternites first to fourth with short hairs, second and third with long hairs on posterior end; fifth sternite Y-shaped and each arm is bifurcated with short closely set spines laterally; first and second genital segments broad, greyish but without marginal bristles; inner forceps almost straight and terminally wide; outer forceps wide at middle with hairs; anterior paramere short, wide at subapical end and curved; posterior paramere almost oval; theca very short; paraphallus wide and elongated; apical plate of paraphallus well developed and slightly pitted; lateral plate of paraphallus wide and blunt; styli of glans short, slender and apically spinous; ventralia wide, apically striated with one long anterior lobe.

Female : Unknown.

Material examined : *Holotype* ♂, India : West Bengal; Darjeeling, 13–18. xii. 1913, E. Brunetti.

Discussion on species : This species is similar to *Stackelbergeola sushkini* Rohdendorf, 1937 but differs from it by the structures of spical plate of paraphallus, ventralia and anterior paramere, Moreover, the structure of fifth sternite is quite distinguishable in this species from *sushkini*.

Biology : Nothing is known regarding the biology of this species.

Distribution : India ; WB (Darjeeling).

Type deposited : *Holotype* ♂, BMNH, studied.

Genus 39. *Horiisca* Rohdendorf, 1965

1965. *Horiisca* Rohdendorf, *Ent Obozr.*, **44**(3) : 691.

Type species : *Sarcophaga hozawai* Hori, 1954.

Morphology : Presutural acrostichal bristles many, well developed and the last one very strong; *dc* 5+4 and strong; R_1 bare; hind tibia with tuft of numerous long hairs; anterior paramere wide and bifurcated; apical part of paraphallus without lateral projections and spines but with notches apically ; apical half of inner forceps sharply bent forward almost at right angle and very sharp at end; fifth sternite v-shaped.

Discussion : This is a short genus and only 1 species has been so far reported from the Oriental region.

Biology : Nothing is known regarding the biology of the species.

Distribution : This genus is distributed in the Oriental and Palaeartic regions.

129. *Horiisca hozawai* (Hori)

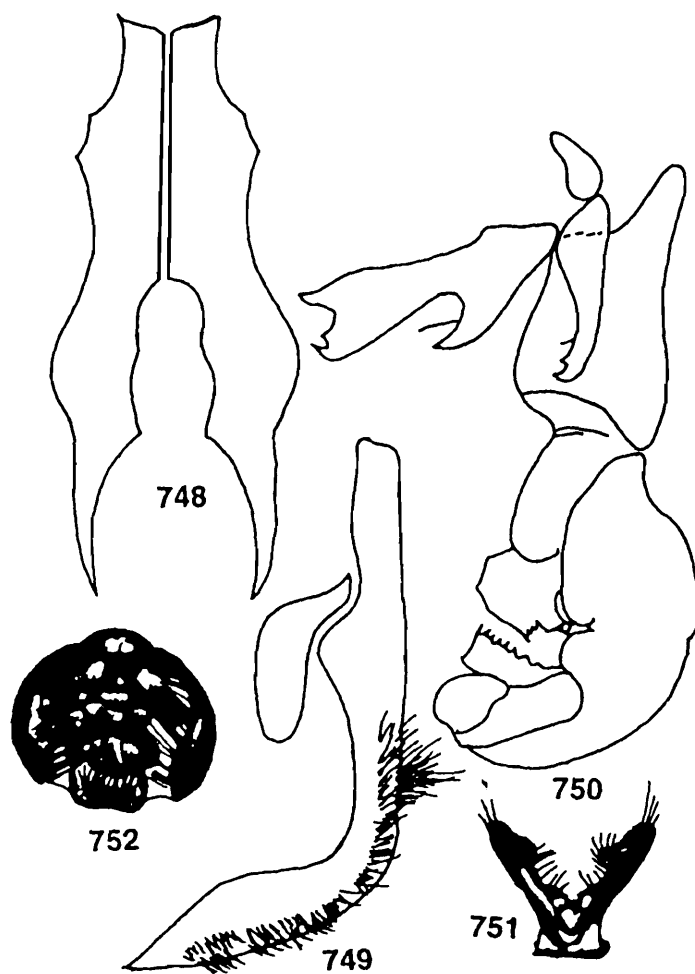
(Figs. 748—752)

1954. *Sarcophaga hozawai* Hori, *Scient. Rep. Kanazawa Univ.*, 2 (2) : 46; Kano and Shinonaga, 1984, *Jap. J. sanit. Zool.*, 45 : 263.

1967. *Horiisca hozawai* : Kano, Field and Shinonaga, *Fauna Japonica, Sarcophagidae* : 32; Verves, 1987, *Cat. Palae. Dipt.*, 12 : 161.

Male : Body length 9–13 mm.

Head : Width of frons about one-half that of one eye; frontal vitta black, its width at narrowest point of frons more than twice that of each parafrontal; parafrontal and parafacial black with bright golden pollen, the former with weak hairs, the latter with a row of short hairs near the eye margin; antennae dark brown to black and



Figs. 748-752 : *Horiisca hozawai* (Hori). 748, Inner forceps (posterior view) ; 749, Inner and outer forceps (lateral view); 750, Penis (lateral view); (after Hori, 1954); 751, Fifth sternite; 752, Penis Genitalia ♀ (ventral view); (after Kano, Field and Shinonaga, 1967)

reaching up to about 0.8 distance to vibrissae, first segment black, second blackish, third brown with whitish pollen and about twice that of the second; arista long, plumose along basal three-fifths; facial ridge deep brownish with short spines along basal half; vibrissae long, crossed, distance between vibrissae slightly less than that of one parafacial width; frontal bristles 9—13, posterior 2 reclinate, anterior 3—4 below base of antennae and reaching up to half of second antennal segment, rest cruciate and directed forwards; gena black with silvery to golden pollen and numerous black hairs; post gena black with numerous yellowish white hairs; outer vertical bristle absent, inner vertical well developed, post vertical shorter than inner vertical; ocellar and postocellar bristles short; a row of regular postocular setae besides postocular cilia, rest of the area with irregular white and black hairs; palpi dark brown; proboscis black.

Thorax : Grey, silvery to golden pollen and with three black longitudinal stripes ; *ac* 5-7+1 ; *dc* 6-5+1 ; *ia* 1+3; *ps* 1; *h* 2 or 3; *ph* 1 ; *np* 4 ; *pa* 2 ; *sa* 4; *st* 1+1+1 ; *mpl* 7; *hpl* 6-7 : upper part of propleura bare ; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro-and mesothoracic spiracles dark brown; apicoscutellar bristles 1 pair; discoscutellar bristles 2 pairs and lateroscutellar bristles 4 pairs.

Wings : Hyaline with brown veins ; R_1 bare; R_{4+5} with a row of 10 short setae located dorsally and extending up to about more than half from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than the third, the former with short spines along basal one-third of its anterior margin; costal spines stout; epaulet black; basicostal scale light brown; squama creamy white; halter brown.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface, a row of bristles along posterior margin of ventral surface and numerous black hairs along ventral surface; fore tibia with 2 bristles on distal part of anterodorsal surface and 1 bristle on posterolateral surface at about one-third the distance from the distal end; mid femur with 4-5 bristles along middle portion of anterolateral surface, a row of short setae each along distal half of anteroventral and posteroventral surfaces, few hairs along basal half of anteroventral surface, few bristles along middle portion of posteroventral surface and 3 bristles along distal part of posterolateral surface; mid tibia with 2 bristles on anterodorsal surface, a row of short bristles along posterodorsal surface 1 bristle on posteroventral surface at about one-third the distance from the distal end and 2 bristles on posterolateral surface on distal one-third; hind femur with 2 rows of long bristles along anterodorsal surface, a row of bristles along anteroventral surface, 2 or 3 bristles on distal part of posterodorsal surface, 1 bristle on distal part of posterolateral surface and numerous long hairs along ventral surface; hind tibia with a row of bristles along anterodorsal surface, 2 bristles on posterodorsal

surface, 1 bristle on anteroventral surface at about one-fourth the distance from the distal end and with numerous long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery to golden checkered pattern; median marginal bristles on second and third abdominal tergites weak or absent, but third and fourth each with few lateral marginal bristles; fifth with a row of marginal bristles; sternites with few short hairs; fifth sternite cup-shaped with wide window and bearing strong spines and hairs laterally and short hairs terminally on arms; first genital segment black with greyish pollen, second black with numerous black hairs but each without marginal bristles; inner forceps deeply curved, terminally pointed and with hairs and short spines medially on posterior end; outer forceps almost triangular; anterior paramere bifurcated and one arm very long and wide; posterior paramere slender, pointed at end and slightly curved; theca and paraphallus almost equal in length, both are sclerotised; apical plate of paraphallus wide and curved; lateral plate of paraphallus not distinct; styli of glans short and serrated anteriorly; ventralia wide and blunt at end.

Female : Kano (1967) reported one female from Japan and figured the genitalia but the description was not included.

Material examined : 1 ♂, Nepal: Biratnagar, 9. vii. 1992, Kurahashi (dep. in NSMT).

Discussion on species : This species is peculiar in having long, inward bending of inner forceps, shape of anterior paramere and simple construction of paraphallus.

Biology : Nothing is known regarding the biology of the species but it is a mountain species and can be collected from leaves on trees.

Distribution : Ne (Biratnagar); China; Japan and Korea.

Type deposited : *Holotype* ♂, ZIKU, not studied.

Subtribe **Helicophagellina** Lopes *et al.*

This subtribe is characterised by having claw-shaped process of paraphallus and short ventralia and absence of lateral plate of paraphallus. The larvae are without well sclerotised mandible and clypeal arch. This subtribe is richly developed and many species have been described by different authors. Verves (1986) reported quite a large number of species under this subtribe from the Palaearctic region. He made synonyme this subtribe with *Pierretina* in 1987. Lopes *et al.* (1977) reported 15 species from the Oriental region and they also synonymized this subtribe with *Bellieriina* Enderlein in 1977. Four genera : *Helicophagella* Enderlein, *Pierretia* Robineau-Desvoidy, *Bellieriomima* Rohdendorf and *Thyrsocnema* Enderlien are present in the Oriental region which are also available in this area.

Most of the larvae of this subtribe breed in different types of dead animals. Larval stages of few species were studied from the Oriental and Australasian and Oceanian regions.

Members of this subtribe are mostly distributed in the Oriental, Nearctic, Afrotropical, Palaearctic and Australasian and Oceanian regions.

Key to genera

1. Lateral plate of paraphallus wanting or poorly developed 2
 Lateral plate of paraphallus fairly developed 3
2. Penis poorly developed and it is slightly sclerotised in the middle
 *Helicophagella* Enderlein
 Penis highly developed and always with a well developed median transparent
 zone *Thyrsocnema* Enderlein
3. Apical plate of paraphallus large and forms a broad leaf-like lobe
 *Bellieriomima* Rohdendorf
 Apical plate of paraphallus not forms a lobe, usually slender, high or truncate
 *Pierretia* Robineau-Desvoidy

Genus 40. *Helicophagella* Enderlein, 1928

1928. *Helicophagella* Enderlein, *Arch. klassif. phylogen. Ent.* 1(1) : 38

Type species : *Sarcophaga noverca* Rondani, 1860.

1928. *Bellieria* Enderlein, *Arch. klassif. phylogen. Ent.*, 1(1) : 36 (misidentification, not Robineau-Desvoidy, 1863).

Type species : *Bellieria melanura* Meigen, 1826.

1937. *Boettcheriola* Rohdendorf, *Fauna USSR, Dipt.*, 19 (1) : 143 (as subgenus of *Bellieria*).

Type species : *Sarcophaga rosellei* Böettcher, 1912.

1937. *Villeneuvea* Rohdendorf, *Fauna USSR, Dipt.*, 19 (1) : 147.

Type species : *Sarcophaga agnata* Rondani, 1860.

Morphology : Width of frons about two-fifths to four-fifths that of one eye; outer vertical bristles well developed; sternopleural bristles 2-1; post scutellar dorsal bristles 3; lateroscutellar bristles 2 pairs; hind tibia with a tuft of long hairs; third abdominal tergite without median marginal bristles; first genital segment with strong marginal bristles; penis slightly sclerotised in the middle; paraphallus claw-shaped and elongated; apical plate of paraphallus small; lateral plate of paraphallus wanting; styli of glans short; ventralia well developed and heavily pigmented.

Discussion : This is a rather well defined genus and Rohdendorf (1965) placed it under the subtribe Bellieriina of the tribe Sarcophagini. Pape (1987b) reviewed this from Fennoscandia and Denmark and reported a total of 5 species. Verves (1986) reported 15 species from the Palaearctic region and this region is richly represented by this species. Later on Verves (1987) placed all the Palaearctic species under the subgenus *Parabellieria* Verves, 1987.

Biology : Most of the species breed in different types of snails, beetles, faeces and animal carcasses and the larvae may cause intestinal myiasis in man and traumatic myiasis in birds and mammals (Séguy, 1941a; Emden, 1954). Larval descriptions of few species have been given by Kano, Sato and Tange (1951), Ishijima (1967) and Draber-Mónko (1973). Few species are also associated with different microorganisms (Greenberg, 1971).

Distribution : This genus is distributed in the Oriental and Palaearctic regions.

Key to male species

1. Inner forcep with tuft of setae at subapical end; ventralia curved, ill-developed and pointed*girnarensis* Nandi
 Inner forcep without tuft of setae at subapical end; ventralia well developed, wide and straight.....2
2. Ventralia without terminal projection3
 Ventralia with transparent terminal projection.....*gorodkovi* (Grunin)
3. Apical part of paraphallus with wide long lateral process
*melanura* (Meigen)
 Apical part of paraphallus without lateral process4
4. Ventralia without groove anteriorly; apical part of paraphallus short and slightly curved*rohdendorfi* (Grunin)
 Ventralia with groove anteriorly; apical part of paraphallus long and strongly curved*maculata* (Meigen)

130. *Helicophagella girnarensis* Nandi

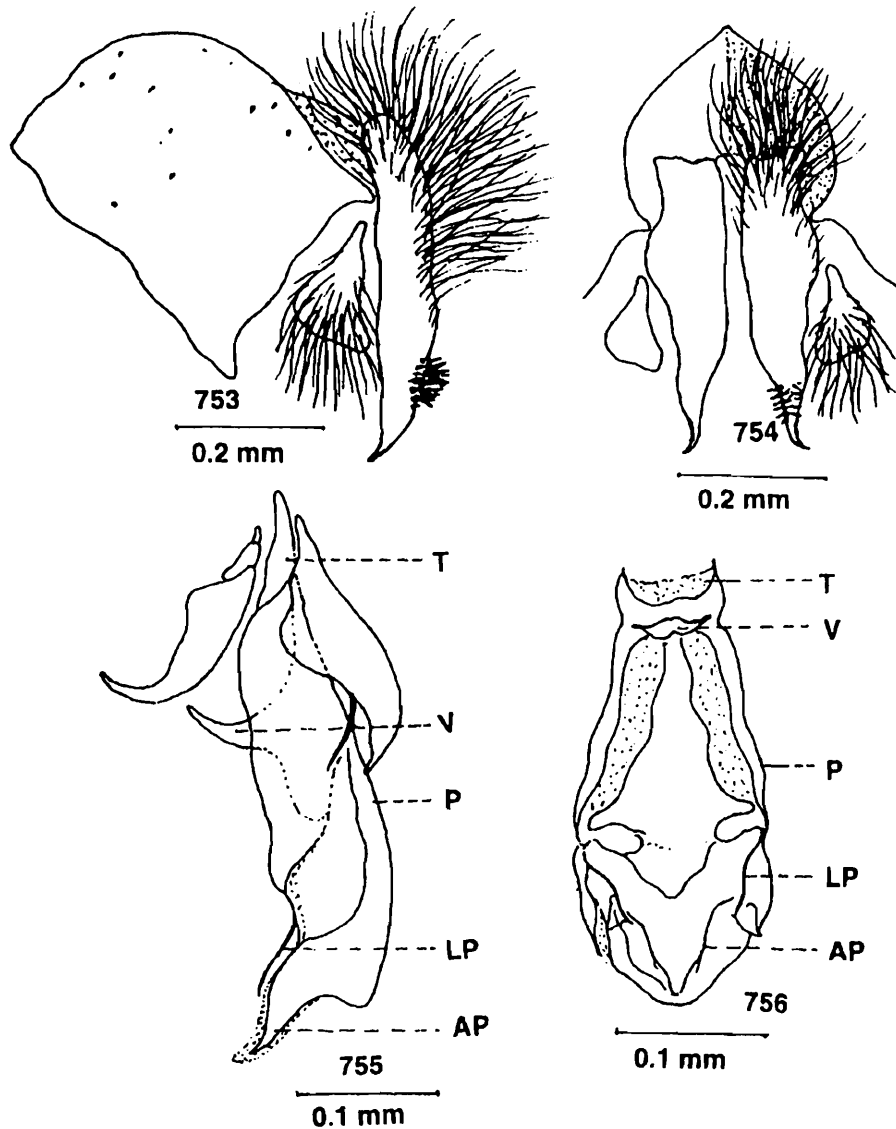
(Figs. 753—756)

1992. *Helicophagella girnarensis* Nandi, *Proc. zool. Soc., Calcutta*, **45** (2) : 193

Male : Body length 8 mm.

Head : Width of frons about two-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of 8 hairs near the eye margin; antennae dark brown and reaching up to

about 0.8 distance to vibrissae, first and second segments black with short black hairs, the latter with 1 long hair, third brownish, silvery pollen and about twice that of the second; arista long, plumose along more than basal half; vibrissae long, distance between vibrissae equal to one parafacial width; frontal bristles 11, posterior 3 reclinate, anterior 3 below base of antennae and reaching up to about less than half of second antennal segment, rest cruciate and directed forwards; facial ridge black with silvery pollen; gena blackish with silvery pollen; post gena black; outer vertical bristle ill-developed, inner vertical well developed, post vertical less than half of inner



Figs. 753-756 : *Helicophagella girnarensis* Nandi. 753, Inner and outer forceps (lateral view); 754, Inner and outer forceps (posterior view); 755, Penis (lateral view); 756, Penis (ventral view).

vertical; ocellar bristles short, postocellar greater than half of inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with short irregular whitish hairs; palpi slender and black; proboscis short and black.

Thorax : Blackish with three black longitudinal stripes; *ac* 0+1; *dc* 4+3; *ia* 0+2; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 3; *sa* 3; *st* 1+1+1; *mpl* 9; 6; *hpl* 8; upper part of propleura bare, black with silvery pollen; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles blackish; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of short setae located dorsally and extending up to two-thirds from the basal node to r-m and 3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to third, the former with short spines along basal half of its anterior margin; costal spines not so stout; epaulet black; basicostal scale whitish; squama creamy white; halter brown.

Legs : Black; fore femur with a row of bristles along posterodorsal surface, a row of bristles along posterior margin of ventral surface and a row of long hairs along basal half of posteroventral surface; fore tibia with a row of 3 bristles along basal one-third of anterodorsal surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end; mid femur with a row of bristles along anterolateral surface on basal half, a row of bristles with long hairs along basal half and a row of short setae along distal half of anteroventral surface, a row of long hairs along basal half and a row of comb-like setae along distal half of posteroventral surface and 1 long bristle each on posterodorsal and posterolateral surfaces on distal end; mid tibia with 2 bristles along middle portion of anterodorsal surface, 2 bristles along basal one-third of anteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces at about one-third the distance from the distal end; hind femur with a row of bristles along anterodorsal surface, a row of long bristle-like hairs along posteroventral surface and 1 bristle each on anterodorsal and anterolateral surfaces distally; hind tibia with 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from basal end, a row of bristles along anterodorsal surface and numerous long hairs along anterior and posterior margins of ventral surface at about two-thirds the distance from the distal end.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 1 lateral marginal bristles, fourth with a pair of median and 4 lateral marginal bristles; sternites first to fourth with short hairs; first and second genital segments blackish but without marginal bristles; inner forceps almost straight, terminally beak-like and with tuft of spines at the subapical end; outer forceps slightly elongated with long hairs; anterior paramere deeply curved and pointed at end; posterior paramere pointed, slightly curved and with 1 long hair at the subterminal end; theca shorter than paraphallus,

both are sclerotised; apical plate of paraphallus curved at end and slightly membranous; lateral plate of paraphallus very slender or partly developed; ventralia recurved posteriorly and not so much developed.

Female : Unknown.

Material examined : *Holotype* ♂, India : Gujarat; Girnar Hills, 820 m, 13. x. 1980, B.C. Nandi.

Discussion on species : This species resembles *H. melanura* (Meigen, 1826) but differs from it by the structures of ventralia and apical plate of paraphallus. Moreover, the inner forcep in this species has a tuft of spines along its subapical end.

Biology : This is a rare species which was collected from bushes in hill shrub.

Distribution : India ; Gu (Girnar Hills).

Type deposited : *Holotype* ♂, ZSIC, studied.

131. *Helicophagella gorodkovi* (Grunin)

(Figs. 757—760)

1964. *Bellieria* (*s. str.*) *gorodkovi* Grunin, *Ént. Obozr.*, **43** (1) : 74.

1986. *Helicophagella gorodkovi* : Verves, *Cat. Palae. Dipt.*, **12** : 137.

1987. *Helicophagella* (*Parabellieria*) *gorodkovi* : Verves, *Ént. Obozr.*, **66** (3) : 664.

1988. *Sarcophaga gorodkovi* : Sugiyama, *Jap. J. sanit. Zool.*, **40** : 119.

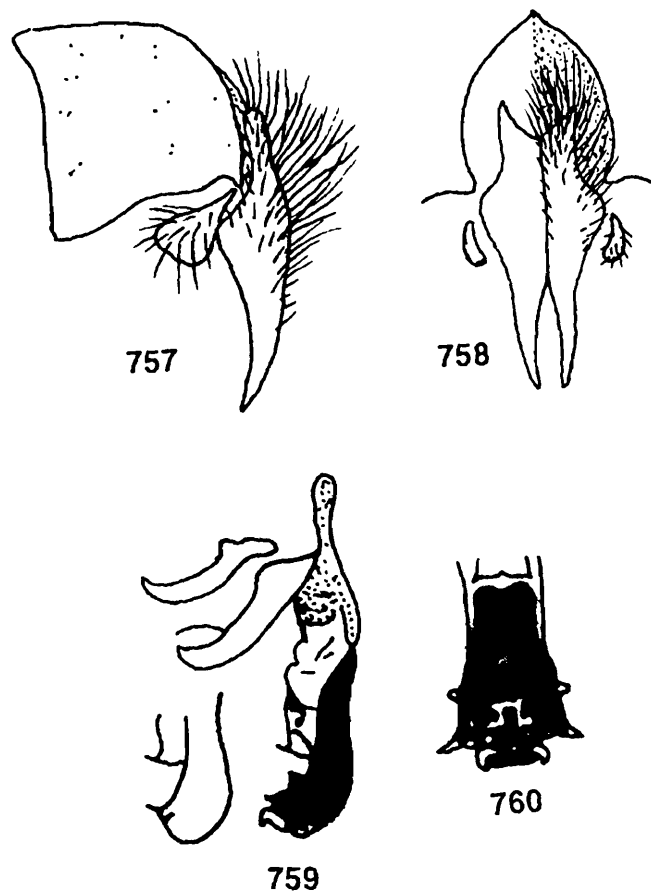
Male : Body length 9–12 mm.

Head : Black; width of frons slightly less than one eye; frontal vitta black, slightly widened anteriorly and its width at narrowest point of frons more than twice that of each parafrontal; parafrontal black with few short scattered hairs; parafacial black, silvery pollen and with a row of about 8—9 short hairs near the eye margin; antennae black, reaching up to about 0.80 distance to vibrissae, first and second segments deeply black, third less black and about one and half times that of the second; arista long, plumose along basal half ; facial ridge black with silvery pollen; vibrissae long, distance between vibrissae equal to one parafacial width; frontal bristles 11, posterior 2 reclinate, anterior 2 proclinate and reaching up to about one-third of second antennal segment, rest cruciate and directed forwards; gena yellowish, silvery pollen and with several fine hairs; post gena black with black hairs; inner vertical bristle well developed, outer vertical moderately developed and slightly shorter than inner vertical, post vertical short, post ocellar longer than post vertical; a row of regular postocular setae besides postocular cilia, rest of the area with black hairs; palpi long and black; proboscis black.

Thorax : Deeply black with three black longitudinal stripes ; *ac* 0+1; *dc* 4+3; *ia* 0+1; *-ps* 1; *h* 3; *ph* 1; *np* 4; *pa* 2; *sa* 2; *st* 1+1+1; *mpl* 6; *hpl* 7—8; upper part of

propleura bare, prostigmatic and propleural bristles well developed and accompanied with short hairs; a few scutellar bristles moderately developed and discoscutellar bristles short, 1 pair; lateroscutellar bristles well developed, 2 pairs.

Wings : Hyaline with slightly blackish veins; R_1 bare; R_{4+5} with a row of 5—6 short setae located dorsally and extending up to one-third from the basal node to r-m and 3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment slightly shorter than third, the former with short spines along basal half of its anterior margin; costal spine short; epaulet black; basicostal scale yellowish; squama slightly yellowish; halter brown.



Figs. 757-760 : *Helicophagella gorodkovi* (Grunin). 757, Inner and outer forceps (lateral view); 758, Inner and outer forceps (posterior view); 759, Penis with anterior and posterior parameres (lateral view, after Grunin, 1964); 760, Penis (ventral view, after Grunin, 1964).

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface on distal two-fifths; mid femur with a row of 5—6 bristles along

anterolateral surface, a row of bristles along basal half of posteroventral surface, a row of short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal, posterolateral and posteroventral surfaces on distal end; mid tibia with a row of bristles along anterodorsal surface, 2 bristles apart medially on posterodorsal surface, 1 bristle each on anteroventral and posteroventral surfaces on distal half, a row of bristles along anteroventral surface and 3 bristles on posterodorsal surface distally; hind femur with a row of bristles along anterodorsal surface and 1 bristle each on anterodorsal and anteroventral surfaces on distal end ; hind tibia with a row of bristles along anterodorsal surface, 2 bristles apart medially on posterodorsal surface and with long hairs along anteroventral and posteroventral surfaces on distal fifth-sixths.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 1 lateral marginal bristles, fourth with a pair of median and 2 lateral marginal bristles; fifth with a row of 22 marginal bristles; first to fourth sternites with short hairs; fifth sternite v-shaped with tuft of strong spines laterally on basal end of arms; genital segments black but without marginal bristles; inner forceps slightly elongated; outer forceps slightly elongated with hairs; anterior paramere shorter, elongated and slightly curved; posterior paramere more elongated, sharply curved apically and with 1 hair at subterminal end; theca shorter than paraphallus, both are sclerotised; paraphallus more sclerotised, its apical part small and bent; apical plate of paraphallus with wide long lateral process; lateral plate of paraphallus prominent in profile; ventralia prominent, transparent and with terminal projection.

Female : Unknown.

Material examined : 1 ♂, Pakistan : Khunjerab Pass, 4, 700 m, 20. viii. 1988, K. Kurahashi (det. by R. Kano as *Sarcophaga gorodkovi*; dep. in NSMT).

Discussion on species : This species is closely similar to *H. melanura* (Meigen, 1826) but differs from it by the structure of inner forceps which are without protuberance on the inner side, by the structure of apical plate of paraphallus which bends towards the tip and also by the structure of lateral plate of paraphallus each of which has a sharp teeth.

Biology : It is a high mountain species and develops in excrement.

Distribution : Pa (Khunjerab Pass); Kyrgyzstan; Mongolia and Tajikistan.

Type deposited : *Holotype* ♂, ZSIP, not studied.

132. *Helicophagella melanura* (Meigen)
(Figs. 761—766)

1826. *Helicophagella melanura* Meigen, *Syst. Besch. europ. zweifl. Insekt.*, 5 : 23.

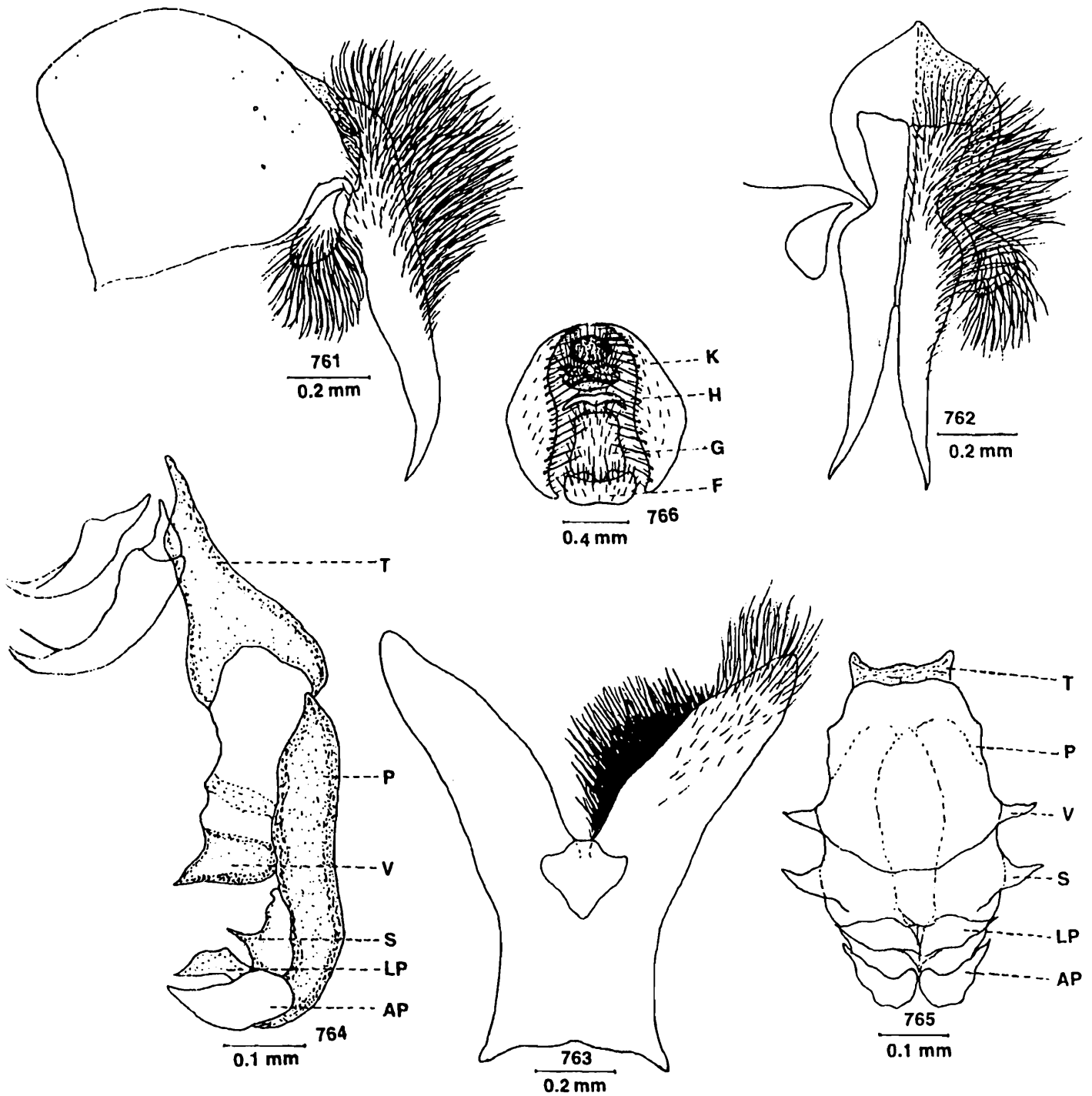
1830. *Myophora striata* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. sci. Inst. Fr.*, (2) 2 : 352.
1849. *Sarcophaga edax* Walker, *List. dipt. Br. Mus.*, 4 : 832.
1862. *Sarcophaga striata* Schiner, *Die Fliegen (Diptera)*. Wien, 1 : 570.
1863. *Mulsantia striata* : Robineau-Desvoidy, *Hist. nat. Dipt. Paris*, 2 : 565.
1928. *Bellieria melanura* : Enderlein, *Arch. klassif. phylogen. Ent.*, 1(1) : 36.
1967. *Helicophagella melanura* : Kano, Field and Shinonaga, *Fauna Japonica*, Sarcophagidae : 21; Verves, 1986, *Cat. Palae. Dipt.*, 12 : 138.
1937. *Bellieria (s. str.) melanura* : Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 135.
1987. *Helicophagella (Parabellieria) melanura* : Verves, *Ént. Obozr.*, 66(3) : 664.

Male : Body length 7–11 mm.

Head : Width of frons slightly less than that of one eye; frontal vitta black, its width at narrowest point of frons more than twice that of each parafrontal; parafrontal and parafacial blackish with golden pollen, the former with short scattered hairs, the latter with a row of 8–9 short black hairs near the eye margin; antennae dark brown and reaching up to about 0.8 distance to vibrissae, first and second segments blackish-brown, third slightly brownish with silvery pollen and about twice that of the second; arista long, plumose along basal half; facial ridge blackish with silvery pollen; vibrissae long, crossed, distance between vibrissae greater than one parafacial width; frontal bristles 9–11, posterior 1 reclinate, anterior 2–3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards; gena black with golden to greyish pollen; post gena blackish with silvery pollen; ocellar triangle black with long hairs; outer vertical bristle moderately developed, inner vertical well developed, post vertical half of the inner vertical; ocellar bristles short, postocellar less than half of inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with irregular setae along with black and greyish hairs; palpi black; proboscis blackish-brown.

Thorax : Greyish with three black longitudinal stripes ; *ac* 0+1; *dc* 4+3; *ia* 0+2; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 6—7; *hpl* 8; upper part of propleura bare, prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 10 short setae located dorsally and extending up to more than half from the basal node to r-m and 5–6 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than third, the former with short spines along basal three-fifths of its anterior margin;



Figs. 761-766 : *Helicophagella melanura* (Meigen). 761, Inner and outer forceps (lateral view); 762, Inner and outer forceps (posterior view); 763, Fifth sternite; 764, Penis (lateral view); 765, Penis (ventral view); 766, Genitalia ♀ (ventral view).

costal spines stout; epaulet black; basicostal scale light brown; squama creamy white; halter brown.

Legs : Black; fore femur with a row of long bristles along posterodorsal surface, numerous long hairs along basal half of posteroventral surface and a row of long bristles along posterior margin of ventral surface; fore tibia with 2–3 long bristles along posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of several short bristles along middle portion of anterolateral surface, a row of long hairs with few bristles along anteroventral surface, 1 bristle each on distal half of posterodorsal and posteroventral surfaces and numerous long hairs along basal half and short bristles along distal half of posteroventral surface; mid tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end, a row of 3 long bristles along middle portion of posterolateral surface and 1 bristle on posteroventral surface at about two-thirds the distance from the basal end; hind femur with a row of long bristles along anterodorsal surface, a row of bristles along anteroventral surface, a row of bristle-like long hairs along posteroventral surface and numerous long hairs along ventral surface; hind tibia with a row of bristles along anterodorsal surface, 1 bristle each on anteroventral surface at about one-third and two-thirds the distances from the distal end, 1 bristle on posterodorsal surface at about one-third the distance from the basal end and numerous long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery grey checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 5 and third with 2 lateral marginal bristles, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of 16 marginal bristles; sternites first to fourth with short hairs; fifth sternite v-shaped with strong lateral and terminal hairs on arms; first genital segment shiny black with 3 pairs of median marginal bristles, second black with numerous black hairs; inner forceps elongated, slightly curved at end but without setae on subapical end; outer forceps slightly elongated and curved; anterior paramere elongated, pointed and curved at end; posterior paramere longer, curved and with 1 hair; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus medium in size, broad at end and with one wide prominent lateral process; lateral plate of paraphallus absent; ventralia wide, well developed, membranous and straight but without projection.

Female : Body length 6–13 mm.

Head : Similar to that of male except frons almost equal to the width of one eye; 2 proclinate fronto-orbital bristles present.

Thorax : Similar to that of male except mid femur with a row of bristles each along anterior and posterior margins of ventral surface; hind femur with several bristles

along anterior and posterior margins of ventral surface and a row of bristles along anterodorsal surface.

Abdomen : Similar to that of male but the following differences : sixth sternite wide and concave on posterior end, seventh elongated with few spines posteriorly, eighth narrow and pointed on both ends; seventh tergite wide at middle.

Material examined : 3 ♂♂, Japan : Ozegahara; Gumma pref., 28–30. viii. 1978, H. Kurahashi (det. by H. Kurahashi; dep. in NSMT).

Discussion on species : Senior-White (1924) reported it from Jhelum Valley, Kashmir, but through extensive survey since 1973 this species was not available again from India. This species is almost similar to *H. gorodkovi* (Grunin, 1964) but differs from it by the structure of apical plate of paraphallus and absence of transparent projection in ventralia. Moreover, the presence of lateral process in apical plate of paraphallus is characteristic in this species.

Biology : This is an uncommon synanthropic species, mostly attracted to fruit and meat and can be collected from bushes near human excrement, animal dung and dead bodies of different animals. The larvae breed in animal carcasses, human excrement, animal dung, snails, garbages and are reared on those substances. This species cause traumatic myiasis in birds and mammals (Séguy, 1941; Emden, 1954). Zetterstedt (1845) recorded it (as *striata*) to breed from *Oryctes* (Coleoptera : Scarabaeidae) and Nielsen *et al.* (1978) from hedgehog. Séguy (1929) listed the rearing of this species from swallow and also reported the breeding of this species from *Heliadporso* sp. and *Arion hortensio* (Mollusca) in 1941. Kano, Sato and Tange (1951), Sanjean (1957), Ishijima (1967) and Draber Mónico (1973) studied the larval stages. This species is associated with *Bacillus* sp., *Escherichia coli*, *Herpetomonas* sp., *Leptomonas mirabilis*, *Leishmania* sp. and *Habronema microstoma* (Greenberg, 1971).

Distribution : India ; B (Pusa), TN (Coonoor) and JK (Jhelum Valley); Pa (several localities); Afghanistan; Albania; Algeria; Armenia; Austria; Azerbaijan; Belgium; Bulgaria; Byelorussia; Canada; Canary Islands; China; Cyprus; Czech Republic; Denmark; Egypt; Europe; Finland; France; Germany; Great Britain; Greece; Gruzia; Hungary; Iran; Iraq; Ireland; Israel; Italy; Japan (including Ryuku Islands); Kazakhstan; Kyrgyzstan; Latvia; Lithuania; Luxembourg; Malayasia; Malta; Mauritania; Moldova; Mongolia; Morocco; Netherlands; New York; North Korea; Norway; Poland; Portugal; Romania; Russia; Serbia; Slovakia; South Korea; Southern Spain; Sweden; Switzerland; Syria; Taiwan; Tajikistan; Tunisia; Turkey; Turkmenistan; Ukraine; United Kingdom and Uzbekistan.

Type deposited : *Holotype* ♂, MNHN, not studied.

133. *Helicophagella rohdendorfi* (Grunin)

(Figs. 767—771)

1964. *Bellieria* (*s.str.*) *rohdendorfi* Grunin, *Ént. Obozr.*, **43** (1) : 76.1986. *Helicophagella rohdendorfi* : Verves, *Cat. Palae. Dipt.*, **12** : 138.1987. *Helicophagella* (*Parabellieria*) *rohdendorfi* : Verves, *Ént. Obozr.*, **66** (3) : 664.1988. *Sarcophaga altitudinis* Sugiyama, *Jap. J. sanit. Zool.*, **40** : 117.*Male* : Body length 10 mm.

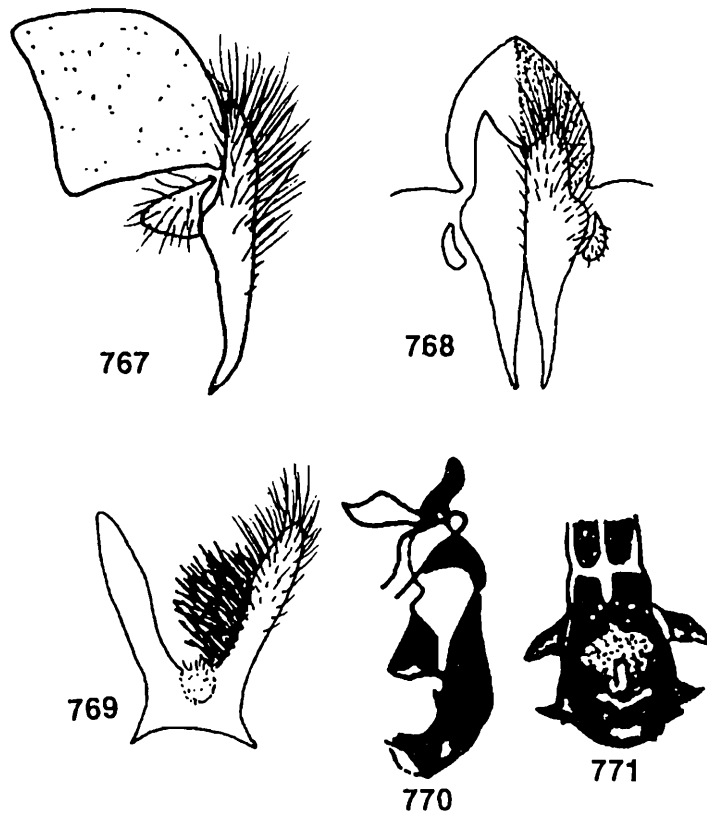
Head : Black; width of frons slightly less than one and half times that of one eye; frontal vitta black, slightly wider anteriorly and its width at narrowest point of frons equal to that of each parafrontal; parafrontal black, yellowish pollen and with few short hairs; parafacial black, silvery pollen and with a row of 9 short hairs near the eye margin; antennae black, reaching up to about 0.78 distance to vibrissae, first and second segments deeply black, third less black and about twice that of the second; arista long, plumose along more than basal half; facial ridge blackish with silvery pollen; vibrissae long, distance between vibrissae equal to one parafacial width; frontal bristles 9, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to half of second antennal segment, rest cruciate and directed forwards; gena yellowish with silvery pollen; post gena black, silvery pollen and with black hairs; inner vertical bristle well developed, outer vertical short and three-fifths that of inner vertical; a row of regular postocular setae besides postocular cilia, rest of the area with black hairs; palpi long and black; proboscis blackish-brown.

Thorax : Blackish with three black longitudinal stripes and golden pollen; *ac* 0+1; *dc* 4+3; *ia* 0+2; *ps* 1; *h* 3; *ph* 1; *np* 1; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 6; *hpl* 7; upper part of propleura bare; prostigmatic and propleural bristles well developed and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles well developed, 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 3–4 short setae located dorsally and extending up to about one-fifth from the basal node to r-m and 2 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment greater than one and half times that of the third, the former with short setae along basal half of its anterior margin; costal spines short; epaulet blackish; basicostal scale slightly yellowish; squama creamy white; halter brown.

Legs : Black; fore femur with a pair of rows of strong bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 4 bristles along distal one-third of posteroventral surface; mid femur with a row of 5 bristles along middle portion of anterodorsal surface, 1 bristle each on posterodorsal, posterolateral and posteroventral surfaces on one-third from the distal end, a row of long hairs along basal half and a row of short setae along distal half

of posteroventral surface; mid tibia with a row of long bristles along anterodorsal surface, a row of 3 bristles along basal half of posterodorsal surface and 1 bristle each on distal one-third of posterodorsal and anteroventral surfaces; hind femur with a pair of rows of bristles along anteroventral surface and a row of long hairs along posterolateral surface on distal one-third; hind tibia with 2 bristles apart on posterodorsal surface, a row of bristles along anterodorsal surface, 1 bristle on distal one-third of anteroventral surface and with long hairs along anterior and posterior margins of ventral surface on distal three-fourths.



Figs. 767-771 : *Helicophagella rohdendorfi* (Grunin). 767, Inner and outer forceps (lateral view); 768, Inner and outer forceps (posterior view); 769, Fifth sternite; 770, Penis (lateral view, after Grunin, 1964); 771, Penis (ventral view, after Grunin, 1964).

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with 1 lateral marginal bristle, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of 12-14 marginal bristles; sternites first to fourth with short hairs; fifth sternite v-shaped with strong spines laterally on arms; genital segments black but without marginal bristles; inner forceps elongated, slightly curved at end and pointed apically; outer forceps triangular; anterior paramere short and almost blunt at end; posterior

paramere elongated with hairs terminally; theca shorter than paraphallus, both are sclerotised; paraphallus with tiny ears and apical plate of paraphallus short, wide at end, slightly curved but without process; lateral plate of paraphallus absent; styli of glans short; ventralia without grooved-projection, large and triangular in profile.

Female : Unknown.

Material examined : 1 ♂, Pakistan : Khunjerab Pass, 4, 700 m, 18. vii. 1988, T. Hayashi (det. by R. Kano as *Sarcophaga altitudinis*; dep. in NSMT).

Discussion on species : This species is similar to *H. melanura* (Meigen, 1826) but can be distinguished from it by the wideness of frontal vitta, colour of parafrontal, shortness of third antennal segment and structure of ventralia. This species is also distinguishable from *maculata* (Meigen, 1835) by the shorter and less curved of apical plate of paraphallus.

Biology : This species was collected from excrement on bank of river.

Distribution : Pa (Khunjerab Pass); China; Kyrgyzstan and Tajikistan.

Type deposited : *Holotype* ♂, ZISP, not studied.

134. *Helicophagella maculata* (Meigen)

(Figs. 772—776)

1835. *Sarcophaga maculata* Meigen, *Faunus. Zool. vergl. Anat.*, **2** : 71.

1837. *Bellieria* (s. str.) *maculata* : Rohdendorf, *Fauna USSR, Dipt.*, **19** (1) : 132.

1986. *Helicophagella maculata* : Verves, *Cat. Palae. Dipt.*, **12** : 137.

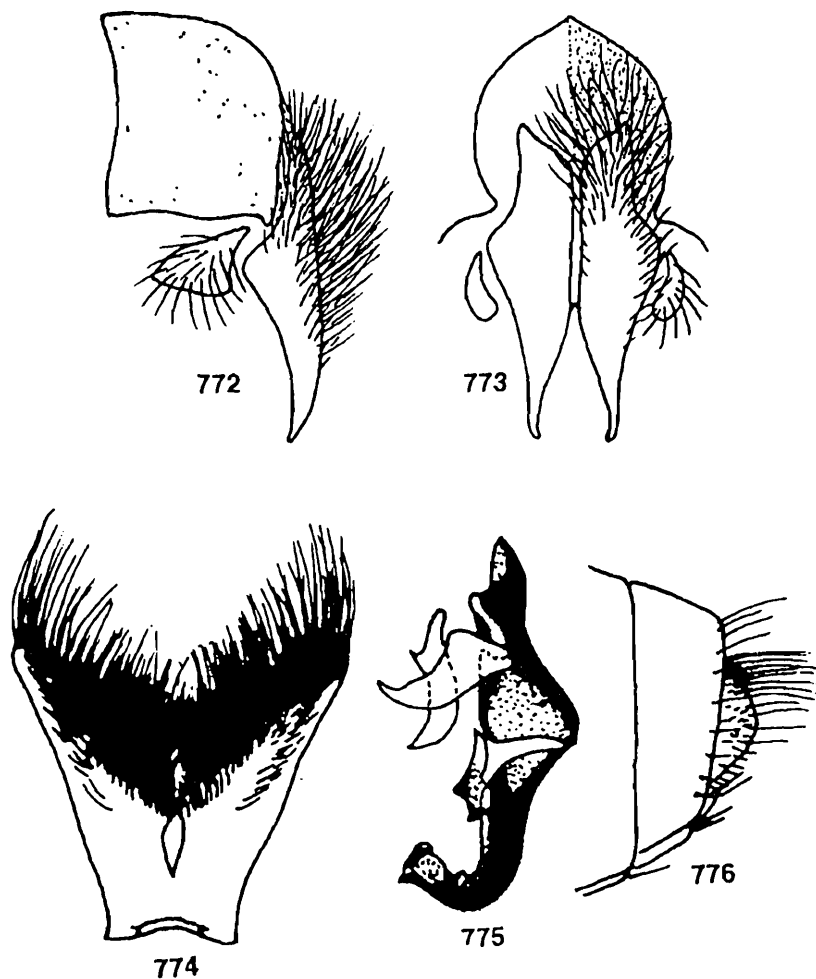
1987. *Helicophagella* (*Parabellieria*) *maculata* : Verves, *Ént. Obozr.*, **66** (3) : 664.

Male : Body length 6–16 mm.

Head : Width of frons very wide and about equal to four-fifths that of one eye; frontal vitta uniform and dull black, the edges covered with whitish coating and always not less than one and half times that of one eye; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of 5–6 short hairs near the eye margin; antennae black, second segment of antennae more black, third segment black and about three-fourths to twice that of the second; arista long, plumose along basal three-fifths; facial ridge black with silvery pollen; vibrissae long, distance between vibrissae less than one parafacial width; frontal bristles 9–10, posterior 2 reclinate, anterior 2 below base of antennae and reaching up to about half of second antennal segment, rest cruciate and directed forwards; gena black with silvery pollen; post gena black with silvery pollen and short black hairs; inner vertical bristle short but well distinguishable, outer vertical short and about one-third the inner vertical, post vertical less than half of inner vertical; a pair

of rows of regular postocular setae, rest of the area with black hairs; palpi and proboscis black.

Thorax : Greyish-black with bright silvery coating and three black longitudinal stripes; *ac* 2+1; *dc* 4+3; *ia* 1+2; *ps* 1; *h* 3; *ph* 1; *np* 3; *pa* 2; *sa* 2; *st* 1+1+1 ; *mpl* 6; *hpl* 7-8; pro-and mesothoracic spiracles brown with short hairs; apicoscutellar bristles 1 pair, lateroscutellar bristles 2 pairs, discoscutellar bristles 1 pair.



Figs. 772-776 : *Helicophagella maculata* (Meigen). 772, Inner and outer forceps (lateral view); 773, Inner and outer forceps (posterior view); 774, Fifth sternite (after Rohdendorf, 1937) ; 775, Penis (lateral view) (after Rohdendorf, 1937) ; 776, Genitalia ♀ (lateral view) ; (after Rohdendorf, 1937).

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 7-8 short setae located dorsally and extending up to two-thirds from the basal node to r-m and 2 short setae on ventral surface of basal node of R_{4+5} ; fifth costal segment less than the third, the former with short spines along basal two-thirds of its anterior margin; costal spines absent; epaulet blackish; basicostal scale and squama white; halter brownish.

Legs : Black; fore femur with a row of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 2–3 bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface on distal one-third; mid femur with a row of 4–5 bristles medially along anterolateral surface, a row of bristles along anteroventral surface, a row of long bristles along basal three-fourths, a row of short setae along distal one-fourth on posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end; mid tibia with 1 bristle apart medially each on anterodorsal and posterodorsal surfaces and 1 bristle each on posteroventral and anteroventral surfaces on distal one-third; hind femur with a row of bristles along anterodorsal surface, a row of long bristles along anteroventral surface and a row of short hairs along posteroventral surface; hind tibia with 2 bristles apart medially on posterodorsal surface, a row of bristles along anterodorsal surface, 2 bristles on distal part of dorsal surface and long curled hairs along posteroventral and anteroventral surfaces on distal four-fifths.

Abdomen : Black with shining coating and with well designed spots and a pair of black maculae; second and third abdominal tergites without median marginal bristles but each with lateral marginal bristles, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of 16 marginal bristles, third and fourth each with long median and small rounded black spots, fifth with two lateral rounded spots and all the spots nearer to the suture; sternites first to fourth with short hairs; fifth sternite v-shaped with well defined brush of spines basally and long hairs terminally on arms; first and second genital segments black, shining with many black hairs but without median marginal bristles, posterior end of seventh tergite without row of strong bristles; inner forceps straight, short and sharply pointed at end; outer forceps almost triangular; anterior paramere slightly curved at end; posterior paramere wide at base, pointed and sharply bent at end; theca slightly shorter than paraphallus, the former wide and massive; apical plate of paraphallus without process, very curved and narrow; lateral plate of paraphallus not visible; ventralia well developed with groove and in the form of hooks at the sides.

Female : Body length 5–12 mm.

Head : Frontal vitta more wider and equal to the width of eye; 2 pairs of fronto-orbital bristles present.

Abdomen : Colour as in male; sixth abdominal tergite divided into two lobes and each lobe is semi-circular in form and with a row of 9–10 very long strong bristle-like thorn on distal half of posterior end; sometimes brown and always with grey coating; seventh and eighth sternites wide.

Material examined : 1♂, Pakistan; Baluchistan (Ziarat), 16.ix. 1988, M. Iwasa (det. by E. Sugiyama as *Sarcophaga maculata*; dep. in NSMT).

Discussion on species : This species is distinguishable from other species of the genus by the colour of abdomen and their spots. It is also differ from *H. rohdendorfi* (Grunin, 1964) by the structure of ventralia and strongly curved apical plate of paraphallus.

Biology : It is a synanthropic species and the larvae feed on faeces (Rohdendorf and Verves. 1978).

Distribution : Pa (Ziarat); Afghanistan; Albania; Algeria; Armenia; Azerbaijan; Azores; Bulgaria; Canary Islands; China; Egypt; France; Germany; Gruzia; Iran; Iraq; Israel; Italy; Kazakhstan; Kyrgyzstan; Lebanon; Mongolia; Morocco; Poland; Romania; Russia; Saudi Arabia; Spain; Syria; Tajikistan; Tunisia; Turkey; Turkmenistan; Ukraine; Uzbekistan; West Siberia and Yugoslavia (former).

Type deposited : *Holotype* ♂, MNHN, not studied.

Genus 41. *Thyrsocnema* Enderlein, 1928

1928. *Thyrsocnema* Enderlein, *Arch. klassif. phylogen. Ent.*, 1(1) : 42.

Type species : *Musca striata* Fabricius, 1794, sensu Enderlein (misidentification = *Sarcophaga incisilobata* Pandellé, 1896).

1928. *Liosarcophaga* Enderlein, *Arch. klassif. phylogen. Ent.*, 1(1) : 19 (as distinct genus).

Type species : *Cynomyia madeirensis* Schiner, 1868.

1937. *Engelisca* Rohdendorf, *Fauna USSR, Dipt.*, 19 (1) : 254 (as subgenus of *Parasarcophaga*).

Type species : *Sarcophaga nodosa* Engel, 1925.

1963. *Parathalattisca* Rohdendorf, *Stuttg. Beitr. Naturk.*, 124 : 10 (as subgenus of *Parasarcophaga*).

Type species : *Sarcophaga maritima* Engel, 1925.

Morphology : R₁ and propleura bare; three or more postsutural dorsocentral bristles present; second abdominal sternite with dense hairs; third and fourth abdominal sternites with long dense hairs; paraphallus not laterally compressed but sometimes dorso-ventrally compressed; apical and lateral plates of paraphallus well developed; ventralia long or short.

Discussion : This is comparatively a long genus. Rohdendorf (1937) reviewed this genus from USSR who placed it under the subtribe Bellieriina in 1965. Zumpt (1972) and Dear (1980) placed this as subgenus under the genus *Sarcophaga* and listed a total of 25 species from the Ethiopian region. Lopes *et al.* (1977) reported 6 species

from the Oriental region and divided it into two subgenera : *Thyrsocnema* Enderlein, 1928 and *Pseudothyrsocnema* Rohdendorf, 1937 and both the genera are available here. Only 2 species have been reported from India. Pape (1987b) listed 2 species from Fennoscandia and Denmark. Verves (1986) recorded a quite large number of species from the Palaeartic region.

Biology : Few members of the genus have been reported as parasite on Acridid grasshoppers (Séguy, 1941) and most of the species have been collected from flowering plants. Few larvae breed in faeces and also have the record of breeding from snails. Some species have been recorded from *Eurygaster* sp. (Scutelleridae, Hemiptera).

Distribution : This genus has been recorded to be distributed in the Oriental, Palaeartic and Afrotropical regions.

Key to subgenera

1. Apical part of paraphallus not so developed; ventralia long; inner forceps apically blunt and each with a sharp teeth*Thyrsocnema* Enderlein
 Apical part of paraphallus well developed, long and slender; ventralia short; inner forceps with a distinctly separate slender apical part and covered with hairs almost to apex*Pseudothyrsocnema* Rohdendorf

Subgenus *Pseudothyrsocnema* Rohdendorf, 1937

1937. *Pseudothyrsocnema* Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 167.

Type species : *Sarcophaga spinosa* Villeneuve, 1911.

Morphology : Paraphallus well developed, long and slender; apical plate of paraphallus well developed and elongated; lateral plate of paraphallus short ; ventralia short with 1 or 3 pairs of lobes; styli of glans long and extending in some cases beyond the end of apical plate of paraphallus; inner forceps almost wholly covered with hairs, its apical part slender.

Shinonaga and Lopes (1975) revised this subgenus and listed a total of 8 species from the Palaeartic and the Oriental regions. Only 5 species have been reported from the Oriental region (Lopes *et al.*, 1977) and 4 species from the Palaeartic region (Verves, 1986). A total of 5 species are represented here.

So far the literature is concerned there is no much report regarding the biology of the members of this subgenus but most of them were collected from bushes and flowering plants.

This subgenus is distributed in the Oriental and Palaeartic regions.

Key to male species

1. Apical plate of paraphallus reaching beyond anterior end of ventralia ; ventralia well developed2
 Apical plate of paraphallus not reaching beyond anterior end of ventralia ; ventralia small*nicoborensis* Nandi
2. Ventralia composed of a pair of elongated lobes3
 Ventralia composed of 3 pairs of lobes4
3. Apical plate of paraphallus bifurcated at end*dasguptai* Nandi
 Apical plate of paraphallus single and pointed
*longistylata* Shinonaga and Lopes
4. Ventralia curved posteriorly and the lobes unequal
*indica* Shinonaga and Lopes
 Ventralia curved anteriorly and the lobes almost equal
*lushainensis* Nandi

135. *Thyrsocnema (Pseudothyrsocnema) nicoborensis* Nandi

(Figs. 777–781)

1989. *Thyrsocnema (Pseudothyrsocnema) nicoborensis* Nandi, *J. Andaman Sci. Assoc.*, **5**(2) : 120 ; Nandi, 1989, *Mems Inst. Oswaldo Cruz*, **84**(4) : 398.

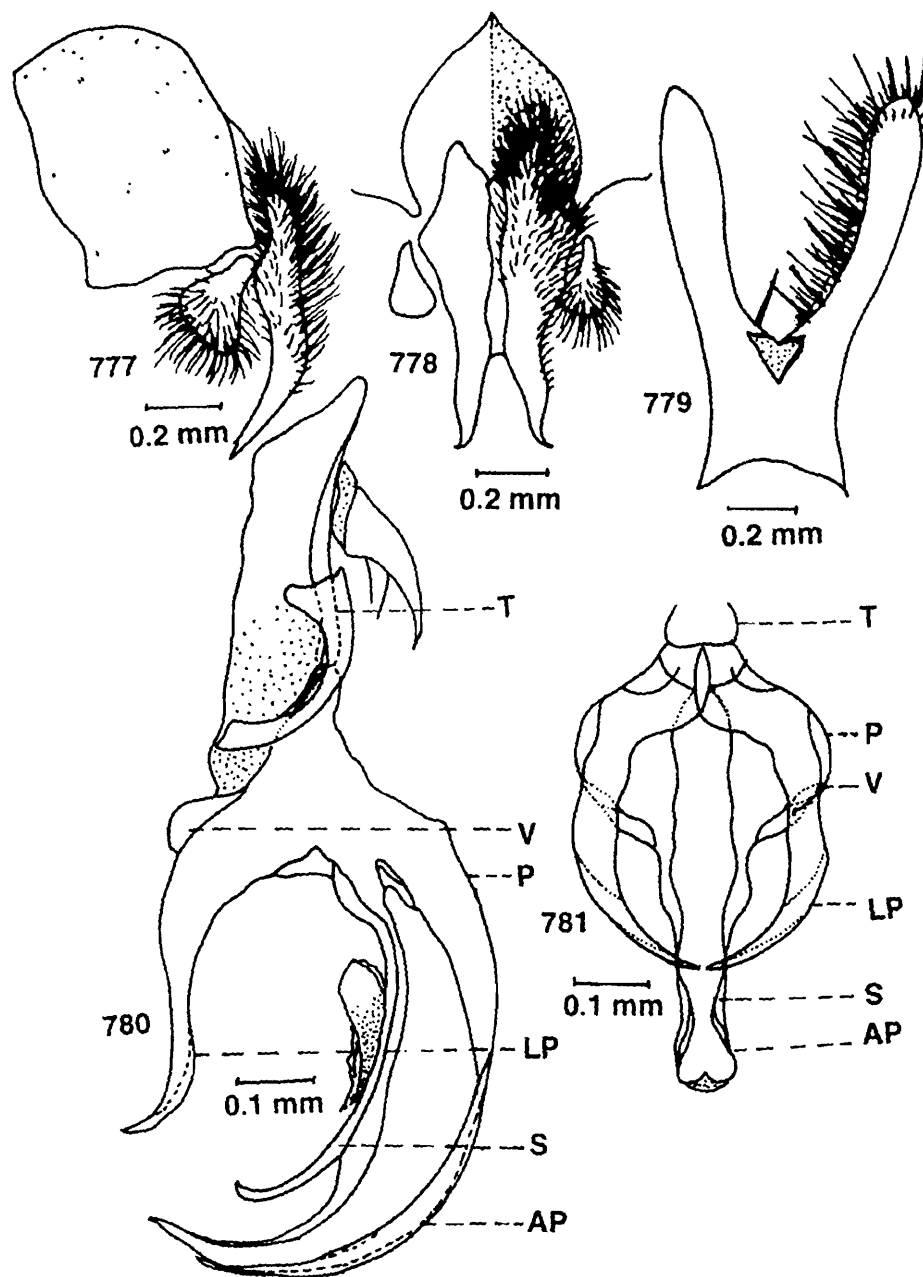
Male : Body length 7 mm.

Head : Width of frons about half that of one eye ; frontal vitta blackish, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial blackish with silvery pollen, the former with short scattered hairs, the latter with a row of short hairs near the eye margin ; antennae brownish-black and reaching up to about 0.85 distance to vibrissae, first and second segments black with black hairs, third brownish, silvery pollen and about three times that of the second ; arista long, plumose along basal three-fifths ; vibrissae long, crossed, distance between vibrissae greater than one parafacial width ; frontal bristles 8–9, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about more than half of second antennal segment, rest cruciate and directed forwards ; gena black with long hairs ; post gena black with black hairs ; outer vertical bristle not differentiated, inner vertical well developed, post vertical less than inner vertical ; a pair of rows of postocular setae besides postocular cilia, rest of the area with black hairs ; palpi slender and black ; proboscis short and black.

Thorax : Black with three black longitudinal stripes ; *ac* 4+1 ; *dc* 5+4 ; *ia* 1+3 ; *ps* 2 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 9 ; *hpl* 7 ; upper part of propleura bare, black with silvery pollen ; prostigmatic and propleural bristles well developed

and accompanied with short hairs; pro- and mesothoracic spiracles brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with short setae along half of its length from the basal node to r-m and 3-4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to the third, the former with short spines less



Figs. 777-781 : *Thyrsocnema (Pseudothyrsocnema) nicoborensis* Nandi. 777, Inner and outer forceps (lateral view); 778, Inner and outer forceps (posterior view); 779, Fifth sternite; 780, Penis (lateral view); 781, Penis (ventral view).

than half of its distal anterior end; basicostal scale yellowish; epaulet black with short spines; squama brownish; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3–4 short bristles along basal one-third of anterodorsal surface, 1 bristle on posterolateral surface at about two-thirds the distance from the basal end ; mid femur with a row of 3–4 bristles along middle portion of anterolateral surface and 1 bristle each on posterodorsal and posterolateral surfaces at about one-third the distance from the distal end ; mid tibia with a row of bristles along posterolateral surface ; hind femur with a row of bristles along anterodorsal surface but without long hairs along anterior and posterior margins of ventral surface ; hind tibia with a row of bristles along anterodorsal surface, 2 bristles each on posterodorsal surface at about one-third and two-thirds the distances from the distal end but without tuft of long hairs along ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 1 lateral marginal bristles, fourth with 2 lateral but without median marginal bristles, fifth with a row of 18 marginal bristles ; sternites first to third with short hairs, fourth with long hairs ; fifth sternite Y-shaped with strong spines and long hairs on lateral sides of arms ; first genital segment black but without marginal bristles, second blackish with numerous black hairs ; inner forceps elongated, curved and bearing notch at end ; outer forceps almost oval ; anterior paramere deeply curved and blunt at end ; posterior paramere pointed at end with 2 long hairs on anterior end ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus curved, gradually pointed terminally but not reaching beyond ventralia ; lateral plate of paraphallus long, curved and pointed ; styli of glans elongated but without serrations ; ventralia small and rounded at end.

Female : Unknown.

Material examined : *Holotype* ♂, India : Car Nicobar ; Agricultural Farm area, 19.xii.1988, B.C. Nandi ; *Paratype* ♂, same data as *Holotype* ; 1♂, Tripura ; Jamerdhapa. 30.vi.1989, B. C. Nandi.

Discussion on species : This species is characteristic by its small oval ventralia, elongated lateral plate of paraphallus and sharply curved apical plate of paraphallus. This species is almost similar to *T. (Pseudothyrsocnema) longistylata* Shinonaga and Lopes, 1975 but distinguished from it by the detailed structures of apical and lateral plates of paraphallus. Moreover, the structure of anterior paramere is quite distinguishable here from *longistylata*.

Biology : This is a rare species which was collected from bushes in Agricultural Farm area and bushes in the flowering garden.

Distribution : India ; T (Jamerdhapa) and AN (Car Nicobar).

Type deposited : *Holotype* ♂, ZSIC, studied.

136. *Thyrsocnema (Pseudothyrsocnema) dasguptai* Nandi

(Figs. 782–787)

1979. *Thyrsocnema (Pseudothyrsocnema) dasguptai* Nandi, *Orient. Insects*, **13** (1–2) : 194 ;
Nandi, 1990, *J. Beng. nat. Hist. Soc.*, **9** (1) : 53.

Male : Body length 6–8 mm.

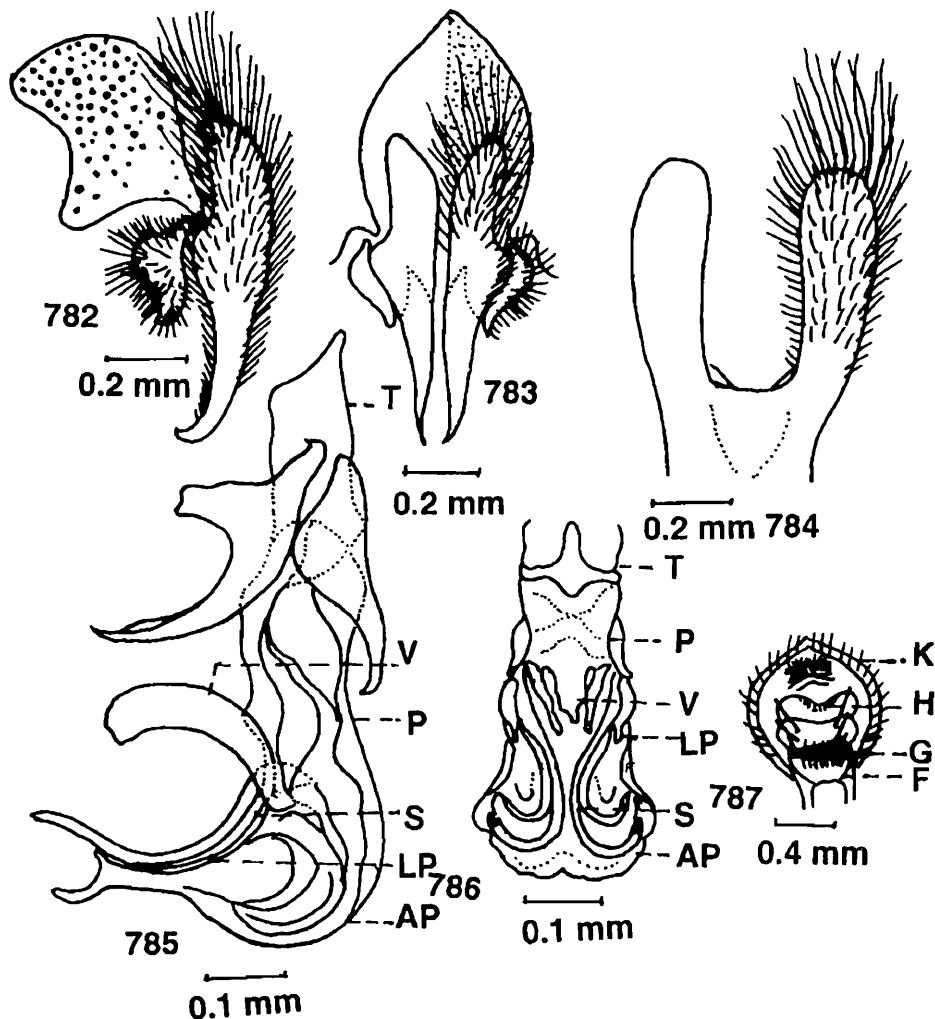
Head : Width of frons greater than half of one eye ; frontal vitta black ; its width at narrowest point of frons about twice that of each parafrenal ; parafrenal and parafacial brown with silvery pollen, the former with short scattered hairs, the latter with a row of short hairs near the eye margin ; antennae black and reaching up to about 0.83 distance to vibrissae, first and second segments brownish with short hairs, third slightly black with brown pollen and about three times that of the second ; arista long, plumose along basal two-thirds ; facial ridge brownish, silvery pollen and with short hairs ; vibrissae long, distance between vibrissae about twice that of one parafacial width ; frontal bristles 8–9, posterior 2 reclinate, anterior 2 below base of antennae and reaching up to about one-third of second antennal segment, rest cruciate and directed forwards ; gena black with silvery pollen ; post gena black with short white hairs ; ocellar triangle black with short black hairs ; outer vertical bristle not differentiated, inner vertical well developed, post vertical short and about one-third the inner vertical ; a row of irregular postocular setae besides postocular cilia, rest of the area with whitish hairs ; palpi slender and black ; proboscis blackish.

Thorax : Blackish with three black longitudinal stripes ; *ac* 0+5 ; *dc* 5+5 ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 5 ; *hpl* 8–9 ; upper part of propleura bare and brownish ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brownish ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of about 5–6 short setae located dorsally and extending up to half from the basal node to r-m and few short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than one and half times that of the third, the former with short spines along basal half of its anterior margin ; costal spines not stout ; epaulet black with short spines ; basicostal scale yellowish ; squama white ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a pair

of rows of bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row of 2–4 bristles along middle portion of anterolateral surface, few long bristles along basal one-third and a row of short setae along distal two-thirds of anteroventral surface, a row of short setae along distal two-thirds of posteroventral



Figs. 782-787 : *Thyrsocnema (Pseudothyrsocnema) dasguptai* Nandi. 782, Inner and outer forceps (lateral view); 783, Inner and outer forceps (posterior view); 784, Fifth sternite; 785, Penis (lateral view); 786, Penis (ventral view); 787, Genitalia ♀ (ventral view).

surface and 1 bristle on posterodorsal surface on distal end ; mid tibia with a row of short bristles along anterodorsal surface and 1 bristle each on posterodorsal, posterolateral and posteroventral surfaces at about one-fourth the distance from the distal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of 3–4 long bristles along anteroventral surface and a row of long bristles along posteroventral surface on distal end ; hind tibia with a row of short and 3 long

bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-fifth the distance from the distal end, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end and a row of long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with 1 lateral marginal bristle, fifth with a row of 14–16 marginal bristles ; sternites first to fourth with long hairs ; fifth sternite v-shaped with short spiny hairs laterally and several long hairs terminally on arms ; first and second genital segments brownish, the former with short marginal spines, the latter with long hairs ; inner forceps almost straight but slightly curved apically ; outer forceps slightly elongated with long hairs distally ; anterior paramere elongated, almost straight with subbasal process ; posterior paramere pointed apically and slightly sclerotised ; apical plate of paraphallus curved, reaching beyond anterior end of ventralia and bifurcated at end of which first process is elongated ; lateral plate of paraphallus short and pointed ; styli of glans long, crossing the apical plate of paraphallus but without serrations ; ventralia well developed, elongated and with a pair of apically curved dumble-shaped and slightly sclerotised lobes.

Female : Body length 7–9 mm.

Head : Frontal bristles 7–8 ; proclinate bristles 2 ; fronto-orbital bristles 2 ; outer vertical bristle well developed and half that of inner vertical.

Thorax : Similar to that of male but 1 pair of additional bristles in front of apicoscutellar bristles.

Wings : Same as in male.

Legs : Same as in male.

Abdomen : Sixth sternite with 6–7 bristles, seventh in addition with 2 long bristles laterally and 2 medially, eighth membranous but without bristles.

Puparium : Length about 5–7 mm, diameter 1–1.5 mm, cylindrical in shape and tapering in both ends ; colour light brown ; spine bands on segments not prominent.

Material examined : *Holotype* ♂, Pakistan : Baluchistan ; Fort Sandeman, 24. vi. –3. vii. 1943, C.K. Samuel ; *Allotype* ♂, same data as *Holotype* ; *Paratypes* 2 ♂ ♂, same data as *Holotype* ; 1 ♂, India : Rajasthan ; Bharatpur Bird Sanctuary, 18.xii.1986, B. C. Nandi.

Discussion on species : This species is similar to *T. (Pseudothyrsocnema) longistylata* Shinonaga and Lopes, 1975 but differs from it by the structures of ventralia and apical plate of paraphallus. This species may also be distinguished from *T. (Pseudothyrsocnema) caudagalli* (Böettcher, 1912) by the detailed structures of ventralia and apical part of apical plate of paraphallus.

Biology : This species is not so abundant which was collected from bushes in forest area. This species breeds in *Eurygaster* sp. (Scutelleridae).

Distribution : India ; R (Bharatpur) and Pa (Baluchistan).

Type deposited : *Holotype* ♂, IARI, studied.

137. *Thyrsocnema (Pseudothyrsocnema) longistylata* Shinonaga and Lopes
(Figs. 788–793)

1975. *Thyrsocnema (Pseudothyrsocnema) longistylata* Shinonaga and Lopes, *Pacif. Insects*, **16**(4) : 459.
1924. *Sarcophaga crinita* Senior-White, *Rec. Indian Mus.*, **26**(3) : 245 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 254.
1938. *Sarcophaga caudagalli* Lopes, *Mems Inst. Oswaldo Cruz*, **33**(4) : 557 (nec Böettcher, 1912).
1977. *Thyrsocnema (Pseudothyrsocnema) longistylata* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 578 ; Nandi, 1977, *Rec. zool. Surv. India*, **73** : 215 ; 1979 ; *Orient. Insects*, **13** (1–2) : 194 ; 1990, *Hexapoda*, **2** : 23.
1984. *Sarcophaga longistylata* : Sugiyama and Kano, *Jap. J. sanit. Zool.*, **35**(4) : 351.

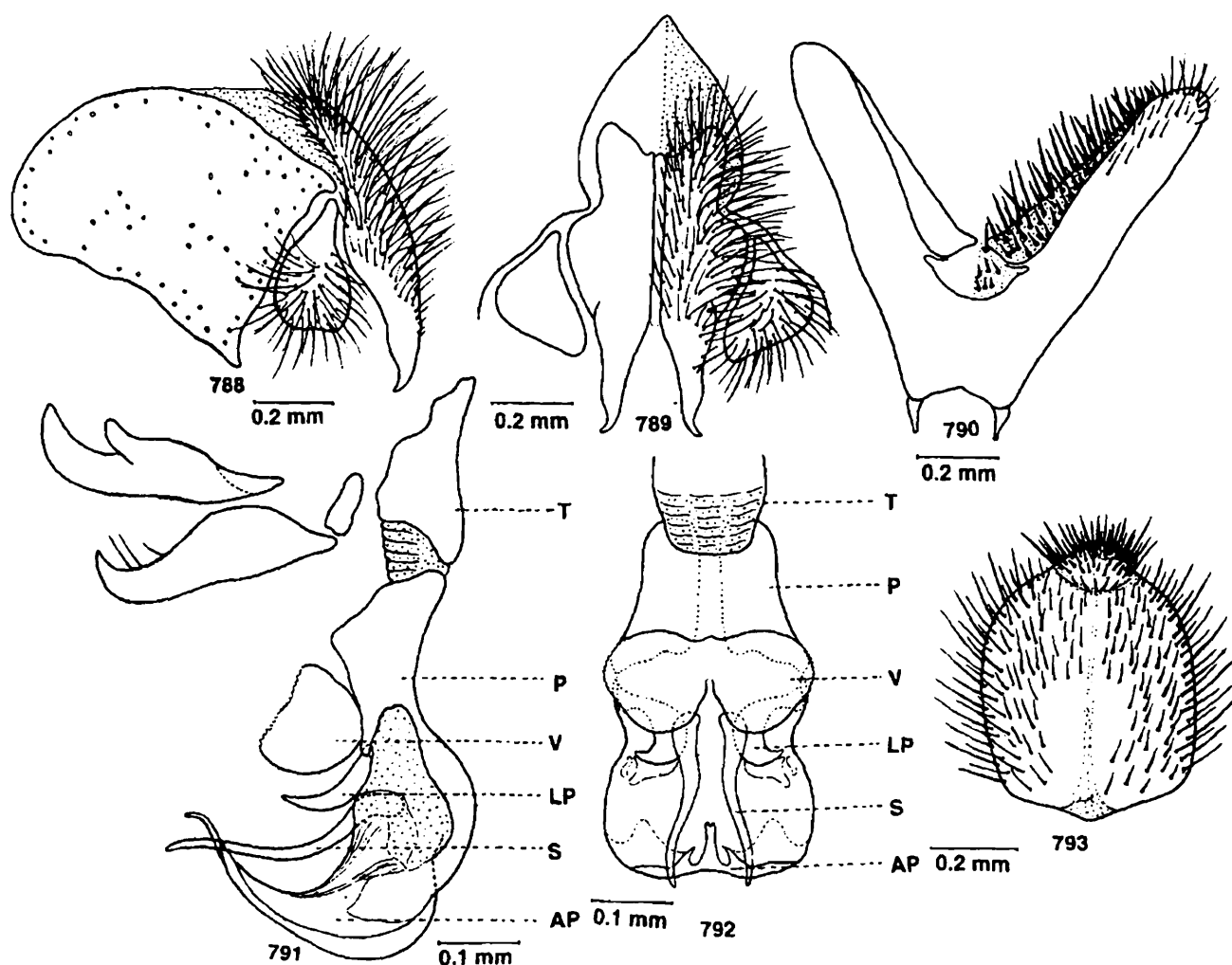
Male : Body length 8–10 mm.

Head : Width of frons about three-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered black hairs, the latter with a row of black hairs near the eye margin ; antennae brownish and reaching up to about 0.9 distance to vibrissae, first and second segments blackish-brown with short spines, the tip of second segment reddish, third brownish, silvery pollen and about two and half times that of the second ; arista long, plumose along basal half ; facial ridge brownish, wholly with silvery pollen and short black spines ; vibrissae long, distance between vibrissae about one and half times that of one parafacial width ; frontal bristles 9–10, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about two-thirds of second antennal segment, rest cruciate and directed forwards ; gena black, silvery pollen and with black hairs ; post gena black with silvery greyish hairs ; ocellar triangle black with long black hairs ; outer vertical bristle short, inner vertical well developed, post vertical moderately developed and about two-fifths that of inner vertical ; ocellar bristles short, post ocellar less than half of inner vertical ; a pair of rows of postocular setae besides postocular cilia, of which the first row almost regular and the second row irregular, rest of the area with greyish hairs, palpi slender and black ; proboscis brown.

Thorax : Grey with three black longitudinal stripes, *ac* 0+1 ; *dc* 5+5 (posterior 2 *dc* stout) ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 6–7 ; upper

part of propleura bare and black ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown, apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 7–8 short setae located dorsally and extending up to three-fifths from the basal node to r-m and



Figs. 788-793 : *Thyrsocnema (Pseudothyrsocnema) longistylata* Shinonaga and Lopes. 788, Inner and outer forceps (lateral view); 789, Inner and outer forceps (posterior view); 790, Fifth sternite; 791, Penis (lateral view); 792, Penis (ventral view); 793, Fourth sternite.

several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment about one and half times that of the third, the former with short spines along basal four-fifths of its anterior margin; costal spines stout; epaulet black with short spines; basicostal scale yellowish; squama yellowish; halter brown.

Legs : Black; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal half of anterodorsal surface, 1 bristle each on posterolateral and posterodorsal surfaces at about one-third the distance from the distal end; mid femur with a row of about 4–5 bristles along middle portion of anterodorsal surface, a row of bristles along basal half and a row of short setae along distal half of posteroventral surface and 3 bristles on distal part of posterolateral surface; mid tibia with a row of bristles along anterodorsal surface, a row of 2 long and few short bristles along posterodorsal surface and 1 bristle on posterolateral surface at about one-third the distance from the distal end; hind femur with a pair of rows of long bristles along anterodorsal surface, a row of bristles each along anteroventral and posteroventral surfaces and 1 bristle each on posterodorsal and posterolateral surfaces distally; hind tibia with a row of bristles along anterodorsal surface, 1 bristle each on distal part of posterodorsal and posterolateral surfaces and with tuft of long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of lateral marginal bristles, fifth with a row of about 14–16 marginal bristles; sternites first to third with moderately long hairs, fourth with tuft of short setae along its posterior end; fifth sternite v-shaped with short spines laterally and long hairs terminally on arms; first and second genital segments brownish-black with short hairs but without marginal bristles; inner forceps long, straight and with small notch at its pointed end; outer forceps almost triangular with hairs on distal end; anterior paramere almost blunt at end with small lateral projection medially; posterior paramere curved, pointed at end and with 2 hairs on its anterior margin; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus as long as the styli; lateral plate of paraphallus narrow and curved anteriorly; styli of glans long, crosses the apical plate of paraphallus but without serrations anteriorly; ventralia with a pair of rounded well sclerotised and anteriorly dentate plates.

Female : Unknown.

Material examined : 1♂, India : West Bengal; Diamond Harbour, 6.vii.1974, B. C. Nandi; 1 ♂, Midnapore; Digha, 30.xi. 1974, B.C. Nandi; 1 ♂, Midnapore; Arabari Forest, 26.xi.1974, B.C. Nandi; 1 ♂, Kerala; Palghat; 82m, 28.x.1985, B. C. Nandi; 1♂, Bihar; Netarhat, 23.vi 1989, 1,250m, B. C. Nandi.

Discussion on species : This species is similar to *T. (Pseudothyrsocnema) dasguptai* Nandi, 1979 but differs from it by the structures of ventralia and apical plate of paraphallus. This species is also distinguished from *T. lushainensis* Nandi, 1992 by the structures of ventralia and anterior paramere.

Biology : This is relatively common species which was collected from bushes and grasses in plain as well as in hill areas.

Distribution : India ; B (Chapra, Chota Nagpur, Netarhat, Pusa), K (Cinchona, Karikal, Palghat), O (Dogoaposi, Hatisalpara), TN (Kazanthum, Kodaikanal, Kotagiri, Chennai) and WB (Arabari Forest), Calcutta, Canning, Diamond Harbour, Digha) ; M (Mandalay) and SL (Colombo).

Type deposited : *Holotype* ♂, ABC, not studied.

138. *Thyrsocnema (Pseudothyrsocnema) lushainensis* Nandi

(Figs. 794–798)

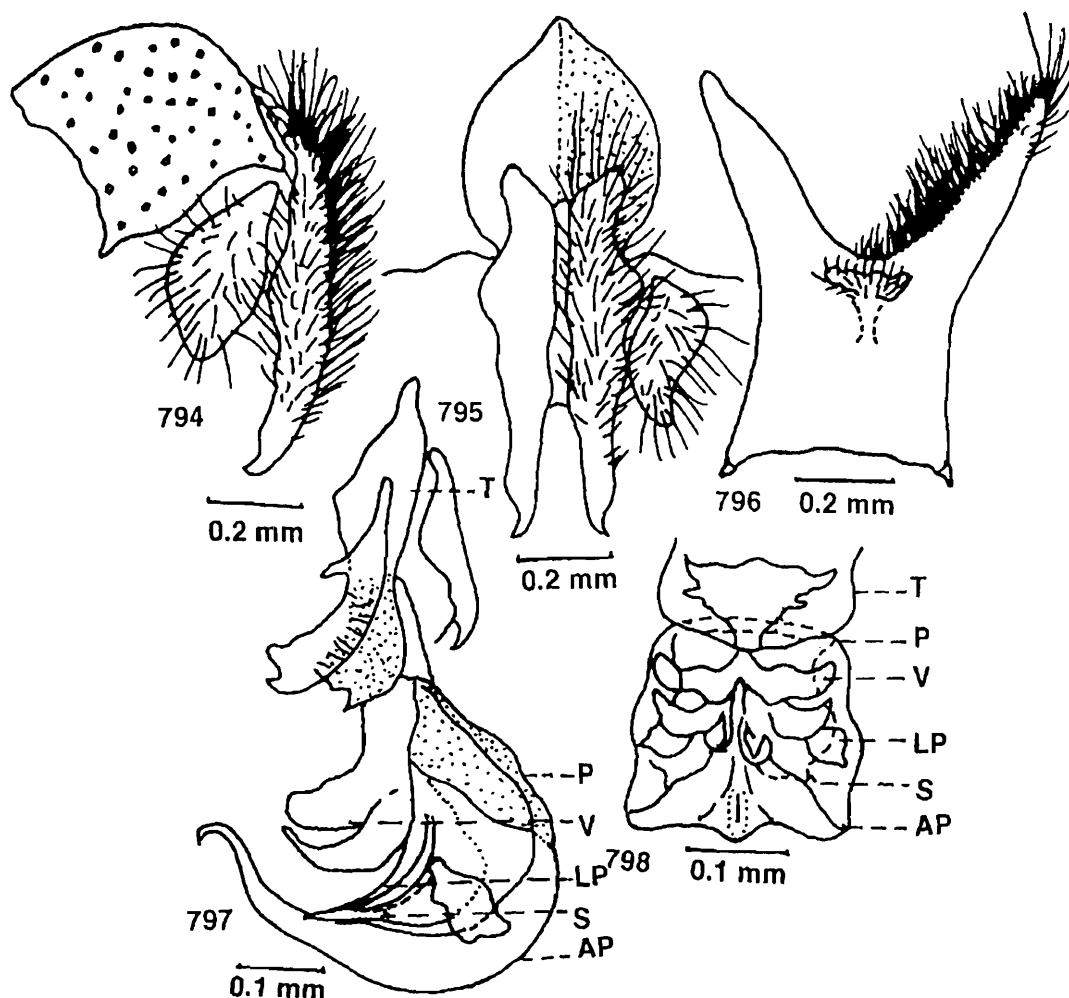
1992. *Thyrsocnema (Pseudothyrsocnema) lushainensis* Nandi, *J. Beng. nat. Hist. Soc.*, **11**(2) : 41.

Male : Body length 6–8 mm.

Head : Width of frons about two-thirds that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial black with golden pollen, the former with short scattered hairs, the latter with a row of 5–7 short hairs near the eye margin ; antennae brownish and reaching up to about 0.9 distance to vibrissae, first and second segments blackish-brown with short spines, third brownish with silvery pollen and about three times that of the second ; arista long, plumose along more than basal half ; frontal ridge brownish with silvery pollen ; vibrissae long, distance between vibrissae twice that of each parafacial width ; frontal bristles 9, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about two-thirds of second antennal segment, rest cruciate and directed forwards ; gena black, silvery pollen and with short black hairs ; post gena black with greyish hairs ; ocellar triangle black with black hairs ; outer vertical bristle short, inner vertical well developed, post vertical moderately developed and about one-fourth the inner vertical, post vertical equal to ocellar and about two-fifths that of inner vertical ; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with greyish hairs ; palpi slender and black ; proboscis brownish.

Thorax : Grey with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 5 ; *hpl* 6–7 ; upper part of propleura bare and black ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 7–8 short setae located dorsally and extending up to three-fifths from the basal node to r-m and 3–4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment greater than the third, the former with short spines along whole length of its anterior margin ; costal spines not so stout ; epaulet black with short spines ; basicostal scale yellowish ; squama yellow ; halter brown.



Figs. 794-798 : *Thyrsocnema (Pseudothyrsocnema) lushainensis* Nandi. 794, Inner and outer forceps (lateral view); 795, Inner and outer forceps (posterior view); 796, Fifth sternite; 797, Penis (lateral view); 798, Penis (ventral view).

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row of 4 bristles along middle portion of anterodorsal surface, a row of bristles along basal half and a row of short setae each along distal half of anteroventral and posteroventral

surfaces and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with a row of 3 long and few short bristles along anterodorsal surface, 1 bristle each on anteroventral surface at about one-third and two-thirds the distances from the distal end ; hind femur with a row of bristles along anterodorsal surface, a row of bristles each along anteroventral and posteroventral surfaces and 1 bristle each on distal part of posterodorsal and posterolateral surfaces ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end but without tuft of long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth without median but with a pair of lateral marginal bristles, fifth with a row of 14–16 marginal bristles ; sternites first to third with short hairs, fourth with tuft of setae along its posterior end ; fifth sternite v-shaped with spines laterally and short hairs terminally on arms and bearing spines on window ; first and second genital segments without marginal bristles ; inner forceps long with slight notch at the anterior end ; outer forceps almost oval with long hairs ; anterior paramere wide, strongly grooved at the anterior end and with short pointed lateral projection at subbasal end ; posterior paramere thin, curved at end and with single hair ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus curved, hook-shaped anteriorly but without bifid process terminally ; lateral plate of paraphallus elongated and longer than styli ; styli of glans short, pointed but without serrations ; ventralia slightly sclerotised, well developed and with 2 pairs of almost equal lateral lobes, posterior one curved and pointed apically and the anterior one blunt and wide.

Female : Unknown.

Material examined : *Holotype* ♂, India : Mizoram ; Champai Zote village, 1,500 m, 13.vi.1989, B.C. Nandi ; *Paratype* ♂, same data as *Holotype*.

Discussion on species : This species is similar to *T. (Pseudothyrsocnema) indica* Shinonaga and Lopes, 1975 but is distinguished from it by the detailed structures of fifth sternite, ventralia and apical plate of paraphallus. This species also differs from *T. (Pseudothyrsocnema) caudagalli* (Böttcher, 1912) by the structure of ventralia and bifidness of process of apical plate of paraphallus.

Biology : This is a rare species which was collected from bushes and grasses near rice field.

Distribution : India ; MnP (Churachandpur) and Mz (Champai Zote village).

Type deposited : *Holotype* ♂, ZSIC, studied.

139. *Thyrsocnema (Pseudothyrsocnema) indica* Shinonaga and Lopes
(Figs. 799–803)

1975. *Thyrsocnema (Pseudothyrsocnema) indica* Shinonaga and Lopes, *Pacif. Insects*, **16** (4) : 459 ; Verves, 1991, *Proc. Zool. Ins. USSR*, **240** : 131, Nandi, 1992, *Hexopoda*, **4** (1) : 76.
1924. *Sarcophaga caudagalli* Senior-White, *Rec. Indian Mus.*, **26**(3) : 227 (nec Böettcher, 1912).
1976. *Thyrsocnema (Pseudothyrsocnema) fernandae* Lehrer, *Bull. Annl. Soc. r. ent. Belg.*, **112** (4–6) : 154.

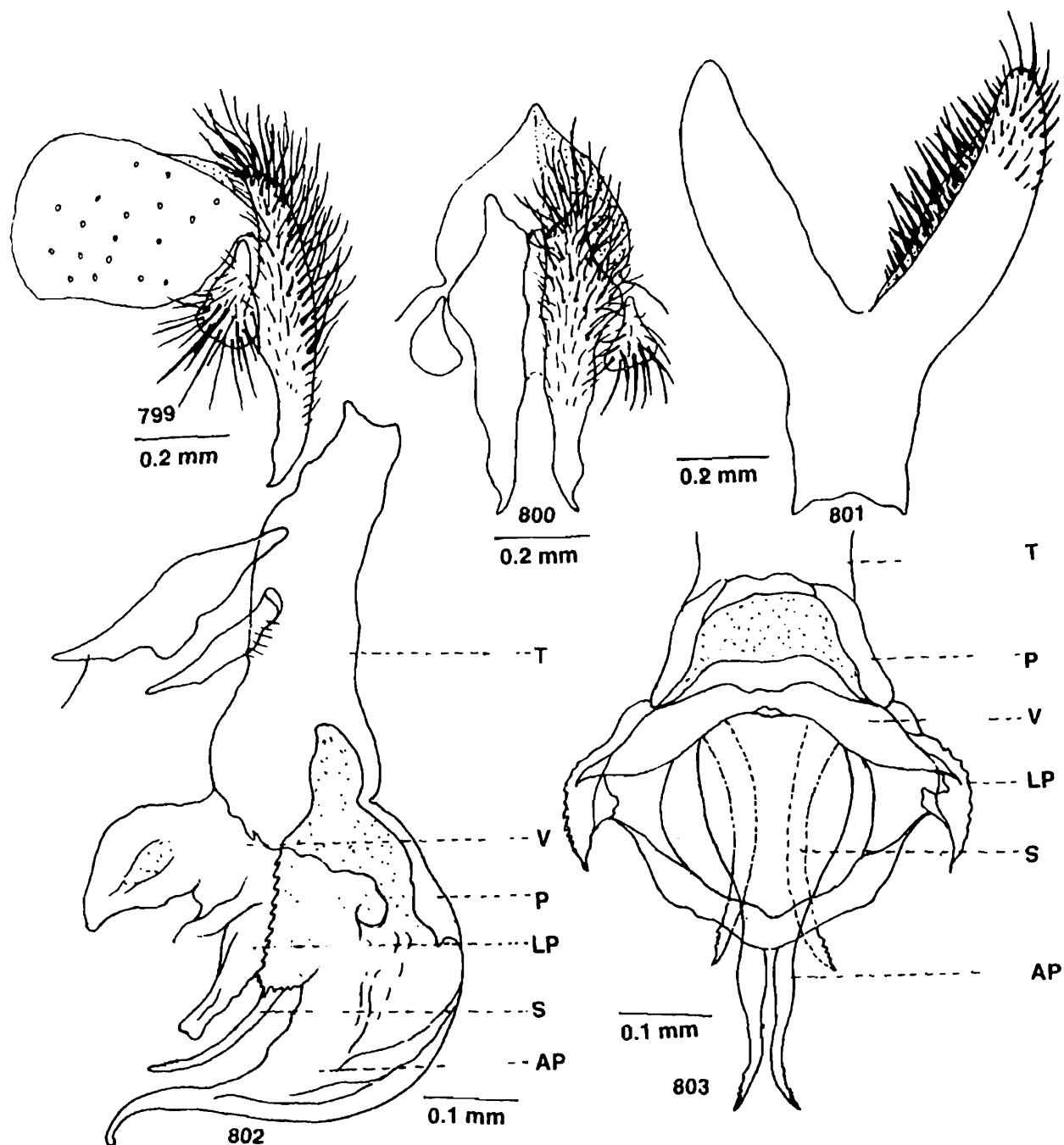
Male : Body length 7–8 mm.

Head : Width of frons about three times that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered black hairs, the latter with a row of black hairs near the eye margin ; antennae brownish-black and reaching up to about 0.92 distance to vibrissae, first and second segments brownish-black, the tip of the second slightly black, third brownish, slightly with silvery pollen and about three times that of the second ; arista long, plumose along basal two-thirds ; facial ridge black, silvery pollen and with short spines ; vibrissae long, distance between vibrissae about one and half times that of one parafacial width ; frontal bristles 8–10, posterior 2 reclinate, anterior 2 below base of antennae and reaching up to about one-third of second antennal segment, rest cruciate and directed forwards ; gena black, silvery pollen and with short black hairs ; post gena black with silvery greyish hairs ; ocellar triangle black with long black hairs ; outer vertical bristle short, inner vertical well developed, post vertical short and about two-fifths that of inner vertical ; ocellar bristles short, postocellar less than half of inner vertical ; a pair of rows of postocular setae besides postocular cilia, of which the first row regular and second row irregular, rest of the area with greyish hairs ; palpi slender and black ; proboscis blackish-brown.

Thorax : Yellowish-grey with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 (posterior 2 *dc* strong) ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 3 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 7–8 ; upper part of propleura bare and black ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 8–9 short setae located dorsally and extending up to three-fourths from the basal node to r–m and 3–4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment about more than that of the third, the former with short spines along basal three-fifths of its anterior margin ; costal spines strong ; epaulet whitish-brown with short spines ; basicostal scale yellowish ; squama yellowish ; halter brown.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with



Figs. 799-803 : *Thyrsocnema (Pseudothyrsocnema) indica* Shinonaga and Lopes. 799, Inner and outer forceps (lateral view) 800, Inner and outer forceps (posterior view); 801, Fifth sternite; 802, Penis (lateral view); 803, Penis (ventral view); (after Shinonaga and Lopes, 1975).

a row of 3 bristles along basal half of anterodorsal surface, 1 bristle each on posterolateral and posterodorsal surfaces at about one-third the distance from the distal end ; mid femur with 3–4 bristles along middle portion of anterodorsal surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of bristles along basal half and a row of short setae along distal half of posteroventral surface and 3 bristles along distal part of posterolateral surface ; mid tibia with a row of bristles along anterodorsal surface, a row of bristles along posterodorsal surface and 1 bristle on posterolateral surface at about one-third the distance from the distal end ; hind femur with a row of bristles along anterodorsal surface, a row of bristles each along anteroventral and posteroventral surfaces and 1 bristle each on posterodorsal and posterolateral surfaces distally ; hind tibia with a row of bristles along anterodorsal surface and 1 bristle each on posterodorsal and posterolateral surfaces distally but without tuft of long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of lateral and a pair of median marginal bristles, fifth with a row of 14–16 marginal bristles ; sternites first to fourth with moderately long hairs ; fifth sternite v-shaped with strong spines laterally and short hairs terminally on arms ; first and second genital segments black but without marginal bristles ; inner forceps long, almost straight and with small notch at the pointed end ; outer forceps almost oval with short hairs distally ; anterior paramere almost straight at end with 1 hair posteriorly ; posterior paramere slightly curved with few hairs posteriorly ; theca shorter than paraphallus, both are heavily sclerotised ; apical plate of paraphallus long, very narrow and bifid apically ; lateral plate of paraphallus dentate anteriorly, short and strongly sclerotised ; ventralia large with distal concave unequal lobes and covers the base of the styli.

Female : Unknown.

Material examined : 4 ♂♂, India : Karnataka ; Kemangundi Hills, 1,500 m, 25. vi.1990, B.C. Nandi ; 1 ♂, Tamil Nadu ; Kodaikanal, 1,982 m, 1.xi.1953, P.S.Nathan.

Discussion on species : This species is similar to *T (Pseudothyrsocnema) lushainensis* Nandi but differs from it by the structures of ventralia and anterior paramere.

Biology : This is a rare species which was collected from bushes.

Distribution : India ; AnP (Araku) ; Kt (Kemangundi, Mudigare), Mr (Mahabaleshwar), K (Calicut, Cinchona, Muttupatty, Munnar), TN (Kodaikanal, Kotagiri), Ld (Kavarati) and SL (Pattipola).

Type deposited : *Holotype* ♂, BPBM, not studied.

Subgenus *Thyrsocnema* Enderlein, 1928

1928. *Thyrsocnema* Enderlein, *Arch. klassif. phylogen. Ent.*, 1(1) : 42.

Type species : *Sarcophaga striata* Meigen, 1826 (= *Sarcophaga incisilobata* Pandellé, 1896).

Morphology : R₁ bare ; abdomen with chess-board pattern ; inner forceps apically blunt but without spines ; abdominal sternites with short and long hairs ; penis long ; apical plate of paraphallus not so developed but with processes ; lateral plate of paraphallus well developed ; ventralia and styli of glans long and easily recognized.

This is comparatively a short subgenus and only 2 species have been reported from the Palaearctic region. Dear (1980) placed it under the genus *Sarcophaga* and listed many species from the Afrotropical region. Only 1 species is reported here.

Some members of this subgenus have been recorded as parasites on grasshoppers. Few have been bred from dead locusts and also have the record of rearing from dead scorpions (Zumpt, 1972).

Mostly distributed in the Afrotropical region.

140. *Thyrsocnema (s.str.) kentejana* Rohdendorf

(Figs. 804-808)

1937. *Thyrsocnema (s. str.) kentejana* Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 174; 1979, Verves, *Cat. Palae. Dipt.*, 12 : 145.

1965. *Pierretia (Thyrsocnema) kentejana* : Fan, *Synan. flies China*, 15 : 237.

1988. *Sarcophaga kentejana* : Sugiyama, *Jap. J. sanit. Zool.*, 40 : 120.

Male : Body length 7.5–9 mm.

Head : Width of frons about equal to that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of 5 hairs near the eye margin ; antennae blackish and reaching up to about 0.85 distance to vibrissae ; first and second segments black with short spines, third slightly brownish and about two and half times that of the second ; arista long, plumose along basal half ; facial ridge brownish, greyish pollen and with short spines ; vibrissae long, distance between vibrissae about one and half times that of one parafacial width ; frontal bristles 9, posterior 2 reclinate, anterior 2 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; gena black with brown pollen and black hairs ; post gena blackish with black hairs ; outer vertical bristle short, inner vertical well developed, post vertical short and about one-fourth that of inner vertical ; ocellar bristles short, postocellar less than half of inner vertical ; a pair of rows of postocular setae besides

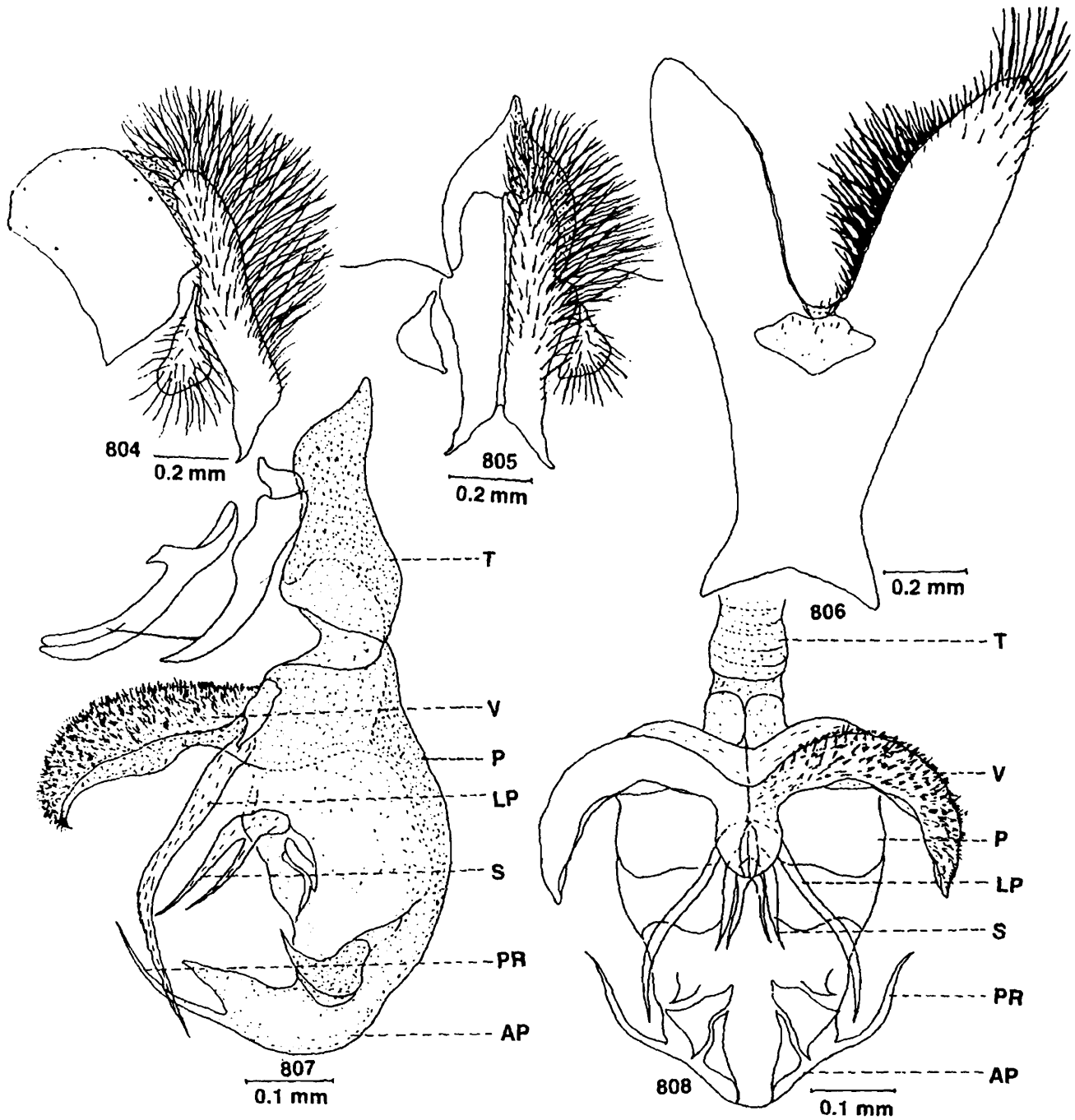
postocular cilia, rest of the area with black hairs, palpi slender and black ; proboscis black.

Thorax : Black with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+3 (posterior 2 *dc* strong) ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 3 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 8 ; upper part of propleura bare and black ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro-and mesothoracic spiracles black ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 6–8 short setae located dorsally and extending up to about three-fifths from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment longer than the third, the former with short spines along basal half of its anterior margin ; costal spines stout ; epaulet blackish-brown ; basicostal scale whitish ; squama white ; halter brown.

Legs : Black ; fore femur with a pair of rows of long bristles along anterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2 bristles along basal half of anterodorsal surface, 1 bristle each on posterolateral and posteroventral surfaces at about one-third the distance from the distal end ; mid femur with a row of 4–5 bristles along middle portion of anterodorsal surface, a row of long hairs along basal half and a row of short setae along distal half of anteroventral surface, a row of short setae along distal half of posteroventral surface and 1 bristle on distal end of posterolateral surface ; mid tibia with a row of bristles along anterodorsal surface, a row of bristles along posterodorsal surface and 1 bristle each on anteroventral and posterolateral surfaces at about one-third the distance from the distal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface and 1 bristle each on posteroventral and posterolateral surfaces on distal end ; hind tibia with 2 bristles along middle portion of anterolateral surface, 2 bristles along basal half of posteroventral surface, 1 bristle each on anterolateral and posteroventral surfaces and with short hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but second with 1 and third with 2 lateral marginal bristles, fifth with a row of 14 marginal bristles ; sternites first to fourth with short hairs ; fifth sternite Y-shaped, bearing window, with strong spines laterally and many long hairs terminally on arms ; first and second genital segments black but without marginal bristles ; inner forceps straight, beak-shaped at end and with many hairs basally ; outer forceps elongated with short hairs ; anterior paramere almost straight with slight projection at the subbasal end ; posterior paramere slightly curved at end with 1 strong hair apically ; theca shorter than paraphallus both are sclerotised ; apical plate of paraphallus wide, pointed at end and with one long apical process ;



Figs. 804-808 : *Thyrsocnema (s.str.) kentejana* Rohdendorf. 804, Inner and outer forceps (lateral view); 805, Inner and outer forceps (posterior view); 806, Fifth sternite; 807, Penis (lateral view); 808, Penis (ventral view).

lateral plate of paraphallus very elongated and crosses the apical plate of paraphallus ; styli of glans long and bifurcated ; ventralia well developed, sclerotised, curved posteriorly and with many short spines almost throughout the structure.

Female : Unknown.

Material examined : In spite of extensive survey from this area, this species was not available and the description provided here is based on Russian specimen identified by Yu. G. Verves.

Discussion on species : This species has its unique specific characters by having spined-ventralia, very elongated lateral plate of paraphallus, bifurcated styli of glans and elongated process of apical plate of paraphallus. It may be separated from all other species of the genus particularly from *T. (s. str.) incisilobata* (Pandellé, 1896) by its specific character.

Biology : Nothing is known regarding the biology of this species.

Distribution : India ; JK (Tangmarg) ; Pa (Saiful-Muluklake, Naltar) ; China ; Finland ; France ; Mongolia ; Norway ; Peru ; Romania ; Russia ; Sweden and Switzerland.

Type deposited : Holotype ♂, ZISP, not examined.

Genus 42. *Bellieriomima* Rohdendorf, 1937

1937. *Bellieriomima* Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 164 (as subgenus of *Thyrsocnema* Enderlein, 1928).

Type species : *Sarcophaga laciniata* Pandellé, 1896 (= *Sarcophaga subulata* Pandellé, 1896).

1986. *Bellieriomima* : Verves, *Cat. Palae. Dipt.*, 12 : 134 (as distinct genus).

Morphology : Presence of three posterodorsal bristles ; third abdominal tergite with or without a weak pair of median marginal bristles ; genital segments black or greyish but first segment with marginal bristles ; presence of well developed ventralia ; styli of glans weakly sclerotised and somewhat head-like ; apical part of paraphallus large and forms a broad leaf-like lobe ; lateral plate of paraphallus poorly developed and usually approaches to the apical part of paraphallus ; penis claw-shaped in profile.

Discussion : This is a small genus and Rohdendorf (1937) treated it as subgenus under the genus *Thyrsocnema*. Verves (1986) divided it into four subgenera, of which only one subgenus *Bellieriomima* is present here. A total of 15 valid species have been reported from the Palaearctic region. Pape (1987b) reported only 1 species from Denmark. Lopes *et al.* (1977) reported 4 species from the Oriental region.

Biology : Pape (1987) recorded the breeding of 1 species from *Lymantria disper* (Lepidoptera : Lymantriidae).

Distribution : This genus is distributed in the Oriental and Palaearctic regions.

Subgenus *Bellieriomima* Rohdendorf, 1937.

1937. *Bellieriomima* Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 164.

Type species : *Thyrsocnema laciniata* Pandellé, 1896.

Morphology : Genitalia segments greyish and first segment with marginal bristles ; ventralia well developed ; styli of glans poorly sclerotised ; apical plate of paraphallus large and forms beak-like ; lateral plate of paraphallus not so developed.

This is comparatively large subgenus and Verves (1986) reported 12 species from the Palaearctic region and 2 species are reported here.

Nothing is known regarding the biology of the species and it is mostly distributed in the Palaearctic region.

Key to male species

1. Gena with only black hairs ; apical part of paraphallus pointed
*situliformis* (Zhong, Wu and Fan)
- Gena with white hairs; apical part of paraphallus broad*globovesica* (Ye)

141. *Bellieriomima* (s. str.) *situliformis* (Zhong, Wu and Fan)
 (Figs. 809–811)

1981. *Pierretia* (*Bellieriomima*) *situliformis* Zhong, Wu and Fan, *Contr. Shanghai Inst. Ent.*, **2** : 248.

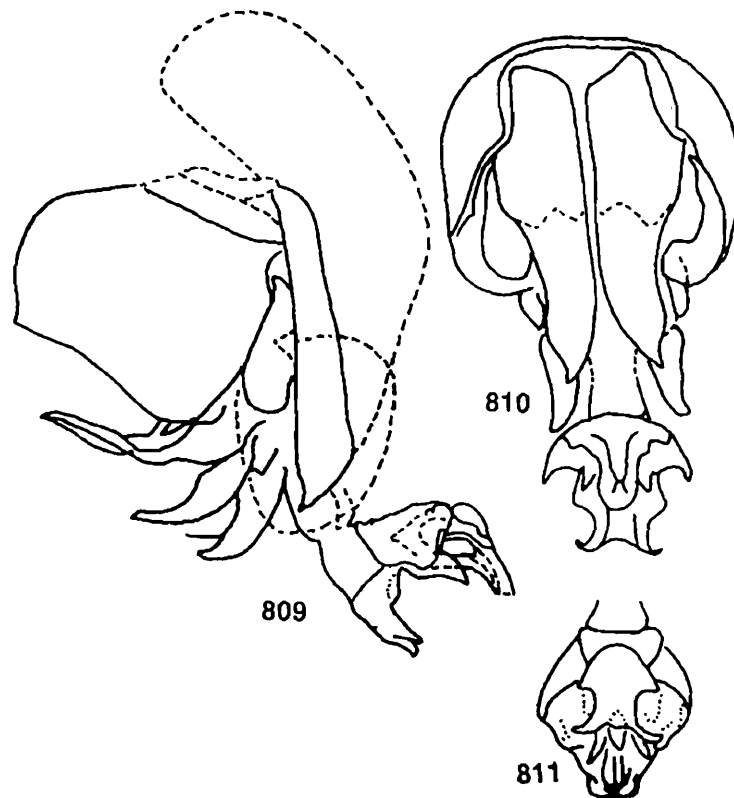
1994. *Sarcophaga situliformis* : Kano and Shinonaga, *Jap. J. sanit. Zool.*, **45** : 269.

1996. *Bellieriomima* (s. str.) *situliformis* : Nandi, n. comb.

Male : Body length 10.5 mm.

Head : Width of frons about four-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of 6–7 short hairs near the eye margin ; upper part of frons about four times that of one eye ; antennae greyish-black, reaching up to about 0.83 distance to vibrissae, first segment with short hairs, second black with short bristle-like hairs, third about three times that of the second ; arista long, plumose along basal three-fifths ; facial ridge greyish-black, silvery pollen and with few short hairs; vibrissae long, distance between vibrissae less than one parafacial width ; frontal bristles 12, posterior 2 reclinate, anterior 4 below base of antennae and reaching up to about two-thirds of second segment, rest cruciate and directed forwards ; gena black with black hairs ; post gena black with long yellowish hairs ; ocellar triangle black with short black hairs ; outer vertical bristle very short, inner vertical well developed and more than twice that of outer vertical, post vertical and post ocellar shorter than outer vertical ; palpi long and black ; proboscis moderately long and greyish.

Thorax : Whitish or pink in colour with three black longitudinal stripes *ac* 0+1 ; *dc* 3+3-4 ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 1 ; *np* 3 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 7 ; *hpl* 8-9 ; upper part of propleura bare ; pro- and mesothoracic spiracles blackish brown ; apicoscutellar and discoscutellar bristles not so developed, 1 pair each ; lateroscutellar bristles well developed, 2 pairs.



Figs. 809-811 : *Bellieriomima* (*s. str.*) *situliformis* (Zhong, Wu and Fan). 809, Penis with anterior and posterior parameres and inner and outer forceps (lateral view); 810, Penis and inner and outer forceps (ventral view); 811, Penis (ventral view); (after Zhong, Wu and Fan, 1981).

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 6-7 short setae located dorsally and extending up to one-third from the basal node to r-m and 2-3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment almost equal to third, the former without spines on its anterior margin ; costal spines strong ; epaulet black ; basicostal scale yellow ; squama transparent ; halter slightly brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface on basal two-thirds ; mid femur with a row of 3 bristles along subbasal region of anterodorsal surface, a row of 3-5 short bristles along basal half and a row of short

setae along distal half of anteroventral surface, a row of short hairs along basal half and few short setae along distal half of posteroventral surface and 2 bristles distally on posterodorsal surface; mid tibia with few bristles along middle portion of anterodorsal surface and 1 bristle each on posteroventral and anteroventral surfaces on distal one-third; hind femur with a row of bristles along anterodorsal surface, few bristles along anteroventral and posteroventral surfaces and 1 bristle on posterodorsal surface on distal end; hind tibia with a row of 2 long and few short bristles along anterodorsal surface, 1 strong bristle and 3 short hairs along anteroventral surface on distal half and 2 bristles medially on posterodorsal surface.

Abdomen : Greyish with checkered pattern; third abdominal tergite with lateral stripes, fifth with a row of central longitudinal stripes, second and third without median marginal bristles but second with 1 and third with 2 lateral marginal bristles, fourth with 2 strong median and 2 lateral marginal bristles, fifth with a row of long hairs; sternites first to fourth with long hairs along posterior margin; fifth sternite v-shaped with long hairs laterally on arms; genital segments black but without marginal bristles; inner forceps straight and wide at subapical end; outer forceps elongated with long hairs; anterior and posterior parameres slightly curved apically; basal part of paraphallus as long as apical part, paraphallus tounge-shaped and it seems that it looks like a bucket in a navy; lateral part of paraphallus short and pointed; styli of glans small and slender, its apex covers the apical plate of paraphallus; tip of ventralia inclined laterally and bifid.

Female : Unknown.

Material examined : 1 ♂, Nepal : Kathmandu ; Thankot, 10.vii.1964, R. Kano (det. by E. Sugiyama as *Sarcophaga situliformis*; dep. in NSMT).

Discussion on species : Sugiyama, Shinonaga and Kano (1988) placed it under the genus *Sarcophaga* due to its coiled basal part of styli. This species may be distinguished from other species of the genus by the structures of ventralia and lateral plate of paraphallus.

Biology : Nothing is known regarding the biology of this species.

Distribution : Sugiyama, Shinonaga and Kano (1988) reported it first from Ne (Thankot) and also it is distributed in China (Tibet).

Type deposited : Holotype ♂, SIES, not studied.

142. *Bellieriomima* (*s. str.*) *globovesica* (Ye)

(Figs. 812–814)

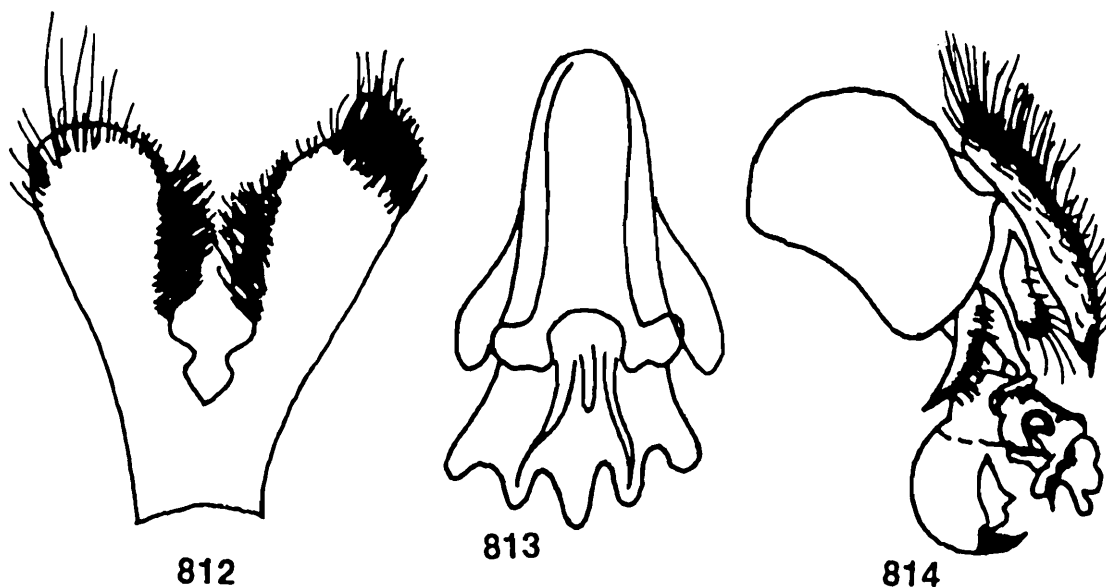
1980. *Pierretia* (*Bellieriomima*) *globovesica* Ye, *Acta zootax. sin.*, 5(4) : 411.

1986. *Bellieriomima* (*s.str.*) *globovesica* : Verves, *Cat. Palae. Dipt.*, 12 : 135.

1994. *Sarcophaga globovesica* : Kano and Shinonaga, *Jap. J. sanit. Zool.*, 45 : 269.

Male : Body length 10–11 mm.

Head : Width of frons about half that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of 9–10 short hairs near the eye margin ; upper part of frons less than three times that of one eye ; antennae greyish-black and reaching up to about 0.84 distance to vibrissae, first segment black with short hairs, second black with short bristle-like hairs, third greyish and about three times that of the second ; arista long, plumose along basal three-fifths ; facial ridge blackish, silvery pollen and with few short hairs ; vibrissae long, distance between vibrissae less than one parafacial width ; frontal bristles 13–14, posterior 2–3 reclinate, anterior 4–5 below base of antennae and reaching up to tip of second antennal segment, rest cruciate and directed forwards ; gena black with black hairs ; post gena blackish with short greyish hairs ; ocellar triangle black with short black hairs ; outer vertical bristle very short, inner vertical well developed and more than twice that of outer vertical, postocellar longer than outer vertical ; three rows of postocular setae besides postocular cilia, third row irregular, rest of the area with greyish hairs ; palpi long and black ; proboscis slightly greyish.



Figs. 812-814. : *Bellieriomima* (*s. str.*) *globovesica* (Ye). 812, Fifth sternite; 813, Penis with anterior and posterior parameres and inner and outer forceps (lateral view, after Kano and Shinonaga, 1994); 814, Penis (ventral view, after Ye, 1980).

Thorax : Greyish in colour with three black longitudinal stripes *ac* 0+1 ; *dc* 4+3 ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 3 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 10–11; upper part of propleura bare ; pro- and mesothoracic spiracles brownish ; apicoscutellar and discoscutellar bristles not so developed, 1 pair each ; lateroscutellar bristles well developed, 2 pairs.

Wings : Hyaline with brown veins : R_1 bare ; R_{4+5} with a row of 15 setae located dorsally and extending up to four-fifths from the basal node to r-m and 5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment slightly shorter than the third, the former with short spines along its anterior margin on basal half ; costal spines strong ; epaulet black-brown ; basicostal scale yellowish ; squama white ; halter brown.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of short bristles along posterior margin of ventral surface ; fore tibia with 3 bristles along basal half of anterodorsal surface, 1 bristle on posterolateral surface on basal two-thirds ; mid femur with 3 bristles along basal part of anterodorsal surface, a row of 5 bristles along basal half and a row of very short setae along distal half of anteroventral surface, a row of long hairs along basal half and very short setae along distal half of posteroventral surface and 2 bristles distally on posterodorsal surface ; mid tibia with 3 bristles along basal one-third of posterodorsal surface and 1 bristle each on anterodorsal, anteroventral, posterodorsal and posterolateral surfaces on distal one-third ; hind femur with a row of bristles along anterodorsal surface, very few short bristles along anteroventral and long hairs along posteroventral surfaces and 1 bristle on posterodorsal surface on distal end ; hind tibia with a row of 2 long and few short bristles along anterodorsal surface, 1 long bristle each on one-third and two-thirds of anteroventral surface on basal end, 2 bristles medially on posterodorsal surface and with long hairs along anteroventral and posteroventral surfaces.

Abdomen : Greyish with checkered pattern ; median marginal bristles on second and third abdominal tergites absent but third with 2 lateral marginal bristles, fourth with 2 median and 2 lateral marginal bristles, fifth with a row of 14 marginal bristles ; sternites first to fourth with long hairs ; fifth sternite v-shaped with short groove and tuft of spines laterally and few long hairs distally on arms ; genital segment slightly brownish but without marginal bristles ; inner forceps almost straight with pointed end ; outer forceps elongated with long hairs terminally ; anterior and posterior parameres slightly curved at end ; theca very short and shorter than paraphallus ; paraphallus wide but pointed abruptly at end ; ventralia well developed, laterally oblate spheroid form with irregular hind margin which consists of three pairs of processes on lower part.

Female : Unknown.

Material examined : 1 ♂ Nepal : Khunbu ; Nuntara, 29. vii. 1992, S. Shinonaga (dep. in NSMT).

Discussion on species : Ye Zong-Mao (1980) while described this species from China distinguished it from *Sarcophaga pterygota* (Thomas, 1949) by the characters of outer forceps and anterior paramere. This species can be distinguished from *situliformis* (Zhong, Wu and Fan) by the structures of ventralia and outer forceps.

Biology : Nothing is known regarding the biology of the species.

Distribution : Ne (Khunbu); China and Vietnam.

Type deposited : *Holotype* ♂, IMEAMS, not studied.

Genus 43. *Pierretia* Robineau-Desviody, 1863

1863. *Pierretia* Robineau-Desviody, *Hist. nat. Dipt., Paris*, **2** : 422.

Type species : *Sarcophaga praecox* Robineau-Desviody, 1863 (= *Sarcophaga nigriventris* Meigen, 1826).

1928. *Villeneuveella* Enderlein, *Arch. klassif. phylogen. Ent.*, **1**(1) : 34.

Type species : *Sarcophaga soror* Rondani, 1860.

1928. *Athyrsia* Enderlein, *Arch. klassif. phylogen. Ent.*, **1**(1) : 34.

Type species : *Sarcophaga nigriventris* Meigen, 1826.

1928. *Kramerella* Enderlein, *Arch. klassif. phylogen. Ent.*, **1** (1) : 48.

Type species : *Sarcophaga granulata* Kramer, 1905.

1928. *Sarina* Enderlein, *Arch. klassif. phylogen. Ent.*, **1** (1) : 48.

Type species : *Sarcophaga nigrans* Pandellé, 1896 (= *Sarcophaga clathrata* Meigen, 1826).

1934. *Arhopocnemis* Enderlein, *Sber. Ges. naturf. Freunde Berl.*, **4** : 188.

Type species : *Arhopocnemis boettcheri* Enderlein, 1928 (= *Sarcophaga clathrata* Meigen, 1826).

1937. *Thyrosocnema* Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 153.

Type species : *Thyrosocnema incisilobata* Pandellé, 1896.

1937. *Mimarhopocnemis* Rohdendorf, *Fauna USSR, Dipt.*, **19** (1) : 166.

Type species : *Sarcophaga granulata* Kramer, 1905.

Morphology : Antennae short and inserted in the middle of eye ; oral margin protruding forwards ; preacrostichal bristles ususally present ; postsutural acrostichal bristles usually more ; sternopleural bristles 3 ; lateroscutellar bristles 2 pairs ; genital segments black, first segment usually with marginal bristles ; inner forceps tapering towards their apices ; theca short and shorter than paraphallus ; lateral part of paraphallus poorly developed, usually slender and not lobed, but usually fused with the basal part ; styli of glans long and bent, rarely short and stout ; ventralia usually well developed ; apical part of paraphallus forms a lobe, usually slender, high or truncate.

Discussion : This is a large genus and is fairly represented in the Palaearctic region. Verves (1986) divided it into five subgenera of which *Asceloctella* and *Pierretia* are present here. He raised this genus into subtribal rank Pierretiina in 1987 which

is also a synonyme of subtribe Phallanthina Rohdendorf, 1965. Rohdendorf (1965) placed this genus under the subtribe Bellieriina Rohdendorf and Shewell (1987) placed it under the tribe Bellieriini. Rohdendorf (1937) revised this genus from USSR and described many new species. Kano *et al.* (1967) reviewed it from Japan and Lopes *et al.* (1977) divided this genus into two subgenera : *Asceloctella* Enderlein, 1928 and *Parathyrsocnema* Fan, 1965. Pape (1987b) reported 6 valid species from Fennoscandia and Denmark.

Biology : Most of the species are attracted to faeces and dead organic matters. Some species breed in various kinds of vertebrate hosts and also have the record of breeding from egg-cocoons of spiders, snails, beetles, different types of bees and various Acridid grasshoppers. Few species are known as parasites of spiders (Kano *et al.*, 1967) and also preying or scavangeing on snails and various arthropods (Pape, 1987b).

Distribution : This genus is distributed in the Oriental, Palaeartic and Nearctic regions.

Key to subgenera

1. Apical part of paraphallus slender ; lateral plate of paraphallus elongated and slender*Asceloctella* Enderlein
- Apical part of paraphallus large ; lateral plate of paraphallus short and massive*Pierretia* Robineau-Desvoidy

Subgenus *Asceloctella* Enderlein, 1928

1928. *Asceloctella* Enderlein, *Arch. klassif. phylogen. Ent.*, 1(1) : 50 (as distinct genus).

Type species : *Asceloctella formosana* Enderlein, 1928 (= *Sarcophaga calicifera* Böettcher, 1912).

1965, *Oxyphalla* Rohdendorf, *Ént. Obozr.*, 44(3) : 681.

Type species : *Sarcophaga calicifera* Böettcher, 1912.

Morphology : R₁ with short setae ; apical part of paraphallus slender ; lateral plate of paraphallus slender and extending forwards ; paraphallus filiform and genital segments black ; fifth sternite v-shaped.

This is a very small subgenus and only 1 species has been reported from India. Only 1 species has so far been reported from the Palaeartic region. Dear (1980) placed a few species of this subgenus under the genus *Uroxanthisca* Rohdendorf, 1963.

Members of the subgenus breed in meat and dead bodies of gastropods.

This subgenus is mostly distributed in the Oriental and Palaeartic regions.

143. *Pierretia (Asceloctella) calicifera* (Böettcher)

(Figs. 815–820)

1912. *Sarcophaga calicifera* Böettcher, *Ent. Mitt.*, **1** : 169; Senior-White, 1924, *Rec. Indian Mus.*, **26** (3) : 226 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 216.
1928. *Asceloctella formosana* Enderlein, *Arch. klassif. phylogen. Ent.*, **1** (1) : 50.
1936. *Sarcophaga dispessa* Villeneuve, *Bull. Anns Soc. ent. r. Belg.*, **76** : 418.
1965. *Pierretia calicifera* : Fan, *Synan. flies China*, **15** : 233 ; Kano, Field and Shinonaga, 1967, *Fauna Japonica, Sarcophagidae* : 112.
1965. *Pierretia (Oxyphalla) calicifera* : Rohdendorf, *Ént. Obozr.*, **44**(3) : 692.
1979. *Pierretia (Asceloctella) calicifera* : Lopes and Kano, *Revta bras. Biol.*, **30** (2) : 315.
1980. *Heteronychia (Uroxanthisca) calicifera* : Dear, *Cat. Dipt. Afrotrop. Region*, **821** : 809.

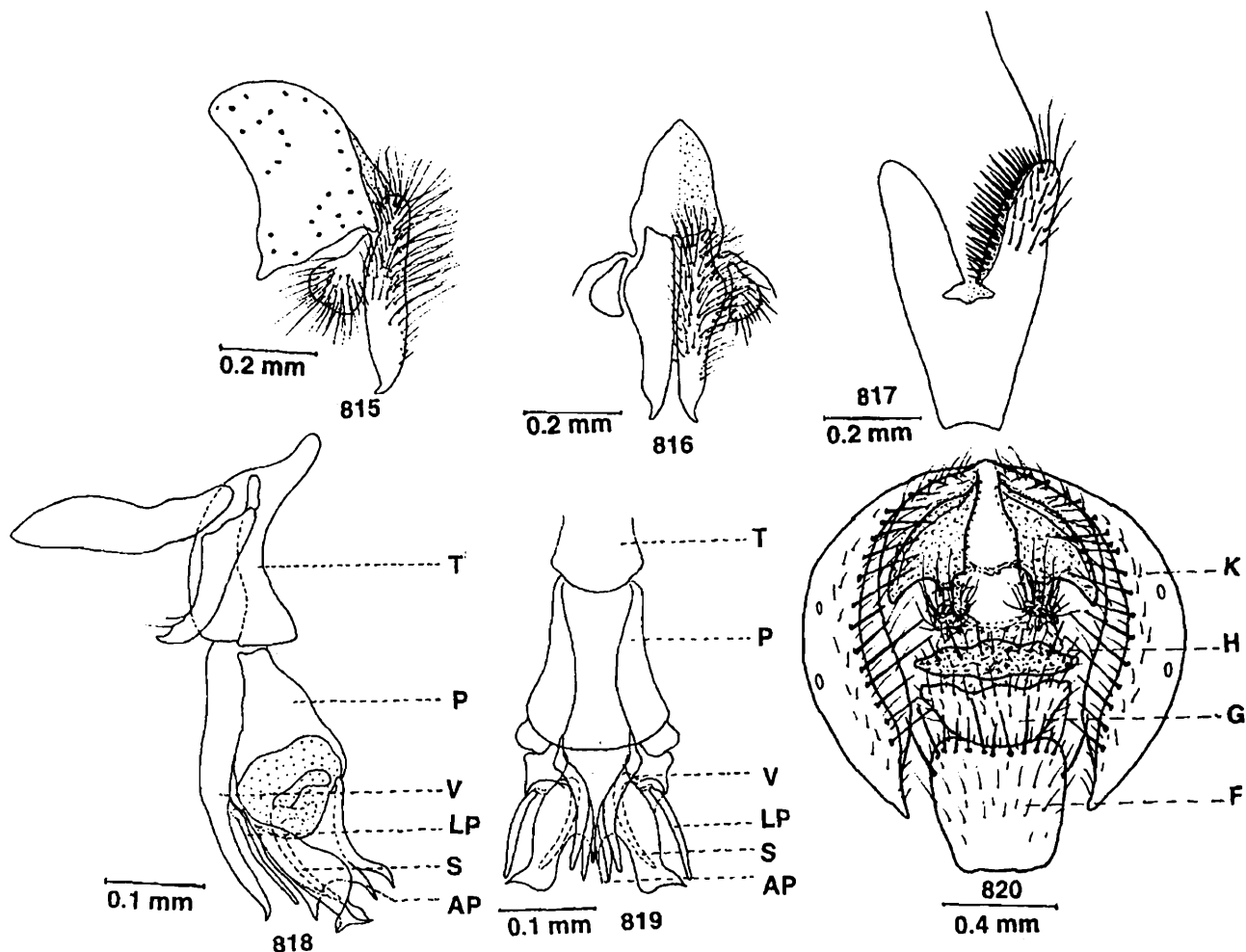
Male : Body length 5–7 mm.

Head : Width of frons about two-thirds that of one eye ; frontal vitta black, its width at narrowest point of frons more than that of each parafrontal ; parafrontal and parafacial blackish with silvery pollen, the former with short scattered hairs, the latter with a row of short hairs near the eye margin ; antennae brown and reaching up to about 0.9 distance to vibrissae, first and second segments blackish-brown with short black hairs, third black with silvery pollen and about two and half times that of the second ; arista long, plumose along basal two-thirds ; facial ridge almost bare, brownish-black and with silvery pollen ; vibrissae long, distance between vibrissae about twice that of one parafacial width ; frontal bristles 8, posterior 2 reclinate, anterior 2 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; gena black with short hairs ; post gena black with greyish hairs ; ocellar triangle brownish with golden pollen ; outer vertical bristle not differentiated, inner vertical well developed, post vertical short and about one-third the inner vertical ; ocellar bristles well developed, postocellar short ; a pair of rows of postocular setae besides postocular cilia, first row regular, second row irregular, rest of the area with greyish hairs ; palpi slender and blackish ; proboscis black.

Thorax : Greyish with three black longitudinal stripes ; *ac* 0+1 ; *dc* 4+4 (posterior *dc* 1-weak) ; *ia* 0+2 ; *ps* 1 ; *h* 3 ; *ph* 4 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 7 ; upper part of propleura bare with silvery pollen ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 with short setae ; R_{4+5} with a row of 9–10 short setae located dorsally and extending up to three-fourths from the basal node to

r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment longer than the third, the former with short spines along whole length of its anterior margin; costal spines short; epaulet black; basicostal scale yellowish; squama creamy white; halter brownish.



Figs. 815-820 : *Pierretia (Asceloctella) calicifera* (Böttcher). 815, Inner and outer forceps (lateral view); 816, Inner and outer forceps (posterior view); 817, Fifth sternite; 818, Penis (lateral view); 819, Penis (ventral view); 820, Genitalia ♀ (ventral view).

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of bristles along middle portion of anterolateral surface, a row of about 4 bristles

along basal half and a row of short setae along distal half of anteroventral surface, a row of bristles along basal half and a row of short setae along distal half of posteroventral surface and 1 bristle on posterolateral surface distally ; mid tibia with a row of bristles along anterodorsal surface, 2 bristles on posterodorsal surface and 1 bristle each on posterolateral and posteroventral surfaces at about one-third the distance from distal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of 3 bristles along anteroventral surface and several bristle-like hairs along posterior margin of ventral surface ; hind tibia with a row of short and long bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-fourth the distance from the distal end, 2 bristles on middle portion of posterodorsal surface and with several long hairs along anterior and posterior margins of ventral surface on distal half.

Abdomen : Grey with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of median and 3 pairs of lateral marginal bristles, fifth with a row of about 14 marginal bristles ; fifth sternite v- shaped with short spines laterally and several short and 1–2 long hairs apically on arms ; first genital segment black with short black hairs but without marginal bristles, second black with numerous short and long hairs ; inner forceps almost straight, curved slightly, pointed at apex and with short hairs on four-fifths of its basal end ; outer forceps almost triangular with hairs ; anterior paramere slender and blunt at end ; posterior paramere curved, pointed at end and with 2 short hairs on anterior end apically ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus curved and pointed at end ; lateral plate of paraphallus poorly developed with one anteriorly sclerotised process ; styli of glans long and sclerotised ; ventralia less sclerotised apically, long, curved and pointed at end.

Female : Body length 4–7 mm.

Head : Frons wider than that of one eye ; presence of 2 fronto-orbital bristles ; outer vertical bristle well developed.

Thorax : Similar to that of male except apicoscutellar bristles absent.

Legs : Hind tibia with 2 bristles on anteroventral surface but without moderately long hairs along ventral surface.

Abdomen : Similar to that of male but the following differences : sixth sternite wider, elongated and with 6–8 bristles, seventh anteriorly concave but with slight groove posteriorly, eighth short, membranous and with few hairs ; seventh sternite wide with many bristles.

Material examined : Inida : Several male specimens from different localities of Bihar, Haryana, Himachal Pradesh, Karnataka, Maharashtra, Nagaland, Tamil Nadu, West Bengal and union territories of Andaman and Nicobar Islands collected by B. C. Nandi.

Discussion on species : This species has its characteristic features of elongated ventralia which is less sclerotised and lateral plate of paraphallus with anteriorly sclerotised process and is distinguished from other species of the genus by the above mentioned distinguished characters.

Biology : This is relatively a rare species which was collected from bushes and grasses. The larvae of the species breed in meat and gastropods.

Distribution : India ; B (Pusa), H (Kalka), HP (Solan), Kt (Bangalore, Hebbal), Mr (Nagpur), N (Mokokchung), TN (Coonoor), WB (Calcutta, Sal Bankura, Sukna Forest) and union territories of AN (Netaji Nagar) ; Ne (several localities) ; Pa (several localities) ; SL (Pattipola) ; Japan (including Ryukyu Islands) ; Nigeria ; Philippines ; South Africa ; South China ; Taiwan ; Uganda ; Vietnam ; Zaire and Zimbabwe.

Type deposited : *Holotype* ♂, ZMB, studied.

Subgenus *Pierretia* Robineau-Desviody, 1863

1863. *Pierretia* Robineau-Desviody, *Hist. nat. Dipt., Paris*, **2** : 422.

Type species : *Sarcophaga praecox* Robineau-Desviody, 1863 (= *Sarcophaga nigriventris* Meigen, 1826).

Morphology : R_1 with setae ; inner forceps without spines ; styli of glans slender and strongly curved ; apical plate of paraphallus moderately large with well developed spoon-shaped lateral apophyses and usually large sized median piece ; lateral plate of paraphallus sharp, often massive, slightly sclerotised and with hook-forming arch but without apophyses.

This subgenus is well represented by 8 species in the Palaearctic region. Nothing was known earlier regarding the species from the Oriental region and only 1 species is present here.

Nothing is known regarding the biology of the species of this subgenus.

This subgenus is distributed in the Palaearctic and Oriental regions.

144. *Pierretia* (*s.str.*) *wyatti* Nandi

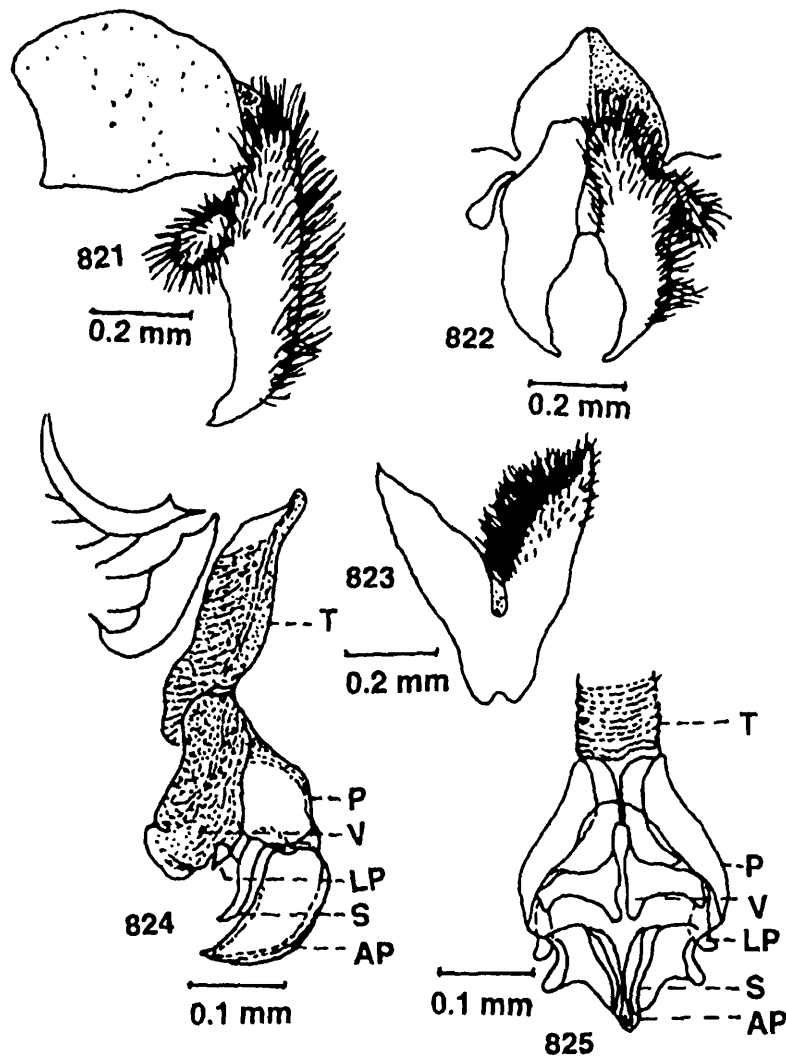
(Figs. 821–825)

1994. *Pierretia* (*s.str.*) *wyatti* Nandi, *Proc. zool. Soc., Calcutta*, **47** (1) : 59.

Male : Body length 6 mm.

Head : Width of frons less than twice that of one eye ; frontal vitta black, its width at narrowest point of frons slightly greater than that of each parafrenal ; parafrenal and parafacial blackish with silvery pollen, the former with short scattered hairs, the latter with a row of moderately long hairs near the eye margin ; antennae black and

reaching up to about 0.80 distance to vibrissae, first and second segments black with short black hairs; arista long, plumose along more than basal half; facial ridge brown, silvery pollen and with short scattered hairs; vibrissae long, distance between vibrissae about one and half times that of one parafacial width; frontal bristles 9, posterior 2 reclinate, anterior 2 below base of antennae and reaching up to about the base of second antennal segment, rest cruciate and directed forwards; gena black



Figs. 821-825 : *Pierretia (s. str.) wyatti* Nandi. 821, Inner and outer forceps (lateral view); 822, Inner and outer forceps (posterior view); 823, Fifth sternite; 824, Penis (lateral view); 825, Penis (ventral view).

with silvery pollen and black hairs; post gena blackish with black hairs; outer vertical bristle short, inner vertical well developed, post vertical short about one-third the inner vertical; 1 ocellar bristle strong, others short, post ocellar slightly greater than the post vertical; a pair of rows of regular postocular setae besides

postocular cilia, rest of the area with black hairs and short intermittent spines ; palpi and proboscis black.

Thorax : Black with three black longitudinal stripes ; *ac* 1+2+0 ; *dc* 3+3 ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 3 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 7 ; upper part of propleura bare and black ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles black ; apicoscutellar and discoscutellar bristles well developed, 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hayline with brown veins ; R_1 bare ; R_{4+5} with a row of 8–9 short setae located dorsally and extending up to about two-thirds from the basal node to r-m and 3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to the third, the former with short spines along whole length of its anterior margin ; costal spines stout ; epaulet blackish-brown ; basicostal scale white ; squama creamy white ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 bristles along basal half of anterodorsal surface, 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row of bristles along middle portion of anterolateral surface, a row of long bristles along basal half of anteroventral surface, a row of short setae each along distal half of anteroventral and posteroventral surfaces and with 2 bristles distally on posterodorsal surface ; mid tibia with a row of bristles along anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces distally ; hind tibia with 2 long bristles on middle portion of anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end, 1 bristle each on one-third and two-thirds the distances from the basal end on posterodorsal surface but without hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent, but each with 2 lateral marginal bristles, fourth with 3 lateral marginal bristles, fifth with a row of 14 marginal bristles ; sternites first to fourth with short hairs ; fifth sternite v-shaped with window and strong spines laterally on arms ; first and second genital segments brown but without marginal bristles ; inner forceps elongated, slightly curved at end and with slight notch terminally ; outer forceps slightly wide with short hairs ; anterior paramere curved with 3 short hairs on posterior end ; posterior paramere strongly curved, hook-shaped and with 2 hairs on anterior end ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus well developed, wide, curved at end and

pointed ; lateral plate of paraphallus short ; styli of glans short but not serrated ; ventralia wide and upper part of its much sclerotised.

Female : Unknown.

Material examined : *Holotype* ♂, India : Kashmir ; Dal Lake, v. 1946, Senior-White.

Discussion on species : This species has its distinctive structures of ventralia and apical plate of paraphallus. It is almost similar to *P. (s. str.) sororcula* (Rohdendorf, 1937) but differs from it by the structures of apical plate of paraphallus and ventralia. Moreover, the structure of anterior paramere is quite distinguishable here from *sororcula*.

Biology : Nothing is known regarding the biology of this species.

Distribution : India ; JK (Dal Lake).

Type deposited : *Holotype* ♂, BMNH, studied.

Subtribe **Heteronychiina** Rohdendorf

This subtribe is characterised by the absence of dorsal process of paraphallus and if present the ventralia awl-shaped ; apical part of paraphallus clearly defined. Three genera : *Heteronychia* Brauer and Bergenstamm, *Kozlovea* Rohdendorf and *Phytosarcophaga* Rohdendorf are representing in the Oriental region which are also occurred in India. Verves (1986) reported five genera from the Palaearctic region and later on revised this subtribe in 1989b.

Few members of the subtribe breed in some snails and the species can be collected from bushes.

This subtribe is distributed in the Oriental, Afrotropical and Palaearctic regions.

Key to genera

1. Upper part of propleura bare ; R₁ without setae ; post abdomen black ; paraphallus unsymmetrical *Kozlovea* Rohdendorf
Upper part of propleura with black setae ; R₁ with setae ; post abdomen red ; paraphallus symmetrical 2
2. Apical part of paraphallus well differentiated ; lateral plate of paraphallus well distinguished and massive *Phytosarcophaga* Rohdendorf
Apical part of paraphallus usually small ; lateral plate of paraphallus long and slender *Heteronychia* Brauer and Bergenstamm

Genus 44. **Kozlovea** Rohdendorf, 1937

1937. *Kozlovea* Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 300 ; Rohdendorf, 1965, *Ént. Obozr.*, 44(3) : 683.

Type species : *Kozlovea tshernovi* Rohdendorf, 1937.

Morphology : Antennae long ; width of frons about half that of one eye ; third antennal segment 2.5–3 times that of the second ; R_1 without setae ; arista plumose and not so long ; upper part of propleura bare ; *ac* 0+3 ; 3 pairs of posterior *dc* present ; genital segments well developed and black ; post abdomen black ; inner forceps with or without spines ; apical part of inner forceps pointed with notched anteriorly ; lateral plate of paraphallus with short basal process ; paraphallus asymmetrical with very large funnel-shaped styli.

Discussion : Rohdendorf (1965) placed this genus under the subtribe Bellieriina Enderlein, 1928. Verves (1989) revised this genus, raised it to subtribal rank Kozloveina and reported only 2 species from the Palaearctic region in 1976. Only 4 species have been reported from this area.

Biology : Nothing is known regarding the biology of the members of this genus.

Distribution : This genus is distributed in the Oriental and Palaearctic regions.

Key to male species

1. Inner forcep without subapical spines 2
 Inner forcep with subapical spines 3
2. Lateral plate of paraphallus strongly developed and shovel-shaped
 *peshelicis* (Senior-White)
 Lateral plate of paraphallus ill-developed and pointed *lopesi* Nandi
3. Ventralia elongated ; anterior paramere without hairs on posterior side ; lateral plate of paraphallus elongated and pointed *vervesi* Nandi
 Ventralia short ; anterior paramere with numerous hairs on posterior side ; lateral plate of paraphallus short and flattened *cavangarei* Nandi

145. *Kozlovea peshelicis* (Senior-White)

(Figs. 826–831)

1930. *Sarcophaga peshelicis* Senior-White, *Rec. Indian Mus.*, **32** : 71 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 218 ; Kano, and Shinonaga, 1994, *Jap. J. sanit. Zool.*, **45** : 269.
1977. *Kozlovea peshelicis* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 579 ; Nandi, 1976, *Orient. Insects*, **10** (3) : 369 ; 1990, *J. Beng. nat. Hist. Soc.*, **9**(2) : 20, Verves, 1993, *Die Fliegen Palaearct. Region*, **11** : 487.

Male : Body length 10 mm.

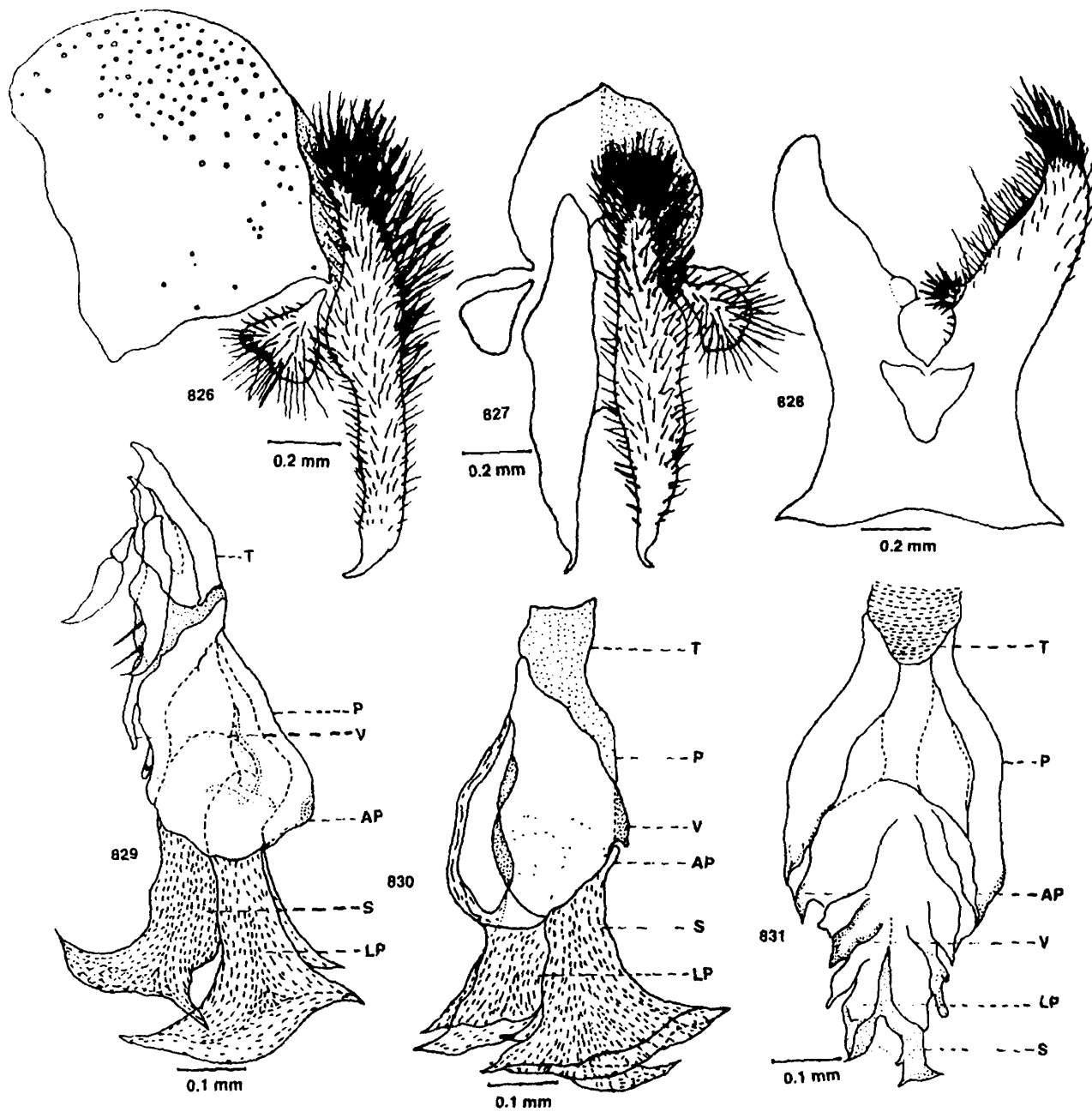
Head : Width of frons about two-fifths that of one eye : frontal vitta blackish, its width at narrowest point of frons more than twice that of each parafrenal; parafrenal

and parafacial blackish with silvery pollen, the former with short numerous scattered hairs, the latter with a row of 11–12 long hairs near the eye margin ; antennae black and reaching up to about 0.85 distance to vibrissae, first and second segments blackish with short black hairs, third light black with silvery pollen and about three times that of the second ; arista long, plumose along basal two-thirds ; facial ridge blackish with silvery pollen ; vibrissae long, distance between vibrissae more than one parafacial width ; frontal bristles 13, posterior 3 reclinate, anterior 4 below base of antennae and reaching up to about the tip of second antennal segment, rest cruciate and directed forwards ; gena black with numerous long black hairs ; post gena black with blackish hairs ; ocellar triangle blackish with very long black hairs ; outer vertical bristle ill-developed, inner vertical well developed, post vertical short and about less than half of inner vertical ; ocellar and postocellar bristles moderately developed, postocellar more than half of inner vertical ; a row of regular postocular setae besides postocular cilia, rest of the area with irregular black and white hairs ; palpi slender ; proboscis long and black.

Thorax : Blackish with three black longitudinal stripes ; *ac* 0+1 ; *dc* 3+5 ; *ia* 1+2 ; *ps* 1 ; *h* 2 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 4 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 10 ; upper part of propleura bare, black with silvery pollen ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles well developed, 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of short setae located dorsally and extending up to more than half from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment twice that of the third, the former with short spines along basal half of its anterior margin ; costal spines not stout ; epaulet blackish ; basicostal scale yellowish ; squama whitish ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 bristles along basal one-third of anterodorsal surface and 1 long bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row of bristles along middle portion of anterolateral surface, a row of long hairs along basal half and a row of short setae each along distal half of anteroventral and posteroventral surfaces and 1 bristle each on posterodorsal, posterolateral and posteroventral surfaces on distal end ; mid tibia with a row of bristles along basal half of anterolateral surface, 1 bristle each on posterolateral surface at about one-third and two-thirds the distances from the basal half of anterolateral surface, 1 bristle each on posterolateral surface at about one-third and two-thirds the distances from the basal end and 1 bristle on anteroventral surface at about one-fourth the distance



Figs. 826-831 : *Kozlovea peshelicis* (Senior-White). 826, Inner and outer forceps (lateral view); 827, Inner and outer forceps (posterior view); 828, Fifth sternite; 829, Penis (left side view); 830, Penis (right side view); 831, Penis (ventral view).

from the distal end ; hind femur with a row of bristles along anterodorsal surface, a row of numerous bristles and long hairs along anteroventral surface and 1 bristle on posteroventral surface at about one-fifth the distance from the distal end ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-fourth the distance from the distal end, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end and with tuft of long hairs along ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with 1 lateral marginal bristle, fourth with 2 median and 3 lateral marginal bristles, fifth with a row of 14 marginal bristles ; sternites first to third with black hairs, fourth with few long hairs ; fifth sternite v-shaped with wide window and tuft of hairs laterally on arms ; first genital segment black with black hairs and subapical spines ; inner forceps almost straight with pointed end ; outer forceps almost oval ; anterior paramere short, almost straight and slightly pointed apically ; posterior paramere elongated, curved, pointed at end and with 2 subbasal hairs anteriorly ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus reduced ; lateral plate of paraphallus well developed and shovel-shaped ; styli of glans extremely long and plough-shaped ; ventralia short.

Female : Unknown.

Material examined : 1♂, India : West Bengal ; Lebong, 10.vi.1978, B. C. Nandi ; 1♂, Haryana ; Kalka, 656 m, 12.x.1988, B.C. Nandi ; 1♂, Himachal Pradesh ; Kullu, 1,219 m, 19.x.1988, B. C. Nandi.

Discussion on species : This species is distinguished from *K. lopesi* Nandi, 1976 by the structures of apical and lateral plates of paraphallus, anterior and posterior parameres and ventralia.

Biology : This is relatively rare species which was collected from bush- sweeping.

Distribution : India ; H (Kalka), HP (Kullu) and WB (Darjeeling, Lebong) ; Ne (Godawari) and Pa (several localities).

Type deposited : *Holotype* ♂, BMNH, not studied.

146. *Kozlovea lopesi* Nandi

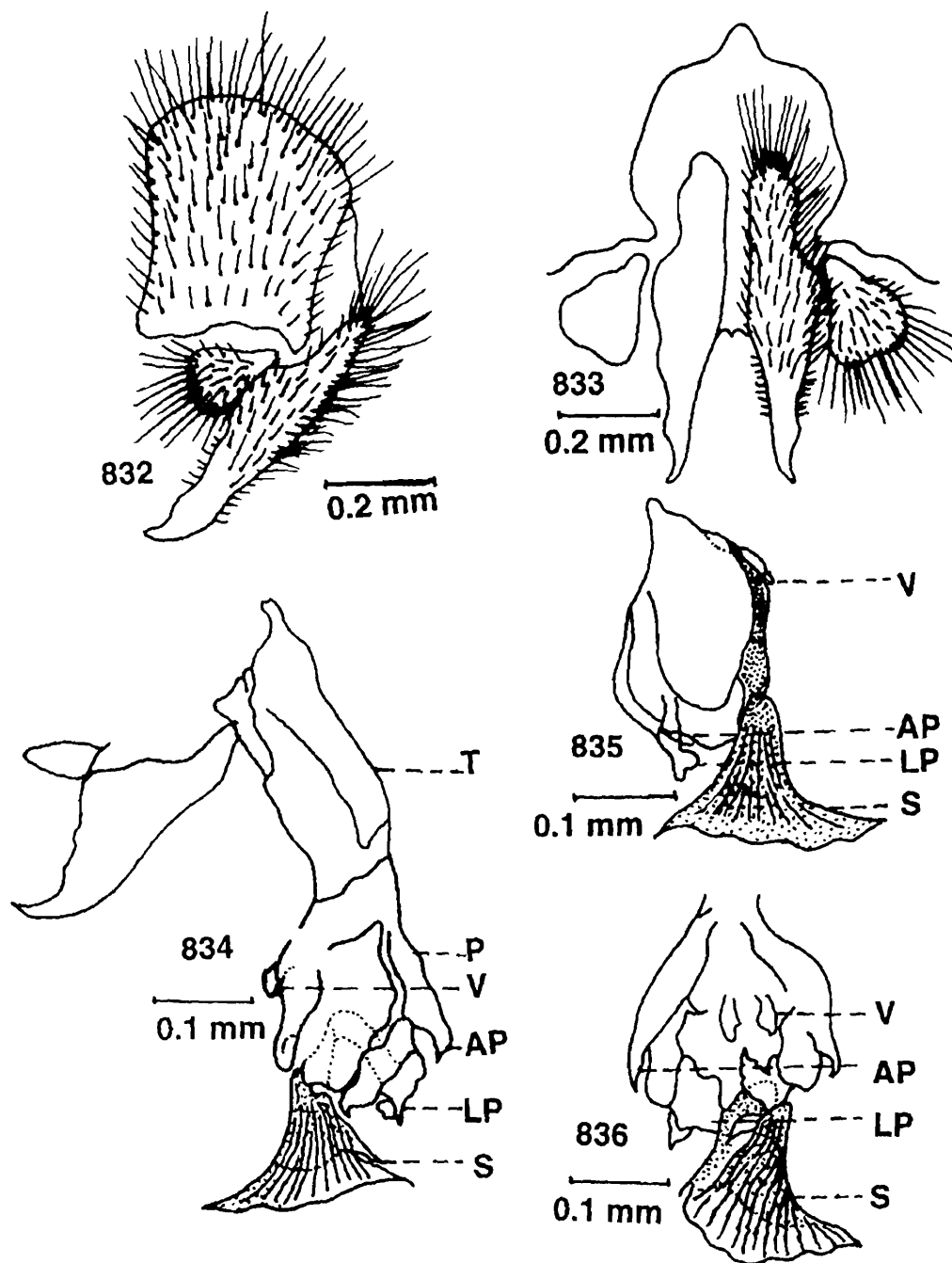
(Figs. 832-836)

1976. *Kozlovea lopesi* Nandi, *Orient. Insects*, **10**(3) : 369 ; Verves, 1986, *Cat. Palae. Dipt.*, **12** : 158 ; Verves, 1993, *Die Fliegen Palae. Region*, **11** : 486.

Male : Body length 10 mm.

Head : Width of frons about two-fifths that of one eye ; frontal vitta blackish, its width at narrowest point of frons more than twice that of each parafrontal ; parafrontal

and parafacial blackish with silvery pollen, the former with short numerous scattered hairs, the latter with a row of 10–11 long hairs near the eye margin ; antennae black, silvery pollen and reaching up to about 0.8 distance to vibrissae, first and second segments black with short black hairs, third light black with silvery pollen and about two and half times that of the second ; arista long, plumose along basal two-thirds ; facial ridge black with white pollen ; vibrissae long, distance between vibrissae more



Figs. 832-836 : *Kozlovea lopesi* Nandi. 832, Inner and outer forceps (lateral view); 833, Inner and outer forceps (posterior view); 834, Penis (left side view); 835, Penis (right side view); 836, Penis (ventral view).

than one parafacial width ; frontal bristles 13, posterior 6 reclinate, anterior 4 below base of antennae and reaching up to about tip of second antennal segment, rest cruciate and directed forwards ; gena black ; post gena black with long hairs ; ocellar triangle black with many long black hairs ; outer vertical bristle moderately developed, inner vertical well developed, post vertical short, about one-third the inner vertical ; a row of regular postocular setae besides postocular cilia, rest of the area with irregular black and white hairs ; palpi slender and dark brown ; proboscis black.

Thorax : Blackish-grey with three black longitudinal stripes ; *ae* 0+1 ; *dc* 4+3 ; *ia* 1+2 ; *ps* 1 ; *h* 4 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 4 ; *st* 1+1+1 ; *mpl* 7 ; *hpl* 11 ; upper part of propleura black and bare ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro-and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 8 short setae located dorsally and extending up to less than half from the basal node to r-m and 4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment about one and half times that of the third, the former with short spines along basal half of its anterior margin ; costal spines not so stout ; epaulet black with short spines ; basicostal scale yellowish-brown ; squama whitish ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 1 short bristle each on about basal one-third of anterodorsal and posterodorsal surfaces ; mid femur with a row of bristles along anterodorsal surface, 2 bristles on posterodorsal and 1 bristle on posterolateral surfaces distally and a row of long bristles along basal half of anterior and posterior margins of ventral surface ; mid tibia with 2 bristles each almost medially on anterolateral and posterolateral surfaces and with tuft of long hairs along anterior and posterior margins of ventral surface ; hind femur with a pair of rows of long bristles along anterodorsal surface, 1 bristle on posterodorsal surface at about one-fourth the distance from the distal end, numerous long hairs and bristles along anteroventral surface and a row of bristles with hairs along posteroventral surface ; hind tibia with a row of bristles along anterodorsal surface, 2 bristles each on posterodorsal surface at about one-third and two-thirds the distances from the basal end and with tuft of long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with well developed lateral marginal bristles, fourth with 2 median marginal bristles, fifth with a row of 16 marginal bristles ; sternites first to third with black hairs, fourth with a row of marginal bristles ; first genital segment brownish-black with well developed a row of 10 marginal bristles, second blackish without marginal bristles but with tuft of long

hairs ; inner forceps curved, pointed at end but without subapical spines ; outer forceps somewhat slightly elongated ; anterior paramere short and blunt ; posterior paramere wide at middle, curved and pointed at end ; styli of glans long, bell-shaped, membranous and apically situated ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus reduced and curved ; lateral plate of paraphallus chitinous, ill-developed and pointed ; ventralia very small.

Female : Unknown.

Material examined : *Holotype* ♂, India : Himachal Pradesh ; Chatru (Spiti Valley), 3,354m, 16.vi.1955, A. P. Kapur.

Discussion on species : This species is similar to *K. peshelicis* (Senior-White, 1930) but differs from it by short and wide apical plate of paraphallus and very short lateral plate of paraphallus. Moreover, the posterior paramere is wide and more prominent in this species.

Biology : This is a rare species and nothing is known regarding its biology.

Distribution : India : HP (Chatru, Spiti Valley) and China (East Tibet).

Type deposited : *Holotype* ♂, ZSIC, studied.

147. *Kozlovea vervesi* Nandi

(Figs. 837–841)

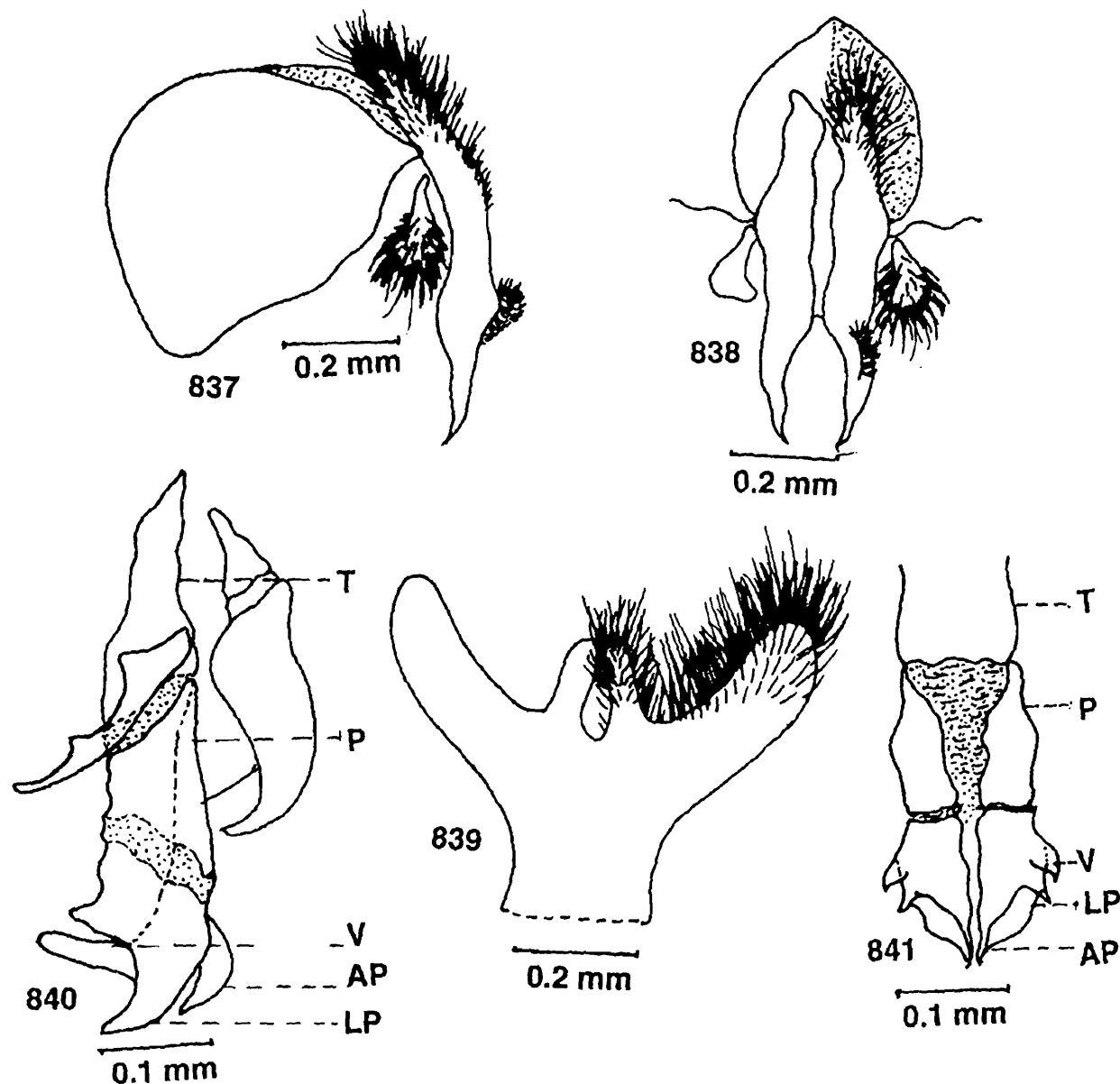
1993. *Kozlovea vervesi* Nandi, *Rec. zool. Surv. India*, **93** (1–2) : 287.

Male : Body length 8–10 mm.

Head : Width of frons about half that of one eye ; frontal vitta black, its width at narrowest point of frons about more than twice that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of 7 hairs near the eye margin ; antennae blackish-brown and reaching up to about 0.85 distance to vibrissae, first and second segments black with short black hairs and spines, third brownish, silvery pollen and about twice that of the second ; arista long, plumose along basal two-thirds ; facial ridge brownish, silvery pollen and with long hairs ; vibrissae long, distance between vibrissae equal to one parafacial width ; frontal bristles 10, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about half of second antennal segment, rest cruciate and directed forwards ; gena and post gena black with long hairs ; ocellar triangle black with short black hairs ; outer vertical bristle moderately developed, inner vertical well developed, post vertical equal to ocellar and about one-third the inner vertical ; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with short brownish hairs ; palpi slender and blackish ; proboscis black.

Thorax : Blackish with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+4 ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 7 ; *hpl* 6 ; upper part of propleura

bare ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar bristles well developed, 1 pair ; discoscutellar bristles wanting ; lateroscutellar bristles well developed, 2 pairs.



Figs. 837-841 : *Kozlovea vervesi* Nandi. 837, Inner and outer forceps (lateral view); 838, Inner and outer forceps (posterior view); 839, Fifth sternite ; 840, Penis (lateral view); 841, Penis (ventral view).

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of short setae located dorsally and extending up to two-thirds from the basal node to r-m and 5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than the third, the former with short spines along more than basal half of its anterior margin ; costal

spines stout ; epaulet yellowish with short spines ; basicostal scale brownish ; squama whitish ; halter brownish.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 bristles along basal one-third of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of bristles along basal half and a row of comb-like short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal, posterolateral and posteroventral surfaces at about one-third the distance from the distal end ; mid tibia with 1 bristle each on anterodorsal surface at about one-third and two-thirds the distances from the distal end, a row of bristles along basal half of posterodorsal surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end ; hind femur with a pair of rows of bristles along anterolateral surface, a row of bristles along anteroventral surface at about one-third the distance from the distal end, 1 bristle each on posterodorsal and posterolateral surfaces at about one-fifth the distance from the distal end and with long hairs along ventral surface ; hind tibia with 1 bristle each on anteroventral and posteroventral surfaces at about one-third the distance from the basal end, a row of 3 bristles along posterodorsal surface at about three-fourths the distance from the basal end, 1 bristle on anteroventral surface at about one-third the distance from the distal end and with numerous long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but second with 2 and third with 1 lateral marginal bristles, fourth with 2 median marginal bristles, fifth with a row of 16 marginal bristles ; sternites first to fourth with short hairs ; fifth sternite v-shaped with long hairs apically and two knob-like projections basally on arms ; first and second genital segments brownish but without marginal bristles ; inner forceps elongated, slightly curved, pointed at end and with tuft of spines on subapical end ; outer forceps slightly elongated ; anterior paramere elongated with slight projection medially but without hairs on posterior end ; posterior paramere well developed, deeply curved at end, pointed and with 1 hair anteriorly ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus curved and pointed at end ; lateral plate of paraphallus well developed and pointed at end ; ventralia elongated and membranous.

Female : Unknown.

Material examined : *Holotype* ♂, India : Maharashtra ; Nagpur Seminary Hills, 350 m, 14, vi. 1990, B. C. Nandi ; *Paratype* ♂, Khandala, 950 m, 21.vi.1990, B. C. Nandi.

Discussion on species : This species closely resembles *K. cavangarei* Nandi, 1988 but differs from it by the structures of apical and lateral plates of paraphallus and also from *K. lopesi* Nandi, 1976 by the structures of lateral plate of paraphallus and ventralia. Moreover, the structures of ventralia and fifth sternite of this species are quite distinguishable from *cavangarei*.

Biology : This is relatively rare species which was collected from bushes under hill trees.

Distribution : India ; Mr (Khandala, Nagpur Seminary Hills).

Type deposited : *Holotype* ♂, ZSIC, studied.

148. *Kozlovea cavangarei* Nandi

(Figs. 842–845)

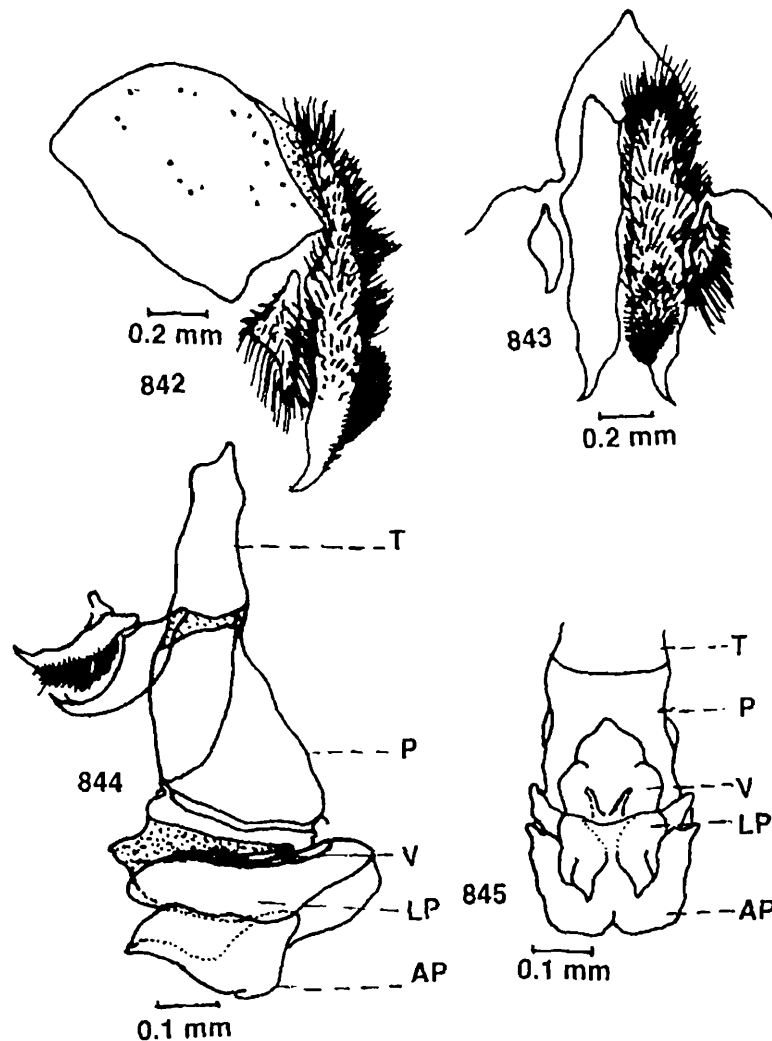
1988. *Kozlovea cavangarei* Nandi, *J. Beng. nat. Hist. Soc.*, 7(2) : 19; Verves, 1993, *Die Fliegen Palae. Region*, 11 : 486.

Male : Body length 9 mm.

Head : Width of frons about half that of one eye ; frontal vitta black, its width at narrowest point of frons about more than twice that of each parafrontal ; parafrontal and parafacial blackish with silvery pollen, the former with short scattered hairs, the latter with a row of 6 short hairs near the eye margin ; antennae blackish-brown and reaching up to about 0.8 distance to vibrissae, first and second segments black with black hairs and spines, third brown with silvery pollen and about three times that of the second ; arista long, plumose along basal two-thirds ; facial ridge brownish, silvery pollen and with black hairs ; vibrissae long, crossed, distance between vibrissae less than one parafacial width ; frontal bristles 13, posterior 2 reclinate, anterior 4 below base of antennae and reaching up to about two-thirds of second antennal segment, rest cruciate and directed forwards ; gena blackish with long black hairs and short bristles ; post gena black, silvery pollen and with short black hairs ; ocellar triangle black with short hairs ; outer vertical bristle ill-developed, inner vertical well developed, post vertical shorter than ocellar and almost one-third the inner vertical ; a pair of rows of postocular setae besides postocular cilia, first row regular, second row irregular, rest of the area with scattered black hairs ; palpi slender ; proboscis brownish-black.

Thorax : Blackish with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+4 ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 3 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 7 ; *hpl* 6 ; upper part of propleura bare, black with silvery pollen ; prostigmatic and propleural bristles well developed and accompanied with short black hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of short setae located dorsally and extending up to about two-thirds from the basal node to r-m and a row of 5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to third, the former with short spines along basal three-fifths of its anterior margin ; costal spines stout ; epaulet yellowish with short spines ; basicostal scale brownish ; squama whitish ; halter brownish.



Figs. 842-845 : *Kozlovea cavangarei* Nandi. 842, Inner and outer forceps (lateral view); 843, Inner and outer forceps (posterior view); 844, Penis (lateral view); 845, Penis (ventral view).

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 bristles along basal one-third of anteroventral surface, 1 bristle on posteroventral surface at about one-third the distance from the distal end ; mid femur with a row of short bristles along anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of bristles along

basal half and a row of short setae along distal half of posteroventral surface, 1 bristle each on posterodorsal and posterolateral surfaces at about one-third the distance from the distal end and with tuft of long hairs along anterior and posterior margins of ventral surface ; mid tibia with 2 bristles on anterodorsal surface at about one-third the distance from the distal end, a row of 2–3 bristles along posterolateral surface, 1 bristle on posteroventral surface at about one-third the distance from the distal end and a row of bristles along posteroventral surface ; hind femur with a pair of rows of bristles along posteroventral surface and a row of bristles along anterodorsal surface ; hind tibia with a row of long bristles along posterodorsal surface, a row of 3 bristles along anterodorsal surface at about three-fourths the distance from the basal end and with numerous long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent, but second with 1 and third with 3 lateral marginal bristles, fifth with a row of 16 marginal bristles ; sternites first to third with short hairs, fourth with moderately long hairs ; first and second genital segments black but without marginal bristles ; inner forceps elongated, slightly curved at end and with tuft of spine-like hairs at the subterminal end ; outer forceps slightly triangular with long hairs ; anterior paramere elongated with notch at the end and numerous long hairs along posterior end ; posterior paramere longer, curved and with 1 hair at the anterior end ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus flattened, blunt at end but without any process ; lateral plate of paraphallus short, blunt and flattened ; ventralia membranous and short.

Female : Unknown.

Material examined : *Holotype* ♂, India : Tamil Nadu ; Kodaikanal, 30.iii.1962, E. S. Ross and D. O. Cavangare.

Discussion on species : This species is similar to *K. vervesi* Nandi, 1993 but differs from it by the structures of anterior and posterior parameres and apical plate of paraphallus. Moreover, the structure of ventralia is also different here from *vervesi*. This species is also distinguishable from *K. peshelicis* (Senior-White, 1930) by the detailed structure of penis.

Biology : This is a rare species and nothing is known regarding its biology.

Distribution : India ; TN (Kodaikanal).

Type deposited : *Holotype* ♂, ZSIC, studied.

Genus 45. *Phytosarcophaga* Rohdendorf, 1937

1937. *Phytosarcophaga* Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 301.

Type species : *Sarcophaga destructor* Malloch, 1929.

1963. *Curranisca* Rohdendorf, *Stuttg. Beitr. Naturk.*, **124** : 8 (as subgenus).

Type species : *Sarcophaga chapini* Curran, 1934.

Morphology : Arista moderately long ; upper part of propleura with bristles ; R_1 with setae ; ac 0+1 ; 3 posterior dc strong ; second genital segment with marginal bristles ; anal tergite very short ; post abdomen red ; theca moderately developed and almost equal to paraphallus ; lateral plate of paraphallus considerably large and massive ; ventralia large, well developed ; apical part of paraphallus well developed, long, thin and strongly arched, but not reaching up to the end of ventralia ; styli of glans long, thin and approaches to the apical part of paraphallus.

Discussion : This is a small genus and 1 species has so far been reported from the Oriental and Palaearctic regions which is also reported from here. Dear (1980) synonymized this genus with the subgenus *Heteronychia* Brauer and Bergenstamm, 1889 but Lopes *et al.* (1977) and Verves (1986) made it a separate genus. Verves (1987) referred this genus to the new subtribe Pierretiina and later on in 1989 he shifted this genus to the subtribe Phytosarcophagina.

Biology : So far as the literature is concerned nothing is known regarding the biology of the members of this genus. A few members are attracted to fishes.

Distribution : This genus is distributed in the Oriental, Afrotropical and Palaearctic regions.

149. *Phytosarcophaga sawainensis* Nandi

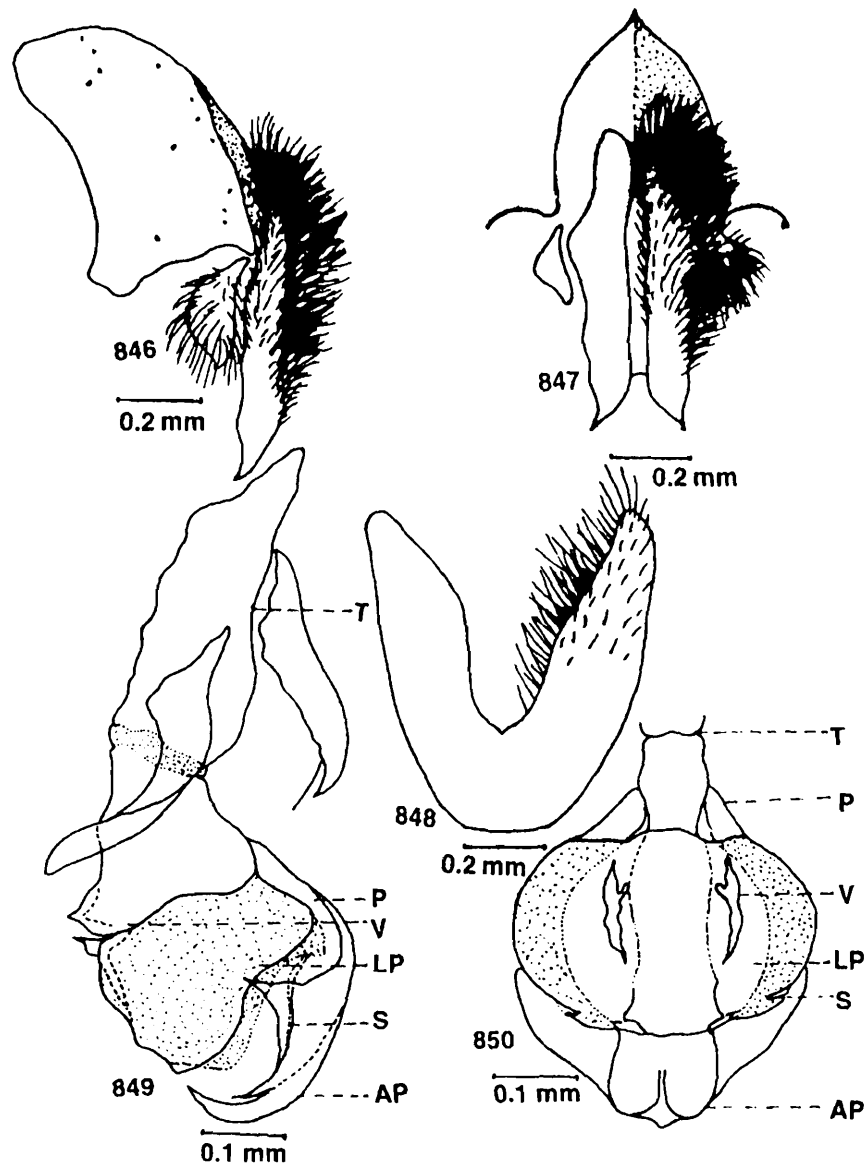
(Figs. 846–850)

1989. *Phytosarcophaga sawainensis* Nandi, *J. Andaman Sci. Assoc.*, **5**(2) : 123.

Male : Body length 7 mm.

Head : Width of frons about two-fifths that of one eye ; frontal vitta blackish, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of hairs near the eye margin ; antennae brownish-black and reaching up to about 0.85 distance to vibrissae, first and second segments blackish-brown with black hairs, third brownish with silvery pollen and about two and half times that of the second ; arista long, plumose along basal half ; facial ridge brownish with silvery pollen ; vibrissae long, distance between vibrissae about one parafacial width ; frontal bristles 9, posterior 3 reclinate, anterior 2 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; gena blackish with black hairs ; post gena blackish with silvery pollen ; ocellar triangle black with short black hairs ; outer vertical bristle moderately developed, inner vertical well developed, post vertical longer than half of inner vertical ; ocellar bristles short, postocellar longer than half of inner vertical ; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with short hairs.

Thorax : Black with three black longitudinal stripes ; *ac* 0+1 ; *dc* 2+3 ; *ia* 1+2 ; *ps* 2 ; *h* 2 ; *ph* 2 ; *np* 2 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 8 ; *hpl* 6 ; upper part of propleura hairy and black ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brownish ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.



Figs. 846-850 : *Phytosarcophaga sawainensis* Nandi. 846, Inner and outer forceps (lateral view); 847, Inner and outer forceps (posterior view); 848, Fifth sternite; 849, Penis (lateral view); 850, Penis (ventral view).

Wings : Hyaline with brown veins ; R_1 with short setae ; R_{4+5} with a row of 3 short setae located dorsally and extending up to half from the basal node to r-m and 3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment greater than the

third, the former with a row of spines throughout its length on its anterior margin ; costal spines not stout ; epaulet blackish with short spines ; basicostal scale yellowish ; squama whitish ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 short bristles along basal half of anterodorsal surface and 2 bristles on posterodorsal surface on distal end ; mid femur with a row of 3 bristles along middle portion of anterolateral surface and a row of bristles along anteroventral surface on basal half ; mid tibia with a row of bristles along middle portion of anterodorsal surface, 1 bristle each on anteroventral and posteroventral surfaces at about one-third the distance from the distal end, 1 bristle on posterolateral surface and a row of bristles along basal two-thirds of posterodorsal surface ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles each along anteroventral and posteroventral surfaces and 1 bristle each on distal one-third of posterodorsal and posterolateral surfaces ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end, 1 bristle on posteroventral surface on two-thirds the distance from the distal end and with tuft of long hairs along ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but second to fourth each with 1 lateral marginal bristle, fifth with a row of 16 marginal bristles ; sternites first to fourth with short hairs ; fifth sternite v-shaped with hairs and bristles laterally on arms ; first genital segment reddish-brown but without any marginal bristles, second black with marginal bristles ; inner forceps elongated, slightly curved and sharply pointed at end ; outer forceps slightly elongated ; anterior paramere longer but without hair ; posterior paramere almost straight, slightly curved and with 1 hair anteriorly ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus curved, pointed at end and with one pointed lateral process at the middle ; lateral plate of paraphallus long, wide and membranous ; styli of glans short and pointed ; ventralia small and chitinous.

Female : Unknown.

Material examined : *Holotype* ♂, India : Car Nicobar ; Sawai, 19.xii.1988, B.C. Nandi.

Discussion on species : This species is characterised by its membranous lateral plate of paraphallus and angular form of apical plate of paraphallus on its subterminal end. Moreover, the fifth sternite is also quite distinguishable here from other species. This species may be distinguished from *Phytosarcophaga gressitti* (Hall and Bohart, 1948) by the structures of apical and lateral plates of paraphallus.

Biology : This is a relatively rare species which was collected from bushes near the fishery department. It seems that this species is attracted to dead fishes.

Distribution : India ; AN (Sawai).

Type deposited : Holotype ♂, ZSIC, studied.

Genus 46. *Heteronychia* Brauer and Bergenstamm, 1889

1889. *Heteronychia* Brauer and Bergenstamm, *Denkschr. Akad. Wiss. Wien, Kl. math. naturw.*, **56** : 124.

Type species : *Heteronychia chaetoneura* Brauer and Bergenstamm, 1889 (= *Sarcophaga dissimilis* Meigen, 1826).

1863. *Erichsonia* Robineau-Desvoidy, *Hist. nat. Dipt., Paris*, **2** : 481 (a junior homonym of *Erichsonia* Westwood, 1840, Hymenoptera).

Type species : *Sarcophaga haemorrhoea* Meigen, 1826.

1863. *Hartigia* Robineau-Desvoidy, *Hist. nat. Dipt., Paris*, **2** : 521 (a junior homonym of *Hartigia* Zetterstedt, 1838, Hymenoptera).

Type species : *Hartigia concolor* Robineau-Desvoidy, 1863 (= *Sarcophaga dissimilis* Meigen, 1826).

1928. *Bercaea* sensu Enderlein, *Arch. klassif. phylogen. Ent.*, **1** (1) : 40 (misidentification, not Robineau-Desvoidy, 1863).

Type species : *Sarcophaga penicillata* Villeneuve, 1907.

1928. *Dasypygia* Enderlein, *Arch. klassif. phylogen. Ent.*, **1**(1) : 40.

Type species : *Sarcophaga arvorum* Meigen, 1826 sensu Rondani (1860).

1928. *Pierretia* Enderlein, *Arch. klassif. phylogen. Ent.*, **1**(1) : 47 (misidentification, not Robineau-Desvoidy, 1863).

Type species : *Sarcophaga haemorrhoea* Meigen, 1826.

1972. *Helicobia* sensu Zumpt, *Explor. Parc natn. Virunga*, **101** : 211 (misidentification, not Coquillett, 1895).

Type species : *Sarcophaga rapax* Walker, 1849.

1976. *Leclercqiomyia* Lehrer, *Bull. Annl. Soc. r. ent. Belg.*, **122** (4-6) : 197.

Type species : *Leclercqiomyia thirionae* Lehrer, 1976.

Morphology : Antennae inserted on a line drawn horizontal from the middle of the eye ; parafacial with usually one row of hairs and some of the lower hairs strong ; oral margin usually strongly protruding forwards ; upper part of propleura with setae or hairs ; *ac* 0-3+1 ; presutural *dc* 3 ; *R*₁ usually with setae ; third abdominal tergite usually with a pair of strong median marginal bristles, rarely absent ; fifth sternite v-shaped with numerous stout spine-like bristles along inner margin of arms ; first genital segment with several strong marginal bristles ; post abdomen almost usually

red ; inner forceps flattened dorsally or with a dorsal excavation ; theca long and slender ; apical part of paraphallus usually small ; styli of glans long and slender ; ventralia small or with spine-like extension.

Discussion : This is a rather large genus and Verves (1986) divided it into seven subgenera and listed a lot of species from the Palaearctic region. Only two subgenera : *Eupierretia* Rohdendorf, 1937 and *Ctenodasypygia* Enderlein, 1928 are available in this area. Lopes *et al.* (1977) reported only 1 species from the Oriental region under the subgenus *Spatulapica* Fan, 1964. Kano *et al.* (1967) reported 3 species from Japan. Dear (1980) listed 28 species from the Afrotropical region and Pape (1987b) reported only 7 species from Fennoscandia and Denmark.

Biology : This genus has been recorded to breed in the small *Cepaea hortensis* and also from snails of the family Succineidae (Pape, 1987b). Schiner (1862) reported the breeding of 1 species in human flesh but Verves (1987) reported that the species identification might be erroneous.

Distribution : This genus is distributed in the Oriental, Palaearctic, Afrotropical and Australasian and Oceanian regions.

Key to subgenera

1. Apical plate of paraphallus moderate in size ; lateral process of apical plate of paraphallus strongly sclerotised, short and in the form of more or less projecting hook*Eupierretia* Rohdendorf
2. Apical plate of paraphallus very large and complex ; lateral process of apical plate of paraphallus less sclerotised, long, slender but not in the form of hook*Ctenodasypygia* Enderlein

Subgenus *Eupierretia* Rohdendorf, 1937

1937. *Eupierretia* Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 363.

Type species : *Sarcophaga proxima* Rondani, 1860.

Morphology : Big or medium sized flies with postabdomen usually red ; penis elongated ; apical plate of paraphallus moderate in size with short lateral projection, sometimes in the form of teeth ; basal part of paraphallus very massive, with big ventral projection and carrying well developed ventral extension which is in the form of hook ; lateral process of apical plate of paraphallus strongly sclerotised, short and not thickened apically but is in the form of more or less projecting hooks ; styli of glans fine and long.

This subgenus is represented by only 1 species in the Oriental region. Verves (1986) reported a total of 21 species from the Palaearctic region.

So far nothing is known regarding the biology of the members of this subgenus.

This subgenus is distributed in the Oriental and Palaearctic regions.

150. *Heteronychia (Eupierretia) portschinskyana* Rohdendorf
(Figs. 851–852)

1937. *Pierretia (Eupierretia) portschinskyana* Rohdendorf, *Fauna USSR, Dipt.*, 19(1) : 373.

1986. *Heteronychia (Eupierretia) portschinskyana* : Verves, *Cat. Palae. Dipt.*, 12 : 150.

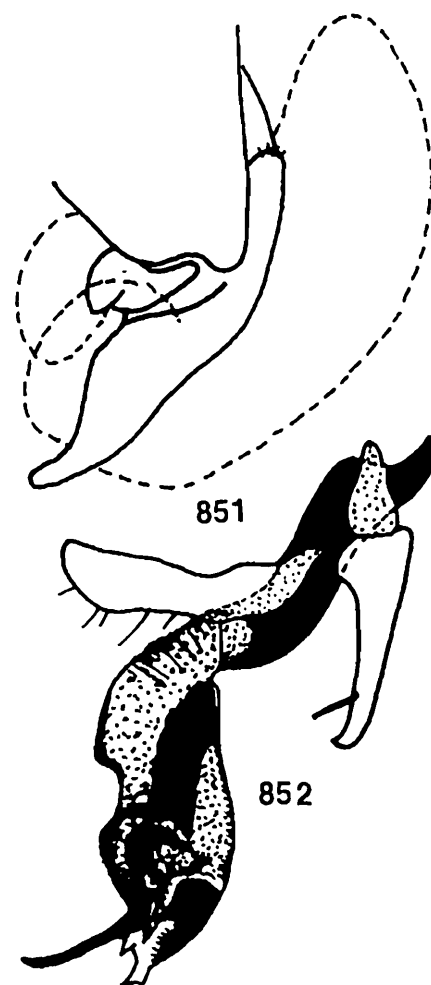
Male : Body length 7–11 mm.

Head : Width of frons equal or somewhat narrower than that of one eye ; frontal vitta black, its width at narrowest point of frons about one and half times that of one parafacial width ; antennae short and reaching up to the level of eye end, second segment reddish-brown to dark brown, third long and one and three-fourths that of second ; facial ridge with median length bristles at the base ; frontal bristles 11–13, longer and strong ; gena one-third that of one eye length, bearing 2–3 rows of hairs along the upper genal part and with especially thin bristles ; post gena with densely coloured hairs and bristles ; outer vertical bristle absent ; three rows of postocular setae besides postocular cilia, rest of the area with densely covered light coloured hairs ; palpi reddish-brown to dark-brown, not so much long, cylindrical and not thickened at the base.

Thorax : Greyish with dark faintly longitudinal stripes ; *ac* 3+1 (presutural bristles often asymmetrical) : scutellum with 2 strong lateral and one pair of thinner apical bristles, discoscutellar bristles thinner and somewhat near the scutellum.

Wings : Hyaline with brown veins ; R_1 bare ; fifth costal segment shorter than one and one-fourth to one and one-half that of third segment.

Abdomen : Thickly dusted blue to grey, brightly chess-marked with well dark spots but sometimes faintly demarcated ; third abdominal tergite without median marginal bristles ; sternites first to fourth with densely covered hairs but fourth with slightly shorter hairs ; fifth sternite v-shaped with extended arms and the inner edges with long bristles ; first genital segment slightly brown and at the rear end reddish, sometimes reddish-brown and less extended and one and half to one and one-fifth as long as that of height, arched at the posterior end



Figs. 851-852 : *Heteronychia (Eupierretia) portschinskyana* Rohdendorf. 851, Inner and outer forceps (lateral view); 852, Penis with anterior and posterior parameres (lateral view); (after Rohdendorf, 1937).

and with 4–5 strong marginal bristles, posterior half of genital tergite not particularly thick but with short hairs ; second genital segment red and arched with strong extended portion in posteroventral surface ; inner forceps gradually thickened at the anterior end, bent towards posterior end but not particularly pointed ; outer forceps at the basal end concave ; anterior paramere wide, bent, wave-like basally, thickened, expanded gradually to apex and with hairs posteriorly ; posterior paramere straight, rod-like, thin, pointed but hook-like terminally and with 1 hair at the anterior end ; theca shorter than paraphallus ; paraphallus extended and wide ; apical plate of paraphallus rather small and wide, covering its apex, gradually pointed and with well developed lateral teeth ; lateral plate of paraphallus extensively sclerotised and arched apically ; styli of glans small and slender ; ventralia wide with very long straight ventral process.

Female : Almost smaller to small but for the following differences ; frontal vitta somewhat narrower than that of one eye and with 2–3 strong fronto-orbital bristles in addition to 1 outer vertical bristle ; sixth tergite dark, thickly dusted, light colour at the edge and often reddish deep coating.

Material examined : No material was available for study and the description provided here is mainly based on Rohdendorf's original description.

Discussion on species : Sugiyama (1989) placed this species under the genus *Sarcophaga*. This species is similar to *Pierretia (Heteronychia) schnabli* Villeneuve, 1911 but differs from it by the expanded and pointed anterior paramere, thin and pointed outer forceps and also by the wide frons. Moreover, the apical plate of paraphallus in this species is quite distinguishable from *schnabli*.

Biology : Nothing is known regarding the biology of this species.

Distribution : Sugiyama (1989) reported this species from Pa (Saiful-Muluk Lake). It is also distributed in Bulgaria, Russia and Ukraine.

Type deposited : *Holotype* ♂, ZISP, not studied.

Subgenus *Ctenodasypygia* Enderlein, 1928

1928. *Ctenodasypygia* Enderlein, *Arch. klassif. phylogen. Ent.*, 1 (1) : 40.

Type species : *Sarcophaga fertoni* Villeneuve, 1911.

Morphology : Medium sized flies ; frontal vitta black ; facial ridge almost bare ; R₁ bare ; postabdomen usually black ; penis moderately developed ; apical plate of paraphallus very large and massive ; lateral process of apical plate of paraphallus less sclerotised, long, slender but not in the form of hook ; styli of glans elongated ; ventralia large.

This is a little known subgenus and only 8 species have so far been reported from the Palaearctic region. 1 species is present here.

So far the literature is concerned no much is known regarding the biology of the species but most of them are attracted to flowering plants.

This subgenus is distributed in the Oriental and Palaearctic regions.

151. *Heteronychia (Ctenodasypygia) smithi* (Nandi)

(Figs. 853–856)

1990. *Pierretia (Bercaea) smithi* Nandi, *Hexapoda*, 2 : 21.

1996. *Heteronychia (Ctenodasypygia) smithi* : Nandi, n. comb.

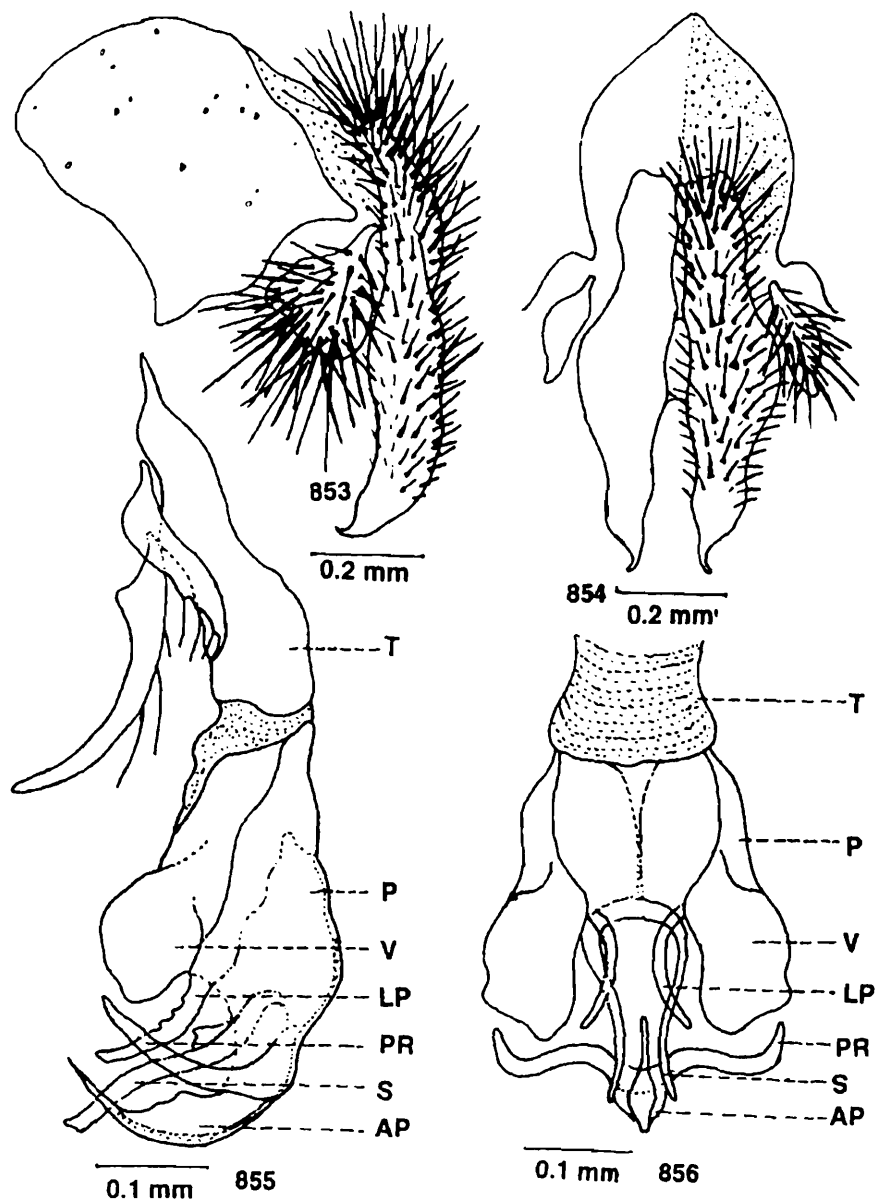
Male : Body length 7–8 mm.

Head : Width of frons about the width of one eye ; frontal vitta black, its width at narrowest point of frons about more than that of each parafrontal ; parafrontal and parafacial blackish with silvery pollen, the former with short scattered hairs, the latter with a row of short hairs near the eye margin ; antennae brownish and reaching up to about 0.85 distance to vibrissae, first and second segments brownish with brown and black hairs, third brown with silvery pollen and about two and half times that of the second ; arista long, plumose along basal half ; facial ridge almost bare, brownish-black and with silvery pollen ; vibrissae long, crossed, distance between vibrissae more than one parafacial width ; frontal bristles 9, posterior 2 reclinate, anterior 2 below base of antennae and reaching up to about half of second antennal segment, rest cruciate and directed forwards ; gena black with silvery pollen ; post gena blackish-brown ; ocellar triangle brownish, silvery pollen and with long hairs ; outer vertical bristle short, inner vertical well developed, post vertical half the inner vertical, postocellar less than inner vertical ; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with greyish hairs ; palpi slender ; proboscis long and black.

Thorax : Black with three black longitudinal stripes ; *ac* 0+1 ; *dc* 4+4 ; *ia* 0+2 ; *ps* 1 ; *h* 3 ; *ph* 4 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 7 ; upper part of propleura bare with silvery pollen ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles well developed, 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of short setae located dorsally and extending up to three-fourths from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to the third, the former with short spines throughout its length on anterior margin ; epaulet black with black hairs ; basicostal scale yellowish ; squama white ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of bristles along basal half of anterodorsal surface, 1 bristle on posterodorsal surface at about one-third the distance from the distal end ; mid femur with a row of 3



Figs. 853-856 : *Heteronychia (Ctenodasypygia) smithi* (Nandi). 853, Inner and outer forceps (lateral view); 854, Inner and outer forceps (posterior view); 855, Penis (lateral view); 856, Penis (ventral view).

bristles along middle portion of anterolateral surface, a row of short bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of bristles along basal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with 2 bristles along middle

portion of anterodorsal surface, 1 bristle each on anteroventral, posterodorsal and posterolateral surfaces at about one-third the distance from the distal end and 1 bristle on posterodorsal surface at about one-third the distance from the basal end ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface, 1 bristle on posterodorsal surface and several long bristles along posterior margin of ventral surface ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-fourth the distance from the distal end, 1 bristle on posterodorsal surface at about two-thirds the distance from the basal end but without tuft of hairs along posterior margin of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with 2 lateral marginal bristles, fourth with 1 median and 2 lateral marginal bristles, fifth with a row of 16 marginal bristles ; sternites first to fourth with short hairs ; first genital segment black with 4 median marginal bristles and short hairs, second blackish with long black hairs ; inner forceps almost straight, curved at end with short spines laterally and long hairs terminally on arms ; outer forceps oval with long hairs ; anterior paramere more elongated, curved in the middle and with 2–3 hairs medially on the posterior end ; posterior paramere shorter, curved at end and with 3 hairs anteriorly ; apical plate of paraphallus curved, pointed at end and with one strong lateral process ; lateral plate of paraphallus moderately developed and slightly serrated anteriorly ; styli of glans very long, serrated anteriorly and crosses the apical plate of paraphallus ; ventralia oval and large.

Female : Unknown.

Material examined : *Holotype* ♂, India : Bihar ; Deoghar (Nalakha) 265 m, 6. vi. 1988, B. C. Nandi ; *Paratype* ♂, same data as *Holotype*.

Discussion on species : This species has its specific characters of oval structure of ventralia, presence of short spines on inner forceps, its acuteness at its end and elongated lateral plate of paraphallus. This species is almost similar to *P (Bercaea) graeca* Rohdendorf, 1937, now treated as *Heteronychia (Ctenodasypygia) graeca* but is differentiated from it by the structures of lateral and apical plates of paraphallus.

Biology : This is a rare species which was collected from bushes including the flowers of *Lantena camara* (Verbenaceae).

Distribution : India ; B (Nalakha)

Type deposited : *Holotype* ♂, ZSIC, studied.

Subtribe **Harpagophallina** Rohdendorf

This subtribe is characterised by having penis with poorly developed ventralia, apical plate of paraphallus with long cylindrical apical process and lateral plate of

paraphallus is in the form of short hamate processes. Base of wing hyaline or slightly fuscous. This subtribe is represented in the Oriental region by two genera: *Harpagophalla* Rohdendorf and *Iranihindia* Rohdendorf. Both genera have been reported from this region. Verves (1989b) revised this subtribe.

Some of the members of this subtribe are attracted to flowering plants and a few species breed in mollusca, dead bodies of vertebrates, human excrement and sphingid larvae.

This is distributed in the Oriental, Palaearctic and Australasian and Oceanian regions.

Key to genera

1. Paraphallus with very large ventral process forming a large hook ; apical plate of paraphallus with a pair of slender processes ; lateral plate of paraphallus with the form of a single pair of moderately large and sharp processes ; styli of glans short and curved ; antennae and palpi black *Harpagophalla* Rohdendorf
Paraphallus without a large hook ; apical plate of paraphallus with a pair of anchor-like transparent and membranous processes ; lateral plate of paraphallus with thick, short and sharp hooks, ; styli of glans extending distally in the form of a large, straight and elaborate processes ; antennae and palpi orange-yellow *Iranihindia* Rohdendorf

Genus 47. *Harpagophalla* Rohdendorf, 1937

1937. *Harpagophalla* Rohdendorf, *Fauna USSR, Dipt.*, **19** (1) : 276 ; Rohdendorf, 1965, *Ént. Obozr.*, **44**(3) : 697 ; Lopes and Kano, 1981, *Revta bras. Biol.*, **41**(3) : 645.

Type species : *Sarcophaga sera* Rohdendorf, 1930 (= *Sarcophaga kempi* Senior-White, 1924).

Morphology : Third antennal segment about two and half times that of the second ; antennae and palpi black ; width of frons about half that of one eye ; upper part of propleura bare ; presutural acrostichal bristles not differentiated ; postsutural dorsocentral bristles 3–5, posterior 1 more stout ; third abdominal tergite without median marginal bristles ; hind tibia with hairs ; presence of a large region between theca and paraphallus ; apical plate of paraphallus with two very long cylindrical transparent processes ; lateral plate of paraphallus very stout but with a pair of pointed apical arms ; ventralia long, very much sclerotised, cylindrical and with pointed apophysis ; styli of glans short and dorsal part straight or curved anteriorly.

Discussion : This is a small genus and so far only 3 species are known from the Oriental region which are also reported from this area. Lopes and Kano (1981) revised this genus.

Biology : This species visits flowering plants. The larvae breed in mollusca and beef.

Distribution : This genus is distributed in the Oriental, Palaeartic and Australasian and Oceanian regions.

Key to male species

1. Anterior paramere without hairs on posterior end ; inner forceps wide at subterminal end ; ventral plate of paraphallus well developed with short processes2
 Anterior paramere with long hairs on posterior end ; inner forceps pointed at end ; ventral plate of paraphallus wide with long processes
*kempi* (Senior-White)
2. Apical plate of paraphallus short and pointed at end ; ventralia curved anteriorly*panchganiensis* Nandi
 Apical plate of paraphallus elongated and blunt at end ; ventralia cock-shaped
*talonata* (Senior-White)

152. *Harpagophalla kempi* (Senior-White)

(Figs. 857-861)

1924. *Sarcophaga kempi* Senior-White, *Rec. Indian Mus.*, **26** (3) : 247 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 264 ; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, **45** : 270.
1930. *Sarcophaga sera* Rohdendorf, *Bull. ent. Res.*, **21**(3) : 316 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 220.
1931. *Sarcophaga kempioides* Baranov, *Konowia*, (2) **10** : 114.
1937. *Harpagophalla sera* : Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 276 ; Fan, 1965, *Synan. flies China*, **15** : 261.
1977. *Harpagophalla kempi* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 580 ; Nandi, 1992, *Hexapoda*, **4** (1) : 76.

Male : Body length 6–11 mm.

Head : Width of frons about two-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial black with golden pollen, the former with short scattered hairs, the latter with a row of 5 black hairs near the eye margin ; antennae brownish-black and reaching up to about 0.8 distance to vibrissae, first segment brownish-black with short hairs, second black at base and reddish at apex, third brown with silvery pollen and about two and half times that of the second ; arista long, plumose along basal

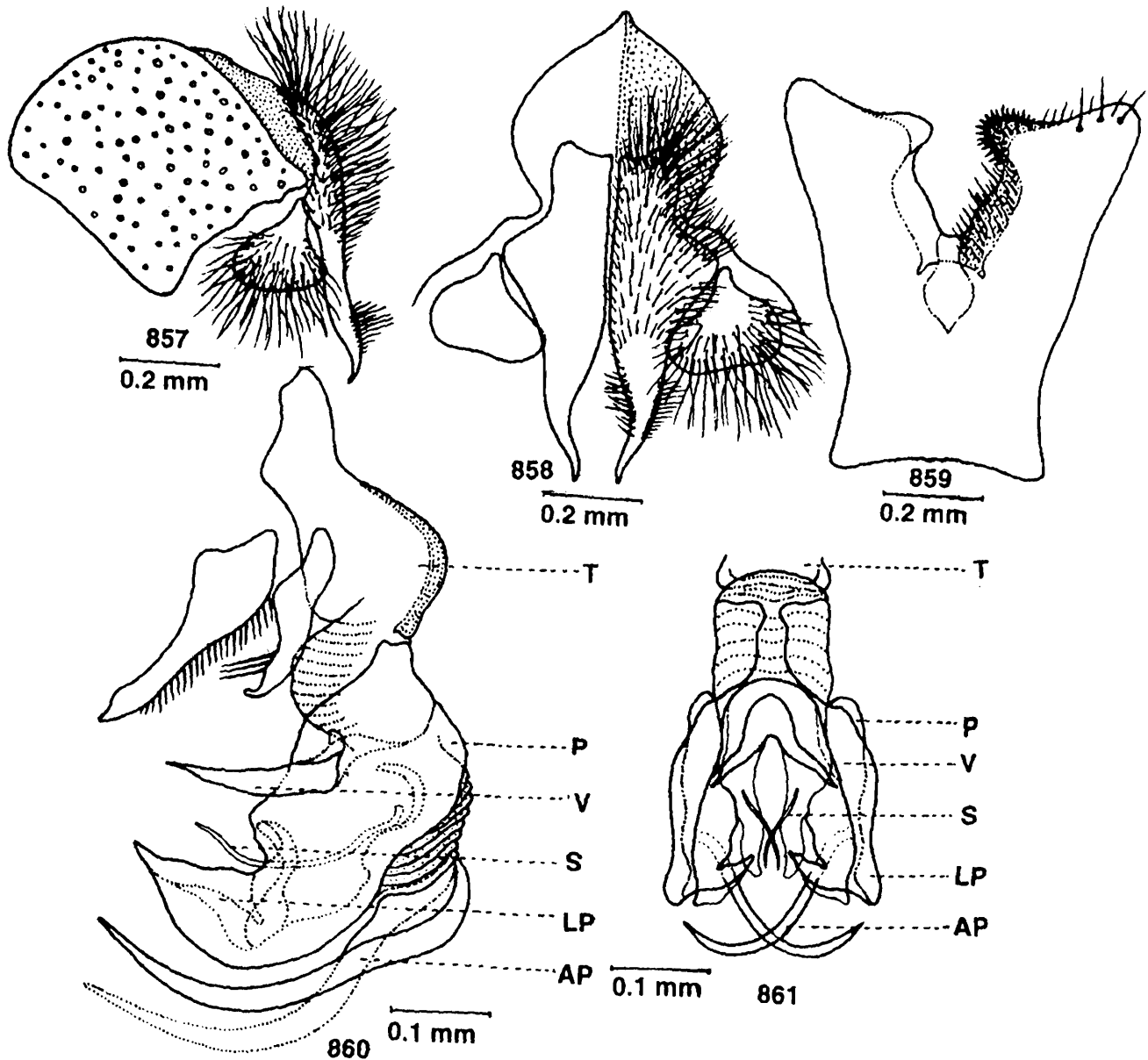
two-thirds ; facial ridge brown with silvery pollen ; vibrissae long, crossed, distance between vibrissae about twice that of one parafacial width ; frontal bristles 9–10, posterior 3 reclinate, anterior 3 below base of antennae and reaching up to about half of second antennal segment, rest cruciate and directed forwards ; gena black with short black hairs ; post gena black with long grey hairs ; ocellar triangle black with short hairs ; outer vertical bristle absent, inner vertical well developed, post vertical short, about one-third the inner vertical ; ocellar and postocellar bristles short, the former about one-third the inner vertical ; a pair of rows of postocular setae besides postocular cilia, first row regular, second row irregular, rest of the area with black and white hairs ; palpi slender and brown ; proboscis black.

Thorax : Black, silvery pollen with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 (posterior 1 *dc* more stout) ; *ia* 0+2 ; *ps* 1 ; *h* 3 ; *ph* 3 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 8–9 ; upper part of propleura bare, black with silvery pollen ; prostigmatic and propleural bristles well developed, the former with long bristle-like hairs, the latter with short hairs ; prothoracic spiracle blackish-brown ; mesothoracic spiracle brown ; apicoscutellar and discoscutellar bristles 1 pair each, the former is very stout ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 8–9 short setae located dorsally and extending up to about two-thirds from the basal node to r–m and 3–5 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to third, the former with short spines along basal two-thirds of its anterior margin ; costal spines almost stout ; epaulet black with short spines ; basicostal scale yellow ; squama white ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 short bristles along basal one-third of anterodorsal surface and 1 bristle each on posterodorsal and posterolateral surfaces at about one-third the distance from the distal end ; mid femur with a row of bristles along basal half and row of short setae along distal half of anteroventral surface, a row of long bristles along basal half and a row of short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces distally ; mid tibia with 2 bristles on middle portion of anterodorsal surface, a row of 3 bristles along posterodorsal surface and 1 bristle each on anteroventral and posteroventral surfaces at about one-third the distance from the distal end ; hind femur with a row of bristles and long hairs along anterodorsal surface, 1 bristle each on distal part of dorsal and posterodorsal surfaces and a row of long hairs along anterior and posterior margins of ventral surface ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-fifth the distance from the distal end, 2 bristles on posterodorsal surface medially and a row of long hairs each along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of median and two pairs of lateral marginal bristles, fifth with a row of about 16 marginal bristles ; sternites first to third with tuft of long hairs, fourth with short hairs basally and numerous short spines distally ; fifth sternite



Figs. 857-861 : *Harpagophalla kempfi* (Senior-White). 857, Inner and outer forceps (lateral view); 858, Inner and outer forceps (posterior view); 859, Fifth sternite; 860, Penis (lateral view); 861, Penis (ventral view).

v-shaped with wide window and tuft of short setae laterally and short hairs terminally on arms ; first genital segment brown with short hairs on distal end, second black

with long hairs but without differentiated bristles ; inner forceps almost straight, curved and pointed at end with long hairs along its basal three-fifths and tuft of short hairs posteriorly on subapical end ; outer forceps somewhat triangular with long hairs distally ; anterior paramere pointed apically, broad basally and with many short hairs posteriorly ; posterior paramere shorter, curved, pointed at end and with 3 long hairs ; theca shorter than paraphallus, the former is more chitinous ; apical plate of paraphallus not well sclerotised but with 2 long, elongated and pointed cruciate processes which extend beyond the tip of lateral plate of paraphallus ; lateral plate of paraphallus wide and well chitinised, almost reddish, curved and pointed at end ; styli of glans short ; ventralia ill-developed, long, pointed but without process.

Female : Unknown.

Material examined : India : Several male specimens from different localities of Arunachal Pradesh, Assam, Bihar, Karnataka, Kerala, Meghalaya, Mizoram, Nagaland, Tripura and West Bengal collected by B. C. Nandi.

Discussion on species : This species is distinguishable from other species of the genus by the elongated apical and wide lateral plates of paraphallus and also by the very ill-developed and pointed ventralia. Moreover, the anterior paramere of this species has many short hairs posteriorly.

Biology : This is a relatively common species which was collected from bushes and grasses. It is attracted to *Aristolochia ridicula* flowers (Aristolochiaceae). The larvae of this species breed in dead *Achatina fulica* (Gastropoda) and dead sphingid larvae (Sphingidae, Lepidoptera). This species was reared on beef (Blackith and Blackith, 1988).

Distribution : India ; ArP (Tipi), A (Barpathar, Dibrugarh, Jorhat), B (Deoghar, Griridih, Mahaudanga, Pusa), HP (Dharmashala), S (Gangtok) K (Trivancore), MnP (D.M. College Campus), Me (Shilong, Singimari), Mz (Aizawl, Kolasib, Lunglei), N (Dimapur), T (Kanchanpur, Sipahijala) and WB (Arabari Forest, Bhatpur, Calcutta, Chandrapur Forest, Gorumara Forest, Kenduah, Ketka, Susunia Forest) ; M (Moulmen) ; Ne (Pokhara, Nijgarh) ; SL (several localities) ; China (Kiangsi) ; Hawaiian Islands ; Indonesia (Java, Sulawesi) ; Laos ; Malaysia ; Papua New Guinea ; Philippines ; Singapore and Thailand.

Type deposited : Holotype ♂, BMNH, not studied.

153. *Harpagophalla panchganiensis* Nandi

(Figs. 862–865)

1993. *Harpagophalla panchganiensis* Nandi, *Rec. zool. Surv. India*, **93**(1–2) : 289.

Male : Body length 8 mm.

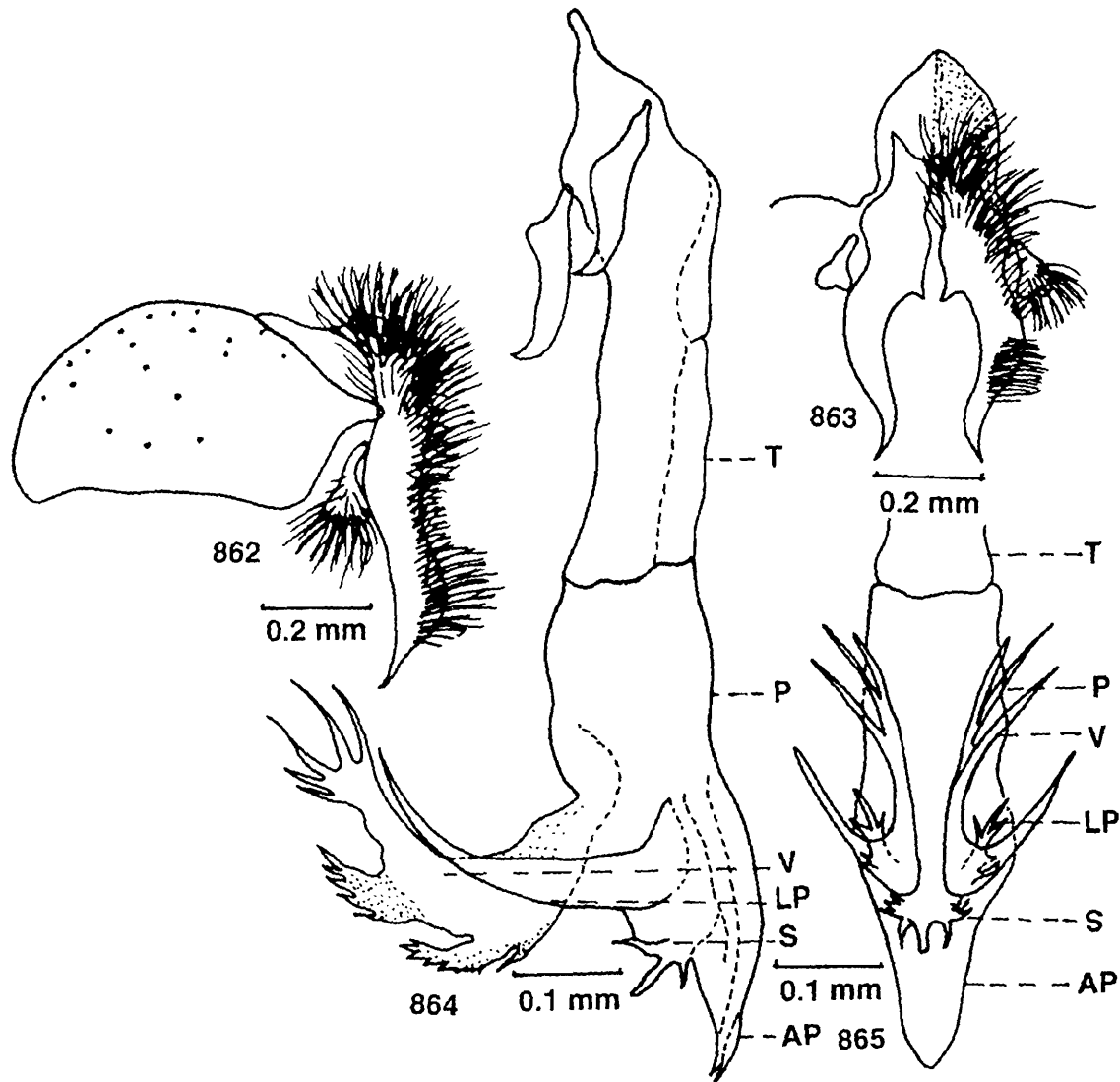
Head : Width of frons about two-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about less than each parafrontal ; parafrontal and parafacial black with golden pollen, the former with short scattered hairs, the latter with a row of about 6 short black hairs near the eye margin ; antennae blackish-brown and reaching up to about 0.8 distance to vibrissae, first and second segments black with black hairs, third black with silvery pollen and about two and half times that of the second ; arista long, plumose along basal two-thirds ; facial ridge brownish with golden pollen and short hairs ; vibrissae long, crossed, distance between vibrissae about half that of one parafacial width ; frontal bristles 10, posterior 2 reclinate, anterior 2 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; gena black with golden pollen ; post gena black with long greyish hairs ; ocellar triangle black with short black hairs ; outer vertical bristle absent, inner vertical well developed, post vertical short and about half of the inner vertical, postocellar less than half of inner vertical ; a pair of rows of regular postocular setae besides postocular cilia, rest of the area with black and white hairs ; palpi slender and black ; proboscis blackish.

Thorax : Black with three black longitudinal stripes : *ac* 0+1 ; *dc* 5+5 (posterior 1 *dc* more stout) ; *ia* 0+2 ; *ps* 1 ; *h* 3 ; *ph* 3 ; *np* 3 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 9 ; upper part of propleura bare with silvery pollen ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brownish ; apicoscutellar and discoscutellar bristles well developed, 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of short setae located dorsally and extending up to two-thirds from the basal node to r-m and 4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than the third ; the former with short spines along basal half of its anterior margin ; costal spines almost stout ; epaulet black with short spines ; basicostal scale yellowish ; squama whitish ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 short bristles along basal one-third of anterodorsal surface and 1 short bristle each on posterodorsal and posterolateral surfaces at about one-third the distance from the distal end ; mid femur with a row of 3 short bristles along basal one-third, a row of short setae each along distal one-third of anteroventral and posteroventral surfaces and 1 long bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with 2 bristles on middle portion of posterolateral surface, 3 bristles along posterodorsal surface on basal one-third and 1 bristle each on posterodorsal, posterolateral and posteroventral surfaces at about one-third the distance from the distal end ; hind femur with a pair of rows of bristles along anterolateral surface, a

row of bristles along anteroventral surface and 1 bristle on distal part of posterodorsal surface ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle on anteroventral surface, a row of 3 bristles along posterodorsal surface at about two-thirds the distance from the basal end and with long hairs along anterior and posterior margins of ventral surface.



Figs. 862-865 : *Harpagophalla panchganiensis* Nandi. 862, Inner and outer forceps (lateral view); 863, Inner and outer forceps (posterior view); 864, Penis (lateral view); 865, Penis (ventral view).

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with 1 lateral marginal bristle, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of 18 marginal bristles ; sternites first to third with tuft of short hairs, fourth with long hairs ; fifth sternite (with the specimen) with short hairs terminally and numerous

short spines laterally on arms ; first and second genital segments brown but without marginal bristles ; inner forceps hump-backed shaped, beak-like, curved at end but with long hairs posteriorly on subbasal end ; outer forceps not elongated but with long hairs ; anterior paramere slightly curved at end but without hairs on posterior end ; posterior paramere more curved at end but without hairs ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus short, straight and pointed at end ; lateral plate of paraphallus elongated and approaches to the apical plate of paraphallus ; styli of glans short and trilobed ; ventralia curved anteriorly, long, broad and with five elongated apical branched processes and 2 subbasal spinous wide projections.

Female : Unknown.

Material examined : *Holotype* ♂, India : Maharashtra ; Panchgani, 1,732 m, 20.vi. 1990, B. C. Nandi.

Discussion on species : This species closely resembles *H. talonata* (Senior-White, 1925) but differs from it by the short structures of apical plate of paraphallus and ventralia. Moreover, the structure of lateral plate of paraphallus in this species is also quite distinguishable from *talonata*.

Biology : This is a very rare species which it was collected from bushes.

Distribution : India ; Mr (Panchgani).

Type deposited : *Holotype* ♂, ZSIC, studied.

154. *Harpagophalla talonata* (Senior-White)

(Figs. 866-867)

1925. *Sarcophaga talonata* Senior-White, *Spolia zeylan.*, **13** : 211 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 246.

1977. *Harpagophalla talonata* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 588.

Male : Body length 6.5 mm.

Head : Frons narrow, less than half of one eye width ; frontal vitta brownish-grey and ill-defined ; parafrontal together rather wider than frontal stripe ; frontal bristles diverging ; parafrontal and parafacial with silvery pollen, the latter with well developed bristles ; face grey ; gena silvery grey ; occiput grey with three rows of postocular cilia ; lateral vertical bristle absent ; second antennal segment yellowish-brown, third grey, pollinose and about three and half times that of the second ; palpi yellow and dark basally.

Thorax : Very light bluish-grey ; propleura bare ; *ac* 2 ; *ps* 2 ; posterior *dc* 4 ; apicoscutellar bristles crossed, 1 pair.

Wings : R_1 bare : costal spines strong ; fifth costal segment equal to the third.

Legs : Mid femur with some long apical bristles below but without a comb and fringed ; mid tibia bare ; hind femur with long hind macrochaetal row but hardly any trace of fringe except basally ; hind tibia bare.

Abdomen : Second abdominal tergite bare ; first genital segment dark but without marginal bristles, second brownish-black ; fifth sternite Y-shaped with wide window and few bristles on lateral sides of arms ; inner forceps almost straight, slightly curved at end but with few short bristles posteriorly ; outer forceps wide ; apical plate of paraphallus elongated, blunt and bifurcated apically ; lateral plate of paraphallus short ; ventralia cock-tail shaped with few projections posteriorly.

Female : Unknown.

Material examined : No material was available during the present examination and the description as provided here is mostly based on Senior-White *et al.*, 1940.

Discussion on species : This species is similar to *H. panchganiensis* Nandi, 1993 but differs from it by the structure of apical plate of paraphallus which is more elongated and bifid at end here and also by the cock-tail like ventralia. Moreover, the fifth sternite is Y-shaped with wide elongated window here.

Biology : Nothing is known regarding the biology of this species.

Distribution : SL (Murukan).

Type deposited : *Holotype* ♂, CM, not studied.



Figs 866-867 : *Harpagophalla talonata* (Senior-White). 866, Penis with anterior and posterior parameres and inner and outer forceps (lateral view); 867, Fifth sternite; (after Senior-White, 1925).

Genus 48. *Iranihindia* Rohdendorf, 1961

1961. *Iranihindia* Rohdendorf, *Stuttg. Beitr. Naturk.*, **58**(3) : 2 ; Nandi, 1979, *Orient. Insects*, **13** (1-2) : 201.

Type species : *Sarcophaga futilis* Senior-White, 1924.

Morphology : Third antennal segment long and about 3 times or more than that of the second ; upper part of propleura bare ; *dc* 5+5 (posterior 3 post *dc* short) ; setae on middle legs well developed ; abdominal tergites with long hairs or with short and stout bristles ; fifth sternite with window ; genital segments without bristles ; inner forceps deeply cleft in the middle, bearing large hump at the base and with spines

apically ; theca shorter than paraphallus ; apical plate of paraphallus long with a pair of posteriorly bent armature-shaped membranous and transparent processes, the basal process simple and flap-like ; lateral plate of paraphallus with 3 short sharp hooks and processes ; styli of glans long and extending distally ; ventralia short and serrated.

Discussion : This is a rather small genus with a total of 7 species. Most of the species have been recorded from the Oriental region. Nandi (1979) revised this genus from India and reported 5 species. A total of 6 species are at present represented in this area.

Biology : Some members of the genus breed in dead rabbit and human excrement and some of them are also attracted to nectar.

Distribution : This genus is distributed in the Oriental and Palaeartic regions.

Key to male species

1. Third abdominal tergite with strong marginal bristles ; styli of glans long and blunt2
Third abdominal tergite without or with weak median marginal bristles ; styli of glans short and pointed.....*martellata* (Senior-White)
2. Inner forceps with a single row of spines3
One of the inner forceps with a double row of spines*jamesi* Nandi
3. Styli of glans long and slender4
Styli of glans short, not very slender.....*futilis* (Senior-White)
4. Lateral plate of paraphallus with equal process*martellatoides* (Baranov)
Lateral plate of paraphallus with unequal process5
5. Apical plate of paraphallus almost straight*nepalensis* Kano and Sugiyama
Apical plate of paraphallus strongly curved*indica* Nandi

155. *Iranihindia martellata* (Senior-White)

(Figs. 868-873)

1924. *Sarcophaga martellata* Senior-White, *Rec. Indian Mus.*, **26**(3) : 247 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 258 ; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, **45** : 268.

1961. *Iranihindia martellata* : Rohdendorf, *Stuttg. Beitr. Naturk.*, **58**(3) : 2 ; Nandi, 1979, *Orient. Insects*, **13** (1-2) : 202.

Male : Body length 9–11 mm.

Head : Width of frons about two-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal

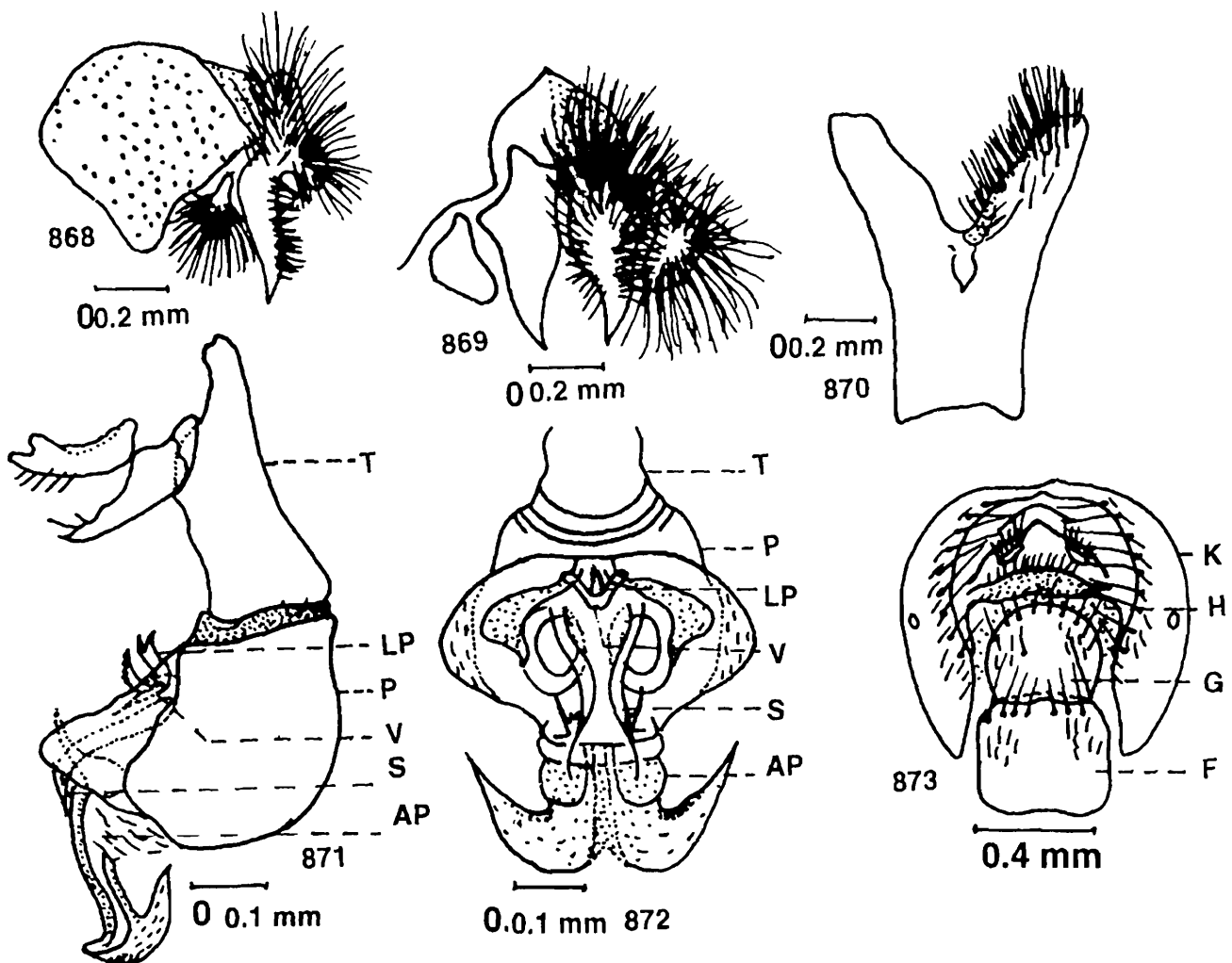
and parafacial black, the former with short scattered hairs, the latter with a row of few short and 3–4 long hairs near the eye margin ; antennae yellowish-red to orange and reaching up to about 0.8 distance to vibrissae, first segment brown, second more reddish, third reddish and about three times that of the second ; arista long, plumose along basal three-fifths ; facial ridge brown with silvery pollen ; vibrissae long, crossed, distance between vibrissae slightly more than one parafacial width ; frontal bristles 8–11, posterior 1 reclinate, anterior 2 below base of antennae and reaching up to about one-third of second antennal segment, rest cruciate and directed forwards ; gena and post gena black with silvery hairs ; ocellar triangle black with black hairs ; outer vertical bristle very weak, inner vertical well developed, post vertical short and about two-fifths the inner vertical ; ocellar and postocellar bristles moderately developed ; a row of regular postocular setae besides postocular cilia, rest of the area with scattered hairs ; palpi slender and black ; proboscis short and black.

Thorax : Black with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 (anterior 3 *dc* very slender) ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 8–10 ; upper part of propleura bare and black ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 8–9 short setae located dorsally and extending up to about three-fifths from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment a little shorter than the third, the former with short spines along basal three-fifths of its anterior margin ; costal spines stout ; epaulet black ; basicostal scale yellow ; squama white ; halter brown.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of long bristles along posterior margin of ventral surface ; fore tibia with a row of 3 short bristles along basal part of anterodorsal surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end ; mid femur with a row of about 3–4 short bristles along middle portion of anterolateral surface, 1 bristle each on distal part of posterodorsal and posterolateral surfaces, a row of 4–5 short bristles along basal half and a row of short setae along distal half of posteroventral surface ; mid tibia with 2 bristles medially on anterolateral surface, 1 bristle on posterodorsal surface at about one-third the distance from the distal end, 2 short bristles on posterolateral surface at about one-third the distance from the basal end and 1 bristle each on distal one-third of anteroventral and posteroventral surfaces ; hind femur with a pair of rows of long bristles along anterodorsal surface, 1 bristle each on distal part of dorsal and posterodorsal surfaces, 1 bristle on anterior margin of ventral surface on distal end and several long and bristle-like hairs along

anterior and posterior margins of ventral surface; hind tibia with a row of long bristles along anterodorsal surface, 2 long bristles on middle portion of posterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end and a row of several long hairs each along anterior and posterior margins of ventral surface at about two-thirds the distance from the distal end.



Figs. 868-873 : *Iranihindia martellata* (Senior-White). 868, Inner and outer forceps (lateral view); 869, Inner and outer forceps (posterior view); 870, Fifth sternite; 871, Penis (lateral view); 872, Penis (ventral view); 873, Genitalia ♀ (ventral view).

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but second with 1 and third with 2 pairs of lateral marginal bristles; sternites first to fourth with tuft of long hairs; fifth sternite v-shaped with brush of spines laterally and long hairs terminally on arms; first genital segment brownish-black but without marginal bristles, second blackish with long hairs; outer forceps with long hairs apically; inner forceps with long hairs

on basal part and a row of short comb-like spines on subterminal end ; anterior paramere bifurcated at distal end with many short hairs posteriorly ; posterior paramere long, slender, pointed at end but with hairs anteriorly ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus membranous, not so curved but plough-shaped at end ; lateral plate of paraphallus short, bifurcated and pointed at end ; styli of glans short and pointed at end ; ventralia curved inwards and serrated.

Female : Body length 6–7 mm.

Head : Width of frons half that of one eye ; third segment of antennae more than two and half times that of the second, the former reaching up to about 0.85 distance to vibrissae ; frontal bristles 8 ; fronto-orbital bristles 2, of which 1 proclinate ; ocellar bristles more developed than male ; outer vertical bristle stout and about three-fifths the inner vertical.

Thorax : Similar to that of male but for the absence of apicoscutellar bristle.

Wings : Same as in male.

Legs : Chaetotaxy same as in male but for the following differences : hind femur without long hairs but with only 2 bristles on anterodorsal surface, several bristles along anterior and posterior margins of ventral surface and 1 bristle at about in the middle of anteroventral surface.

Abdomen : Sternites second, third and fifth each with 4 marginal bristles, fourth with only 2 short marginal bristles, seventh oval with short marginal bristles, eighth membranous but without hairs and bristles ; anal sternite covered with numerous short and long hairs ; seventh tergite entire with stout marginal bristles and hairs.

Material examined : India : Several male specimens from different localities of Andhra Pradesh, Assam, Bihar, Gujarat, Karnataka, Madhya Pradesh, Mizoram, Orissa, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal collected by B.C. Nandi.

Discussion on species : This species has its specific character by having plough-shaped apical plate of paraphallus, paraphallus is medially triangular with elongated extension and short and pointed styli of glans.

Biology : This is a common species which was collected from bushes and flowering plants. The larvae of this species breed in dead rabbit and human excrement. It feeds also on neem fruits.

Distribution : India ; AnP (Mangalagiri), A (Silchar), B (Chota Nagpur, Deoghar, Dumraon, Giridih Water Falls, Hazaribagh, Patna, Raja Rappa Water Falls, Rajgir, Ranchi, Titalgarh), Gu (Ahmedabad, Bet Dwarka, Dwarka, Gir Sanctuary), Kt (Bannerghata National Park, Bangalore, Kallar, Mysore), K (Calicut, Willingdon Island), Mr (Lonavale, Nagpur), MP (Artham, Jonk River), N (Dimapur), Mz (Aizawl,

Bonkon), O (Ashanput, Balugaon, Hirakud), TN (Coimbatore, Chennai, Parvatipuram), T (Matabari, Pratia Forest), UP (Dehra Dun), WB (Bhatpur, Bishnupur, Calcutta, Dulmi West, Kachujur, Sahebbundh, Sasankali) ; Ne (Birganj) and SL (Manna, Matale, Niroddumunai).

Type deposited : *Holotype* ♂, CM, not studied.

156. *Iranihindia jamesi* Nandi

(Figs. 874–879)

1979. *Iranihindia jamesi* Nandi, *Orient. Insects*, 13 (1–2): 214 ; Nandi, 1992, *Hexapoda*, 4 (1) : 77.

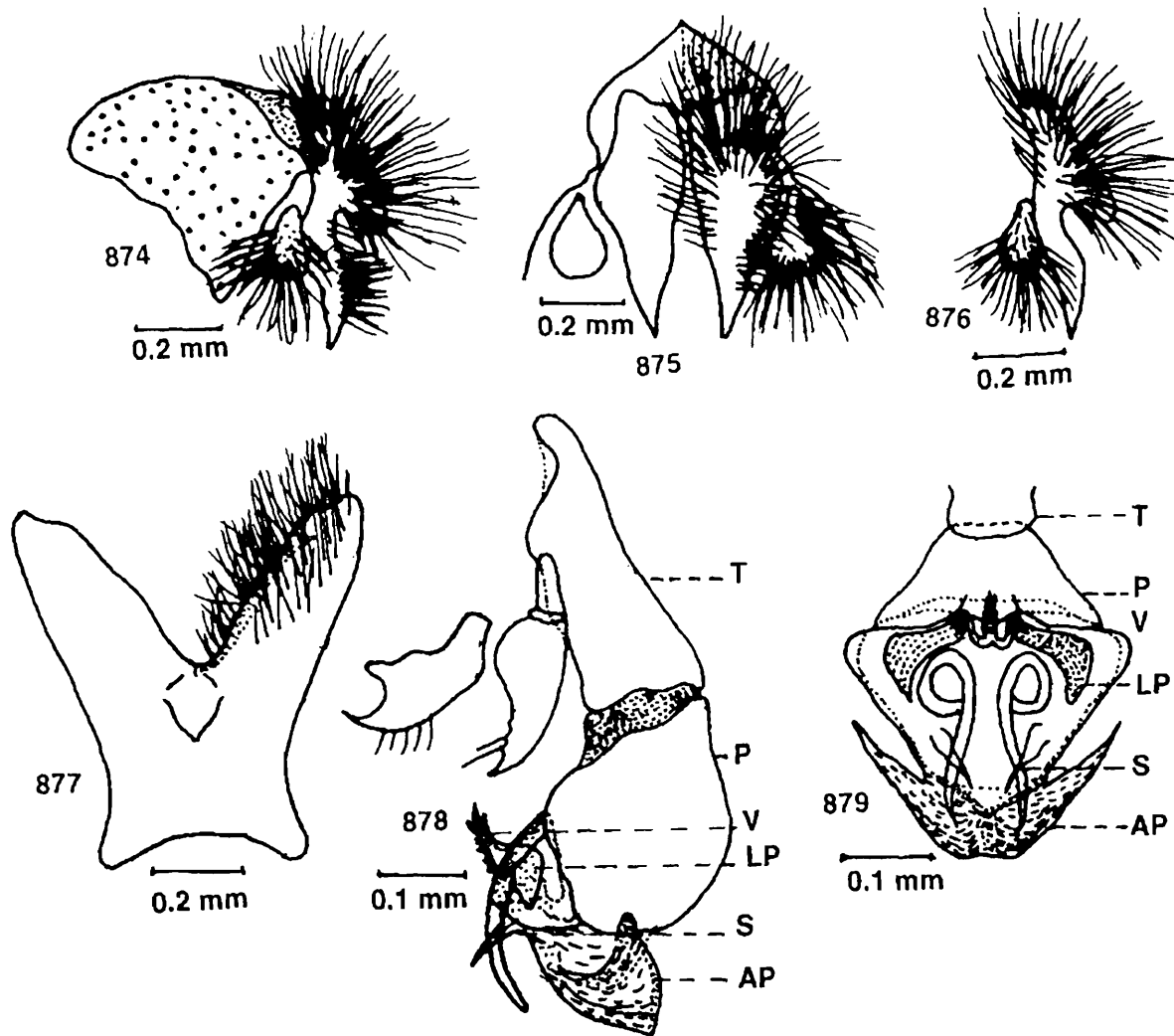
Male : Body length 8–10 mm.

Head : Width of frons about one-third that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrenal ; parafrenal and parafacial black with silvery pollen, the former with short scattered hairs, the latter with a row of long hairs near the eye margin ; antennae deeply brown, sometimes orange and reaching up to about 0.85 distance to vibrissae, first segment black, second orange to red, third brown with silvery pollen and about three times that of the second (sometimes distal part of second and basal part of third segment reddish-brown) ; arista long, plumose along basal three-fifths ; facial ridge brown with short spines ; vibrissae long, distance between vibrissae more than one parafacial width ; frontal bristles 10, posterior 2 reclinate, anterior 2 below base of antennae and reaching up to about one-third of second antennal segment, rest cruciate and directed forwards ; gena black, silvery pollen and with numerous short black hairs ; post gena black with long silvery hairs ; ocellar triangle black with short hairs ; outer vertical bristle absent, inner vertical well developed, post vertical short about three-fifths the inner vertical ; ocellar and postocellar bristles well developed ; a pair of rows of postocular setae besides postocular cilia, rest of the area with silvery hairs ; palpi slender and light brown ; proboscis blackish-brown.

Thorax : Blackish with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 (anterior 3 *dc* very slender) ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *n_p* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 8 ; upper part of propleura bare and blackish ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; *R*₁ bare ; *R*₄₊₅ with a row of 9 short setae located dorsally and extending up to about three-fifths from the basal node to r-m and several short setae along ventral surface of basal node of *R*₄₊₅ ; fifth costal segment slightly shorter than the third, the former with short spines along basal three-fifths

of its anterior margin ; costal spines stout ; epaulet black with short spines ; basicostal scale yellow ; squama white ; halter brown.



Figs. 874-879 : *Iranihindia jamesi* Nandi. 874, Inner and outer forceps (lateral view); 875, Inner and outer forceps (posterior view); 876, One of the inner forcep showing double rows of spines (lateral view); 877, Fifth sternite; 878, Penis (lateral view); 879, Penis (ventral view).

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 short bristles along basal half of anteroventral surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end ; mid femur with a row of 5 short bristles along middle portion of anterolateral surface, a row of short setae each along distal half and a row of long hairs each along basal half of anteroventral and posteroventral surfaces and 1 bristle each on distal part of posterodorsal and posterolateral surfaces ; mid tibia with 2 bristles on middle portion of anterolateral surface, 1 bristle on posterodorsal surface at about one-third the

distance from the distal end, 2 short bristles on posterolateral surface at about half the distance from the distal end and 1 bristle each on distal one-third of anteroventral and posteroventral surfaces; hind femur with a pair of rows of long bristles along anterodorsal surface, 1 bristle each on distal part of dorsal and posterodorsal surfaces, 1 bristle on distal part of anterior margin of ventral surface and several long hairs along ventral surface; hind tibia with a row of long bristles along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end and several long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second abdominal tergite absent but with a pair of lateral marginal bristles, third with a pair of well developed median and 4 lateral marginal bristles, fourth with a pair of median and 6 lateral marginal bristles, fifth with a row of 10–12 marginal bristles; sternites first to fourth with numerous long hairs but without differentiated bristles; fifth sternite v-shaped with brush of spines laterally and long hairs terminally on arms; first genital segment black without marginal bristles, second brownish-black with long hairs; inner forceps of one side with long hairs basally and a row of 6 spines distally, the other with double rows of closely set spines along distal half; outer forceps with numerous long hairs; anterior paramere pointed at end; posterior paramere curved, pointed at end with 2 short hairs on anterior margin; theca shorter than paraphallus, both are sclerotised; apical plate of paraphallus membranous, curved, blunt at end and with pointed process; lateral plate of paraphallus short with elongated process; styli of glans slender, long and blunt; ventralia curved backwards and serrated.

Female : Unknown.

Material examined : *Holotype* ♂, India : West Bengal ; Birbhum (Ganpur Forest), 10.xi.1975, B. C. Nandi ; *Paratype* ♂, same data as *Holotype* ; 2♂♂, Purulia ; Ketka, 14.xi.1974, B. C. Nandi ; 1 ♂, Bihar ; Hazaribagh National Park, 300 m, 20.vi.1988, B.C. Nandi ; 8♂♂, Palamau Forest Rest House, 320 m, 22. vi. 1988, B. C. Nandi ; 2♂♂, Mahaudanga, 880 m, 23.vi.1988, B. C. Nandi.

Discussion on species : This species is similar to *I. martellatoides* (Baranov, 1931) but differs from it by the character of having double rows of spines in the distal half of inner forceps, long styli of glans and by the structure of anterior paramere.

Biology : This species is not so abundant which was collected from bushes and flowering plants.

Distribution : India ; B (Hazaribagh, Mahuadanga, Netarhat, Palamau), Kt (Bangalore) and WB (Ganpur Forest, Panchubaga, Salboni).

Type deposited : *Holotype* ♂, ZSIC, studied.

157. *Iranihindia futilis* (Senior-White)

(Figs. 880–885)

1924. *Sarcophaga futilis* Senior-White, *Rec. Indian Mus.*, **26** (3) : 246 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 257.
1961. *Iranihindia futilis* : Rohdendorf, *Stuttg. Beitr. Naturk.*, **58** : 2 ; Nandi, 1979, *Orient. Insects*, **13** (1–2) ; 206 ; Nandi, 1992, *Hexapoda*, **4** (1) : 76.

Male : Body length 9–11 mm.

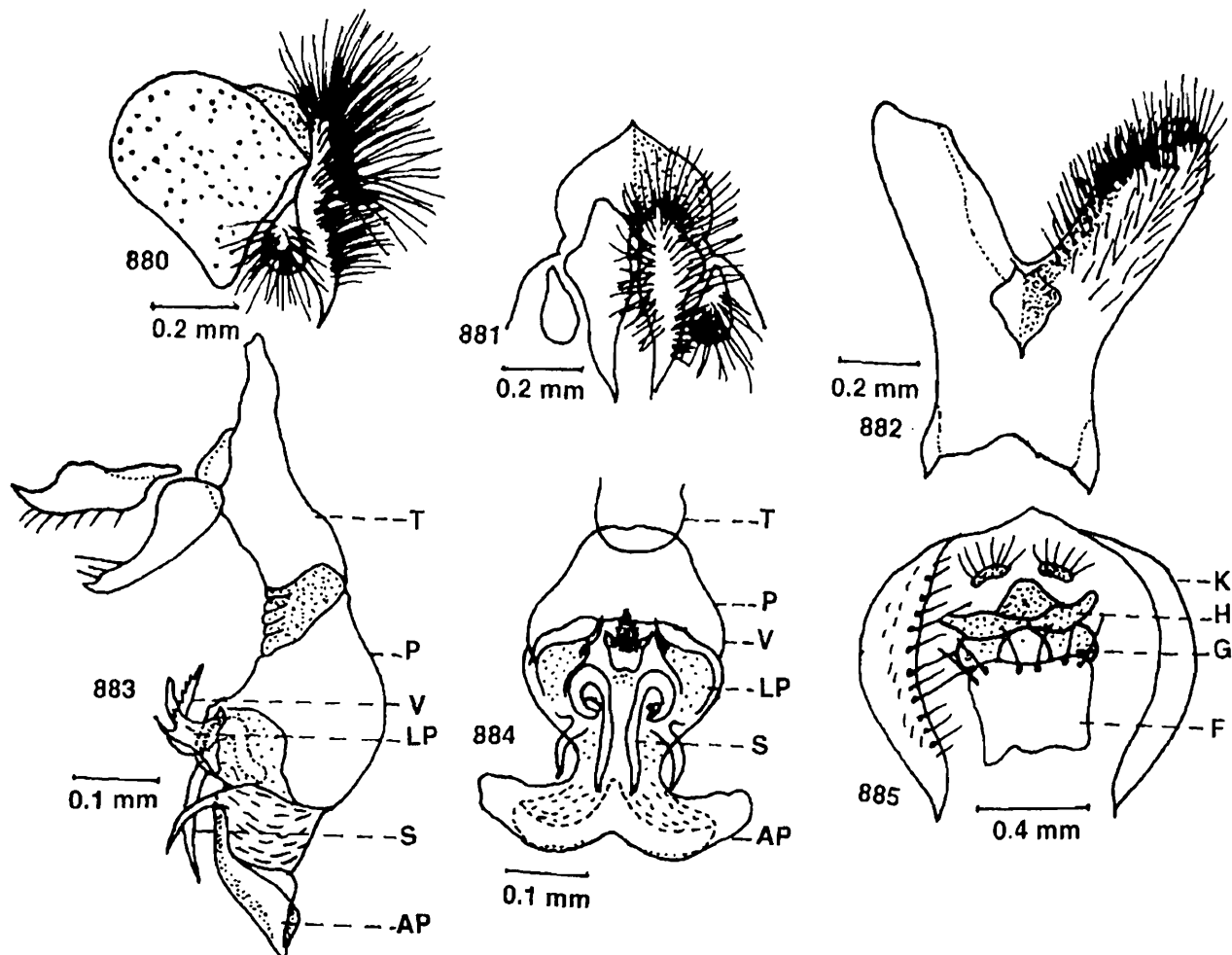
Head : Width of frons about two-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal black with short hairs ; parafacial blackish–brown, silvery pollen and with a row of 8–10 long hairs near the eye margin ; antennae black and reaching up to about 0.8 distance to vibrissae, first segment black, second brown but sometimes orange at tip, third black with white pollen and about three times that of the second ; arista long, plumose along basal three-fifths ; facial ridge blackish-brown with white pollen ; vibrissae long, distance between vibrissae almost equal to one parafacial width ; frontal bristles 9–10, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about half of the second antennal segment, rest cruciate and directed forwards ; gena black, silvery pollen and with numerous short black hairs ; post gena black with silvery hairs ; ocellar triangle black ; outer vertical bristle absent, inner vertical well developed, post vertical about two-fifths the inner vertical ; ocellar and postocellar bristles stout ; a pair of rows of postocular setae besides postocular cilia, first row stout and regular, second row with irregular black and white hairs, rest of the area with silvery hairs ; palpi slender and light brown ; proboscis black.

Thorax : Black with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 ; (posterior 3 *dc* more stout) ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 9 ; upper part of propleura bare ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brown ; apicoscutellar and discoscutellar bristles well developed, 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with 9–10 short setae located dorsally and extending up to three-fifths from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment equal to third, the former with short spines along basal three-fourths of its anterior margin ; costal spines stout ; epaulet black with short spines ; basicostal scale yellowish ; squama white ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 short bristles along basal half of anterodorsal surface and 1 bristle on

posteroventral surface at about one-third the distance from the distal end ; mid femur with a row of 3–4 short bristles along middle portion of anterodorsal surface, 1 short bristle each on distal part of posterodorsal and posterolateral surfaces, a row of



Figs. 880-885 : *Iranihindia futilis* (Senior-White). 880, Inner and outer forceps (lateral view); 881, Inner and outer forceps (posterior view); 882, Fifth sternite; 883, Penis (lateral view); 884, Penis (ventral view); 885, Genitalia ♀ (ventral view).

3–4 bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of long bristle-like hairs along basal half and a row of short setae along distal half of posteroventral surface ; mid tibia with a row of 2–3 bristles along middle portion of anterolateral surface, 1 bristle on posterodorsal surface at about one-third the distance from the distal end, 2 short bristles on posterolateral surface on distal half and 1 bristle each on distal one-third of anteroventral and posteroventral surfaces ; hind femur with a pair of rows of long bristles along anterodorsal surface, 1 bristle on anterior margin of ventral surface and numerous long hairs along anterodorsal surface ; hind tibia with a row of bristles along anterodorsal surface, 2 bristles on

middle portion of posterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end and a row of several long hairs along anterior and posterior margins of ventral surface at about one-third the distance from the distal end.

Abdomen : Black with silvery checkered pattern ; second and third abdominal tergites with well developed median marginal bristles, third with a pair of lateral marginal bristles, fourth with a pair of median and 8 lateral marginal bristles, fifth with a row of 16–18 marginal bristles ; sternites first to fourth with numerous long hairs ; fifth sternite Y-shaped with spines laterally and long hairs terminally on arms ; first genital segment black but without marginal bristles, second brownish-black with hairs ; inner forceps with long hairs on basal part and a row of 4–5 stout comb-like spines on distal part ; outer forceps with numerous long hairs distally ; anterior paramere without bifurcation, pointed and curved at end but with many hairs on posterior end ; posterior paramere pointed, curved at end but with 2 hairs on anterior end ; theca shorter than paraphallus, both are sclerotised ; apical plate of paraphallus long and wide at end ; lateral plate of paraphallus with unequal bifurcations ; styli of glans short, slender and blunt ; ventralia curved, long and serrated.

Female : Body length 6–7 mm.

Head : Width of frons about equal to that of one eye ; third segment of antennae two and half times that of the second ; frontal bristles 9 ; fronto-orbital bristles 3 ; ocellar bristles more developed than frontal bristles ; outer vertical bristle well developed and about four-fifths the inner vertical.

Thorax : Similar to that of male except apicoscutellar bristles absent.

Legs : Mid femur with 3 bristles along ventral surface on basal half ; hind femur without long hairs along ventral surface ; hind tibia with 2 bristles on ventral surface but without long hairs along anterior and posterior margins of ventral surface.

Abdomen : Sternites first to fifth without marginal bristles, sixth broader than the rest and with 8 marginal bristles, seventh oval with short bristles ; anal sternite with marginal bristles and long hairs ; seventh tergite with long and short hairs.

Material examined : India : Several male specimens from different localities of Andhra Pradesh, Assam, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal collected by B. C. Nandi.

Discussion on species : This species is similar to *I. jamesi* Nandi, 1979 but differs from it by the structures of apical plate of paraphallus, inner forceps and also by the detailed structure of anterior paramere.

Biology : This is a common species which was collected from bushes, grasses and flowering plants. Probably this species is attracted to nectar.

Distribution : India ; AnP (Enturnagaram), A (Gauhati, Kaziranga, Silchar), B (Chakradharpore, Chapra, Deoghar, Dumraon, Giridih, Hazaribagh, Jona Water Falls, Mahuadanga, Chota Nagpur, Netarhat, Palamau, Posoita, Pusa, Raja Rappa Water Falls, Tanga Manda, Trikuti Hills), Gu (Ahmedabad, Okha, Saputara), Kt (Bandipur National Park, Bangalore, Chikmagalore, Mysore, Nandi Hills), K (Ernakulam, Walayar Forest), MP (Artham, Bilaspur, Jabalpur, Khajuraho), Mr (Aurangabad, Daulatabad, Ellora, Lonavale, Nagpur), Mz (Aizawl), O (Barkuda Island, Lahamani, Sagbahal, Taptapani, Taypore), TN (Anamalai Hills, Coimbatore, Chennai, Madurai, Marudamalai), T (Agartala, Betaga Forest, Belonia, Jamerdhapa, Kanchanpur, Kunjaban, Matabari, Melaghar, Sabrum, Santirbazar), UP (Allahabad, Dehra Dun) and WB (Calcutta, Purulia, Ranaghat, Siliguri, Tollygunge) ; M (Minbu) ; Pa (Balakot, Abbottabad) and SL (Kandy, Hrbarane).

Type deposited : *Holotype* ♂, BMNH, not studied.

158. *Iranihindia martellatoides* (Baranov)

(Figs. 886-890)

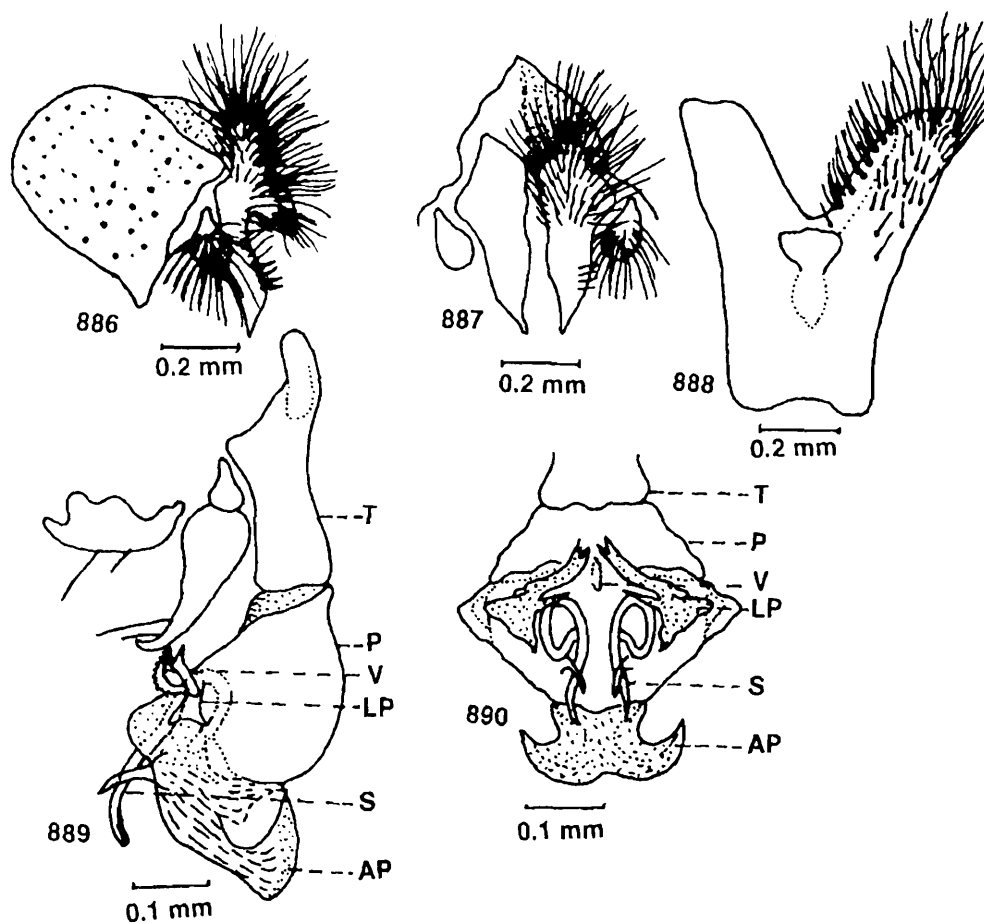
1931. *Sarcophaga martellatoides* Baranov, *Konowia*, (2) 10 : 14 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, 6 : 259.

1961. *Iranihindia martellatoides* : Rohdendorf, *Stuttg. Beitr. Naturk.*, 58(3) : 2, Nandi, 1979, *Orient. Insects*, 13 (1-2) : 209 ; Nandi, 1992, *Hexapoda*, 4 (1) : 77.

Male : Body length 6-9 mm.

Head : Width of frons about two-fifths that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial golden, silvery pollen and with short scattered hairs ; antennae brown and reaching up to about 0.8 distance to vibrissae, first segment blackish-brown, second brown basally and reddish-brown distally, third brown, silvery pollen and about three times that of the second ; arista long, plumose along basal four-fifths ; facial ridge light brown with silvery pollen ; vibrissae long, distance between vibrissae longer than one parafacial width ; frontal bristles 9-11, posterior 1 reclinate, anterior 3 below base of antennae and reaching up to about half of second antennal segment, rest cruciate and directed forwards ; gena black, silvery pollen with short black hairs ; post gena black with whitish hairs ; ocellar triangle black and with black hairs ; outer vertical bristle weak, inner vertical well developed and shorter than post vertical ; ocellar and postocellar moderately developed, postocellar less than inner vertical ; a pair of rows of postocular setae besides postocular cilia, first row regular, second row irregular and black, rest of the area with black and white hairs ; palpi slender and dark brown ; proboscis black.

Thorax : Greyish, silvery pollen with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 (posterior 1 *dc* more stout) ; *ia* 0+2 ; *ps* 1 ; *h* 3 ; *ph* 3 ; *np* 3 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 8-9 ; upper part of propleura bare with white pollen ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles blackish-brown ; apicoscutellar and discoscutellar bristles well developed, 1 pair each ; lateroscutellar bristles 2 pairs.



Figs. 886-890 : *Iranihindia martellatoides* (Baranov). 886, Inner and outer forceps (lateral view); 887, Inner and outer forceps (posterior view); 888, Fifth sternite; 889, Penis (lateral view); 890, Penis (ventral view).

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 7-8 short setae located dorsally and extending up to about three-fifths from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment shorter than the third, the former with short spines along basal four-fifths of its anterior margin ; costal spines stout ; epaulet black with short black spines ; basicostal scale yellowish-brown ; squama whitish ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface (first row with long and second row with short bristles) and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3-4 short bristles along

basal half of anterodorsal surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end ; mid femur with a row of short bristles along middle portion of anterolateral surface, 1 bristle each on distal part of posterodorsal and posteroventral surfaces, a row of short bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of long hairs along basal half and a row of short setae along distal half of posteroventral surface ; mid tibia with 2 bristles on middle portion of anterolateral surface, 1 bristle on posterodorsal surface at about one-third the distance from the distal end, 2 short bristles on posterolateral surface at about one-third the distance from the basal end and 1 bristle each on anteroventral and posteroventral surfaces at about one-third the distance from the distal end ; hind femur with a pair of rows of long bristles along anterodorsal surface, 1 bristle each on dorsal and posterodorsal surfaces, numerous long hairs along posterior margin of ventral surface and a row of about 5 long bristles and several hairs along anterior margin of ventral surface ; hind tibia with a row of bristles along anterodorsal surface, 2 bristles on middle portion of posterodorsal surface, 1 bristle on distal one-fourth of anteroventral surface and a row of long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second abdominal tergite absent but with a pair of lateral marginal bristles, third with well developed median marginal bristles, fourth with a pair of median and 6 lateral marginal bristles, fifth with a row of 12–14 lateral marginal bristles ; sternites first to fourth with well developed long black hairs ; fifth sternite v-shaped with brush of stout spines laterally on arms ; first genital segment brownish-black but without marginal bristles, second black with long hairs ; outer forceps almost sub spherical with numerous long hairs ; inner forceps pointed apically with numerous long hairs along basal half and a row of about 5–7 stout comb-like spines along distal half ; anterior paramere wide at end, bifurcated and with 2 short hairs on posterior end ; posterior paramere long, slender, curved at end and with 2 hairs anteriorly ; theca shorter than paraphallus and the latter much sclerotised ; apical plate of paraphallus long, curved, membranous and with short spines ; lateral plate of paraphallus short with thin equal processes ; styli of glans long, slender and blunt ; ventralia curved and serrated.

Female : Unknown.

Material examined : India : Several male specimens from different localities of Bihar, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Tripura, Uttar Pradesh and West Bengal collected by B. C. Nandi.

Discussion on species : This species is similar to *I. nepalensis* Kano and Shinonaga, 1969 but differs from it by the structures of lateral plate of paraphallus and ventralia. This species is also distinguished from *I. futilis* (Senior-White, 1924) by the structure of apical plate of paraphallus and the short styli of glans.

Biology : This is a relatively common species which was collected from bushes and flowering plants.

Distribution : India ; B (Hazaribagh, Palamau, Pusa), Kt (Bangalore, Mysore, Srirangapatana), MP (Bilaspur, Jabalpur, Khajuraho), Mr (Aurangabad, Daulatabad, Ellora), O (Balugaon, Sundargarh), T (Agartala, Santirbazar, Trishna), UP (Dehra Dun), WB (Calcutta, Dulmi West, Hijuli Forest, Panchubaga, Sahebbundh) and SL (Colombo).

Type deposited : *Holotype* ♂, lost ; *Lectotype*, USNM, not studied.

Discussion on type : Sabrosky and Crosskey (1970) studied the type material and designated a *Lectotype*. They mentioned that the genitalia are situ. They also designated 1 ♂ as *Paralectotype* which had same data as the *Lectotype* and is deposited in USNM, Washington. They further stated that the original description had not given any indication of the number of specimens for the provisional name, but a male in the Baranov's collection, with data identical to the published data and bearing the Baranov's hand writtern label "*Sarcophaga martellatoides* (sic) sp. nova N. Baranoff", indicates that he had at least two. The genitalia of this male are not extended and could not have been the basis of the figure published by Baranov.

159. *Iranihindia nepalensis* Kano and Shinonaga

(Figs. 891–895)

1969. *Iranihindia nepalensis* Kano and Shinonaga, *Pacif. Insects*, **11** (2) : 191 ; Lopes, Kano, Shinonaga and Kurahashi, 1977, *Cat. Dipt. Orient. Region*, **3** : 580 ; Nandi, 1979, *Orient. Insects*, **13** (1–2) : 217.

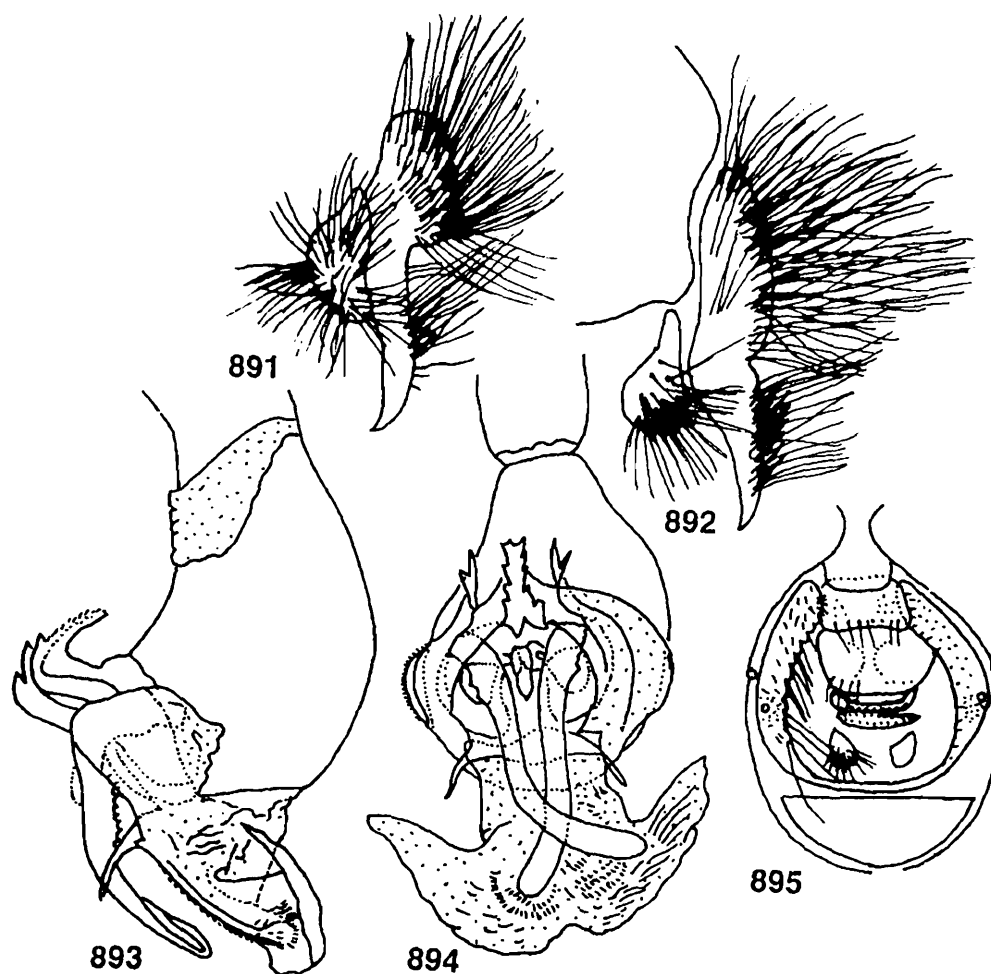
1994. *Sarcophaga nepalensis* : Kano and Shinonaga, *Jap. J. sanit. Zool.*, **45** : 267.

Male : Body length 5–11 mm.

Head : Black ; width of frons about four-sevenths that of one eye ; frontal vitta black, its width at narrowest point of frons about less than twice that of each parafrontal ; parafrontal and parafacial black with golden to silvery pollen, the former with few short hairs, the latter with a row of 5–6 short bristles near the eye margin ; face light brown with silvery pollen ; antennae usually dark brown, reaching up to about 0.90 distance to distal part of second segment, basal part of third segment reddish-brown and about two and half times that of the second ; arista long, plumose along basal three-fifths ; facial ridge reddish-brown ; vibrissae long, distance between vibrissae half that of one parafacial width ; frontal bristles 7–9, reaching up to half of the second antennal segment, posterior 2 reclinate, anterior 2–3 divergent ; gena black, golden to silvery pollen and with numerous long hairs along posterior half, its width about half of the height of one eye ; post gena black with black hairs ; ocellar region black with few short hairs ; ocellar bristle equal to post vertical ; outer vertical bristle short, inner vertical well developed and more than twice that of outer vertical, post vertical greater than outer vertical ; a pair of rows of postocular setae, first row regular and black, second row irregular and sometimes mixing with a few white

setae, rest of the area with white hairs ; palpi dark brown, slender and light brown at apex ; proboscis blackish.

Thorax : Black, silvery to golden pollen with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 (former 1 very fine, hind 2 strong) ; *ia* 1+2 (rarely 3) ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 7 ; upper part of propleura bare ; prostigmatic and propleural bristles well developed ; prosternum hairy posteriorly ; apicoscutellar and discoscutellar bristles well developed, 1 pair each ; lateroscutellar bristles well developed, 2 pairs.



Figs. 891-895 : *Iranihindia nepalensis* Kano and Shinonaga. 891 and 892, Inner and outer forceps (lateral view); 893, Penis (lateral view); 894, Penis (ventral view); 895, Genitalia ♀ (ventral view); (after Kano and Shinonaga, 1969).

Wings : Hyaline ; R_1 bare ; R_{4+5} with a row of about 10 short setae located dorsally and extending up to more than half from the basal node to r-m and 2-4 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment a little shorter than the third, the former with short spines along basal three-fourths to four-fifths of its

anterior margin ; costal spines strong ; epaulet black ; basicostal scale light brown to pale yellow ; squama creamy white ; halter brown.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with 2 or 3 short bristles along basal one-third of anterodorsal surface, 1 bristle on posteroventral surface at about one-third the distance from the distal end ; mid femur with a row of several short bristles along anterolateral surface, 2 short bristles on distal part of posterolateral surface, a row of short bristles along anterior margin of ventral surface, a row of short bristles along basal half of posterior margin of ventral surface and a row of long hairs along distal half of posterior margin of ventral surface ; mid tibia with 2 bristles on anterolateral surface, 1 bristle on posterodorsal surface at about one-third the distance from the distal end, 2 or 3 short bristles along basal half of posterolateral surface and 1 bristle each on distal one-third of anteroventral and posteroventral surfaces ; hind femur with a pair of rows of long bristles along anterodorsal surface, 1 bristle each on distal part of dorsal and posterodorsal surfaces (rarely 2 bristles), numerous long hairs along ventral surface and 1 or several bristles along anterior margin of ventral surface ; hind tibia with a row of bristles along anterodorsal surface, 2 bristles on posteroventral surface and several (in small specimens) long hairs each along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery grey checkered pattern ; second abdominal tergite without median but third with 3 strong median marginal bristles, fourth and fifth each with 2 median and 3 lateral marginal bristles, fifth with a row of 16–18 marginal bristles ; first genital segment black with greyish pollen and median marginal bristles absent or weak, second black with greyish pollen but basal half of dorsal surface shiny black ; first to fourth sternites with numerous long hairs ; fifth sternite v-shaped with numerous spines laterally on arms ; inner forceps with numerous long hairs along basal half and a row of 4 to 7 strong comb-like spines on distal half ; outer forceps with numerous long hairs ; anterior and posterior parameres approximately same in length, anterior paramere bifurcated, posterior paramere with 1 long bristle at subapical end ; apical plate of paraphallus wide and almost straight with pointed backward projection ; lateral plate of paraphallus with unequal processes at end ; styli of glans long, blunt, shorter than the length of apical plate of paraphallus but with few striations basally on posterior end ; ventralia sickle-shaped with few striations anteriorly.

Female : Body length 5–10 mm.

Head : Frons about the same width as one eye ; 2 proclinate and 1 reclinate fronto-orbital bristles present ; outer vertical bristle well developed ; apicoscutellar bristle absent.

Legs : Mid and hind femur and hind tibia without long hairs.

Abdomen : First to fourth sternites without long hairs, fourth and fifth narrow, sixth quadrangular, seventh round, eighth short and its posterior margin heavily pigmented ; posterior margin of sixth tergite without strong bristles but only moderate short bristles, seventh wide and with many long bristles.

Material examined : 1 ♂, and 1 ♀ Nepal : Kathmandu Valley; Gokarna, 2.viii.1992, R. Kano (det. by R. Kano ; dep. in NSMT).

Discussion on species : This species is closely related to *I. futilis* (Senior-White, 1924) but differs from it by the colour of palpi and shape of phallus. Moreover, the apical part of palpi is light in this species and it is dark in *I. futilis* and paraphallus and styli of glans are long and slender which are short and stout in *futilis*. This species also differs from *I. indica* Nandi, 1979 by the unequal of lateral plate of paraphallus and long styli of glans.

Biology : This species was collected from flowers, blossom and grasses on the hillsides. It is apparently never attracted to animal carcasses or human or animal faeces. It may be a parasites of Lepidoptera or other insects.

Distribution : Ne (Birganj, Dharan, Kathmandu, Godavari, Gokarna, Hetauda, Pokhara).

Type deposited : *Holotype* ♂, TMDU, not studied.

160. *Iranihindia indica* Nandi

(Figs. 896–900)

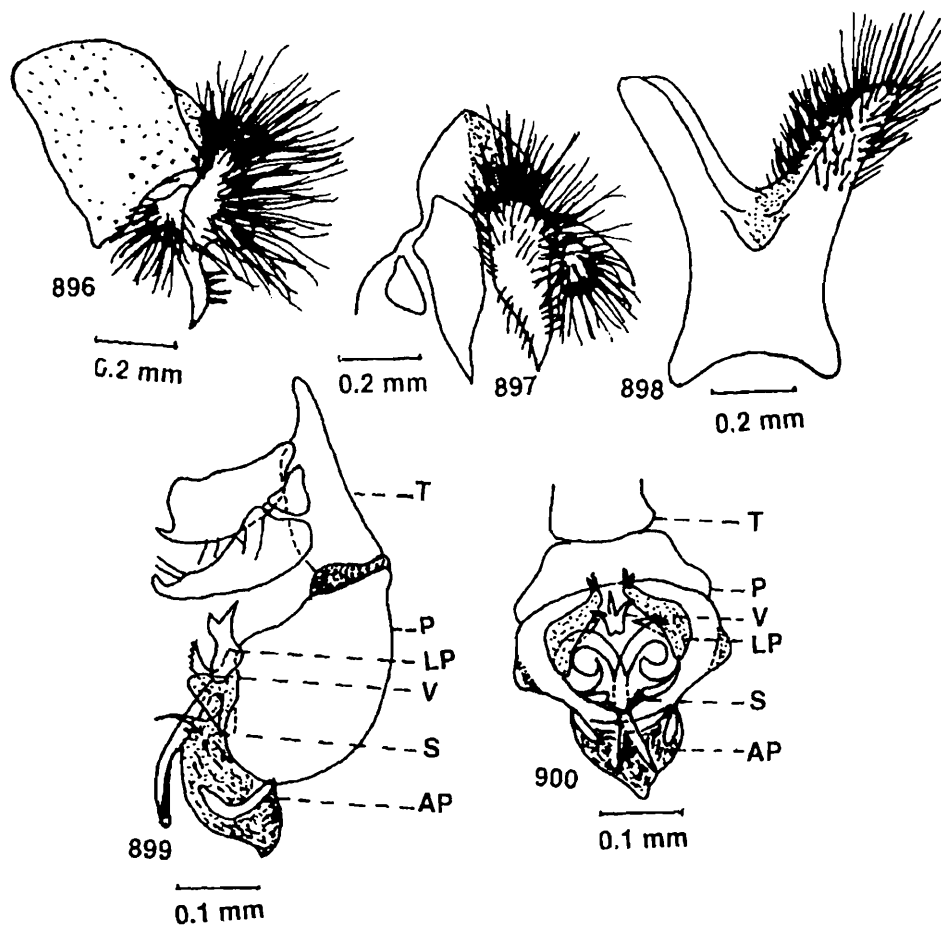
1979. *Iranihindia indica* Nandi, *Orient. Insects*, **13** (1–2) : 211 ; Nandi, 1990, *Hexapoda*, **2** : 27.

Male : Body length 9–15 mm.

Head : Width of frons about one-third that of one eye ; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal ; parafrontal and parafacial black with silvery black hairs, the former with short scattered hairs, the latter with a row of long hairs near the eye margin ; antennae brown and reaching up to about 0.8 distance to vibrissae, first segment blackish-brown, second brown, third reddish-brown, silvery pollen and about three times that of the second ; arista long, plumose along basal three-fifths ; facial ridge light brown, silvery pollen and with short spines ; vibrissae long, distance between vibrissae more than one parafacial width ; frontal bristles 9-11, posterior 1 reclinate, anterior 2 below base of antennae and reaching up to about one-third of second antennal segment, rest cruciate and directed forwards ; gena and post gena black, silvery pollen and with black hairs ; ocellar triangle black with long hairs ; outer vertical bristle short, inner vertical well developed, post vertical less than half of inner vertical ; ocellar and postocellar bristles moderately developed ; a row of regular postocular setae besides postocular cilia, rest of the area with black and white hairs ; palpi slender and light brown ; proboscis black.

Thorax : Black with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 (anterior post 3 *dc* weak) ; *ia* 1+3 ; *ps* 1 ; *h* 3 ; *ph* 1 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 7 ; *hpl* 9-11 ; upper part of propleura bare and black ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles blackish-brown ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 2 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 8-9 short setae located dorsally and extending up to about two-thirds from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment shorter than the third, the former with short spines along basal two-thirds of its



Figs. 896-900 : *Iranihindia indica* Nandi. 896, Inner and outer forceps (lateral view); 897, Inner and outer forceps (posterior view); 898, Fifth sternite; 899, Penis (lateral view); 900, Penis (ventral view).

anterior margin ; costal spines stout ; epaulet black with short spines ; basicostal scale yellowish ; squama whitish ; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row

of 3 short bristles along basal half of anterodorsal surface and 1 bristle on posteroventral surface at about one-third the distance from the distal end ; mid femur with a row of about 5 bristles each along middle portion of posterodorsal and posterolateral surfaces, a row of bristles along basal half and a row of short setae each along distal half of anteroventral and posteroventral surfaces ; mid tibia with a row of 3 bristles along anterolateral surface, 1 bristle on posterodorsal surface at about one-third the distance from the distal end, 1 short bristle on posterolateral surface at about one-third the distance from the distal end and 1 short bristle each on anteroventral and posterolateral surfaces at about one-third the distance from the distal end ; hind femur with a pair of rows of long bristles along anterodorsal surface, 1 bristle each on distal part of dorsal and posterodorsal surfaces, 1 long and 2 short bristles along anterior margin of ventral surface on one-third the distance from the distal end and numerous long hairs along anterior margin of ventral surface ; hind tibia with a row of long hairs along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end, 2 bristles on middle portion of posterodorsal surface and a row of long hairs each along anterior and posterior margins of ventral surface at about two-thirds the distance from the distal end.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites short but second with 1 and third with 4 lateral marginal bristles, fourth with a pair of median and 6 lateral marginal bristles, fifth with a row of 16 marginal bristles ; sternites first to fourth with tuft of numerous long hairs ; fifth sternite v-shaped with brush of spines laterally and long hairs terminally on arms ; first genital segment brownish-black but without marginal bristles, second black with long hairs ; inner forceps with long hairs on basal half and a row of about 3 spines on distal half ; outer forceps somewhat spherical with numerous long hairs ; anterior paramere wide, bifurcated at end, hook-shaped and with short hairs on posterior end ; posterior paramere long, pointed, curved and with hairs on anterior end ; theca shorter than paraphallus ; apical plate of paraphallus short and strongly curved ; lateral plate of paraphallus with unequal processes, one of which elongated and gradually pointed while the other is short, broad at base and abruptly pointed ; styli of glans long, slender and blunt ; ventralia curved and serrated.

Female : Unknown.

Material examined : *Holotype* ♂, India : West Bengal ; Birbhum (Panchubaga), 22.xi.1974, B. C. Nandi ; *Paratype* 1 ♂, same data as *Holotype* ; 2 ♂♂, Midnapore ; Salboni, 28.xi.1974, B.C. Nandi ; 1 ♂, Bihar ; Hazaribagh National Park, 300 m, 20.vi.1988, B. C. Nandi ; 1 ♂, Palamau National Park, 320 m, 22.vi.1988, B.C. Nandi.

Discussion on species : This species is similar to *I. nepalensis* Kano and Shinonaga, 1969 but differs from it by the unequal structure of lateral plate of paraphallus and long styli of glans. Verves (1989b) synonymized this species with *I. nepalensis* Kano and Shinonaga, 1969 but the inner forceps in this species is with few spines on distal

end. I do not see the Type specimens of *nepalensis* to ascertain their synonymy. Type ♂ is in Tokyo Medical and Dental University and two male *Paratypes* are in Instituto Oswaldo Cruz, Rio de Janeiro, Brazil.

Biology : This is a relatively rare species which was collected from bushes and flowering plants near human excrement.

Distribution : India ; B (Hazaribagh, Mahaudanga, Netarhat, Palamau) and WB (Panchubaga, Salboni).

Type deposited : *Holotype* ♂, ZSIC, studied.

Subtribe **Seniorwhiteina** Rohdendorf

This subtribe is characterised by having large penis, lateral plate of paraphallus asymmetrical and inner forceps with tuft of basal bristles. This is a small subtribe and only one genus *Seniorwhitea* Rohdendorf is occurring in the Oriental region.

Some members of this subtribe are attracted to flowering plants, human excrement, dead bodies of *Achatina* sp. (Gastropoda) and different Lepidopterous larvae and breed in such media. Few are parasitic on different insects. Larval stages of the species are little known.

This tribe is distributed in the Oriental, Palaearctic, Afrotropical and Australasian and Oceanian regions.

Genus 49. **Seniorwhitea** Rohdendorf, 1937

1937. *Seniorwhitea* Rohdendorf, *Fauna USSR, Dipt.*, **19**(1) : 297 ; Lopes, 1964. *Mems Inst. Oswaldo Cruz*, **62**(2) 162.

Type species : *Sarcophaga orientaloides* Senior-White, 1924 (= *Sarcophaga reciproca* Walker, 1856).

Morphology : Antennae long, third segment long, slender and about two and half to three times that of the second ; arista long, plumose along basal half ; R_1 bare ; ac 0+1 ; postsutural dc 4 or 5 ; inner forceps long and pointed with a preapical tuft of hairs ; propleura bare ; paraphallus with distinct theca ; apical plate of paraphallus extensively membranous or with a membranous cylindrical apical process and always with conspicuous projections ; lateral plate of paraphallus ill-developed, chitinous and well pigmented ; ventralia small and chitinous ; styli of glans directed anteriorly ; genital segments without bristles ; penis very large, slightly sclerotised and vesiculate.

Discussion : This is a very small genus represented by 1 species in the Palaearctic region which is also present in India. Lopes (1964) revised this genus and reported a total of 3 species but later on Lopes *et al.* (1977) reported 4 species from the Oriental region. Zumpt (1972) treated it as a separate subgenus under the genus *Sarcophaga* and listed only 1 species from the Afrotropical region. Only 2 species are reported here.

Biology : Most of the members of this genus are attracted to dead bodies and excrement of different animals and breed in such media including dead insects and mollusca.

Distribution : This genus is distributed in the Oriental, Palaeartic, Afrotropical and Australasian and Oceanian regions.

Key to male species

1. Apical plate of paraphallus with pointed projection ; styli of glans not remain invaginated within the paraphallus but with a membranous out growth
.....*mantiae* n. sp.
- Apical plate of paraphallus with blunt projection ; styli of glans remain invaginated within the paraphallus.....*reciproca* (Walker)

161. *Seniorwhitea mantiae* n. sp.

(Figs. 901–905)

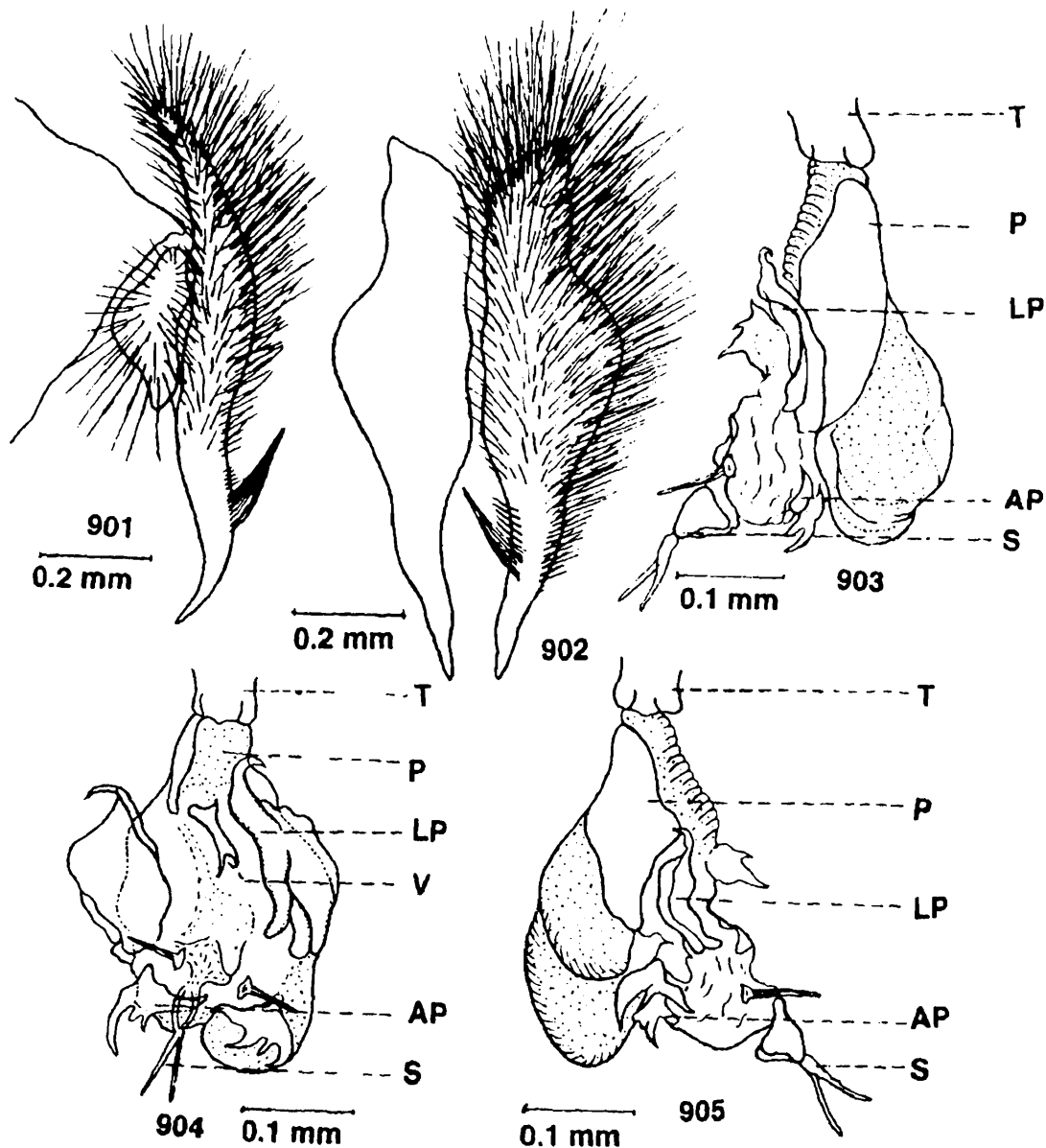
Male : Body length 6 mm.

Head : Width of frons about one-third that of one eye ; frontal vitta black, its width at narrowest point of frons about more than that of each parafrontal ; parafrontal and parafacial brownish-black, the former with short scattered hairs, the latter with a row of 8 hairs near the eye margin ; antennae black and reaching up to about 0.85 distance to vibrissae, first and second segments with short hairs, third with scattered silvery pollen and about three times that of the second ; arista long, plumose along basal three-fifths ; facial ridge brown with black spines ; vibrissae long, crossed, distance between vibrissae about half of one parafacial width ; frontal bristles 8, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about tip of second antennal segment, rest cruciate and directed forwards ; gena greyish with black hairs ; post gena black with black hairs ; ocellar triangle black with black hairs ; outer vertical bristles not differentiated, inner vertical well developed, post vertical half of the inner vertical ; ocellar bristles short ; a pair of rows of postocular setae besides postocular cilia, first row regular, second row irregular, rest of the area with greyish hairs ; palpi slender and dark black ; proboscis black.

Thorax : Grey with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 (posterior 2 *dc* stout) ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 8, upper part of propleura bare and black ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; pro- and mesothoracic spiracles brownish ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 3 pairs of which the first pair near scutellar is not stout.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of 9 short setae located dorsally and extending up to about two-thirds from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment less than

the third, the former with short spines along more than basal half of its anterior margin; costal spines not stout; epaulet black with short spines; basicostal scale brown; squama slightly brown; halter brown.



Figs. 901-905 : *Seniorwhitea mantiae* n. sp. 901, Inner and outer forceps (lateral view); 902, Inner and outer forceps (posterior view); 903, Penis (left side view); 904, Penis (right side view); 905, Penis (ventral view).

Legs : Black; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with 2 bristles along basal half of anterodorsal surface and 1 bristle on posterolateral surface at about one-third the distance from the distal end; mid femur with a row of bristles along basal half and a row of short setae along distal half of anteroventral surface,

a row of short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces at about one-third the distance from the distal end ; mid tibia with a row of 3 bristles along middle portion of anterodorsal surface, 1 bristle on posterolateral surface at about one-third the distance from the distal end and with long hairs along anterior and posterior margins of ventral surface at about four-fifths the distance from the distal end ; hind femur with a pair of rows of bristles along anterodorsal surface, 1 bristle each on posterodorsal and posterolateral surfaces on distal end and numerous long hairs along posterior margin of ventral surface ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the distal end and tuft of long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of stout lateral marginal bristles, fifth with a row of 16 marginal bristles ; sternites first and second with black hairs, third and fourth with tuft of black hairs ; fifth sternite v-shaped with short spines laterally on arms ; first and second genital segments brownish with short hairs but without marginal bristles ; inner forceps curved, pointed at end and with tuft of long hairs near the subterminal end posteriorly ; outer forceps triangular with short hairs ; anterior paramere long, pointed, sharply curved at end but with short hairs posteriorly on distal end ; posterior paramere elongated and curved at end ; theca shorter than paraphallus, both are sclerotised but slightly membranous on distal end of paraphallus ; apical plate of paraphallus with two asymmetrical lateral lobed projections ; lateral plate of paraphallus also asymmetrical, heavily sclerotised and its posterior end hook-shaped ; styli of glans with a pair of membranous reduced lateral lobes, a median process and a pair of elongated and pointed hooks, the median process at its tip with a pair of slender elongated processes and these structures remain within the paraphallus ; ventralia short, well sclerotised and inserted internally between apophyses of paraphallus.

Female : Unknown.

Material examined : *Holotype* ♂, India : West Bengal ; Jalpaiguri (Chilapata Forest), 24.iv.1975, B. C. Nandi.

Discussion on species : This species resembles *S. reciproca* (Walker, 1856) but differs from it by the detailed structures of the lateral plate of paraphallus and styli of glans. Moreover, the eyes are reddish and the antennae are wholly black in *mantiae* but the eyes are brownish and the antennae are brown in *reciproca*.

Biology : This is a very rare species which was collected from thick bushes.

Distribution : India ; WB (Chilapata Forest).

Type deposited : *Holotype* ♂, ZSIC, studied.

162. *Seniorwhitea reciproca* (Walker)

(Figs. 906–912)

1856. *Sarcophaga reciproca* Walker, *J. Proc. Linn. Soc. Lond., Zool.*, **1** : 22.
 1912. *Sarcophaga krameri* Böettcher, *Ent. Mitt.*, **1** : 166.
 1924. *Sarcophaga orientaloides* Senior-White, *Rec. Indian Mus.*, **26** (3) : 244 ; Senior-White, 1930, *Rec. Indian Mus.*, **32** : 73.
 1932. *Sarcophaga procax* Séguy, *Bull. mens. Ass. Nat. Vall. Loing.*, **8** : 23.
 1965. *Seniorwhitea orientaloides* : Fan, *Synan. flies China*, **15** : 260.
 1977. *Seniorwhitea krameri* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Orient. Region*, **3** : 581.
 1979. *Seniorwhitea reciproca* : Lopes and Kano, *Revta brasil Biol.*, **39**(2) : 315 ; Verves, 1986, *Cat. Palae. Dipt.*, **12** : 179 ; Nandi, 1992, *J. Beng. nat. Hist. Soc.*, **11**(2) : 44.
 1984. *Harpagophalla reciproca* : Sugiyama and Kano, *Jap. J. sanit. Zool.*, **35** (4) : 349.

Male : Body length 6–15 mm.

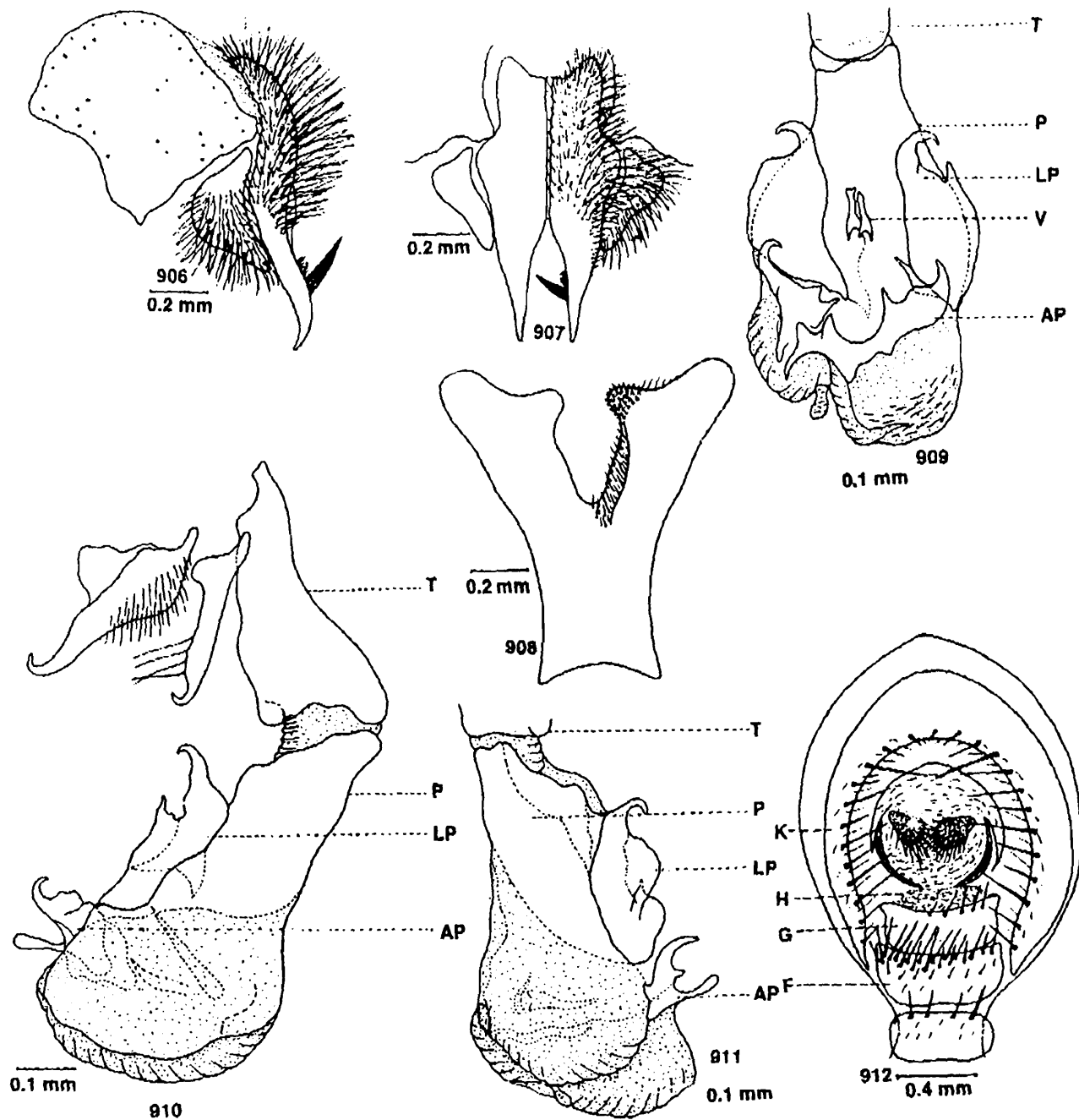
Head : Width of frons about one-third that of one eye ; frontal vitta black, slightly diverging below, its width at narrowest point of frons about more than that of each parafrontal ; parafrontal and parafacial black with silvery pollen, the former with short scattered hairs ; the latter with a row of 3 long hairs below the eye margin ; antennae brown and reaching up to about 0.85 distance to vibrissae, first segment brownish-black, second black and reddish at tip, third brown with silvery pollen and about three times that of the second ; arista long, plumose along basal two-thirds ; facial ridge brown with silvery pollen ; vibrissae long, distance between vibrissae about half of one parafacial width ; frontal bristles 9, posterior 2 reclinate, anterior 3 below base of antennae and reaching up to about two-thirds of second antennal segment, rest cruciate and directed forwards ; gena black with silvery pollen and black hairs ; post gena black ; ocellar triangle black with short black hairs ; outer vertical bristle short, inner vertical well developed, post vertical short and about half of inner vertical ; ocellar and postocellar bristles present, the latter elongated and about two-fifths that of inner vertical ; a pair of rows of postocular setae besides post ocular cilia, first row regular with intermittent black hairs, second row irregular with black and white hairs, rest of the area with white hairs ; palpi slender and black ; proboscis blackish.

Thorax : Grey with three black longitudinal stripes ; *ac* 0+1 ; *dc* 5+5 (posterior 2 *dc* stout) ; *ia* 1+2 ; *ps* 1 ; *h* 3 ; *ph* 2 ; *np* 4 ; *pa* 2 ; *sa* 3 ; *st* 1+1+1 ; *mpl* 6 ; *hpl* 9 ; upper part of propleura bare, black and with silvery pollen ; pro-and mesothoracic spiracles brownish ; prostigmatic and propleural bristles well developed and accompanied with short hairs ; apicoscutellar and discoscutellar bristles 1 pair each ; lateroscutellar bristles 3 pairs.

Wings : Hyaline with brown veins ; R_1 bare ; R_{4+5} with a row of about 9–10 short setae located dorsally and extending up to about two-thirds from the basal node to r-m and several short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment more than one and half times that of the third, the former with short spines along basal two-fifths of its anterior margin ; costal spines stout ; epaulet black with short spines and 2 long bristles ; basicostal scale light brown ; squama white ; halter brown.

Legs : Black ; fore femur with a pair of rows of long bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface ; fore tibia with a row of 3 bristles along basal half of anterodorsal surface and 1 bristle on posterolateral surface at about one-third the distance from the distal end ; mid femur with a row of 4 bristles along middle portion of anterolateral surface, a row of about 5 bristles along basal half and a row of short setae along distal half of anteroventral surface, a row of tuft of short hairs along basal half and a row of short setae along distal half of posteroventral surface and 1 bristle each on posterodorsal and posterolateral surfaces on distal end ; mid tibia with a row of 2 bristles along basal two-thirds of posterodorsal surface, 1 bristle on posterolateral surface at about one-third the distance from the distal end and tuft of long hairs along distal half of anterior and posterior margins of ventral surface ; hind femur with a pair of rows of bristles along anterodorsal surface, a row of bristles along anteroventral surface and with tuft of long hairs along posterior margin of ventral surface on distal half ; hind tibia with a row of bristles along anterodorsal surface, 1 bristle each on posterodorsal surface at about one-third and two-thirds the distances from the basal end and with tuft of long hairs along anterior and posterior margins of ventral surface.

Abdomen : Black with silvery checkered pattern ; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of median and 2 pairs of lateral marginal bristles, fifth with a row of about 12 marginal bristles ; sternites first and second with black hairs, third and fourth with tuft of long hairs along posterior margin ; fifth sternite v-shaped with short hairs laterally and short spines apically on arms ; first genital segment brownish-black with short hairs, second black with long hairs ; inner forceps curved, pointed at end and with tuft of long hairs at the end ; outer forceps mostly triangular with short hairs ; anterior paramere long, pointed, curved sharply and with short hairs posteriorly on distal half ; posterior paramere elongated, terminally hook-shaped and with four hairs anteriorly on terminal half ; theca shorter than paraphallus with 2 rounded lateral and small median elongated lobes ; apical plate of paraphallus with blunt projection ; lateral plate of paraphallus asymmetrical, strongly chitinised and with ventral process ; basal part of paraphallus straight ; styli of glans with a pair of rounded membranous lateral lobes, a long median process and



Figs. 906-912 : *Seniorwhitea reciproca* (Walker). 906, Inner and outer forceps (lateral view); 907, Inner and outer forceps (posterior view); 908, Fifth sternite; 909, Penis (left side view); 910, Penis (right side view); 911, Penis (ventral view); 912, Genitalia ♀ (ventral view).

a pair of long and well chitinised styli of glans which remain within paraphallus ; ventralia small, well chitinised and inserted internally between apophyses of paraphallus.

Female : Body length 9.5 to 12 mm.

Head : General characters similar to those of male except as followings : frons about one-third that of head ; presence of 2 well developed fronto-orbital bristles ; outer vertical bristle not so developed.

Thorax : Similar to those of male but apicoscutellar bristles absent.

Wings : Similar to those of male.

Legs : General characters similar to those of male except mid femur with long hairs.

Abdomen : First to fifth sternites with small hairs and strong marginal bristles, fifth and seventh large, the former with many strong bristles on posterior margin, the latter with 5 bristles on one side of posterior margin, eighth membranous, narrower than the preceding one and with spines on posterior margin ; tergites sixth and seventh large, entirely strongly sclerotised, but the latter is not so much well developed ; anal sternite almost triangular, short, pointed and sclerotised with long hairs.

Material examined : India : Several male specimens from different localities of Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tamil Nadu, Tripura and West Bengal collected by B. C. Nandi.

Discussion on species : This species was placed by Sugiyama and Kano (1984) under the genus *Harpagophalla* Rohdendorf due to the presence of straight basal part of styli and absence of paraphallus but the other characters are shared with the genus *Seniorwhitea*. I think such characters are not sufficient to place it under the genus *Harpagophalla* and it is better to place it under the genus *Seniorwhitea*. This species is distinguished from *mantiae* by the structures of apical and lateral plates of paraphallus.

Biology : This is a common species which was collected from dead fish, dead animals and other decaying organic matters. This species is attracted to *Aristolochia ridicula* flowers (Aristolochiaceae), human excrement and dead *Achatina* sp. (Gastropoda). The larvae of this species breed in dead *Achatina fulica*, grasshoppers, sphingid and other lepidopterous and lepidiota larvae. It is recorded as a parasite, the larvae feeding on the waxy secretion of a Fulgorid (Hemiptera) and on a Noctuid (Lepidoptera).

Distribution : India ; Several localities of AnP, ArP, A, B, Gu, H, HP, Kt, K, MP, Mr, MnP, Me, Mz, N, O, P, S, TN, T, UP, WB and union territories of AN, C, Po ; Bh (several localities) ; M (Maymyo) ; Ne (several localities) ; Pa (several localities) ;

SL (several localities) : China (Kiangsu) ; France ; Hainan Island ; Hawaiian Islands ; Indonesia (Sumatra) ; Laos ; Malaysia ; Singapore ; Taiwan and Thailand.

Type deposited : *Holotype* ♂, BMNH, not studied.

Subtribe **Leucomyiina** Brauer and Bergenstamm

This subtribe is characterised by having lateral plate of paraphallus very elongated which is well sclerotised, multipointed and asymmetrical, and frons of male wider than that of head; body is covered with very dense light bloom. Only one genus *Leucomyia* Brauer and Bergenstamm is available in India.

Members of the genus are available in sandy areas and are attracted to different dead bodies.

This subtribe is distributed in the Oriental and Palaeartic regions.

Genus 50. **Leucomyia** Brauer and Bergenstamm, 1891

1891. *Leucomyia* Brauer and Bergenstamm, *Denkschr. Akad. Wiss. Wien. Kl. math.—naturw.*, **58** : 368.

Type species : *Sarcophila alba* Schiner, 1868 (= *Musca cinerea* Fabricius, 1794).

Morphology : Third antennal segment more than twice that of the second ; arista long with short delicate hairs and plumose along basal half ; width of frons broad and greater than the width of eye ; preacrostichal bristles 12 ; postsutural dorsocentral bristles 4 ; supra-alar bristles 2 of which 1st 1 weak ; sternopleural bristles 2 ; R_{4+5} with short setae on three-fourths of its length from the basal node to r-m ; third abdominal tergite without median marginal bristles but fourth and fifth each with paired median marginal bristles ; first and second genital segments without marginal bristles ; lateral plate of paraphallus very long, heavily sclerotised, cruciate and asymmetrical ; ventralia membranous ; inner forceps with short spines and hairs apically ; apical part of paraphallus not separated.

Discussion : This is a very small genus and only 1 species has been reported from here.

Biology : Members of this genus are entirely available on dead animals and in nests of sphecid wasp (Sphecidae, Hymenoptera). Some larvae of the genus are known as parasites of Acridoidea (Orthoptera), Tenebrionidea (Coleoptera) and other beetles, some butterflies and snails (Rohdendorf and Verves, 1978).

Distribution : The genus is distributed in the Oriental and Palaeartic regions.

163. **Leucomyia cinerea** (Fabricius)

(Figs. 913–918)

1794. *Musca cinerea* Fabricius, *Ent. syst.*, **4** : 331.

1868. *Sarcophila alba* Schiner, *Reise Novara, Dipt.*, **6** : 315.
1891. *Leucomyia cinerea* : Brauer and Bergenstamm, *Denkschr. Akad. Wiss. Wien. Kl. math., -naturw.*, **58** : 368 ; Kano, Field and Shinonaga, 1967, *Fauna Japonica*, Sarcophagidae : 36.
1924. *Sarcophila cinerea* : Senior-White, *Rec. Indian Mus.*, **26**(3) : 257 ; Senior-White, Aubertin and Smart, 1940, *Fauna Br. India, Dipt.*, **6** : 227.
1984. *Sarcophaga cinerea* : Sugiyama and Kano, *Jap. J. sanit. Zool.*, **33**(4) : 350.

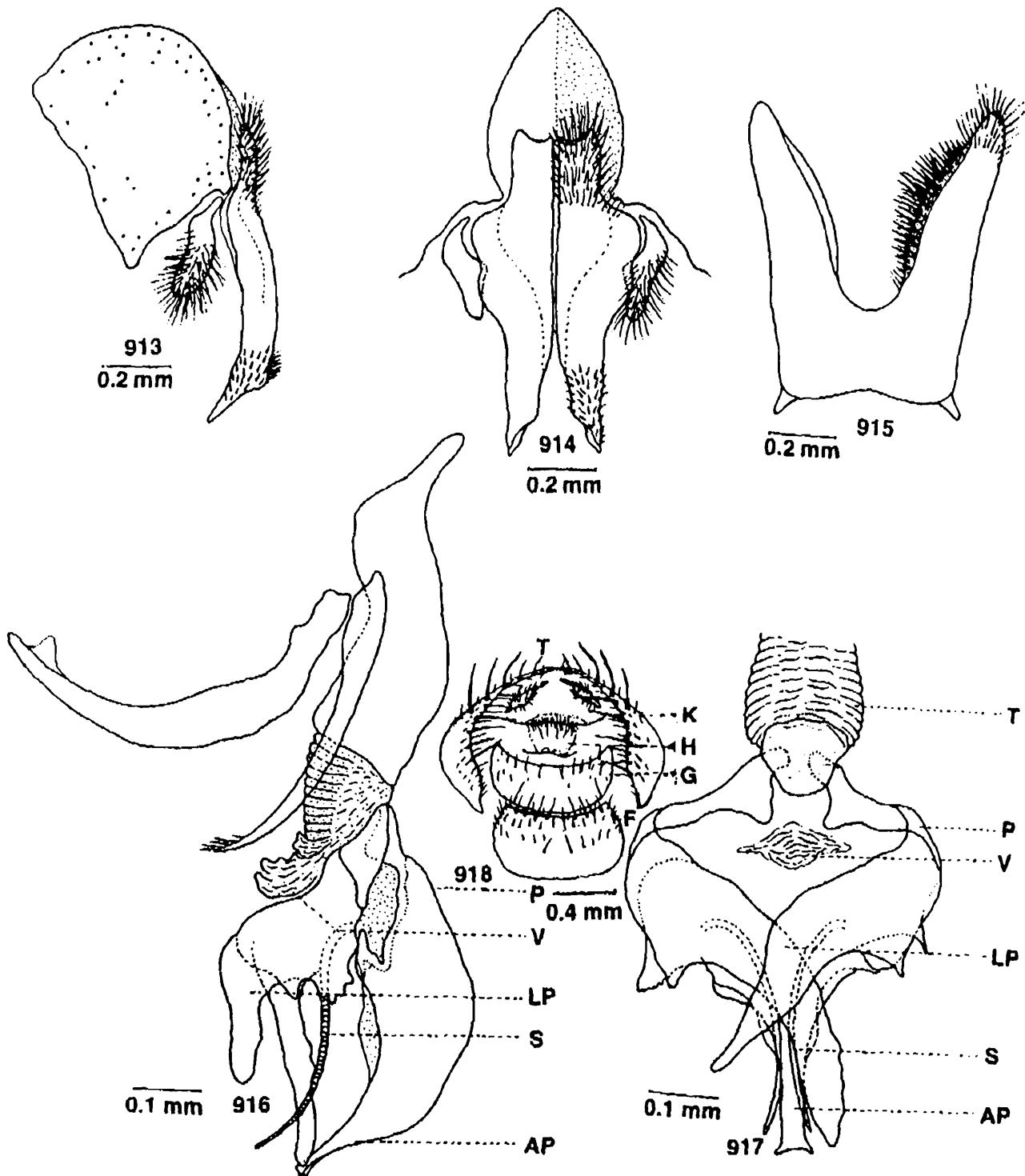
Male : Body length 8–9 mm.

Head : Width of frons about one and half times that of one eye ; frontal vitta black with silvery white pollen, its width at narrowest point of frons broad and about three times that of each parafrontal ; parafrontal and parafacial blackish with silvery pollen, the former with short hairs, the latter bare ; antennae dark brown and reaching up to about 0.9 distance to vibrissae, first and second segments dark brown with short spines, apex of second reddish, third brownish and about two and half times that of the second ; arista long, plumose along basal three-fifths ; facial ridge black with white pollen but without spines ; vibrissae long, distance between vibrissae nearly equal to one parafacial width ; frontal bristles 7, posterior 1 reclinate, anterior 1 below base of antennae and reaching up to about one-third of second antennal segment, rest cruciate and directed forwards ; gena black.

Thorax : Black with white pollen and three black longitudinal stripes; *ac* 1+1; *dc* 4+4 (1st postsutural *dc* weak); *ia* 1+2; *ps* 1; *h* 1; *ph* 2; *np* 2; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 15; *hpl* 6; upper part of propleura bare and black; pro- and mesothoracic spiracles brown; prostigmatic and propleural bristles well developed and accompanied with short hairs; apicoscutellar bristle wanting; lateroscutellar bristles 2 pairs; discoscutellar bristle 1 pair.

Wings : Hyaline with brown veins; R_1 bare; R_{4+5} with a row of 8—9 short setae located dorsally and extending up to about three-fourths from the basal node to r-m and 3 short setae along ventral surface of basal node of R_{4+5} ; fifth costal segment longer than the third, the former with short spines along basal three-fourths of its anterior margin; costal spines moderately stout; epaulet brown; basicostal scale light brown; squama creamy white; halter brown.

Legs : Black ; fore femur with a pair of rows of bristles along posterodorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal half of anterodorsal surface and 1 bristle on posterodorsal surface at about one-third the distance from the distal end; mid femur with a row of 4 bristles along middle portion of anterolateral surface, a row of bristles along basal half and a row of short setae along distal half of anteroventral and posteroventral surfaces; mid tibia with 2 bristles along middle portion of anterolateral surface, 1



Figs. 913-918 : *Leucomyia cinerea* (Fabricius). 913, Inner and outer forceps (lateral view); 914, Inner and outer forceps (posterior view); 915, Fifth sternite; 916, Penis (lateral view); 917, Penis (ventral view); 918, Genitalia ♀ (ventral view).

bristle each on posterolateral, posterodorsal and posteroventral surfaces on distal end, last 2 at about one-third the distance from the distal end; hind femur with a row of bristles along anterodorsal surface, 1 bristle each on posterodorsal and posterolateral surfaces on distal end and a row of bristles along anterior and posterior margins of ventral surface; hind tibia with a row of bristles each along anterodorsal surface, 1 bristle on anteroventral surface at about one-third the distance from the distal end and 2 bristles on posterodorsal surface medially.

Abdomen : Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of median and 2 pairs of lateral marginal bristles; sternites first to fourth with black hairs; fifth sternite v-shaped with stout spines laterally and short hairs apically on arms; first genital segment black with long hairs, second black with short hairs but without marginal bristle; inner forceps almost straight, curved, pointed at end with short spines and hairs distally and long hairs basally; outer forceps elongated with hairs; anterior paramere long, slender with a small projection apically; posterior paramere long with short hairs anteriorly on distal end; theca and paraphallus almost equal, both are sclerotised; apical plate of paraphallus well developed, short and curved anteriorly; lateral plate of paraphallus very long, heavily sclerotised, blackish, cruciate and asymmetrical; styli of glans long, transversely striated and not crossing the apical plate of paraphallus; ventralia single, moderately long and membranous.

Female : Body length 7–9 mm.

Head : Similar to that of male except frons about twice that of one eye; a pair of rows of proclinate fronto-orbital bristles present.

Thorax : Similar to that of male.

Legs : Hind tibia with 2 bristles on anteroventral surface.

Abdomen : Seventh and eighth sternites wide and each with 10 bristles, ninth membranous, short and with few bristles; seventh tergite wide posteriorly with few bristles and hairs.

Material examined : India : Several male specimens from different localities of Andhra Pradesh, Kerala, Orissa, Tamil Nadu, Uttar Pradesh and West Bengal collected by B.C. Nandi in different seasons.

Discussion on species : This species is characterised by the peculiar type of apical and lateral plates of paraphallus and ventralia.

Biology : This is a relatively common species which was collected from weeds, rocks and bushes on sea shore and also from dead animals and other organic debris. It is entirely restricted to the sea-shore species and has been reported as the prey of *Cicindela biramosa* (Coleoptera) and as swarming among *Ipomaea* sp. (Convolvulaceae) on beach. The larvae are found on dead animals on the sea-shore and the species are

reared on dead fishes, birds and mammals. This species was found in the nests of sphecid wasp (Sphecidae, Hymenoptera), Sphecoidea (*Bembix borrei*) (Hymenoptera) and the larvae have been known as schizophages (Verves, 1979b). Larval stages have been described by Venkatraman (1936) and Ishijima (1967).

Distribution : India ; AP (Vishakapatnam), K (Varkalay), Kt (Hanavar), O (Puri), TN (Chennai), UP (Argra doubtful), Po (Aurobindo Ashram Campus); SL (Colombo, Trincomalee); China; Japan (including Ruykyu Islands); Laos; Philippines; Taiwan and Thailand.

Type deposited : *Holotype* ♂ ?, not studied.

Discussion on type : Pape (1986a) labelled one ♂ as *type-cinerea* ; *Holotype Sarcophila cinerea* (Fabr.), det. A. C. Pont (1970) where only wings and scutellum of the *Holotype* remains.

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ABBREVIATIONS

Abbreviations for the states, union territories and adjacent countries used throughout the text and on the geographical distribution of species on the map and chart and in the following table.

Map reference numbers	Abbreviations for the Indian states, union territories and adjacent countries	Total number of species (S-Sarcophaginae, M-Miltogrammatinae, P-Paramacronychiinae)			States, union territories and adjacent countries
States		S	M	P	Total
1.	A	18	3		21 Assam
2.	AnP	15			15 Andhra Pradesh
3.	ArP	10			10 Arunachal Pradesh
4.	B	26	2		28 Bihar
5.	D	6	1		7 Delhi
6.	G	6			6 Goa
7.	Gu	16			16 Gujarat
8.	H	9			9 Haryana
9.	HP	16			16 Himachal Pradesh
10.	JK	8	11		19 Jammu and Kashmir
11.	K	19	2		21 Kerala
12.	Kt	26	3		29 Karnataka
13.	Me	14			14 Meghalaya
14.	MnP	18			18 Manipur
15.	MP	14			14 Madhya Pradesh
16.	Mz	19			19 Mizoram
17.	Mr	21			21 Maharashtra
18.	N	19			19 Nagaland
19.	O	18			18 Orissa
20.	P	7			7 Punjab

Map reference numbers	Abbreviations for the Indian states, union territories and adjacent countries	Total number of species (S-Sarcophaginae, M-Miltogrammatinae, P-Paramacronychiinae)			States, union territories and adjacent countries	
21.	R	10	1	11	Rajasthan	
22.	S	11		11	Sikkim	
23.	T	17		17	Tripura	
24.	TN	28	7	35	Tamil Nadu	
25.	UP	23		23	Uttar Pradesh	
26.	WB	41		41	West Bengal	
Union territories						
27.	AN	12		12	Andaman and Nicobar Islands	
28.	C	4		4	Chandigarh	
29.	DN	5		5	Dadra and Nagar Haveli	
30.	Ld	6		6	Lakshadweep	
31.	Po	7		7	Pondicherry	
32.	DD	3		3	Daman and Diu	
Adjacent countries						
33.	Ne	38	7	45	Nepal	
34.	Bh	12		12	Bhutan	
35.	Pa	38	1	1	40	Pakistan
36.	M	12		12	Myanmar	
37.	SL	24	21	45	Sri Lanka	
38.	BD	11	3	14	Bangladesh	

Abbreviations for depositories. Institutions where type and other material referred to has been deposited have been abbreviated with the following acronyms :

ABC Academia Brasileira de Ciencias, Brazil.

ANIC Australian National Insect Collection, CSIR, Canberra, Australia.

BMJ	Buiterzong Museum, Java.
BMNH	The Natural History Museum, London, England.
BPBM	Bernice P. Bishop Museum, Honolulu, Hawaii, USA.
CM	Colombo Meseum, Sri Lanka.
ECEIAS	East China Entomological Institute, Academia Sinica, China.
EU	Egyptian University, Faculty of Medicine, Egypt.
FMIBP	Fan Memorial Institute of Biology, Peiping, China.
FRID	Forest Research Institute, Dehra Dun, India.
IARI	Indian Agricultural Research Institute, New Delhi.
IMEAMS	Institute of Microbiology and Epidemiology, Academy of Military Science, China.
IOC	Instituto Oswaldo Cruz, Rio de Janeiro, Brazil.
IPEF	Institut für Pflanzenschutzforschung, Eberswaldefinow, Germany.
MNHN	Musée Nationale d' Histoire Naturelle, Paris, France.
MNRJ	Museu Nacional, Rio de Janeiro, Brazil.
MZLS	Museo Zoologico de "La Specola", Florence, Italy.
NHMK	Natural History Museum, Kathmandu, Nepal.
NMP	Natal Museum, Pietermaritzburg, South Africa.
NMW	Naturhistorisches Museum, Wien, Austria.
NRM	Naturhistoris ka riksmuseet Museum, Stockholm, Sweden.
NSMT	National Science Museum, Tokyo, Japan.
SIES	Shanghai Institute of Entomology, Shanghai, China.
TMDU	Tokyo Medical and Dental University, Tokyo, Japan.
USNM	National Museum of Natural History, Washington, D. C., USA.
VM	Vienna Museum.
ZIKU	Zoological Institute, Kanazawa University, Japan.
ZISP	Zoological Institute, St Petersburg, Russia.
ZMB	Zoological Museum an der Humboldt Universität, Berlin, Germany.
ZML	Zoological Museum, University of Lund, Lund, Sweden.
ZMMSU	Zoological Museum, Moscow State Unversity, Russia.
ZMUC	Zoological Museum, University of Copenhagen, Denmark.
ZSIC	Zoological Survey of India, Calcutta.

INDEX

Subfamily, tribe, subtribe and valid names of genera, subgenera (in bracket) are given in boldface capital letters and valid species names are treated in plain types. Synonyms (genus, subgenus, species and subspecies) are given in italics. Numbers in bold indicate page containing detailed description.

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