

Fauna of India

COLEOPTERA

**FAMILY GYRINIDAE
AND
FAMILY HALIPLIDAE**

T. G. VAZIRANI

This is the first compendium of its kind on the gyrid and haliplid water beetles of India. Even no volume was written on these beetles in the 'Fauna of British India' series. Such beetles reported from the adjoining countries like Pakistan, Sri Lanka, Bangladesh, Burma, Nepal and Bhutan are not included in it. The necessity of the appearance of such a book on water beetles of India was long-felt. The author's expertise and experience on the aquatic beetles is well acknowledged and established in the world. This compilation of the knowledge on the morphology, biology, taxonomy and distribution of the Indian species has been effected in a simple and most comprehensive way so much so that the reader finds it interesting and meaningful. The individual species in the coleopteran families Gyrinidae and Haliplidae occurring in India has been treated with authenticity and the interested workers and investigators on these beetles will find it as an aid, useful and dependable. It will serve as a book of reference for taxonomical work on aquatic beetles.

THE FAUNA OF INDIA

COLEOPTERA

FAMILY GYRINIDAE
AND
FAMILY HALIPLIDAE

BY

T. G. VAZIRANI



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Calcutta*

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EDITOR'S PREFACE

Eighteen volumes on various families of the order Coleoptera have been so far published under the title "Fauna of British India" during 1910-1949, but none of them has so far covered the water beetles of India which come under the families Gyrinidae, Haliplidae, Amphizoidae and Dytiscidae. The late Dr. Tahil Gianchand Vazirani, M.Sc., Ph.D., D.Sc., former Deputy Director, Zoological Survey of India, and a well known coleopterist of international repute wrote the present volume in the Fauna of India series on the families Gyrinidae and Haliplidae. His experience and expertise on Indian water beetles is widely acknowledged and well established. He had plans to write another volume on the remaining two families, Amphizoidae and Dytiscidae, but unfortunately passed away before accomplishing it. At the time of his death, he held the high position of Senior Coleopterist in the Commonwealth Institute of Entomology, London.

This volume is a comprehensive monographic study on 58 species of Indian gyrinids and haliplids, including description, synonymy and distribution, in addition to historical review and general remarks on phylogeny, respiration, food and feeding habits, parasitism, and taxonomical characters separately for each of the two families. The presentation of the systematic account has been designed so as to provide useful and workable keys to various taxa at suitable places. The most significant feature of this treatise is that the author has himself worked on most of the species involved, material of which are present in the Zoological Survey of India at Calcutta.

This is an authentic and complete faunistic study on these beetles till 1980 when its manuscript was received for publication. It embodies dependable systematic and distributional accounts of the Indian gyrinid and haliplid aquatic beetles. It is expected that it will meet the needs of workers, in India and abroad, interested in the study of the aquatic beetles of the families Gyrinidae and Haliplidae.

B. K. TIKADER

Director

Zoological Survey of India

CALCUTTA

AUTHOR'S PREFACE

The order Coleoptera has been divided into 2 or 3 suborders depending on the broad classification that may be followed. Crowson (1955) however divides it into 4 suborders, i. Archostemata, ii. Adephaga, iii. Polyphaga and iv. Myxophaga. Ross (1965) and others have followed this arrangement. Mani (1974) however divides the order into 3 suborders, *viz.* i. Rhynchophora, ii. Adephaga, and iii. Polyphaga.

Beetles in general are terrestrial, with the exception of a few families, wherein both the larvae and adults live in water. The larvae generally pupate above the water line, making an earthen cocoon in the nearby soil or on the stems of emerging vegetation. The aquatic groups include both the herbivorous and predacious species just as in the terrestrial forms. It is the predatory species which predominate in the aquatic habitat and these are included in the suborder Adephaga.

It is surmised by several workers that the Coleoptera differentiated from the neuropteroid ancestors over 300 million years ago. Since then, the beetles have evolved into more species than any other living organisms. It is estimated that about 277,000 species are recognized till 1948 (*vide* Sabrosky 1952). About 8% *i.e.* 21160 species occur in India representing over 100 families.

According to Crowson (1955) the beetles arose from an ancestral beetle in which the abdominal sternites of the adults were free and distinct and the larval legs possessed a tarsal segment. The further evolution is presumed to have progressed in two different directions, in one the larval tarsi persisted but the metasternum became fused with the hind coxae, thus dividing the first abdominal sternite. This is the line which gave rise to the species included in the suborder Adephaga, including a primitive small family Rhysodidae which inhabits rotten logs. It is this suborder which

Sabrosky, C. W. 1952 in *Insects—the Year book of Agriculture*. U.S. Dept. of Agriculture, Washington D.C.

includes the aquatic families Gyrinidae, Haliplidae and Dytiscidae the Indian species of which are being included in the present 2 volume series. In all, eight families are included under this suborder but the Hygrobiidae and Rhysodidae do not occur in India and the Carabidae & Cicindelidae are terrestrial. Andrewa (1929) has dealt with the subfamily Carabinae of the family Carabidae.

This first volume includes the Gyrinidae and Haliplidae and will be followed by the volume on Dytiscidae.

I have great pleasure in expressing my thanks to Dr. S. Khera, Joint Director-in-Charge, who assigned this work to me. I am thankful to Dr. R. Zur Strassen of Natur-Museum, Senckenberg for sending on loan 'Type' specimens of some species as mentioned in the text. Prof. P. Brinck of University of Lund kindly helped me through his monographic work on Ethiopian and South African Gyrinidae. I am thankful to my colleagues of the Desert Regional Station, Zoological Survey of India, Dr. N. S. Rathore, and Shri R. Advani, for help in going through the manuscript etc. Shri A. Basit has taken the photographs and Shri Avinash Mehta has made the drawings. Miss. I. Gaster of the Library of the Department of Entomology, British Museum (Natural History), London, has helped in supplying titles, volume numbers and pages for some bibliographic references. Thanks are also due to Dr. A. P. Kapur, Dr. M. S. Mani who were my guides and past Directors of the Zoological Survey. I am also grateful to Late Dr. S. L. Hora and Dr. M. L. Roonwal, Ex-Directors of the Zoological Survey, for their kind courtesies and encouragement in my work, during the period I worked with them.

Last but not the least I am thankful to Dr. B. K. Tikader, Director, Zoological Survey of India, for his keen interest to publish this volume and Shri G. Sivagurunathan, who worked hard for the production of this book. I also wish to express my thanks to Dr. A. K. Ghosh, Deputy Director, Dr. M. Hafeezullah, Superintending Zoologist, Mr. A. R. Bhaumik, Zoologist, Z.S.I., for kindly going through the proof and offering valuable suggestions for improvement.

T. G. VAZIRANI

ABBREVIATIONS

BM	British Museum (Natural History), London
BNHS	Bombay Natural History Society, Bombay
FRI	Forest Research Institute, Dehra Dun, India
Genova Mus.	Museo Civico Storia Naturale, Genova, Italy
Helsingfors Mus.	Helsingfors Museum, Helsinki, Finland
IARI	Indian Agricultural Research Institute, New Delhi
Leiden Mus.	Leiden Museum, Leiden, Netherlands
Mus. Senckenberg.	Natur-Museum, Senckenberg, Frankfurt am main, Germany
Paris Mus.	Laboratoire d' Entomologie, Museum National D' Histoire Naturelle, Paris
T.L.	Type locality
ZSBSM	Zoologischen Sammlung des Bayerischen staates, Munchen, Germany
ZSI	Zoological Survey of India, Calcutta

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<i>Page No.</i>	<i>Read</i>	<i>For</i>
16, last para, line 1	Dineutus (Spinoso- dineutus) Hatch	1. Dineutus (Spinoso- dineutus) Hatch
17, last para, line 1	1. Dineutus (Spinoso- dineutus) spinosus (Fabricius)*	2. Dineutus (Spinoso- dineutus) (Fabricius)
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31, para 1, line 11	Gyrinus huttoni	Gyrinus buttoni
35, last para, line 1	Orectochilinae	Orechochilinae
38, para 6, line 1	Delete (Text fig.) altogether	
51, para 3, line 1	Orectochilus (Patrus) productus Régimbart	Oblongiusculus (Patrus) productus Régimbart
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102, para 1, line 3	Orectochilus spiniger: Vazirani, 1958	Orectochilus spiniger Vazirani, 1958
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* The serial nos. of all subsequent species should be read in continuing sequence according to this.

Family GYRINIDAE

INTRODUCTION

Gyrinus spinosus Fabricius, 1781, (since placed under *Dineutus*) is the oldest species known from India and was collected from Coromandel coast. Subsequent to this we owe our knowledge of Indian Gyrinidae to Aubé (1838), Walker (1858, 1859), Motschulsky (1861), Régimbart (1882, 1883, 1886, 1889, 1891, 1892, 1893), Severin (1890) and Sharp (1891). Among all of these, Régimbart's contribution was a comprehensive monograph of the species known at that time. George Ochs in a series of papers (1924-1966) has studied the material collected by the Zoological Survey of India (then Indian Museum) upto 1923. His subsequent contributions are based on the specimens collected by various expeditions in India, Burma, Nepal etc. and some specimens purchased by him from Mr. Nathan, in South India. The present author (1958) worked out the collection of the Zoological Survey of India, that had accumulated between 1923-1951. The collections made subsequently have been determined now and incorporated in the present work. These fresh collections have added to the earlier known distribution. Some earlier little known species have been rediscovered. The genus *Orectochilus* needs revision but since it is widely distributed in the Oriental Region, and 'Type' specimens being mostly in European Museums, the revision is not attempted here, on the basis of the limited number of species available. Up to 1933, descriptions of species did not include the study of male genitalias, which has come to be regarded as the most reliable character for the separation of species. This shortcoming has been corrected in the present work.

Quite a few species have been recognized as polytypic. Recent arguments regarding the delimiting of subspecies have been critically examined by Simpson (1961), Mayr (1969) and others. Broadly the criteria followed here, is, that the subspecies represent geographical isolation and their breeding ranges often or even usually overlap. Wherever, these criteria are not full-

filled, the subspecies have been merged and the characters on which such subspecies have been based are deemed to represent variations between populations.

Earlier volumes in 'Fauna of India' series have included the fauna of adjoining countries e.g. Pakistan, Bangladesh, Sri Lanka and Burma. As far as the gyrids and haliplids are concerned there are no species endemic in Pakistan or Bangladesh.

PHYLOGENY

The phylogeny of this interesting group has received comments from several authors e.g. Balfour-Browne (1950), Crowson (1955) and others. In short, Horn (1881) followed by Régimbart (1882), grouped Carabidae, Cicindelidae, Dytiscidae, Haliplidae, Peliobiidae (Hygrobiidae), Amphizoidae and Gyrinidae together. Régimbart (l.c.) expressed the opinion that Gyrinidae were very distinct from the others. Hatch (1925a) regarded the simplicity of the mouth parts and that of the aedeagus not as a sign of primitiveness but due to retrograde evolution. As a result of the studies on wing-folding, Forbes (1926), came to the conclusion that the Hydradephaga had two subtypes of wing-folding (i) Hygrobiidae, Haliplidae & the Bidessus-group of Dytiscidae (ii) rest of Dytiscidae, Amphizoidae & Gyrinidae. Latreille (1807) placed *Gyrinus* in the family 'Otiphori' with *Dryops* (*Parnus*); but in 1837 he placed them back in the Hydrocanthares. Gyllenhal (1808) placed the genera *Heterocerus*, *Parnus* and *Gyrinus* in the family 'Amphibii' Aubé (1836 and 1838) agreed with Latreille (1807) in separating *Gyrinus* from the dytiscids, but did not agree on the association of *Parnus* with *Gyrinus*.

Sharp (1899) considered Gyrinidae as one of the most distinct families of Coleoptera and further stated that Adephaga constitute a natural series of allied families, with the exclusion of Gyrinidae. Sharp (l.c.) and Muir (1912) grouped it with series 'Byrrhoidea' thus emphasising its distinctness from Adephaga, although they made it clear that the series is far from homogenous. They also suggested that Caraboidea may possibly be derived from Byrrhoidea.

Leng (1920) proposed series 'Gyrinoidea' of equal standing with the Adephaga. Ochs (1929) showed that Gyrinidae are not closely related to any of the existing groups of Coleoptera, but indicated its origin from pre-carabid ancestor with certain affinities of the Palpicornia—which was also earlier pointed out by Sharp and Muir.

However, Omer Cooper (1934) placing greater reliance on the characters of larvae expressed the opinion that gyrinids and dytiscids have arisen from a common ancestor.

Balfour-Browne, F. (1950) has pointed out 'It seems that each author who attempts the arrangement of the larger groups relies mainly upon a single character, so that we get different combinations of families according to the character chosen, and the question arises, 'is there any one character that can give a reliable history of relationships' Both Balfour-Browne (1950) and Leach and Chandler (1956) consider divided eyes, short thick antenna, middle and hind legs modified as fan-like paddles and form of aedeagophore and ovipositor, as peculiar needs of specialization for their mode of life. Otherwise Gyrinidae clearly belong to the suborder Adephaga and to a caraboid stock as indicated by other characters such as 11-segmented antennae, 5-segmented tarsi, the wing venation with the oblongum cell, the fusion of the first three abdominal sterna and the first (the true second) divided into two by the hind coxae. The larvae have free tarsal claws which is not the case in any other family outside Adephaga.

As pointed out by Balfour-Browne (l.c.) the Hydradephaga may be a polyphyletic group of various carabid or pre-carabid ancestors and gyrinids having evolved independently from an early caraboid stock.

TAXONOMIC CHARACTERS

(Text figs. 1-13)

The beetles of the family Gyrinidae form a very homogenous group. They occupy only a small niche viz. surface in the large volume of aquatic habitat. The morphological structure of the adult beetle is a response to this very restricted and

highly specialized niche. Thus the variation in structure is very much restricted. This renders the study of phylogeny and phylogenetic tendencies very difficult. As pointed out by Brinck (l.c. p. 6) the present morphological characters do not indicate a recent evolutionary development of the family, but are only a response to the very restricted ecological and physiological conditions of the habitat.

It is not proposed to give a comparative account of the morphology of various subfamilies tribes or genera but to broadly enumerate the characters which are necessary to know, for identifying various genera and species that occur in India.

Head: Looking from dorsal surface, it is of the prognathous type and a solid capsule. Anteriorly it is bounded by the labrum, the shape of which being variable does not indicate any true phylogenetic relationship even within the tribes. It varies from short transverse to elongate elliptical form in the genera *Dineutus* and *Orectochilus*. It is short transverse, in all the species of *Gyrinus*, *Aulonogyrus* and *Metagyrynus* occurring in India. In the genus *Orectochilus* which has the largest number of species in this region, the size of the labrum is very important, it may be short and transverse, 3-4 times as broad as long in species of groups 1 & 2; and elliptical and only one and half times as broad as long in *O. gangeticus*. It also varies in the character of punctation and reticulation.

Besides the shape of labrum, the colour of the labrum is also important. It is fringed with bristles along its lower margin. Generally the colour is black but it is bright yellow in a few species of the genus *Orectochilus*.

Clypeus on the dorsal surface is attached to the frons with a generally distinct fronto-clypeal suture. The frons passes into the vertex and the latter into the occipital region of the head. There are no sutures to delineate these regions. The punctation and reticulation of these parts of the epicranium are variable and generally have taxonomic importance at species level.

The area between the dorsal and ventral parts of the eye is

smooth, normally sculptured in some genera (e.g. *Dineutus*), in others it is wrinkled or furrowed. In accordance with mode of life in these beetles *viz.* living on the surface of water, the eyes are modified, being divided into two widely separated parts. The ventral part, remains below the surface film, as the beetles swim and the dorsal part remains above the surface film in the air. Though it is generally believed that structurally the dorsal and ventral parts of the eye are best suited for vision in their respective medium, however there is no evidence from the anatomy of the eye that the lower part is specialized in any obvious way for seeing under water. In some genera the relative position of the dorsal and ventral portion of the eyes is different *i.e.* dorsal one may be somewhat anterior to the posterior *e.g.* in *Metagyrinus* and some species of *Gyrinus*. The minimum distance between the two dorsal portions of the eyes may also prove to be of specific value if subjected to statistical analysis, the lateral margins of the fronto-clypeus also meet the anterior margin of eyes at different points *e.g.* outer side, middle etc.

The general pattern of antenna in the various genera of the family is 2-segmented pedicel and 7 to 9-segmented flagellum. The flagellum is the short cylindrical structure comprising a number of closely jointed segments. It is not easy to make out the exact number of segments without treating the antenna in KOH and dilute HCL to decolorize the chitin. Hatch (1925) has given the details of variations of the number of segments in the various genera of the family. The segments in the antenna of the genera occurring in India is shown below:

<i>Dineutus (Spinodineutus) unidentatus</i> (Aubé)	2+6
<i>D. (Protodineutus) indicus</i> Aubé	2+6
<i>Aulonogyrus obliquus</i> (Walker)	2+7
<i>Metagyrinus arrowi</i> (Régimbart)	2+7
<i>Gyrinus convexiusculus</i> (Macleay)	2+7
<i>Orectochilus (s.str.) murinus</i> Régimbart	2+9
<i>Orectochilus (Patrus) indicus</i> Régimbart	2+7

The number of antennal segments does not indicate primitiveness of any genus as the number varies within the same tribe.

Generally 11-segmented antennae should be considered primitive but this number occurs in Enhydrini as well as in Orectochilini, therefore no conclusions can be drawn regarding the primitiveness, on the basis of the study of this character.

Maxilla consists of a basal cardo, connected with the four-segmented maxillary palpus via the stipes and the palpifer. The basal parts articulate with an internal lacinia and external galea. The galea which is present in Gyrininae is absent in Dineutinae and Orectochilinae. The labium consists of a large submentum with anterior lateral lobes between which is the ligula; attached to the base are the palpifers with three segmented palps. The last joint may be modified.

Thorax : The pronotum is unmodified, and covers the mesothorax. The lateral margins may be flattened or rebordered, and its lateral extensions form the prothoracic epipleurae. The surface is usually reticulated and punctate. Sometimes there may be a median longitudinal line or transverse striations/impressions. The prosternum is transverse and its process is well developed in Gyrininae and Enhydrinae but reduced in Orectochilinae. The procoxal cavities are in contact posteriorly, when at rest.

Meso-and metathorax are covered by the elytra. Scutellum may or may not be exposed. It is a triangular area in certain genera. It is generally smooth, rarely with a keel or strongly impressed sculpture. It shows sexual dimorphism in size and shape in certain species of *Orectochilus*.

Quite a number of taxonomic characters are associated with the elytra eg. striae, pubescence, punctation, reticulation, lateral margins—their colour and epipleural spines. The elytral sculpture consists of punctation (also described by some as punctuation) and reticulation. The punctation may be in the form of striae such as in *Gyrinus*, *Dineutus*, *Aulonogyrus*, *Metagyrius* coupled with interstitial punctures or reticulation. In Dineutinae the number of striae is generally 9, in Gyrinidae 9 or 11 but these are obsolete in Orectochilinae. In the genus *Dineutus* also, the striae may be reduced or obsolete. Some of the striae, in the

same genus or species may be strongly impressed or canaliculate with linear punctures. In the Gyrininae, there is usually an ellipsoid of punctures at the apex.

Both the pronotum and elytra have dorsal pubescence in Orectochilinae. In the subgenus *Orectochilus* (*s.str.*) the whole of the dorsal surface is pubescent-punctate. All of the species of the genus *Orectochilus*, subgenus *Patrus*, to which 81% of our species belong are pubescent—punctate, only on the lateral sides of pronotum and the elytra. The shape of the inner margin of this pubescence on the pronotum and elytra, its relative width on the pronotum and base of elytra, its point of dilatation from base to apex, the meeting point of the inner line of pubescence with the suture or whether it does not meet the suture, at the point of the apex, are the important differences which aid in determination at the specific level.

The reticulation generally consists of rounded areoles sometimes very well impressed which gives the surface dull and sometimes feebly punctate appearance, or it may be obsolete. In certain cases the areoles may be irregularly transverse. In certain species the punctation on the smooth area may be strong in the form of elongate punctures but this condition is rather rare.

The elytral apices are of great taxonomic significance at the specific level. The shape of the external apical angle and the size of epipleural spines is of great help in determining species. The external apical angles are produced into spines (epipleural spines) independent of other characters. Within our genera, this character appears in some species of *Dineutus* and *Orectochilus*.

The Mesosternum is a large plate which may be anteriorly bordered and with a distinct episternum and epimeron. In Enhydrinae and Gyrininae the mesoepisternum does not touch the epipleurae but it is observed that in case of *Dineutus* (*Spinodineutus*) *unidentatus* it is not completely separated from the mesoepimeron, the two are divided by an incomplete suture. In Orectochilinae the mesoepisternum touches the epipleurae. The middle coxae may be close together or quite separated. The

metasternum is a transverse plate with narrow or broad wings laterally, broad in Enhydrinae and narrow in Gyrininae. On the lateral side of the metasternum is the metaepisternum, which separates it from the epipleurae.

Abdomen : The shape of the last abdominal sternite has great taxonomic significance at subfamily/generic level. It is elongate and with a longitudinal row of hairs ventrally in all the genera of Orectochilinae. Abdomen is rounded along the posterior border in *Dineutus* in the Enhydrinae. Within the three genera of Gyrininae occurring in India it is rounded in *Gyrinus*, truncated in *Aulonogyrus* and sinuate in *Metagyrimus*. The longitudinal row of hairs, on the anal sternite is absent in all the genera, under consideration here, except in *Orectochilus*. In some species eg. *O. indicus*, besides the anal sternite, the penultimate segment also bears a longitudinal row of hairs and the apices of the anal sternite and anal tergite are also fringed with hairs.

Genitalia : These structures have been studied by several authors in recent years. Brinck (1955) gives a summary of previous opinions on the genitalia of Gyrinidae and his own conclusions. According to him the closed side of the aedeagus is the dorsal side and the side with sperm groove or gonopore is the ventral one. In Gyrininae (*Gyrinus*) the aedeagus consists of a median lobe (penis) and the flattened lateral lobes (parameres) which are basally united and strongly attached to and articulated with the median lobe. The lateral lobes have an apical fringe of hairs, while the median lobe is naked. The internal sac is not differentiated. The distal part of the ductus ejaculatorius rests in a furrow which is clothed by a weakly sclerotized membrane, which covers the furrow at base, towards the apex it is transformed into a pair of internal membranes separated by a median slit. The dorsal wall of the ductus ejaculatorius has certain sclerotized longitudinal thickenings.

In Enhydrinae the median lobe (penis) of aedeagus has a reduced system of ridges ('lists' of Brinck l.c.). The sclerotized ridges comprise a lateral pair and a median ridge. As in Gyrininae the sperm groove is provided with a membrane but in *Dineutus* this ventral membrane covers the groove completely

and lies as a lobe (ligula) over the apical part of the penis. In *Orectochilus* (Orectochilinae) the aedeagus differs somewhat from the same in Gyrininae or Enhydrinae. The lateral lobes are less flattened and excavated along the inner side, so that they can enclose the middle lobe completely. Further there is dense fringe of hairs along inner margins. The median lobe (penis) is rather weakly sclerotized and mostly consists of a simple tube with ventral sperm-groove, which is more or less covered by a membrane with the apical ligula. The ridges are generally reduced.

The female genitalia (ovipositor) is a simple paired plate and each plate has a narrow strut attached to its outer edge near its base. Régimbart's (1882: 388) opinion is that these struts form an arch above the anus where they are united, has been disputed by Balfour-Browne (l.c.p. 324) who states that this is not so. Guignot (1933: 139) designated the struts as 'paravalvifers' and as being the genital segment. He also followed Régimbart (l.c.) and stated that the struts were united above the anus by a membrane. The struts lie in the same plane as the ovipositor plates and not at right angles to it, thus the sternite of the 8th abdominal segment remains undivided and does not form a part of the genital armature as shown by Balfour-Browne (l.c.), who states that the 9th tergum is reduced, while the 9th sternum persists as the ovipositor. He describes the two hemisternites as lateral lobes of the ovipositor.

In some gyrinids eg. *Enhydrus*, *Macrogyrus*, there is a second anterior projection (strut) on the inner side of the ovipositor plate. The shape of the ovipositor plate which is flat in Gyrininae and Enhydrinae is specific for each species in these subfamilies though the differences are very minute and difficult to describe in writing but the differences are very significant at generic level. In the genus *Orectochilus* the ovipositor plate is more elongate and oval-triangular in cross section than in any other genus under study here and not significant at the specific level. The previous studies on the genitalia of Indian species are confined to the recent species described by Ochs but he did not figure them in all cases.

LIFE HISTORY

In India, there is very little information about the life histories of these beetles. There are only three papers by Nowrojee (1912) Vazirani (1952) & Tonapi (1959) which just touch the fringes of the subject. The former deals with the description of the larva and pupa of *Dineutus spinosus* (Fabricius) and their habits. Tonapi deals with the eggs and larvae of *D. indicus*, Vazirani deals with the parasitism of cocoons in *Dineutus unidentatus*. The cocoons were observed in chambers constructed of mud about a foot above the water level near the shore line, on the stems of the emerging vegetation.

However, the life histories of *Gyrinus* spp., *Orectochilus* spp. or *Dineutus* spp. recorded elsewhere are noted in brief below. The life history of *Gyrinus caspius* has been recorded by Balfour-Browne (1950). He states 'The eggs are laid either singly or in series on the vegetation not far below the surface of the water, and the larvae on hatching, drop to the bottom and disappear in the debris, where they spend most of their lives. They change habits when nearly full grown, and I have taken amongst vegetation when using the net in seeking dytiscids' This is the general pattern, the cocoons are formed outside the water either on the stems of emerging aquatic vegetation as stated above in case of *D. unidentatus* or they may be attached to the under-surface of blades of long grass fringing the margin of the ponds as observed by Nowrojee in *D. spinosus*. They may also be attached to grasses about $\frac{1}{2}$ meter above the ground and as much as one meter away from the edge of the water as observed in other regions. The larvae of *Gyrinus* and *Dineutus* appear to behave in much the same way. In the cases of *Orectochilus* spp. the larvae while climbing above the stems of aquatic vegetation, seek the spot between the axils of leaves attached to the emerging vegetation or cavities of stems. The eggs of *Orectochilus villosus* are laid in rows on the roots of plants as described by Henrikson (1930: 225).

In Palaearctic areas the egg laying has been reported in the summer months, May—August. According to Balfour-Browne (1950: 370) both larvae and adult overwinter. There has not

been much collecting of the larval forms, the data is very poor for any conclusions, but there is certainly no over wintering of adults in any part of our country except perhaps in the himalayan range.

The mandibles of the larvae are canaliculate, only on their inner concave edges. It leaves no doubt that they are adapted for sucking juices from the body of their prey after having injected some poisonous fluids and stupifying their prey, in the same manner as happens in the feeding of dytiscid larvae. Hatch (1925 b) states that the larvae of *Dineutus* feed by sucking. Nowrojee (1912) also states that the prey is grasped between the mandibles and sharp points inserted into its tissues and juices sucked out. Balfour-Browne (1950) could not say definitely whether the larvae only sucked or both sucked and ingested their food. From the mouth apparatus he surmised that the food does enter the mouth and is ground up in the buccal cavity. Such an inference has also been drawn by the presence of a gizzard in the larvae of *Cybister tripunctatus asiaticus* Sharp by Vazirani (1964). The food of the larvae has been stated to be small worms such as *Tubifex* living in the mud of substratum of the bottom. Balfour-Browne (l.c.) has observed the larvae, which were more than half grown, as entering into the furrows of *Tubifex* worms and pulling them out, either whole or their parts. Nowrojee (l.c.) fed the larvae of *D. spinosus* on chironomid larvae and small aquatic bugs. Leech & Chandler (1956) state that the larvae are predaceous and cannibalistic, feeding on bloodworms, odonata nymphs and even small fish.

The process of cocoon formation in *Gyrinus* and *Dineutus* as described by various authors appears to be, that the larvae when full grown crawl up the stem of a suitable emerging plant or suitable substance above the edge of water. They either scrap the stems of the plant, or carry mud and sand particles on their back and deposit them at a suitable spot. This process is followed untill a mass, sufficient for cocoon formation is collected. Then the larvae enters this mass by making a small hole, works its way in and closes the hole. The consistency of the cocoon mass depends upon the material available for its construction. Those constructed by scraping the stems of plants have papery consistency.

Those constructed out of mud etc. are thicker and darker. The adhesive material appears to be secreted by the larvae. The cocoons of *D. spinosus* and *D. unidentatus* are convex above and flattened below, they are about 8.0 mm in length and half as broad, as observed by Nowrojee (l.c.) and the author respectively.

PARASITISM

The only record of parasitism in Indian gyrid beetles, is by the author (1952: 101). An ischnenmonid, *Melcha ornatipennis* Cameron was reared from the cocoons of *Dineutus unidentatus* Aubé. F. G. Bucher (1933) has described quite a few Hymenopterous parasites of North American *Gyrinus* spp. and *Dineutus assimilis*. These parasites belong to the genera *Bathythrix*, *Hemiteles* and *Gyrinophagus*. Wickham (1893) followed by Dimmock and Knab (1904)' have recorded the larva of bombardier beetle *Brachinus* as parasites of the pupae of *Dineutus assimilis*. These *Brachinus* spp. also feed on pupae of *Berosus* and *Tropisturnus* and probably on any other water beetle pupae they can find of suitable size. This is of very great interest.

Some fungi, have also been listed by Leech & Chandler (1956) as parasitic on the pronotum and elytra of some individual beetles, without causing any damage to them.

RESPIRATION

These beetles (adults) generally spend their time, actively gyrating on the surface of the water. It is only occasionally that they dive deep when disturbed or for egg laying. This is true in India for *Gyrinus* spp., *Orectochilus* spp., *Dineutus spinosus* and *D. unidentatus* but in case of *Dineutus indicus* the specimens do not gyrate on the surface. They have been observed by me to dive at a tangent and come up in a circular motion. When disturbed, a few gyrations were observed, under the surface, through clear water. No observations have been recorded for *Aulonogyrus obliquus* (Walker) or *Metagyrynus arrowi* (Régimbart) in India. The air intake takes place at a groove just inside the posterior and of the lateral margin of each elytron and is stored below the elytra, the space between the tergites

and the elytra acting as the reservoir. The abdominal spiracles open into this space. When the insect dives, some of the air comes out as a bubble, at the posterior end and glistens like silver. They can not remain under the surface for long. In India no hibernation has been observed.

The larvae are completely aquatic and provided with tracheal gills, with a pair each, on the abdominal segments 1-8 and two pairs on the ninth abdominal segment. The undulating motion of the body provides sufficient current and movement of water. The oxygen is obtained directly from water and thus the larvae are independent of surface air.

FEEDING HABITS

Most of the observations available regarding feeding habits of these beetles deal with the genus *Gyrinus*. These observations are by Régimbart (1882: 380) who stated that they feed on living prey in the form of small insects on the surface of water. According to Hatch (1925), he fed *Gyrinus*, in captivity upon dead flies and raw beef. He observed that only the food available on the surface was touched and eaten by the beetles. Balfour-Browne (1944) while studying the structure of the proventriculus in these beetles, came across sclerotized parts of corixid bugs. Balfour-Browne (1950) has recorded the observation of his friend E. T. Daniels of Norwich, in which a minnow was kept in an aquarium along with specimens of *Gyrinus aeratus* and some snails. When minnow died at night, it was found surrounded by these beetles who had already begun feasting on the dead minnow, this continued until the fish had been thoroughly mutilated.

The above observation leaves no doubt that these may feed on dead or live organisms, as may be available on the surface.

The author has dissected for studies six specimens of *Dineutus indicus* and found sclerotized parts only in two of them. From these parts, in one case it can be made out that they belong to a midge which must have fallen on the surface of water. In the second example, nothing can be made out with the same certainty. In the remaining 4 examples no sclerotized parts could be made out.

ORDER COLEOPTERA

Suborder ADEPHAGA

KEY TO AQUATIC FAMILIES KNOWN FROM INDIA

1. Eyes divided by sides of head, appearing as dorsal and ventral pair; antennae short, stout, more or less closely unified; middle and hind legs short and flattened, tarsi folding fanwise.....**GYRINIDAE**
- Eyes not divided as above, antennae elongate, slender, middle and hind legs with tarsi not modified as above.....**2**
2. Hind coxae expanded into large plates, covering first, second or third abdominal sternites and bases of hind femora; small beetles, 5.5 mm or less in length.....**HALIPLIDAE**
- Hind coxae not expanded into large plates, neither covering hind femora, nor more than 1st abdominal sternite.....**3**
3. Metasternum with a transverse, triangular ante coxal sclerite separated by a well marked suture; hind legs not adapted for swimming, tarsi not flattened or fringed with hairs but simple and carabid like; black or brownish beetles 11—15.5 mm long.....**AMPHIZOIDAE**
- Metasternum without a transverse suture; no antecoxal sclerite; hind legs modified for swimming, tarsi flattened, usually fringed with long hairs.....**DYTISCIDAE**

Family GYRINIDAE

Diagnostic character: Eyes completely divided into two dorsal and ventral portions. First visible abdominal sternite completely divided by hind coxal cavities, hind coxae immovably united to metathorax. Antennae, short and thick, 2nd segment with a process. Middle and hind legs, short paddle-like, flattened, tarsi folding fanwise.

KEY TO INDIAN SUBFAMILIES

1. **Episternum of the mesothorax not touching the elytral epipleurae ; the apical abdominal sternite more or less rounded, flattened without any longitudinal ventral row of hairs ; pronotum and elytra without any pubescence.....2**
Episternum of the mesothorax touching the base of elytral epipleurae ; the apical abdominal sternite elongate, flattened, with longitudinal, ventral row of hairs, pronotum and elytra with pubescence.....ORECTOCHILINAE

2. **Posterior legs broader on the inner side than the outer side, concave in part ; wings of metasternum form a broad triangle ; elytral suture not bordered ; pronotum with a small pit carrying a tuft of bristles at its posterior corner, maxilla without galea.....ENHYDRINAE**
Posterior legs broader on the outer side than the inner side, the concave part more broad ; the wings of metasternum very narrow, elongate and dilated only on the outer side, elytral suture bordered ; pronotum without bristle carrying pit at its posterior corners ; maxilla with galea.....GYRININAE

Subfamily ENHYDRINAE

Diagnostic character: Episternum of the mesothorax not touching the elytral epipleurae ; the apical abdominal sternite more or less round, flattened, without any longitudinal, ventral row of hairs ; hind legs broader on the inner side than the outer side, concave in part ; wings of metasternum forming a broad triangle ; elytral suture not bordered ; posterior corners of pronotum with a small pit, carrying a tuft of bristles ; maxilla without galea.

General: The members of this tribe are the largest among the gyrid beetles, 8.0 mm.—23.0 mm. They occur in all parts of the world except Europe. The tribe is divided into two more or less natural groups (a) *Dineutus* in which the scutellum is invisible and the protarsi in male is only slightly broader than in female and almost subparallel. (b) *Enhydrus* and *Macrogyrus* in which the scutellum is visible and protarsi in the male is much

broader than in the female, and elongate-oval. In India it is represented only by the genus *Dineutus*.

Genus 1 *Dineutus* MacLeay 1825

Type-species: *Dineutus politus* MacLeay by original designation.

Dineutus MacLeay, 1825, *Annulosa javanica*, ed. 1: 30; 1833, *ibid*, ed. II: 133; Lacordaire, 1854, *Gen.Col.*, 1: 439; Ochs, 1924, *Ent.Bl.*, 20: 233; Hatch, 1925, *Pap. Mich. Acad. Sci.* 5: 444, 447; Ochs, 1926, *Ent. Z. Frankf.*, 40: 64, 136; 1930, *Cat. Indian Ins.*, pt. 19, Gyrinoidea, p. 9; Mouchamps, 1949, *Bull. Anns. soc. r. ent. Belg.*, 85: 216.

Dyneutes: Laporte, 1835, *Etud. Ent.*, p. 109; 1840, *Hist. Nat.*, I: 170.

Dineutes: Brulle, 1835, *Hist. Nat. Ins.*, (5) 2: 234, 240; Abué (1836-38), *Icongraphie Coleopteres Europe*, 5: 407, 1838, *Species Coleopteres*, 6: 761; Laconte and Horn, 1883, *Classification Col. N. America*, Washington, p. 69; Régimbart, 1882, *Ann. Soc. ent. Fr.*, (6) 2: 394; 1902, in Wyttsmann, *Genera Insectorum*, 1: 3; Zimmermann, 1920, *Ent. Bl.*, 16: 231.

Cyclous Eschscholtz, 1833, in Dejean's, *Cat. Coleopteres* ed. II p. 58 (Type-species *australis* Fabricius).

Cyclinus Kirby, 1837, in Richards, *Fauna Bor. Amer.*, 4: 78 (Type-species, *assimilis* Kirby).

Diagnostic character: Subfamily characters plus (i) sectellum invisible (ii) protarsi in male almost sub-parallel only slightly broader than in female. Usually oval, rather flat species, elytral striae indistinct or obsolete.

The genus is represented in India by 2 subgenera. It contains a large number of species, mainly tropical and subtropical but not represented in S. America. As pointed out by Brinck 1955 : 102, the subdivision of the genus on the world basis is still a problem but it is quite easy to place our 3 species into the two subgenera. The genus *Porrorhynchus* Lap. Cast. occurs in Ceylon. Ochs 1926 considered it as a subgenus of *Dineutus* but Brinck (l.c.) considers it a separate genus.

1. *Dineutus* (*Spinodineutus*) Hatch

Type-species: *Gyrinus spinosus* Fabricius by original designation.

Dineutus (*Spinodineutus*) Hatch, 1925, *Pap. Mick. Acd. Sci.*, 5: 447;

1926, *Pap. Mich. Acad. Sci.*, 7: 343; Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 9; Mouchamps, 1949, *Bull. Annl. Soc. r. ent. Belg.*, 85: 216.

Dineutus (*Cyclous*) in part, Hatch. 1925, *Pap. Mich. Acad. Sci.*, 5: 447.
Dineutus (*Gyrinodineutus*) Ochs, 1926, *Ent. Z. Frankf.*, 40: 65, 195
 (Type-species *unidentatus* Aubé)

Hatch (l.c.) established this subgenus with 3 oriental species with yellow border of the elytra and pronotum and the parasutural angle with a spine. Almost simultaneously Ochs (1926) created another subgenus *Gyrinodineutus*, which also included the same 3 species of Hatch but had considerably wider acceptance. At present the subgenus *Spinosodineutus* as redefined by Mouchamps (l.c.) is characterised as below (a) presence of epipleural spine which may be reduced to a point (b) the elytra may have a second parasutural spine or not but its position is always indicated (c) the form generally elongate, frequently rather narrow (d) without any spine on the antero-external face of anterior tibiae.

Mouchamps (l.c.) has divided this subgenus into two groups as below and each of two species known from India is included in the respective group.

Elytral apex with one spine in continuation of epipleural angle (very reduced in one or two species) ventral side concolorous. Metacoxal border straight.....*unidentatus* (Abu )

Elytral apex normally with 2 spines, one in continuation of epipleural angle and another in continuation of parasutural angle, reduced in exceptional cases. Ventral side non-concolorous but with yellow epipleurae. Metacoxal border subsinuate in terminal portion.....*spinosus* (Fabricius)

2. *Dineutus* (*Spinosodineutus*) *spinosus* (Fabricius)

(Text figs. 14A, 31B, 34A, 44A)

Gyrinus spinosus Fabricius, 1781, *Species Insectorum*, p. 298; (T.L.—

(1) *Dineutus spinosus* Fabricius, *orientalis* Modeer and *neoguineensis* R gimbart.

- Coromandal-Brit.Mus.), 1887, *Mant. Ins.* 1: 194; 1792, *Entomologica Systematica*, 1: 203; Oliver, 1795, *Ent. Hist. Nat. Ins. Coleopteres*, 3: 41, pl. 1, f. 7; Fabricius, 1801, *Syst. Eleuth.*, 1: 275; Försberg, 1821, *Nov. Act. Upsal.*, 8: 300; Perty, 1931, *Obs. Col. Ind.*, p. 122.
- Dineutes spinosus*: Aubé, 1838, *Species Coleopteres*, 6: 789; Motschulsky, 1861, *Bull. Soc. Imp. Moscou*, 34: 109; Régimbart, 1882, *Ann. Soc. ent. Fr.*, (6) 2: 425, pl. 12, f. 48, 48a; 1888, *Annali Mus. civ. Stor. nat. Giacomo Doria*, (2) 6: 619; 1891, *Annali Mus. civ. Stor. nat. Giacomo Doria*, (2) 10: 547; 1904, *Mission Favie*, 3: 81; Nowrojee, 1912, *Mem. Dept. Agric. India*, (Ent.ser.2) 9: 177.
- Dineutus (Gyrinodineutus) spinosus*: Ochs, 1926, *Ent. Zeitschr.*, 40: 136; 1927, *Kol. Rundsch.*, 13: 40; 1927, *J. fed. Malay. St. Mus.*, 13: 245; 1928, *Ent. Bl. Biol. Syst.*, 24: 43; 1929, *J. fed. Malay St. Mus.*, 14: 401; *Rec. Indian Mus.*, 31: 247,
- Dineutus spinosus*: Vazirani, 1958, *Rec. Indian Mus.*, 53: 16.
- Dineutus (Spinodineutus) spinosus*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19, Gyrinoidea, p. 10; Mouchamps, 1949, *Bull. Anns. Soc. r. ent. Belg.*, 85: 232, pl. 1 fig. 7, III, IV, fig. 5, V fig. 6, Vazirani, 1977, *News. zool. Surv. India*, 3(6): 291.
- Dineutus (Spinodineutus) spinosus nepalensis* Ochs, *Rec. Indian Mus.*, 31: 247 (T.L. Soondrijal Nepal valley, 1 ex 'Type'—Z.S.I.); Mouchamps, 1949, *Bull. Anns. Soc. r. ent. Belg.*, 85: 234.

Length: 7.0—8.0 mm.

Oval, elongate, sufficiently slender, convex, rather depressed posteriorly.

Head: black with lateral sides bronze; reticulation distinct on the disc, progressively reduced posteriorly and becoming hardly visible. Fronto-clypeal suture sub-straight in the middle. Clypeus reflecting bronze or green, distinctly reticulate, moderately densely punctate. Some large punctures in the ocular region, disc covered with micropunctuation and microreticulation; reticulation more distinct anteriorly and punctation more distinct posteriorly. Antennae black. Palpi ferruginous, labrum bronze, densely and doubly punctate.

Pronotum: black, sometimes bronze, lateral margins yellow, except the fine reborder which are brownish. Lateral margins a little arched/convex and raised. Anterior border sinuate behind

the eyes ; the posterior border laterally sinuate and projected a little backwards in the region of scutellum. Reticulation a little visible on the disc, much more distinct laterally. Punctuation somewhat large and sparse on the disc, deep, twice the size of micropunctures, sufficiently dense but fine elsewhere.

Elytra: black, sometimes bronze, very variable, with a large yellow lateral band, except the fine reborder which is blackish ; posteriorly the lateral margin being prolonged into a blackish spine. 7 striae discernible though faint, punctures very fine. Microreticulation distinct. Interstrial punctures moderate, fine, quite dense and irregularly arranged. The epipleural angle, nearly straight and strongly pointed, the notch formed by it and the spine broad. The apex with double truncature and parasutural spine present, the truncated areas with minute denticles. Sutural angle feebly obtuse, somewhat straight, with 2 or 3 small denticles faintly visible.

Ventral side: entirely testaceous to ferruginous, legs somewhat lighter in shade. Epipleura testaceous to yellow. Furrows for the reception of legs distinct and brownish. Internal border of pro-tibiae sub-straight in both the sexes, antero-external angle of produced into a spine, sub-truncate. Metacoxal process obliquely truncate, external border distinctly sinuate in the terminal portion. Posterior border of the fourth abdominal sternite sinuate in the middle.

Sexual characters: Male anterior tarsi dilated; posterior border of the fourth sternite sub-straight; aedeagus with penis shorter than the parameres, regularly narrowed to the apex, the lateral sides arched, the apex pointed. Female anterior tarsi not dilated.

Remarks: This species is variable in (a) colouration of the dorsal surface, which is sometimes iridescent purple, blue and green, (b) the spines of the apex of elytra are also variable in length, based on this character Ochs, 1929 created a subspecies from Nepal on a single example. Since this character is variable and considering the total range of distribution of the species, the specimens from Nepal are not considered a separate subspecies. These specimens do not constitute a separate zone of geographical isolation.

This species is closely related to *orientalis* Modeer which occurs in Indochina, Japan, Formosa, China, Manchuria and Korea. The distinguishing characters between the two species are based on sexual characters only,

Parasutural spine longer (equally long in both sexes) ; posterior border of the 4th abdominal sternite sub-straight or sub-sinuate but not prolonged in the middle.....*spinosus*

Parasutural spine shorter in female ; posterior border of the 4th abdominal sternite prolonged in the middle.....*orientalis*

Distribution: INDIA: Uttar Pradesh: Lucknow, Nainital District. Bihar: Pusa, Kierpur, Saran District, Santal Parganas. West Bengal: Calcutta, Murshidabad, Darjeeling District. Assam: Sili-guri, Mangaldai, Tezpur, Selaikusi, Kowpati, Gauhati District. Meghalaya: Shillong. Orissa: Puri. Tamil Nadu: Coromandal, Tranquebar. BANGLADESH. BURMA. THAILAND. MALAYSIA. LAOS. VIETNAM.

3. *Dineutus* (*Spinosodineutus*) *unidentatus* (Aubé)

(Text figs. 1B, 4, 14C, 32D, 34B, 44B)

Dineutus unidentatus Aubé, 1838, *Species Coleopteres*, 6: 788 (Brazil wrongly reported); Régimbart, 1882 *Ann. Soc. ent. Fr.*, (6) 2: 424, pl. 12, f. 46; 1889, *Ann. Soc. ent. Fr.*, (6) 9: 156; Severin, 1890, *Bull. Soc. ent. Belg.*, 34: 194; Nowrojee, 1912, *Mem. Dept. Agric. India*, (Ent. Ser. 2) 9: 177; Peschet, 1928, *Opusc. Inst. Scient. Indoch.*, 1: 4.

Dineutus (*Cyclous*) *unidentatus*: Hatch, 1925, *Bull. Brooklyn ent. Soc.*, 20: 110.

Dineutus (*Gyrinodineutus*) *unidentatus*: Ochs, 1926, *Ent. Z. Frankf.*, 40: 112, 136; 1927, *J. fed. Malay St. Mus.*, 13: 245; 1928, *Ent. Bl. Biol. Syst.* 24: 43, 1929, *Rec. Indian Mus.*, 31: 242, 245; 1929, *J. fed. Malay St. Mus.*, 14: 401.

Dineutus (*Spinosodineutus*) *unidentatus*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19, Gyrinoidea, p. 12; Mouchamps, 1949, *Bull. Annls. Soc. r. ent. Belg.*, 85: 221, pl. 1, 3, 4, fig. 1; pl. 5, fig. 2. (T.L.—Brazil wrongly reported; considers India: Pondicherry as type-locality on the basis of female example labeled 'Type' in *Inst. Roy. des Science Naturelles*, Brussels); Vazirani, 1977, *Newsl. zool. Surv. India*, 3(5): 251, 291.

Dineutus unidentatus,: Vazirani, 1958, *Rec. Indian Mus.*, 53: 16.

Length: 6.0—7.2 mm.

Head: black, iridescent with green or copper colours anteriorly and on the sides; punctation fine and sparse on the disc; reticulation distinct, except posteriorly. Fronto-clypeal suture sub-straight in the middle. Clypeus bronze coloured, reticulation distinct, double, some points very sparse. Antennae black, palpi ferruginous, labrum bronze coloured, convex with distinct reticulation.

Pronotum: black, greenish on sides, lateral margin little arched, distinctly raised, anterior border sinuate behind eyes, posterior border distinctly projecting behind in region of scutellum. Anterior angles projecting in front, pointed, a little re-entrant; posterior angles almost right angled and somewhat blunt. A row of punctures behind head (striae retrocephalique of Mouchamps) sub-parallel to anterior border, distinctly interrupted on disc. On outer side, some small vertical striations present in post-ocular region. Reticulation on disc somewhat strong, laterally very distinct. Punctation sparse and little visible on the disc.

Elytra: black, with marginal edge slightly raised; serial striae of fine punctures hardly visible. Microreticulation distinct. Punctation sparse and dense but visible on whole of elytra. Epipleural angle extended into a strong spine, a little stright, notch formed by it broad and regular, variable in both sexes. Apex with double truncature and fine denticles; both truncated portions unequal; parasutural angle obtuse, rounded; sutural angle almost right angled, attenuated.

Ventral side: ferruginous, sternum and epipleurae concolourous. Internal border of anterior tibiae substraight in both sexes, metacoxal process obliquely truncate and apex pointed on outer side; metacoxal process not sinuate in terminal portion.

Sexual characters: Male anterior tarsi distinctly dilated. Prothibiae with apical-external angle prominent. Aedeagus with penis subequal to parameres, lateral borders subparallel in anterior two thirds, with a feeble median triangular apex attenuated into a strong blunt point. Parameres with subparallel borders, slightly

reduced in apical one-third, apex rounded and a little truncate. Female tarsi not dilated. Protibiae with antero-external angle a little blunt. Ovipositor plate, bituberculate at apex, outer tubercle more distinct than internal, both are separated by a small notch. Outer border arched/convex, internal a little depressed. Paravalvifer elongate, slightly arched.

Variation: Though this species is widely distributed the variation is comparatively less than in *spinus*. There is some variation in size and density of punctation on elytra.

Distribution: INDIA: Rajasthan: Ajmer. Bihar: Konbir, Berway, Pust, Saran District. Meghalaya: Shillong, Madhya Pradesh: Mandla District. Orissa: Gurguria R. F., Balassore, Talcher, Angue. Kerala: Tuticorin District. Tamil Nadu: Madras, Tanjore District, Yarcaud (Shevaroy hills) SRI LANKA, BURMA, MALAYSIA, THAILAND, INDOCHINA, INDONESIA.

4. *Dineutus* (*Protodineutus*) *Ochs*

Type-species: *aereus* Klug, by original designation.

Dineutus (*Protodineutus*) *Ochs*, 1926, *Ent. Z. Frankf.*, 40: 66; Hatch, 1926, *Pap. Mich. Acad. Sci.*, 7: 344; *Ochs*, 1930. *Cat. Indian Ins.*, pt. 19, Gyrinoidea, p. 13.

Diagnostic characters: Last segment of the female protarsi without a longitudinal furrow with hairs. Elytra without any spines-epipleural or parasutural.

5. *Dineutus* (*Protodineutus*) *indicus* *Aubé*

(Text figs. 1A, 3, 9, 10A, 14B, 31A, 33D)

Dineutus indicus *Aubé*, 1938, *Species Coléoptères*, 6: 772 ('India-Orient'); *Régimbart*, 1882, *Ann. Soc. ent. Fr.*, (6) 2: 405; *Severin*, 1890, *Bull. Soc. ent. Belg.*, 34: 194; *Sharp*, 1890, *Scientific Results 2nd. Yarkand Mission*, p. 39; *Régimbart*, 1891, *Ann. Soc. ent. Fr.*, 60: 666; 1892, *ibid*, 62: 104; *Lesne*, 1902, *Bull. Soc. ent. Fr.*, 5, 1892 p. 86; *Régimbart*, 1902, *Ann. Soc. Ent. Fr.*, 71: 470; 1903, *ibid*, 72: 334; *Fowler*, 1912, *Fauna Brit. India*, p. 65, f. 30; *Zimmermann*, 1917, *Ent. Mitt.*, 6: 135; *Kempers*, 1923, *Ent. Mitt.*, 12: 75 f. 62 (wing).

Dineutus indicus: Ochs, 1924, *Ent. Bl. Biol. Syst.* 20: 234. Vazirani; 1958, *Rec. Indian Mus.*, 53: 16.

Dineutus (Protodineutus) indicus: Ochs, 1926, *Ent. Z. Frankf.*, 40: 137; 1929, *Rec. Indian Mus.*, 31: 242, 245; 1930, *Cat. Indian Ins.*, pt. 19, Gyrinoidea, p. 13, Vazirani, 1977, *Newsl. Zool. Surv. India*, 3(5): 251, 279.

Length: 12.0—15.0 mm.

Head: black with clypeus and lateral sides showing bronze and green iridescence. Reticulation distinct, double, microreticulation within larger, irregular areoles, getting obsolete posteriorly. Punctuation fine and quite close anteriorly and sparse posteriorly. Frontoclypeal suture almost straight. Clypeus more strongly reticulate than the head, with very sparse punctures; surface almost rough due to strong reticulation. Antennae black. Labrum with blue iridescence; slightly convex along the anterior margin; punctuation moderate, punctures separated by 3-4 times their own diameter.

Pronotum: black; lateral margins slightly oblique, substraight, distinctly raised; anterior border distinctly projecting backwards in the region of scutellum. Anterior angles projecting in front, pointed; posterior angles slightly curved inwards, forming distinctly effaced on disc. Reticulation strong, more so on sides. Punctuation moderate and very close, more so on sides.

Elytra: black, feebly striate; reticulation very fine, subtle, giving the surface somewhat mat appearance, punctuation double, consisting of major and minor punctures, quite well impressed; external apical angle very obtuse and rounded, more or less sinuate; internal apical angle straight and less rounded than external angle.

Ventral surface: black; middle and posterior legs reddish, epipleura black.

Sexual characters: Male anterior tibiae with external apical angle obtuse; anterior tarsi subparallel, hardly broadened. Aedeagus with penis equal to parameres in length, regularly narrowed to apex, rounded and blunt; parameres subparallel, rounded towards apex, external sides more so. Female anterior tibiae and

tarsi almost similar to male, only slightly narrower ; ovipositor plate more than twice longer than broad, twisted on itself in basal region, outer sides rather oblique, inner angles obtuse and rounded.

Remarks: This species is close to *D. africanus* Aubé from which it can be separated by the form generally more depressed and more attenuated anteriorly ; the elytra in this species are more feebly striate, apex less sinuate on outer side, sutural angles less rounded and femora in male, with a tooth on the internal border, a little before apex.

Distribution: INDIA: Kashmir: Jhelam Valley. Punjab: Dharampur Koa : Pinjore. Himachal Pradesh : Kangra. Kandagadh, Kalka, Simla hills, Kasauli. Rajasthan : Gujrat : Junagadh, Dakar, Uttar Pradesh : Dehra Dun, Mussorie, Rajpura, Arnigad. Bihar : Sabibganj, Rajmahal, Tinpaper, Birbhumi, Konbire ; Morel River, Santal parganas, Gurmani River, Paresnath, Ranchi, Paresnath hill, Chota Nagpur, Ghadkuri-Menharpur. West Bengal : Calcutta, Burja, Berhampore Court, Murshidabad, Raniganj, Tetara, Kalimpong. Madhya Pradesh : Kharmer Nullah, Amarkantak, Sone river, Kepilldhara Falls, Jabalpur District, Jabalpur, Joithari Range, Umaria, Lalpure. Maharashtra : Bombay ; Matheram ; Khandesh, Palni hills, Shembaganur. Ramnad District, Nathampata, Nechal, Moleshwar, Khandala, Cherlotle, Ahmednagar, Gokak. Poona Dist : Poona, Nasarpur, Vadgaon, Phulambri, Saswad, Lingamala, Bhivri, Bhimashankar, Manduril. Satara Dist. : Mahableshwar. Aurangabad Dist.: Aurangabad, Sultangad. Orissa : N. Simlipal Range, Mayurbhanj Dist.: Rembha; Burrapani, Kurkai, Simlipal hills. Karnataka: Bangalore, Coorg, Kanara, Belgaum, Dkhan, Andhra Pradesh : Ydayagiri, Horsleykonda, Vizagapatnam, Palkonda hills. Kerala : Nilambwe, Dhoni Forest. Tamil Nadu : Eanur, Trangqueber, Kodeikanal, Sheveroy hills, Shembaganur. Madura, Nethampatti, Wallardi, Mettupalayam, Coimbatore, Maruthamlei. Pondicherry : Mahe. PAKISTAN.

Subfamily GYRININAE

Diagnostic characters: Episternum of mesosternum not touch-

ing elytral epipleura, apical abdominal sternite more or less rounded, flattened, without any longitudinal row of hairs; hind legs broader on outer than on inner side, outer margin broadly concave; metasternal wings strongly narrow and feeble and dilated on outer side; antennae 9 segmented. Pronotum and elytra without pubescence; elytral suture, bordered; pronotum without bristle carrying pit, at its posterior end; maxilla with galea.

General: The tribe is composed of generally moderate sized insects, not more than 9.0 mm. long. They occur in groups of large numbers in streams and ponds near streams where the waters are relatively calm. This tribe is represented in India by 3 genera *Gyrinus* Geoffroy, *Aulonogyrus* Motschulsky and *Metagyrynus* Brinck (= *Paragyrynus* Ochs).

KEY TO GENERA OF INDIAN GYRININAE

1. Pronotum with transverse grooves; elytral striae in the form of punctures; border of pronotum and elytra never yellow; propygidium not trilobed.....*Gyrinus*
 Pronotum without any transverse grooves; elytral striae in the form of furrows; border of pronotum and elytra yellow; propygidium trilobed.....2
2. Scutellum short and broad, length shorter than width; space between the elytral striae convex; dorsal portion of eye scarcely anterior to the ventral portion of eye.....*Aulonogyrus*
 Scutellum long and slender, longer than broad; space between two elytral striae flat; dorsal portion of eye anterior to the ventral portion.....*Metagyrynus*

Genus 2 *Aulonogyrus* Motschulsky*

Type-species: *Aulonogyrus concinnus* Klug vide. Ochs, 1930, *Catalogue Indian Ins.*, pt. 19: 3.

* Balfour-Browne 1950 and Brinck 1955, have considered Régimbart as its author, but under article 16 (a) (v) & (vi) of the International Code of Zoological Nomenclature Motschulsky is the author, since the name was published in combination with *striatus* Motschulsky 1853.

Aulonogyrus Motschulsky, 1853, *Hydrocanthares Russia*, p. 9; (without any description, but name published in combination with *striatus* Motschulsky); Régimbart, 1883, *Ann. Soc. ent. Fr.*, (6) 3: 124; 1902; in Wytstman, *Genera Ins.*, 1: 6; Hatch, 1925, *Pap. Mich. Acad. Sci.*, 3: 456; Ochs, 1930, *Cat. Indian Ins.*, pt. 19, Gyrinoidea, p. 3, Balfour-Browne, 1950, *British water beetles*, 2: 335; Brinck, 1955, in *South African Animal Life*, 1: 334.

Diagnostic characters: Preocular notch penetrating eyes a little, not reaching middle of eyes on upper side. Pronotum without transverse grooves on disc but punctate and finely reticulate; lateral margins of pronotum and elytra yellow, interstrial space convex; dorsal portion of eye scarcely anterior to ventral portion of eye, not so in subgenus *Pterygrus*; propygidium always strongly trilobed; elytral striae present as furrows laterally, more or less reduced towards suture, sometimes anterior legs slender, scarcely modified, propygidium strongly trilobed.

The genus contains about 50 spp. the majority of which occur in the Ethiopian region. 2 spp. are chiefly Mediterranean, 1 is recorded from S. India and Sri Lanka (Ceylon), 1 from Australia and Norfolk Islands and 1 from New Caledonia.

6. *Aulonogyrus obliquus* (Walker)

Gyrinus obliquus Walker, 1958, *Ann. Mag. nat. Hist.*, (3) 2: 205 (T.L.—Ceylon—M.M.); Motschulsky, 1861, *Bull. Soc. Imp. Moscou*, 34: 109.

Aulonogyrus obliquus Régimbart, 1883, *Ann. Soc. ent. Fr.*, (6) 3: 137; 1893, *ibid*, 62: 104; 1902, *ibid*, 71: 470; 1903, *ibid*, 72: 334; Zimmermann, 1917, *Ent. Mitt.*, 6: 142; Ochs, 1930, *Cat. Indian Ins.*, Gyrinoidea, pt. 19: 3; Vazirani, 1958, *Rec. Indian Mus.*, 53: 16, Ochs, 1966, *Mitt. munch. ent. Ges.*, (5) 56: 179.

Length: 6.0—7.0 mm.

Head: black with green-bronze iridescence; frontoclypeal suture distinct; clypeus with bronze iridescence; reticulation distinct anteriorly, betting obsolete posteriorly, more impressed on clypeus punctation moderate but sparse, more close on clypeus. Labrum black, short, transverse without reticulation and punctation.

Pronotum: black, without yellow lateral margins; densely and strongly punctate giving the surface rough appearance; with feeble longitudinal median carina; anterior border, a little sinuate behind eyes; the ridge parallel on anterior border not interrupted in middle; posterior border not directed backwards in region of scutellum; anterior angles acute, posterior angles, subacute, slightly directed backwards.

Elytra: black without yellow border; with 10 striae unequally impressed, striae 1 and 2 (near the suture), 3-4, 5-6, 7-8, and 9-10 connected with each other near apex; striae 1-2, rather feebly impressed, 3-4 more impressed than 1-2, striae 7-10 more impressed than all others, specially near apex; interstitial surface between 7-6, 8-9 and 9-10 more convex than rest; reticulation unequal; punctation between striae fine and very close. Apex truncate; external angle obtuse; sutural angle almost straight, rounded.

Ventral surface: black, with mesosternum, legs and epipleura reddish yellow, epipleurae rather broad.

Sexual characters: Male—anterior tibiae, elongate triangular, tapering in posterior half; external apical angle rounded, anterior tarsi broader than in female, convex on outer side. Aedeagus with penis—a little shorter and narrower than parameres, gradually narrowing from base to middle, distal half more or less uniform in width, apex rounded. Parameres, inner apical angle subright angle, external angle obtuse, rounded; apex subtruncated. Female—anterior tarsi subparallel; ovipositor plate more than two and a half times longer than broad, straight on inner side, irregularly convex on outer side; external angle obtuse and rounded inner angle sub right angle.

Remarks: This species is closely related to *A. caffer* Aubé, an Ethiopian species but differs from it (i) in being a little less convex (ii) surface more shining (iii) elytral furrows/striae more distinct (iv) sixth interstitial space distinctly convex, 8th smooth, shining and marked with elongate punctures, arranged without order; 7th, 9th, 10th interstitial spaces opaque reticulation, distinct but effaced only posteriorly while in the case of *caffer*, the four external furrows are opaque and with reticulation (as against the three external furrows).

Distribution: INDIA: Madhya Pradesh: Rewa Dist., Andhra Pradesh: Eastern Ghat. Tamil Nadu: Madras, Yercaud, Kodai-kanal, Ootacamund, Coonor R., Annamalai hills, Nilgiri hills, Nadupatam. SRI LANKA.

Genus 3 *Metagyrimus* Brinck

Type-species: *Paragyrimus sinensis* Ochs by original designation.

Paragyrimus Ochs, 1924, *Ent. Bl. Biol. Syst.*, 20: 231; 1930 *Cat. Indian Ins.*, Gyrinoidea, pt. 19: 4 (Preoccupied by *Paragyrimus* Handlirsch, 1908, *Die Fossilen Insecten*: 448).

Metagyrimus Brinck, 1955, *Acta. Univ. Lund*, (N.F.) 51(16): 37 (nom.nov.).

Diagnostic characters: Scutellum long and slender, longer than broad; dorsal portion of eye anterior to ventral portion; space between elytral striae rather flat; pronotum without transverse grooves; borders of pronotum and elytra yellow; apex of last abdominal sternite rounded.

7. *Metagyrimus arrowi* (Régimbart)

Aulonogyrus arrowi Régimbart, 1907, *Ann. Soc. ent. Fr.*, 76: 161 (T.L.N.W. India-Paris Mus.).

Paragyrimus arrowi, Ochs, 1924, *Ent. Bl. Biol. Syst.*, 20: 231; 1930, *Cat. Indian Ins.*, Gyrinoidea, pt. 19: 4; Vazirani, 1958, *Rec. Indian Mus.*, 53: 16; Ochs, 1966, *Ergebn Forsch—Unternehmen Nepal Himalaya*, 1(4): 243.

Metagyrimus arrowi, Vazirani, 1977, *Newsl. Zool. Surv. India*, 3(5): 291.

Length: 5.0—5.5 mm.

Head: black; strongly reticulate, giving the surface rough appearance; punctation not distinct; clypeus with reticulation stronger than on head. Labrum short, transverse, black, with blue iridescence; reticulation similar to that on head but less distinct; impunctate.

Pronotum: black, with lateral margins yellow, slightly oblique and flat, not rebordered; without any transverse furrows; anterior border sinuate behind eyes, with a fine ridge, complete and parallel to anterior border; posterior border projecting a little

backwards in region of scutellum. Anterior angles subright angled; posterior angles acute, somewhat pointed. Scutellum elongate, triangular.

Elytra: black, with lateral margin yellow, slightly flat; external angle obtuse and rounded; internal angle sub-straight and rounded. Striae not so deep, almost uniform, consisting of small elongate punctures; interstrial spaces flat, strongly reticulate but less so than on pronotum and giving the surface mat appearance. Punctuation indistinct.

Ventral surface: testaceous with legs and epipleura yellowish.

Sexual character: Male anterior tibiae, rather slender, slightly tapering to base, outer apical angle subobtuse, without any denticles; anterior tarsi slightly broadened. Aedeagus with penis almost as long as parameres, quite broad in basal half, very slightly narrowed to apex, rounded and with a slight notch at apex; parameres slightly narrowed in middle, apex truncate with round angles; anterior tibiae almost slender, tarsi parallel. Female ovipositor plate elongate, rectangular, internal angle substraight, rounded, external angle very much obtuse, apex ablique.

Remarks: This is the only species of this genus occurring in India. It appears to be related to *P. sinensis* Ochs from which it can be easily separated by its distinctive male genitalic characters.

Distribution: INDIA: Himachal Pradesh: Kangra valley. Meghalaya: Shillong, Nawphlong. Uttar Pradesh: Chakrata, Bodyar. NEPAL, LAOS.

Genus 4 *Gyrinus* Geoffroy 1762

Type-species: *Dytiscus natator* Linnaeus vide Latreille 1810, *Cons. Gen. Ordr. nat. anim.*, Paris; (Vide Guignot, 1946, *Rev. franc. ent.*, 13: 118).

Gyrinus Geoffroy, 1762, *Hist. Ins. Paris*, 1: 193, Degeer, 1774, *Mem. Hist. Ins.*, 4: 361, pt. 13, f. 16-20; Latreille, 1810, *Cons. Gen. Ordr. nat. anim.*, Paris; Lacordaire, 1835, *Fauna Ent.*, Paris, 1: 340; Brulle, 1835, *Hist. Nat. Ins.*, (5) 2: 235; Aubé, 1836-38, *Iconographie Coleopteres Europe*, 5: 380; 1838, *Species Coleo-*

pteres; 6: 655; Suffren, 1842, *Stettin. ent. Ztg.*, 3: 219; Lacordaire, 1854, *Genera Col.*, 1: 438; Régimbart, 1883, *Ann. Soc. ent. Fr.*, (6) 3: 141, 1902, in Wytzman, *Genera Ins.*, 1: 7; Zaitzev, 1907, *Rev. russe Ent.*, 7: 238; Zimmermann, 1917, *Ent. Mitt.*, 6: 143; Hatch, 1925, *Pap. Mich. Acad. Sci.*, 5: 457; 1926, *Zool. Anz.*, 68: 184; Ochs, 1930, *Cat. Indian Ins.*, Gyrinoidea pt. 19: 4; Brinck, 1955, *South African Animal Life*, 1: 395.

Diagnostic characters: Pronotum with transverse grooves, elytral striae in form of punctures, generally 10-11 striae; border of pronotum and elytra black very rarely with a yellow lateral margin. Preocular notch, penetrating eyes, just up to middle of upper eye. Size 3.0-8.0 mm. Usually shining black or with a metallic tinge. Anterior legs slender but scarcely modified. Species occurring throughout the world, chiefly in the temperate regions.

KEY TO INDIAN SPECIES

1. Epipleura testaceous or ferruginous.....2
Epipleura black or rarely very feebly tinged
with reddish.....3
2. Length 6.0—7.0 mm; serial punctation
minute, not very close, punctation on outer
striae gradually larger.....*distinctus*
Length 5.75 mm; serial punctation suffi-
ciently minute, close, hardly larger on the
outer striae (external epical angle of
anterior tibiae, straight, hardly prominent).....**ceylonicus*
3. The outer six striae of the elytra deepened
into furrows; size 4.5—5.0 mm.....*smaragdinus*
The outer six striae of the elytra not
deepened into furrows, size 4.0—4.5 mm.....*convexiusculus*

8. *Gyrinus convexiusculus* Macleay

Gyrinus convexiusculus Macleay, 1871, *Trans. ent. Soc. N.S. Wales*, 2: 128 (T.L. Australia:) Régimbart, 1883, *Ann. Soc. ent. Fr.*, (6) 3: 166, pt. 6 f. 88 (Madras); Fauvel, 1883, *Revue Ent.*, 2: 349; Régimbart, 188*, *Ann. Soc. ent. Fr.*, (6) 6: 257; Severin, 1890, *Bull. Soc. ent. Belg.*, 34: 194; Fauvel, 1903, *Revue ent.*,

* Not so far known from India.

22: 255; Zaitzev, 1907, *Rev. Suisse Ent.*, 7: 242; Peschet, 1923, *Opusc. Inst. Scient. Indoch.*, 1: 7; Ochs, 1924, *Ent. Bl. Biol. Syst.*, 20: 229; 1930, *Cat. Indian Ins.*, pt. 19, Gyrinoidea, p. 6; Ochs, 1927, *Suppl. Ent.*, 15: 115. 121; 1928, *Ent. Bl. Biol. Syst.*, 24: 42; 1929, *Rec. Indian Mus.*, 31: 241; 1949, *Rec. Australian Mus.*, 22(2): 172, Vazirani, 1958, *Rec. Indian Mus.*, 53: 16; 1977, *Newsl. zool. Surv. India*, 3(5): 251, 291.

Gyrinus nitidulus Aubé, 1838, *Species Colepotes*, 6: 700 (T.L.—India Orient.) Motschulsky, 1861, *Bull. Soc. Imp. Moscou*, 34: 109 (Ceylon) (Syn. vide Régimbart, 1883).

Gyrinus buttoni Pascoe, 1877, *Ann. Mag. nat. Hist.*, (4) 19: 141 (T.L.—New Zealand: Waikato); Brown, 1880, *Manual New Zealand Col.*, p. 76; Régimbart, 1866, *Ann. Soc. ent. Fr.*, (6) 6: 257, Tilyard, 1926, *Insects of Australia and New Zealand*, p. 194 (Syn. vide Régimbart, 1907: 171).

Length: 4.0—4.5 mm.

Head: black, without any iridescence; frontoclypeal suture substraight; punctation and reticulation indistinct. Clypeus rugose in appearance due to dense punctation and reticulation. Labrum black, short, transverse, truncate along anterior border; reticulation rough. Interocular space with transversely arranged, two foveae.

Pronotum: black, without any visible reticulation and punctation; with a few feeble, transverse, irregular furrows. Lateral margins rebordered, slightly oblique, both anterior and posterior angle acute. Anterior border feebly sinuate behind eyes; a ridge parallel to anterior border distinct behind eyes but interrupted in middle; posterior border slightly projecting backwards in region of scutellum. Scutellum distinct, triangular, anterior border slightly concave but not 'V' shaped; without carina or ridge.

Elytra: black, without iridescence; with 11 striae of punctures, outer 3-4 striae with deeper punctures (normal in apical region) than inner ones, striae joined at apex. The inter-strial spaces without any punctation or reticulation; almost flat except the outer 3, which are rather convex in basal half.

Ventral surface: black, anal sternites and epipleura ferruginous to black; legs reddish yellow.

Sexual characters: Anterior tibiae in male almost cylindrical

only slightly narrowed at base; external apical angle obtuse, rounded, with a few denticles; anterior tarsi scarcely broader than tibiae; aedeagus with penis almost as long as parameres, slightly broader than parameres in basal half, uniformly narrowed in apical half, apex broadly rounded; parameres rounded towards apex. Anterior tibiae in female almost similar to that in male, anterior tarsi subparallel; ovipositor plates more than $2\frac{1}{2}$ times longer than broad, both internal and external angles of apex, obtuse and rounded, outer angles more so.

Remarks: Among the species occurring in this region, it can be very easily separated from *distinctus* by the ferruginous—black epipleurae, from *smaragdinus* it can be separated (i) in the absence of iridescence on head and elytra (ii) lateral striae of the elytra not deepened into furrows (iii) apex of penis rounded.

Distribution: INDIA: Bihar: Ranchi Dist., Chappa Dist., Koina Range. Assam: Mikir hills, Meghalaya: Shillong, Khasi hills. Madhya Pradesh: Jaithari range, Rewa Dist., Mandla Dist. Orissa: Gunguria R.F., Mayurbhanj Dist., Andhra Pradesh: Palkonda hills. Karnatka: Bangalore, Tamil Nadu: Salem Dist., Nilgiri hills.

9. *Gyrinus distinctus* Aubé

(Text figs. 16A, 31D, 33C)

Gyrinus distinctus Aubé, 1838, *Iconographic Coleopteres Europe*, 5: 383, pl. 43, f. 3; (———); 1838, *Species Coleopteres*, 6: 666; Seidlitz, 1887, *Verh. naturf. var. Brünn.*, 25: 115; Zimmermann, 1917, *Ent. Mitt.*, 6: 150, p. 6, f. 10; Ochs, 1930, *Cat. Indian Ins.*, pt. 19, Gyrinoidea, p. 7, *Gyrinus (s.str.) distinctus* Gneorguiev, 1964, *Reichenbachia, Mus. Tierk. Dresden*, 4(28): 259 (Afghanistan, Mongolia, China; Sinkiang).

Gyrinus colymbus Erichson, 1837, *Kaf. Mark., Brandenburg*, 1: 191 T.L.—Germany nr. Berlin). Suffren 1842, *Stett. ent. Ztg.*, 3: 247. Edward, 1890, *Entomologist*, 23: 180; Zaitzev, 1907, *Rev. rusee Ent.*, 7: 241; Sharp, 1914, *Entomologist, mon.*, (2) 25: 135, pt. 9, f. 7, pl. 10, f. 14; Balfour-Browne, F., 1950, *British Water Beetles*, 1: 356.

Gyrinus hungaricus Seidlitz, 1887, *Verh. naturf. var. Brünn*, 25: 115.

Gyrinus distinctus var. *striolatus* Fowler, 1887, *Col. British Islands*, 1: 215.

Gyrinus distinctus var. *strigulosus* Régimbart, 1891, *Ann. Soc. ent Fr.*, 60: 677. (syn. vide Sharp, 1914)

Length: 6.0—7.0 mm.

Head: black, shining, with green, blue or occasionally bronze iridescence on the sides; frontoclypeal suture distinct. Reticulation obsolete. Punctuation fine, irregular, quite sparse. Clypeus black with blue iridescence; reticulation strong rugose, punctuation moderate. Labrum transverse, black, reticulation distinct.

Pronotum: black, shining with transverse furrows; anterior border sinuate behind the eyes, a ridge parallel to anterior border directed backwards in the region of scutellum; lateral margins substraight, slightly oblique, rebordered and raised; anterior angles obtuse and rounded, posterior angles subacute, rounded and fitting into elytra. Reticulation indistinct; punctuation fine. Scutellum elongate, triangular, anterior border 'V' shaped.

Elytra: black with metallic iridescence as on head; striae arranged as shown in (Text fig. 16A); the striae consisting of very fine punctures, rarely larger on the middle striae, less close and stronger on sides; interstriae covered with very fine punctures, evenly spaced and of same size and depth; sometimes surface reticulate when the main punctuation becomes obscure. Truncature of apex a little oblique and broadly rounded; the external angle obtuse more or less rounded, the internal angle straight and slightly rounded. Lateral sides narrowly rebordered and terminating in the posterior angle.

Ventral surface: black, with the mesosternum and anal sternite somewhat ferruginous, epipleurae and legs reddish.

Sexual characters: Male—with anterior tibiae quite narrow, in the posterior half; external apical angle rounded, with denticles; protarsi subparallel, hardly broadened. Aedeagus with penis a little shorter than the parameres, narrowed in the middle portion otherwise equally broad; apex broadly rounded; parameres broader in the apical half, apex rounded. Female ovipositor plate rectangular, about $2\frac{1}{4}$ times longer than broad, external angles more rounded than inner angle.

Remarks: It is very easy to distinguish this species from *convexiusculus* occurring in India by (i) larger size 6.0—7.0 mm. against 4.5—5.0 mm. (ii) shape of the scutellum which is 'V' shaped along anterior border (iii) punctation on elytra (iv) different shape of penis (v) epipleurae reddish as against black. Otherwise this is closely related to two palaeartic species *caspius* Menetries and *natator* Linnaeus. From these two it is distinguished by its elytral punctation and shape of male and female genitalia. Balfour-Browne, 1950, has dealt with the synonymy etc. in detail for this species, which has been followed above.

Distribution: INDIA: Jammu and Kashmir: Chinar Bagh Nullah. EUROPE; SOUTHERN USSR.

10. *Gyrinus smaragdinus* Régimbart

(Text figs. 5, 10D, 11D, 12D, 15A, 32C, 35B)

Gyrinus smaragdinus Régimbart, 1891, *Annali Mus. Civ. Stor. nat., Gia Coma Doria*, (2) 10: 547 (T.L.—Meghalaya: Khasi Hill), Genova Mus. 1891, *Ann. Soc. ent. Fr.*, 60: 682; Zimmermann, 1917, *Ent. Mitt.*, 6: 164; Peschet, 1923, *Opusc. Inst. Scient. Indoch.*, 1: 7; Ochs, 1924, *Ent. Bl. Biol. Syst.*, 20: 230; 1930, *Cat. Indian Ins.*, pt. 19, Gyrinoidea, p. 8; Vazirani, 1947, *Newl. Zool. Surv. India*, 3(5): 291.

Length: 4.5—5.0 mm.

Head: black with green-blue iridescence; fronto clypeal suture substraight; punctation very fine and very sparse, reticulation indistinct. Clypeus rugose in appearance due to dense punctation and reticulation. Labrum black, with blue iridescence, anterior border slightly convex; punctation fine and close; reticulation indistinct. Interocular space with two small transversely arranged foveae.

Pronotum: black with green and reddish iridescence, with a few transverse, irregular furrows, punctation and reticulation indistinct. Lateral borders slightly oblique substraight and re-bordered; anterior border sinuate behind the eyes; a ridge parallel to anterior border interrupted in the middle; posterior border

slightly projecting backwards in region of scutellum. Anterior angles acute, rather pointed, posterior angles sub-acute, rounded. Scutellum distinct, triangular slightly convex along anterior margin; without any carine/ridge, punctation or reticulation.

Elytra: black with reddish iridescence, more so along the striae and furrows; with 11 striae of punctures, the outer six striae having deep punctures and giving the appearance of furrows, except in the apical one fifth portion where the punctures are normal; interstrial space without any punctation or reticulation; a slight oblique furrow at the apex of each elytron present; the striae joined at apex as shown in the figure.

Ventral surface: ferruginous to black, legs yellow, epipleurae reddish with distinct furrows for the reception of the legs.

Sexual characters: Anterior tibiae in male triangular, apical external angle obtuse not denticulate; anterior tarsi, subparallel, not broader than tibiae; aedeagus with penis quite strongly curved, narrowed in the middle, slightly protruding at the apex; parameres slightly broader than penis, more rounded at outer angles. Anterior tibiae in female rather narrower than in male, anterior tarsi almost parallel. Ovipositor plate rectangular, twice as long as broad, external angles more rounded and obtuse than internal angles, which are almost right angled.

Remarks: This species was described on the basis of specimens from two different localities (i) Burma: Carin Ascuii Ghecu and (ii) Khasi hills. A 'paratype' ex. female from Khasi hills is available in the Z.S.I. collection. This species can be very easily distinguished from *G. convexiusculus* on the basis of the outer six elytral striae of punctures being deepened into furrows and other characters as stated under *convexiusculus*.

Distribution: INDIA: Meghalaya: Khasi Hills: Shillong, Umsning, Dumpep.

Subfamily Oreochilinae

Diagnostic characters: Episternum of the mesothorax touching the base of elytral epipleurae; the apical abdominal sternite

elongate, flattened with a longitudinal ventral row of hairs. Pronotum and elytra pubescent punctate, either whole or laterally. Form elongate, strongly convex. The labrum varying very much in form, transverse, short somewhat truncated anteriorly in case of large number of species, in others semicircular or elliptical along the anterior border, always furnished with ciliae along the anterior margin, frontoclypeal suture generally distinct. Lateral margin of elytra generally flat. The truncature of apex of elytra varying very much. The middle legs more developed than in the other two subfamilies. Metasternum narrow towards the coxae and triangular on the outside as in Gyrininae. First ventral suture of the abdomen, rather entirely effaced. Parameres of aedeagus distinctly narrower than in other tribes, female ovipositor plates also elongate and narrow.

Genus 5. *Orectochilus* Eschscholtz

Type-species—*Orectochilus villosus* O. Muller

Orectochilus Eschscholtz, 1833, in *Dejean's Catalogue Coleopteres*, ed. II: 59; Lacordaire, 1835, *Fauna Entomologique*, Paris, 1: 344; Brulle, 1835, *Hist. Nat. Ins.*, 5(2): 234, 238; Aubé, 1836-38, *Iconographie Coleopteres Europe*, 5: 399, 1838, in *Dejean's Species Coleopteres*, 6: 726; Lacordaire, 1854, *Genera Coleopteres*, 1: 411; Régimbart, 1883, *Ann. Soc. ent. Fr.*, (6) 3: 385; 410; 1902, in Wytzman, *Genera Insectorum*, 1: 9; Hatch, 1925, *Pap. Mich. Acad. Sci.*, 5: 452; Balfour-Browne, 1950, *British Water Beetles*, 2: 367.

Diagnostic characters: Scutellum visible at least in one of the sexes, apical segment of protarsi less than one and a half times longer than the preceding segment.

General: It is a very large genus occurring in tropical countries of Asia. Only one species occurs in Africa and Europe. 'It generally occurs in running waters, streams and occasionally in perennial ponds. This large number of species was originally split by Régimbart 1883 into four groups as below:

1. Labrum more than 2 times as broad as long;
pronotum and elytra without yellow border...(species 202-206)* Gr. 1

* These nos. refer to Régimbart's species,

- Labrum at most 2 times as broad as long.
 Pronotum and elytra with yellow or ferruginous border.....(species 207-224) Gr. 2
- 2 External angle of the elytra more or less acute but without spine.....(species 255-230) Gr. 3
- External angle of the elytra sharp or prolonged into a spine, more or less projecting.....(species 231-235) Gr. 4

The genus was subsequently split into two subgenera by Hatch (1925) on the basis of dorsal pubescence whether it is whole or only lateral. Most of the species are placed in the subgenus *Patrus* which have only lateral pubescence on the pronotum and elytra.

KEY TO THE SUBGENERA OF *Orectochilus*

1. Pronotum and elytra entirely pubescent-punctate.....*Orectochilus* (s.str.)
- Pronotum and elytra pubescent-punctate on lateral sides only and glabrous in the middle.....*Orectochilus* (*Patrus*)

Subgenus *Orectochilus* (s. str.)

Diagnostic characters: Pronotum and elytra entirely pubescent—punctate.

KEY TO THE SPECIES KNOWN FROM INDIA

1. Epipleurae reddish, elytra more densely pubescent-punctate, penis less narrowed in the apical half; size 5.5-7.0 mm (North India, Bhutan).....*murinus*
- Epipleurae black, elytra less densely pubescent-punctate, penis narrower in the apical half; size 4.3-5.5 mm (South India).....*castesi*

11. *Orectochilus* (s. str.) *castesi* Régimbart

(Text figs. 17A, C)

Orectochilus castesi Régimbart, 1891, *Ann. Soc. ent. Fr.*, 60: 709
 (T.L.—Kodaikanal—Paris Mus.)

Orectochilus (s. str.) *castesi*: Ochs, 1930, *Cat. Indian Ins.*, 19: 18.

Length: 4.3—5.5 mm.

Head: black, without any iridescence; frontoclypeal suture distinct; anterior margin straight; reticulation distinct; quite well impressed; punctation moderate, more dense anteriorly than posteriorly. Labrum black, semicircular, twice broader than long, strongly punctate, anterior margin with white/grey ciliae.

Pronotum: black, punctate, pubescent; reticulation obsolete; anterior border without any parallel ridge; only slightly sinuate behind the eyes; posterior border almost straight; lateral margins straight, slightly oblique not rebordered. Anterior angles sub-right angled, posterior angle acute or rounded. Scutellum distinct, triangular, slightly broader than long, moderate sized, punctate.

Elytra: black, punctate pubescent; punctation more impressed and more remote than on pronotum; moderately broad at the shoulders; apex obliquely truncate; sutural angle quite straight, subright angled; external angle obtuse, rounded, truncature not much different in both sexes.

Ventral surface: black, epipleurae also black, anterior legs and last 3 abdominal sternites reddish, middle and hind legs darker.

Sexual characters: Male—anterior tibiae (Text fig.) almost straight, narrowed towards base, external apical angle somewhat obtuse, rounded, without any denticles; protarsi sub-parallel. Aedeagus with penis somewhat shorter than the parameres, rounded at apex. Female—anterior tibiae almost similar, protarsi slightly narrower than in male. The elytra longer than in male, extending over the pygidium.

Remarks: Régimbart (l.c.) considered this species to be very near *villosus* Muller from which it can be distinguished (i) by the uniformly black colour on the dorsal and ventral sides including the epipleurae (ii) punctation more impressed (iii) pubescence less grey (iv) elytra more truncated and the external angle acute and almost similar in both the sexes. From *murinus* Reg. it can be distinguished by the colouration as stated above and the truncature of the elytra being different in both the sexes and the penis narrower in the apical half.

Distribution: INDIA: Tamil Nadu: Kodaikanal, Mgodhra, Trichnopoly, Palni hills.

12. *Orectochilus* (s. str.) *murinus* Régimbart

(Text figs. 17B, D)

Orectochilus murinus Régimbart, 1891, *Ann. Soc. ent. Fr.*, 60: 709 (T.L.—Pedong—In R. Oberthur colln. and Régimbart colln. Paris Mus.); Vazirani, 1958, *Rec. Indian Mus.*, 53: 17.

Orectochilus (s. str.) *murinus*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19 Gyrinoidea: 18-19, Vazirani, 1977, *Newsl. Zool. Surv. India*, 3(5): 292.

Length: 5.5—7.0 mm.

Head: black; fronto-clypeal suture distinct; anterior margin slightly concave; reticulation distinct, well impressed on the frons but less impressed on the clypeus; punctation moderate, more dense anteriorly than posteriorly; sparsely pubescent on the lateral sides of eyes. Labrum twice broader than long, semicircular, with white cilia along anterior border, surface punctate pubescent; reticulation indistinct.

Pronotum: black; punctate pubescent; reticulation obsolete; anterior border without any parallel ridge, only slightly sinuate behind the eyes; posterior border almost straight; lateral margins not rebordered, straight, very slightly oblique. Anterior angles almost right angled, posterior angles acute, a little rounded. Scutellum triangular, slightly broader than long, moderate sized, strongly punctate.

Elytra: black; punctate—pubescent; broader than the pronotum at the shoulders, apex obliquely truncate, depressed behind the middle—in male sutural angle subright angled, external angle obtuse; in female the sutural angle more straight and external angle less rounded.

Ventral surface: black with abdominal sternites, epipleurae and legs reddish.

Sexual characters: Anterior tibiae in male almost straight,

external apical angle moderately obtuse with a few denticles, protarsi subparallel. Anterior tibiae in female hardly narrower than in male protarsi slightly narrower. Aedeagus with penis somewhat shorter than the parameres, regularly narrowed in the apical half apex bluntly pointed; parameres rounded at apex.

Remarks: This species is considered by its author (Régimbart l.c.) to be intermediate between *O. villosus* Muller and *O. villosovittatus* Régimbart from Burma. From the first it is broader at the shoulders and is more densely punctate-pubescent, the truncature of elytra is less oblique; from *villosovittatus* also it is broader at the shoulders but has the different angles of the elytral truncature and the colour of the ventral side is less black. However from *castesi*, the species occurring in India, it is distinguished by (i) larger size 5.5—7.0 mm. against 4.3—5.5 mm. (ii) epipleurae reddish against black (iii) elytra more densely pubescent punctate (iv) penis less narrowed in the apical half.

Distribution: INDIA: Himachal Pradesh: Simla hills, Sutlej valley, Malvatal, Ghuma, Dharampur. Uttar Pradesh: Dehra Dun, Chakrata Dist., Rishikesh, Nainital Dist. West Bengal: Kalimpong, Kurseong. Assam: Mikir hills. Meghalaya: Shillong, Motinagar, Khasi hills. Sikkim. BHUTAN. INDOCHINA.

Subgenus *Patrus* Aubé

Patrus Aubé, (1936-38), *Iconographic Coleopterus Europe*, 5: 397.
Orectochilus (*Patrus*) Hatch, 1925, *Pap. Mich. Acad. Sci.*, 5: 452.

Type-species—*Orectochilus javanus* Aubé.

Diagnostic characters: Pronotum and elytra pubescent—puncate on the lateral sides.

This subgenus is now divided into six groups. It is not only the relative measurements of length of labrum that are important but its shape and colour are also important in grouping the species. Régimbart (l.c.) while grouping species with a semi-circular or elliptical labrum stated that the labrum was at most twice as wide as long. On examination of the species under these

groups, it is found that while the labrum is semicircular or elliptical the width of the labrum may be almost 3 times its length.

KEY TO THE GROUPS OF SUBGENUS *Patrus*

1. Labrum generally 3-4 times or more broader than long, truncate along anterior margin, not semi-circular.....2
 Labrum generally less than 3 times broader than long, semicircular or elliptical along anterior margin.....3
2. Pronotum and elytra not bordered yellow.....Gr. 1
 Pronotum and elytra with yellow border.....Gr. 2
3. External angle of the elytra acute but not pointed or produced into a spine.....4
 External angle of the elytra sharp or produced into a spine.....5
4. Labrum bright yellow.....Gr. 3
 Labrum brown or black.....Gr. 4
5. Elytra without yellow lateral margin, elytra with longitudinal carina marking the inner pubescent margin in female.....Gr. 5
 Elytra with yellow lateral margin and without any carina marking the inner pubescent margin in female.....Gr. 6

Gr. 1

1. External apical angle of elytra with a small spine.....2
 External apical angle of elytra without spine, obtuse or right angled.....3
2. Elytral pubescence touching the suture at about the middle (Fig. 18A).....*desgodinsi desgodinsi*
 Elytral pubescence touching the suture beyond the middle (Fig. 18B).....*desgodinsi assamensis*
3. Size 10.5—11.5 mm. Reticulation on elytra indistinct in male, but well impressed in posterior part of the glabrous region in female. Elytral pubescence showing great sexual dimorphism (Fig. 18C).....*coimbatorensis*

Size 11.5—12.5 mm. Reticulation on elytra distinct giving its surface a dull appearance. Elytral pubescence showing only slight sexual dimorphism (Fig. 18D, E).....*semivestitus*

13. *Orectochilus* (*Patrus*) *coimbatorensis* Ochs

(Text figs. 18C, 45C)

Orectochilus (*Patrus*) *coimbatorensis* Ochs, 1925 *Rec. Indian Mus.*, 27: 194-195 (T.L.—Tinnevelly Hills—1 female in Agriculture Research Institute Coimbatore and 1 male, 1 female paratypes in Ochs colln.—Mus. Senckenberg).

Length: 10.5—11.5 mm.

Head: black, somewhat iridescent; punctation fine and remote; reticulation obsolete; labrocypeal suture distinct, anterior margin slightly concave. Labrum short and very transverse, scarcely convex along anterior margin furnished with reddish cilia, posteriorly strongly punctate and pubescent.

Pronotum: black, almost without any reticulation; punctation very fine and very sparse. Lateral margins oblique, sub-straight, rebordered. Posterior border not directed backwards in the region of scutellum. Scutellum very small and triangular in female.

Elytra: black; punctation very fine and very sparse; reticulation almost indistinct in male but well impressed in the posterior part of glabrous region in female. Lateral pubescence different in two sexes; glabrous area almost heart-shaped in male while in female broad anteriorly and nearly horizontally truncate in the posterior one fourth. External apical angle obtuse not pointed, inner angle almost right angled.

Ventral surface: black, abdominal sternites, less so; epipleura ferruginous.

Sexual characters: Anterior tibiae in male exceptionally short and strongly arcuate externally, the protarsi very robust and nearly as long as the tibiae; in female the anterior tibiae not very short; external apical angle obtuse without any denticles, protarsi shorter

than tibiae and slightly narrower towards apex. Aedeagus not examined.

Remarks: As pointed out by Ochs (l.c.) in this species there is an exceptionally well marked distinction between the sexes. While in the genus *Orectochilus* the males are larger in size than females, in this species the male is smaller. There is great difference in the shape of the lateral pubescence of the elytra, the glabrous area in the male is almost heart-shaped, while in female it is very broad anteriorly and nearly truncate behind. It comes close to *semivestitus* which also occurs in the same general area but differs from it by (i) being more convex (ii) elytral sculpture being rather indistinct as against reticulation distinct and giving the surface a rough appearance (iii) in the shape of the inner line of pubescence on the elytra. Two examples, both female, were received for examination from the Agricultural Research Institute, Coimbatore. Ochs had stated 'Types' to be in that institute. One of the examples (figured here) though not labelled as Type, agrees with the description while the other example smaller in size does not agree with it.

Distribution: INDIA: Tamil Nadu: Coimbatore Dist. Tinnevelly hill.

14. *Orectochilus (Patrus) desgodinsi desgodinsi* Régimbart

(Text figs. 18A, 35A, D, 45B, E)

Orectochilus desgodinsi Régimbart, 1886, *Ann. Soc. ent. Fr.*, (6) 6: 260, pl. 4, f. 10 (T.L.—Pedong—Paris Mus.); Régimbart 1891, *ibid*, 60: 691; Zimmermann, 1917, *Ent. Mitt.*, 6: 166; Ochs, 1925, *Rec. Indian Mus.*, 27: 194.

Orectochilus (Patrus) desgodinsi desgodinsi: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 23.

Length: 9.5—11.5 mm.

Head: black; punctation fine, dense, somewhat transverse and irregular giving the surface dull appearance; reticulation feeble, present on the anterior portion only; frontoclypeal suture straight; clypeus with punctation less close than on the head, anterior margin truncate. Labrum black; transverse, short, strongly

punctate pubescent hardly convex and with reddish cilia along anterior margin.

Pronotum: black; lateral pubescence quite broad reaching inner margin of eyes; punctuation finer than on head; reticulation distinct towards sides, rather effaced on disc; posterior border not produced backwards in region of scutellum; lateral margins oblique, re-bordered, slightly convex. Scutellum small, triangular.

Elytra: black; pubescence at base slightly narrower in width than on pronotum, quite broad, dilated from basal one-fourth and then obliquely directed backwards leaving a very narrow glabrous area along suture and meeting it, at about four-fifth of sutural length. External apical angle produced into a small spine; internal angle (Para Sutural) sub-right angled. Punctuation on glabrous area fine transverse, quite close; reticulation obsolete. Punctuation of pubescent area, moderate, punctures separated by their own diameter.

Ventral surface: ferruginous, legs and epipleura reddish.

Sexual characters: Male and female differ in (i) elytral pubescence (ii) scutellum large, triangular in male and small triangular in female, (iii) anterior tarsi in male as broad as tibiae (rather narrow and subparallel in female) anterior tibiae narrowed posteriorly, external apical angle obtuse rounded, without any denticles. Aedeagus with penis about 6/7 length of parameres, narrowed towards apex from basal 1/3rd, slightly constricted before apex, but rounded towards apex; parameres straight on outer side, slightly oblique on inner side in apical half and rounded at apex.

Remarks: Among the species occurring in India it is close to *semivestitus* from which it can be easily distinguished (i) by the presence of small external apical spine (ii) larger pubescent area of elytra (iii) penis narrower towards apex.

Distribution: INDIA: Bihar: Buxar; W. Bengal: Darjeeling Dist., Kalimpong, Mongpoo, Sureil. Sikkim: Pedong. BHUTAN.

15. *Orectochilus* (Patrus) *desgodinsi assamensis* Ochs

(Text fig. 18B)

Orectochilus desgodinsi assamensis Ochs, 1925, *Rec. Indian Mus.*, 27: 194 (T.L.—Assam: Garo hills, above Tura, 3800 ft., 1 male, 4 female in Z.S.I. Calcutta Reg. No. 7586/H2 and 1 ex. Cotype in Ochs Colln. Mus. Senckenberg)

Length: 9.5—11.5 mm.

This subspecies differs from the nominotypical form in the size being generally larger, form more convex and less depressed posteriorly. The glabrous area on the elytra is greater than in the nominotypical subspecies, thus it appears less acuminate posteriorly. The legs also are darker.

Distribution: INDIA: Meghalaya: Garo and Khasi hill.

16. *Orectochilus* (Patrus) *semivestitus* Guerin

(Text figs. 18D, E, 35A, F, 45D, F)

Orectochilus semivestitus Guerin, 1840, *Revue. Zool.*, 3: 38 (T.L.—Nilgiri); Régimbart, 1882, *Ann. Soc. ent. Fr.*, (6) 2: pl. 10, f. 4; Régimbart, 1883, *Ann. Soc. ent. Fr.*, (6) 3: 413, pl. 6 fig. 123 & 123 a; Régimbart, 1902, in Wyttsmann, *Genera Ins.*, f. 29; Régimbart, 1903, *Ann. Soc. ent. Fr.*, 72: 334; Zimmermann, 1917. *Ent. Mitt.*, 6: 166; Vazirani, 1958, *Rec. Indian Mus.*, 53: 16; Ochs, 1966 *Mitt. mün. ent. Ges.*, 56: 185.

Length: 11.5—12.5 mm.

Head: black, reticulation distinct; punctation fine and quite sparse; fronto-clypeal suture distinct, anterior margin slightly concave; on clypeus, reticulation obsolete, punctation fine and quite close, punctures separated by 3-4 times their own diameter. Labrum short, transverse, three times as broad as long, punctation strong and irregular; somewhat pubescent.

Pronotum: black; lateral pubescence not extending beyond middle of eyes, obliquely narrowed posteriorly and then slightly broadened to coincide with line of pubescence on elytron; punctation fine and very remote; reticulation more impressed than on

head. Lateral margins slightly rebordered and arched. Scutellum hardly visible in male ; triangular three times broader than long in female.

Elytra: black, including lateral margin without any iridescence; smooth area impunctate; reticulation distinct, giving surface dull appearance; external apical angle obtuse, rounded, internal angle straight. Lateral pubescence very narrow in humeral region, obliquely directed backwards from basal one third, slightly sinuate before touching suture at about posterior one fifth; slightly variable between sexes.

Ventral surface: black-piceous; legs, epipleura and abdominal sternites ferruginous.

Sexual character: Size of scutellum and elytral pubescence variable between sexes as shown above; anterior tibiae in male robust, short, external apical angle, almost right angled, rounded; protarsi subconical, almost as broad as tibiae; in female tibiae almost similar, tarsi parallel and narrow. Aedeagus with penis shorter than parameres, slightly constricted before apex which is rather spathulate, apex rounded; parameres, somewhat broader than penis, external angle straight, internal angle obtuse and rounded.

Remarks: This species is quite close to *coimbatorensis* Ochs but can be easily distinguished by (i) its larger size (ii) different shape of the elytral pubescence (iii) elytral smooth surface with strongly impressed reticulation as against indistinct reticulation in male and only moderately impressed reticulation in the posterior half of female. Type-locality of this species is Nilgiri but Régimbart (1882) has mentioned Pondicherry as the only locality thereby implying that it is the Type-locality.

Distribution: INDIA: Karnataka: Bangalore. Andhra Pradesh: Eastern Ghats. Kerala: Cochin. Tamil Nadu: Palni and Nilgiri hills, Annamalai hills. Pondicherry.

Gr. 2

1. Epipleural angle produced into a spine.....2
- Epipleural angle not produced into a spine.....3

2. Size large, 11.0 mm.....*similis*
 Size small, 4.5—5.0 mm.....*productus*
3. Labrum not more than 3 times as broad as long, anterior margin rounded or arched.....4
 Labrum more than 3 times as broad as long, anterior margin generally truncated or only very slightly convex.....6
4. Labrum a little less than 3 times as broad as long, anterior margin rounded; glabrous surface on elytra, regularly oval, lateral pubescence uniformly broad and meeting suture just before apex; size 4.5—5.0 mm.....*limbatus*
 Labrum 3 times as broad as long; not so rounded along anterior margin as in above; glabrous surface on elytra not regularly oval; lateral pubescence not uniformly broad.....5
5. Dorsal surface black, without iridescence, reticulation on head distinct, consisting of rounded areoles; labrum rounded anteriorly; size 5.25—5.5 mm.....*neglectus*
 Dorsal surface black with iridescence, reticulation on head subtle; labrum not so rounded anteriorly; lateral margin of pubescence on elytra, dilated before the middle; size 5.0 mm.....*rivularis**
6. Lateral pubescence on elytra broader than on pronotum; size more than 9.0 mm.....7
 Lateral pubescence on elytra not broader than on pronotum; size less than 9.0 mm.....8
7. Scutellum visible in male; size 9.0—9.5 mm.....*cuneatus*
 Scutellum invisible in male; size 10.3 mm.....*himalayensis* sp.no.
8. Labrum about $3\frac{1}{2}$ times, as broad as long.....9
 Labrum 4 times or more, as broad as long.....12
9. Size 5.75—6.0 mm.; colour brown-black, reddish; punctation on elytra moderate and more impressed.....*punctulatus*

* Not examined, doubtfully recorded from India.

- Size larger 6.5—8.0 mm.; colour black, including labrum; punctation on elytra fine and remote.....10
10. Size 6.0—7.25 mm.; lateral pubescence on elytra reaching suture just behind 3/4th or just before apex; penis much shorter than parameres.....11
- Size 8.0 mm.; lateral pubescence on elytra reaching suture just behind the middle; penis only a little shorter than parameres.....*dilatatus*
11. Size 6.0—7.0 mm.; reticulation on head distinct; lateral pubescence on elytra, meeting suture just before apex; penis about 4/5th length of parameres, acuminate at apex.....*kempi*
- Size 6.5—7.25 mm.; reticulation on head subtle; lateral pubescence on elytra, meeting suture at about 3/4th length of suture; penis about 2/3rd length of parameres, spatulate at apex.....*discifer*
12. Smooth area on the pronotum and elytra oval.....13
- Smooth area on the pronotum and elytra cordiform (some species showing sexual dimorphism in this character).....16
13. Lateral pubescence of pronotum reaching middle of eyes on inner side; size 6.0—6.5 mm.....14
- Lateral pubescence of pronotum reaching inner margin of eyes on inner side, size 5.75—6.0 mm.....*punctulatus*
14. Size 7.0 mm.; reticulation on elytra subtle, punctation fine and diffused.....*eberti*
- Size 6.0—6.5 mm.; reticulation on elytra more impressed; punctation moderate to very strong.....15
15. Colour bluish black; punctation on elytra strong; very close, giving surface dull and chiseled appearance; more impressed than reticulation; penis constricted in the apical 3/4th portion and gradually acuminate at apex; size 6.0—6.5 mm.....*cribratellus mattlescence*

- Colour bronze-black; punctation on elytra moderate, very close, but does not give the surface chiseled appearance; reticulation more impressed than punctation; penis not constricted but gradually acuminate at apex; size 6.0—6.5 mm.....*metallicus*
16. Elytra with reticulation consisting of transverse areoles/meshes.....17
Elytra with reticulation of rounded areoles/meshes or indistinct.....20
17. Lateral pubescence on pronotum reaching inner margin of eyes; size 6.15—6.27 mm.....*choprai*
Lateral pubescence on pronotum not reaching of eyes.....18
18. Punctation on elytra fine and remote; size 6.0—6.5 mm.....*cameroni*
Elytra impunctate.....19
19. Lateral pubescence on elytra dilated just before middle; size 6.0—6.25 mm.....*figuratus*
Lateral pubescence on elytra dilated behind middle; size 6.0—6.5 mm.....*horni*
20. Lateral pubescence on pronotum reaching inner margin of eyes; size 5.0—6.0 mm.....*oblongiusculus*
Lateral pubescence on pronotum reaching upto middle of eyes on inner side; size 4.25—4.74 mm.....*cavernicola*

17. *Orectochilus (Patrus) similis* Ochs

(Text figs. 18F, 35F, 45A)

Orectochilus similis Ochs, 1929, *Rec. Indian Mus.*, 31: 251 (T.L.—Allam: Shillong—Holotype and Paratype Z.S.I. Calcutta).

Orectochilus (Patrus) similis: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 34.

Orectochilus sublineatus Régimbart, 1891, *Ann. Soc. ent. Fr.*, 60: 605 (in part, specimens for Assam).

Length: 11.0 mm.

Head: black-piceous; reticulation distinct; punctation moderate,

quite close, separated by 1-2 times their own diameter. Frontoclypeal suture distinct, anterior margin of clypeus slightly concave and a little raised. Labrum black semicircular ; $2\frac{1}{4}$ times broader than long; punctation strong, irregular, sparse.

Pronotum: black; lateral pubescence moderately broad, reaching middle of eyes on inner side, slightly narrowed backwards; lateral margins yellow, somewhat oblique but straight; punctation and reticulation as on head. Scutellum in male not visible.

Elytra: black; smooth area shining; lateral pubescence abruptly narrowed behind base and dilated just before apex, rounded and reaching suture at about same level. Punctation and reticulation as on head and pronotum; external apical angle produced into a small spine; sutural angle almost straight, rounded.

Ventral surface: ferruginous, legs reddish, epipleura yellowish.

Sexual characters: Anterior tibiae in male triangular moderately robust, attenuated towards base; external apical angle obtuse with a few denticles; protarsi moderately oval; as broad as tibiae; anterior tibiae in female almost similar, tarsi subparallel. Aedeagus with penis slightly shorter than parameres; somewhat narrower in apical half but abruptly narrowed to a rounded tip near apex; parameres regularly narrowed from base to apex.

Remarks: Ochs (1929) has considered this species to be allied *O. sublineatus* Régimbart from Laos, but is a little larger in size, more elongate and more attenuated anteriorly. The labrum is more strongly produced. The longitudinal striae and the large punctures, which are distinct in *O. sublineatus* are almost inconspicuous in *O. similis*. The external apical angle of the elytra is strongly produced; the pubescent border on elytra is only slightly dilated posteriorly and the inner margin is regularly concave, thus rendering the smooth area on the elytra broadly oval posteriorly. The penis is much narrower and its tip more strongly curved than in *sublineatus*. Though *sublineatus* was described on specimens from Indochina and Assam, Ochs (1929) cites Laos, Annam, Indochina as Type-locality for it. *O. birmanicus* Régimbart is also close to this species in regard to the elytral sculpture, but is

smaller and has the labrum and the outer apical angle of elytra less produced and the line of pubescence much more dilated posteriorly. Among the species occurring in India, it is close to *himalayensis* sp. nov. in size, but differs from it by (i) lateral pubescence on elytra much less broad (ii) epipleural external angle produced into a small spine.

Distribution: INDIA: Meghalaya; Shillong; West Bengal: Calcutta.

18. *Orectochilus* (*Patrus*) *productus* Régimbart

(Text figs. 8, 10E, 11E, 12E, 19A, 36A, 46A)

Orectochilus productus Régimbart, 1883, *Ann. Soc. ent. Fr.*, (6) 5: 422, pl. 12, f. 130 (T.D.—India—Paris Mus.); 1888, *Annali Mus. Civ. Stor. nat. Giacomo Doria*, (2) 6: 623; 1889, *Ann. Soc. ent. Fr.*, (6) 9: 156; 1891, *Annali Mus. Civ. Stor. nat. Giacomo Doria*, (2) 10: 552; 1893, *Ann. Soc. ent. Fr.*, 62: 104; 1903, *Ann. Soc. ent. Fr.*, 72: 334; Zimmermann, 1917, *Ent. Mitt.*, 6: 167; Peschet, 1923, *Opusc. Inst. Sci. ent. Indoch.*, 1: 12; Ochs, 1927, *J. fed. Malay St. Mus.*, 13: 244; 1928, *Ent. Bl. Biol. Syst.*, 24: 100; 1929, *Rec. Indian Mus.*, 31: 246; 1929, *J. fed. Malay St. Mus.*, 14: 402; Vazirani, 1958, *Rec. Indian Mus.*, 53: 15; 1977, *Newsl. Zool. Surv. India*, 3(5): 251.

Orectochilus (*Patrus*) *products*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 31-32.

Length: 4.5—5.4 mm.

Head: black, sometimes with bronze-green iridescence; frontoclypeal suture distinct, with clypeus slightly raised anteriorly; reticulation distinct giving the surface somewhat dull appearance, punctation indistinct. Labrum-short transverse, about 3 times broader than long, anterior border truncate; pubescent-punctate.

Pronotum: black; lateral margins yellow, oblique/substraight; lateral pubescence quite narrow, reaching only the inner margin of eyes and progressively reduced in width posteriorly; impunctate; reticulation less impressed than on head; faint depression of a median longitudinal line present. Scutellum triangular slightly broader than long.

Elytra: bronze-black; impunctate; reticulation rather invisible, more shining than on pronotum; lateral pubescence, almost equal

to that on pronotum at base, very feebly dilated behind the middle, obliquely directed to suture and meeting it just before apex; lateral margin yellow; epipleural angle produced into a small spine; sutural angle slightly obtuse.

Ventral surface: bronze to black, legs and abdominal sternite paler, epipleura yellow.

Sexual characters: Male anterior tibiae with external apical angle rounded and a little obtuse; outer side almost straight, tarsi almost as broad as tibiae, somewhat conical. In female tibiae almost similar but tarsi subparallel and narrow. Aedeagus with penis almost uniformly broad in basal 5/6th, then uniformly tapering to pointed apex.

Remarks: In the character of epipleura being produced into a spine it comes close to *similis* but it can be at once distinguished from it by its very small size in which it approaches *limbatus* which is without a spine at the external apical angle.

Distribution: INDIA: Bihar: Singbhum, Manbhum, Pust, Bankipur, Konbira. Assam: Dibrugarh, Mangaldai, Garo hills, Damalgili, Seali Kirsi. W. Bengal: Brahmani river. Madhya Pradesh: Rewa, Ankarkantak, Unaria, Paithari Range, Jabalpur, Mandla. Kerala: Calicut, Travancore, Kerumaadi, Cochin, Chalakudi. Tamil Nadu: Madras. Pondicherry: Mahe.

19. *Orectochilus* (*Patrus*) *limbatus* Régimbart

(Text figs. 19B, 36B, 46B)

Orectochilus limbatus Régimbart, 1883, *Ann. Soc. ent. Fr.*, (6) 3: 424 (T.L.—India Orient. 1 female, Wehncke colln. in Paris Mus.); 1907, *Ann. Soc. ent. Fr.*, 76: 211; Ochs, 1929, *Rec. Indian Mus.*, 31: 243; Vazirani; 1958, *Rec. Indian Mus.*, 53: 16.

Orectochilus gravelve Ochs, 1925, *Rec. Indian Mus.*, 27: 199 (T.L.—Bihar: Chaibassa—Z.S.I.) (Syn. vide Ochs 1929).

Orectochilus (*Patrus*) *limbatus*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 27; Vazirani, 1977, *Newsl. Zool. Surv. India*, 3(5): 252, 279.

Length: 4.5—5.0 mm.

Head: black; reticulation subtle, rounded areoles/meshes; almost

inpunctate. (Labrum black, short transverse, a little less than 3 times as broad as long, rounded along the anterior margin; punctate-pubescent.)

Pronotum: black, lateral margins yellow; reticulation very feeble; almost inpunctate; lateral pubescence broad, reaching middle of eyes on inner side. Scutellum moderate, as broad as long, triangular.

Elytra: black, lateral margins yellow; reticulation absent; inpunctate; lateral pubescence uniformly dilated posteriorly and reaching suture just before apex; glabrous space regularly oval; truncature of apex substraight, slightly oblique; sutural angle right angled, somewhat rounded; epipleural angle somewhat obtuse, hardly prominent.

Ventral surface: reddish brown including abdomen; legs and epipleura yellowish.

Sexual characters: anterior tibiae in male, triangular, external apical angle somewhat obtuse, rounded and without any denticles, protarsi elongate oval; anterior tibiae in female somewhat narrower and protarsi slender and subparallel. Aedeagus with penis somewhat more slender than parameres, slightly constricted in apical half before apex which is rather acuminate but not pointed.

Remarks: It is closely related to *neglectus* in which the smooth surface of elytra is more acuminate posteriorly, the labrum is less rounded along the anterior margin, size a little larger and penis more slender near the apex.

Distribution: INDIA: Uttar Pradesh: Mirzapur. Bihar: Chaibasa, Chakradharpur, Sanjai R., Damodar R., Gurmani R., Morel R., Ranchi Dist., Hazaribagh Dist., Santal Parganas. Madhya Pradesh: Rewa Dist., Mandla Dist., Jabalpur Dist., Jabalpur, Narsinghpur, Hoshangabad, Nerbudda R. Maharashtra: Matheran, Khandesh, Barway, Poona Dist., Shangad, Poona. Ratnagiri Dist., Ratnagiri. Satara Dist., Koyangad. Nasik Dist., Kolwam. Orissa: Nilgiri forest, Angul, Talcher, Gurguria R.F. Tamil Nadu: Nilgiris, Bhawani R. SRI LANKA.

20. *Orectochilus (Patrus) neglectus* Ochs

(Text figs. 19C, 36C)

Orectochilus neglectus Ochs, 1925, *Rec. Indian Mus.*, 27: 199 (T.L.—Uttar Pradesh: Bareilly, Nainital Dist. 1 female 'Type' in Z.S.I. Reg. No. 3229/20, 'Cotype' in Ochs colln. 1 male, 1 female (paratype) Senckenberg Mus.)

Orectochilus (Patrus) neglectus: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 30.

Orectochilus neglectus var. Ochs, 1925, *Rec. Indian Mus.*, 27: 199. (Uttar Pradesh: Almora Dist., Dwaharat—Z.S.I.).

Orectochilus (Patrus) neglectus subsp. Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 30 (E. Himalayas: Mariambari).

Length: 5.25—5.5 mm.

Head: black, reticulation distinct consisting of rounded areoles/meshes; punctation fine rather sparse; frontoclypeal suture distinct, punctation on clypeus less sparse. Labrum black, 3 times broader than long, rounded along the anterior margin; pubescent-punctate.

Pronotum: black, lateral margins yellow, oblique, slightly arched; reticulation very subtle, somewhat transverse areoles/meshes; impunctate, lateral pubescence moderately broad, reaching middle of eyes on inner side. Obliquely reducing in width posteriorly and continued on elytra. Scutellum moderate, triangular in male and very small in female.

Elytra: black, lateral margins yellow; lateral pubescence moderately broad, dilated post medianly and reaching suture just before apex, glabrous area broadly oval and slightly acuminate posteriorly. Epipleural angle slightly obtuse, not prominent. Reticulation hardly visible, punctation moderate but remote. Truncature of apex very slightly sinuate; sutural angle right angled; epipleural angle somewhat obtuse, hardly prominent.

Ventral side: ferruginous—black epipleura yellowish, legs and abdominal sternites reddish.

Sexual characters: Anterior tibiae in male, rather broad triangular, external apical angle rounded and denticulate; protarsi broad, narrowed anteriorly; anterior tibiae in female not so broad

and protarsi narrow and subparallel. Aedeagus with penis as long and as broad at base as parameres, somewhat narrow in the apical half and acuminate at apex.

Remarks: It is quite near to *limbatus* in size etc. but can be separated from it by (i) its larger size (ii) smooth part of elytra which is evidently acuminate posteriorly in this species and oval in *limbatus* (iii) the shape of penis more slender at apex.

Distribution: INDIA: Punjab: Patiala Dist., Kasauli, Almora Dist. Haryana: Ambala Dist. Himachal Pradesh: Kalka, base of Simla hills. Uttar Pradesh: Nainital Dist., Kumaon, Kathgodam.

21. *Orectochilus* (*Patrus*) *cuneatus* Régimbart

Orectochilus cuneatus Régimbart, 1891, *Ann. Soc. ent. Fr.*, 60: 702 (T.L.—Sikkim—Paris Museum); Zimmermann, 1917, *Ent. Mitt.*, 6: 166; Vazirani, 1958, *Rec. Indian Mus.*, 63: 17.

Orectochilus (*Patrus*) *cuneatus*: Ochs. 1930, *Cat. Indian Ins.*, 19: 23; 1966, *Ergebn. Forsch.—Unternehmen Nepal Himalaya*, 1(4): 244.

Length: 9.0—9.5 mm.

Head: bronze-black, reticulation distinct; punctation fine and very sparse; fronto-clypeal suture distinct; anterior margin of clypeus not concave but slightly raised. Labrum bronze-black, short, transverse, four times broader than long, pubescent-punctate posteriorly.

Pronotum: bronze-black; with a median small pit; reticulation as on head; lateral margins reddish yellow, oblique and sub-straight; lateral pubescence moderately broad, reaching inner margin of eyes, only slightly narrowed posteriorly, somewhat narrower than width of pubescence on elytra at base; posterior broader not directed backwards in region of scutellum. Scutellum broad triangular.

Elytra: bronze-black; reticulation on smooth area as on head and pronotum; pubescent border very broad, smooth area almost an elongate triangle, broader at base than on pronotum, dilated obliquely in a straight line and meeting suture a little behind middle. Lateral margins reddish yellow. Truncature of apex

somewhat sinuate, more so on outer side; epipleural angle not produced into a spine, a little obtuse, sutural angle straight.

Ventral surface: ferruginous to black, posterior legs and epipleura reddish.

Sexual character: Anterior tibiae in male, somewhat robust, external apical angle rounded with a row of denticles; protarsi more elongate oval than in female. Aedeagus with penis a little more than 4/5th length of parameres, somewhat constricted just before apex and then abruptly narrowed to a pointed tip; parameres, straight on inner side, apices rounded.

Remarks: Among the species occurring in India, it comes close to *himalayensis* sp.nov. from which it can be easily separated by (i) presence of scutellum (ii) smaller size 9.0—9.5 mm. as against (iii) different shape of penis.

Distribution: INDIA: Punjab: Almora Dist., Patiala Dist., Dharampur. Himachal Pradesh: Simla hills. Uttar Pradesh: Dehra Dun, Kaligad, Kumaon, Kathgodam, Dwarkanath. West Bengal: Pedong, Pashok, Kurseong, Kalimpong, Teesta valley, Sikkim: Sukna, Singla, Ghumti. NEPAL.

22. *Orectochilus* (Patrus) *himalayensis* sp.nov.

(Text figs. 19F, 37B, 46D)

Length: 10.3 mm.

Head: black; reticulation distinct of rounded areoles, progressively less impressed posteriorly; punctation fine and sparse. Frontoclypeal suture distinct; reticulation on clypeus indistinct, punctation moderate and fairly close. Labrum very transverse, more than 5 times as broad as long, very sparsely punctate, anterior margin truncate.

Pronotum: black, shining; lateral sides yellow, slightly arched, lateral pubescence broad, extending upto inner margin of eyes, slightly reduced in width, in posterior half. Reticulation imperceptible, punctation very fine and sparse, almost indistinct, with few irregular, elongate, feeble striae.

Elytra: black, shining; lateral sides yellow, reticulation indistinct, punctation very fine and very sparse, almost indistinct; lateral pubescence broader than on pronotum, about 2/3rd width of elytra, regularly and obliquely dilated posteriorly and meeting suture at about middle, smooth area being triangular. Truncature of apex slightly oblique, outer angle somewhat obtuse and slightly prominent but not produced into spine. Scutellum not visible.

Ventral surface: ferruginous; epipleura yellow, middle and hind legs paler than sternum, abdominal sternites paler than sternum but darker than legs.

Sexual characters: Anterior tibiae in male elongate triangular, more or less straight on outer side, external apical angle rounded with about 12 denticles; tarsi elongate oval, narrower than tibiae. Aedeagus with penis about 4/5th length of parameres, quite broad at base, slightly tapering towards apex, somewhat constricted before apex and then acuminate. Female not known.

Remarks: This species comes very close to *O. cuneatus* in having the lateral pubescence on elytra at base being broader than on pronotum but can be easily distinguished from it by (i) somewhat larger size 10.3 mm. against 9.0—9.5 mm. (ii) absence of scutellum in *O* (iii) different shape of penis.

Holotype: 1 male, India: Uttar Pradesh: Nainital Dist. Jeolikot, stream in Naraini, *P. Pillay* Colln., 18.ix.1952, in Zoological Survey of India, Calcutta, Reg. No. 8451/H4A.

Distribution: INDIA: Uttar Pradesh: Nainital Dist.

23. *Orectochilus* (*Patrus*) *punctulatus* Régimbart

(Text figs. 19D, 36D, 46C)

Orectochilus punctulatus Régimbart, 1886, *Ann. Soc. ent. Fr.*, (6) 6: 261 (T.L.—Kodaikanal—Paris Museum); Ochs, 1966, *Mitt. munch. ent. Ges.*, (5) 56: 180.

Orectochilus (*Patrus*) *punctulatus*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 33; Ochs, 1966, *Mitt. munch. ent. Ges.*, (5) 56: 180.

Orehotichus (*Patrus*) *punctulatus triangulatus* Ochs, 1966, *Mitt. munch. ent. Ges.*, (5) 56: 181 (T.L.—Tenmalai, Courtellam male holotype and female allotype in Senckenberg Mus. and paratype in Z.S.I.)

Length: 5.75—6.0 mm.

Head: bronze-black, reticulation moderate, rounded areoles/meshes; punctation moderate, quite remote, separated by 5-6 times their own diameter; reticulation more impressed than punctation; frontoclypeal suture distinct; clypeus, ferruginous. Labrum reddish brown, short, transverse rounded anteriorly, three and half times broader than long; punctation strong but remote.

Pronotum: bronze-black, lateral margins reddish yellow, oblique, very slightly arched; reticulation less impressed than on head, punctation more close separated by 3-4 times their own diameter; lateral pubescence reaching middle of eyes on inner side, abruptly reduced in width posteriorly. Scutellum small, triangular.

Elytra: bronze-black, lateral margins reddish yellow; reticulation subtle, as on pronotum; punctation more impressed than on pronotum and more impressed than reticulation. Lateral pubescence as broad at base as on pronotum posteriorly, gradually dilated posteriorly and reaching suture in posterior quarter. Truncature of apex substraight, sutural angle right angled, epipleural angle subobtuse, not prominent.

Ventral surface: ferruginous to black; legs, abdominal sternites and epipleura reddish yellow.

Sexual characters: Anterior tibiae in male, broad triangular; external apical angle obtuse, and protarsi elongate oval, anterior tibiae in female somewhat less broad and protarsi narrower and subparallel. Smooth area on elytra in male more acuminate posteriorly and more distinctly reticulate in posterior 2/3rd area. Aedeagus with penis somewhat shorter than parameres, at base as broad as parameres, constricted in about third quarter, apex spatulate; parameres slightly oblique on inner side in apical half.

Remarks: This species comes near to *metalicus* but without metallic iridescence and the punctation on elytra is much less impressed. In the male genitalia it is closer to *cribratellus metallescens* but the penis is more slender and the apex with a different shape. The elytral punctation is also very much less

impressed and quite remote in comparison to the moderate, strong and very close punctation of *cribratellus metallescens*.

Ochs (1966) proposed the subspecies *triangulatus* and stated that 2 ex. from Tenmalai, Courtellum (Ochs 1930) are 'Paratype' specimens in Indian Museum (i.e. Zoological Survey of India). He created this subspecies on the basis of (i) in male the smooth area of the elytra more acuminate posteriorly and (ii) reticulation in male stronger than the reticulation, in the nominotypical form (iii) female having reticulation of rounded meshes in the posterior 2/3rd of the smooth area on elytra and giving the surface a mat appearance.

Since the two subspecies are reported from the same locality viz. Tenmalai, Courtellum the above differences do not constitute justification for separate subspecies rank. The above description is based on the 'Paratype' specimens of the subspecies. Specimens determined as *punctulatus* from Tenmalai, Courtellum, by Ochs have also been examined through the courtesy of the Senckenberg Museum.

Distribution: INDIA: Kerala: Tenmalai Courtellum. Tamil Nadu: Kodaikanal, Annamalai hills.

24. *Orectochilus* (*Patrus*) *kempi* Ochs

Orectochilus kempi Ochs, 1925, *Rec. Indian Mus.*, 27: 198 (T.L.—Abor hills: Yembung, 1 male 'Type' and 3 female 'Cotype' female in Z.S.I. colln. Reg. No. 3049/20 and 2 female paratypes (Cotypes) in Ochs colln. Senckenberg Mus.)

Orectochilus (*Patrus*) *kempi*: Ochs, 1930, *Cat. Indian Ins.*, 19: 27.

Length: 6.0--7.0 mm.

Head: brownish black; frontoclypeal suture not so distinct; anterior margin of clypeus slightly concave; reticulation distinct, punctation moderate and quite dense, reticulation and punctation more impressed anteriorly than posteriorly. Labrum thrice as broad as long transverse, short, punctate pubescent, anterior border slightly arched.

Pronotum: brownish-black; reticulation rather indistinct less

impressed than on head; punctation fine and moderately remote, more impressed than on head; lateral margins reddish yellow, oblique and slightly arched; a few longitudinal wrinkles/striations on surface. Lateral pubescence quite broad but not extending beyond middle of eyes, narrowed posteriorly to meet elytral pubescence. Scutellum very small, triangular.

Elytra: brownish black; reticulation very feeble, rather indistinct; punctation very fine and remote; lateral margins reddish; lateral pubescence as broad as on the pronotum at base, hardly dilated posteriorly and meeting the suture just before apex, leaving the glabrous portion, oval. Trucature of apex substraight, sutural angle right angled epipleural angle a little obtuse, not at all prominent.

Ventral surface: ferruginous; posterior abdominal sternites paler, legs and epipleurae yellow.

Sexual characters: Male, anterior tibiae almost triangular, external apical angle rounded at apex; tarsi slightly dilated almost subparallel. Female—anterior tibiae similar, tarsi narrower and parallel. Aedeagus with penis as broad as parameres at base, about 4/5th length of parameres, slightly narrowed to the apex.

Remarks: In size, elytral pubescence, reticulation and punctation of the dorsal surface this comes near to *O. discifer* but is broader in the humeral region and more attenuated on both ends. The glabrous portion on the elytra is larger, reaching further backwards, broadly oval behind as against acuminate. The colour of *O. discifer* is also much darker. Since only 1 ex. was labelled as 'Type', it has the status of 'Holotype' and all specimens labelled by the author as 'Cotype' are paratypes.

Distribution: INDIA: Arunachal Pradesh: Abor hills: Yembung.

25. *Orectochilus* (*Patrus*) *discifer* (Walker)

(Text figs. 23C, 37F, 46G)

Gyrinus discifer Walker, 1859, *Ann. Mag. nat. Hist.*, (3) 3: 51 (T.L.—Sri Lanka—B.M.)

- Gyretes discifer* Motschulskey, 1861, *Bullt Soc. Imp. Moscou*, 34: 109; Redtenbacher, 1868, *Reise Novara, Zool.*, 2, first section A, 1: 24 pl. 1. f. 11.
- Orectochilus discifer* Régimbart, 1883, *Ann. Soc. ent. Fr.*, (6) 3: 416; 1886, *Ann. Soc. ent. Fr.*, (6) 6: 262; 1893, *Ann. Soc. ent. Fr.*, 62: 1902, *Ann. Soc. ent. Fr.*, 71: 470; 1903, *Ann. Soc. ent. Fr.*, 72: 334; Zimmermann, 1917, *En. Mitt.*, 6: 168; Ochs, 1927, *J. fed. Malay St. Mus.*, 13: 243; 1929, *Rec. Indian Mus.*, 31: 245; Vazirani, 1958, *Rec. Indian Mus.*, 53: 17.
- Orectochilus (Patrus) discifer* Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 24; 1966, *Mitt. munch. ent. Ges.*, (5) 56: 181. Vazirani, 1977, *Newsl. Zool. Surv. India*, 3(5): 280.

Length: 6.5—7.25 mm.

Head: black, shining; reticulation of rounded areoles/meshes, rather subtle; punctation irregular, fine, closer anteriorly, sparse posteriorly; frontoclypeal suture distinct, clypeus black, more densely punctate than head, reticulation similar; anterior margin straight.

Labrum: about three and a quarter times broader than long, transverse, pubescent-punctate on sides and glabrous in middle.

Pronotum: black, shining, sateral margins yellow, slightly oblique, substraight; reticulation very subtle; punctation very fine and remote. Lateral pubescence sufficiently broad anteriorly, just reaching middle eyes, on inner side, slightly narrowed posteriorly to middle and then uniformly broad; with some feeble irregular longitudinal striations. Scutellum black, triangular, as broad as long in male, but broader than long in female.

Elytra: black, shining; lateral margins yellow; reticulation almost indistinct, punctation very fine and very remote, epipleural angle obtuse, somewhat prominent. Lateral pubescence uniformly broad upto one-third, then dilated posteriorly and bent towards suture and meeting it just a little behind third quarter; smooth area a little acuminate posteriorly. Truncature of apex substraight; a little sinuate on outer side; sutural angle right angled; epipleural angle obtuse, hardly prominent.

Ventral surface: ferruginous; legs, sternites and epipleura, reddish yellow.

Sexual character: Anterior tibiae in male broad triangular, external apical angle produced a little, somewhat acute and with very feeble denticles; protarsi, elongate oval, a little attenuated anteriorly; anterior tibiae in female a little less broad protarsi narrow and subparallel. Aedeagus with penis much shorter than parameres, about 2/3rd its length, as broad as parameres at base, somewhat constricted just before apex which is acuminate and rather apathulate.

Remarks: This comes very close to *O. dilatatus* in form and reticulation on head etc., but differs from it (i) smaller size (ii) reticulation on elytra indistinct as against subtle (iii) lateral pubescence on elytra reaching the suture just behind 3/4th length of the elytra as against just behind the middle (iv) penis much shorter than parameres, about 2/3rd its length as against only a little shorter than the parameres.

Distributions: INDIA: Bihar: Parasnath and Ranchi hills. W. Bengal: Calcutta. Madhya Pradesh: Umaria, Rewa Dist., Jaithari Range, Amar Katak, Satpura hills, Panchmari. Maharashtra: Khandala, Ratnagiri Dist., Ratnagiri. Andhra Pradesh: Eastern Ghats. Kerala: Wellardi, Tenmalai, Courtellum, Dhani forest, Cochin, Parambikulam to Kavali. Tamil Nadu: Nilgiris, Madras, Niambur, Kodaikanal. SRI LAKNA.

26. *Orectochilus (Patrus) dilatatus* Redtenbacher

(Text figs. 20A, 37C, 46F)

Patrus dilatatus Redtenbacher, 1868, *Reise Novara Zool.*, first section A, 1: 25, pl. 1, fig. 12 (T.L.—'Cylon' female).

Orectochilus dilatatus: Régimbart, 1883, *Ann. Soc. ent. Fr.*, (6) 3: 419, pl. 12, fig. 126; 1891, *Ann. Soc. ent. Fr.*, 60: 695; 1907, *Ann. Soc. ent. Fr.*, 76: 203 (male described from Ceylon).

Orectochilus (atrus) dilatatus: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 24.

Length: 8.0—8.5 mm. (Holotype female).

Head: black, shining; reticulation of rounded areoles/meshes, rather subtle; punctation irregular fine closer anteriorly and sparse posteriorly; clypeus more densely punctate and equally

reticulate, anterior margin almost straight. Labrum short, transverse, three and half times broader than long, pubescent-punctate, anterior margin slightly arched. Scutellum triangular, very small.

Pronotum: black, shining; lateral margins reddish yellow, slightly oblique; reticulation distinct, subtle punctation very fine and remote somewhat, irregular; with longitudinal striations. Lateral pubescence moderately broad anteriorly, then obliquely narrowed upto middle beyond which, uniformly broad.

Elytra: black, shining; reticulation subtle distinct; punctation very fine and quite remote; lateral margins yellow; epipleural angles obtuse, straight and not blunt. Lateral pubescence as broad at base as on pronotum, dilated behind humeral region, forming concave border on internal side and reaching suture, a little behind middle. Truncature of apex substraight; sutural angle right angled; epipleural angle obtuse, hardly prominent.

Ventral surface: ferruginous to black, a little pale on abdominal sternites, legs and epipleura yellow.

Sexual character: Anterior tibiae in male broad, triangular, external apical angle somewhat produced, with a few minute denticles; protarsi oval, a little attenuated anteriorly. Aedeagus with penis as broad as parameres and a little shorter than them, somewhat constricted just before apex which is broadly spatulate. Lateral pubescence broader in post-humeral region in male than in female.

Remarks: This species was first reported from Ceylon and then by Régimbart (1883) from Madras. I have not seen any examples from India. This is closely related to the *discifer* and can be separated from it by (i) larger size 8.0—8.5 mm. as against 6.5—7.25 mm. (ii) from a little narrower and subparallel as against broad at humeral region (iii) reticulation on elytra distinct as against indistinct (iv) lateral pubescence on elytra reaching the suture just behind the middle as against just behind the three-fourth of the sutural length (v) penis only a little shorter than the parameres as against about two-third its length as in *discifer*.

• *Distribution*: INDIA; Tamil Nadu; Madras, SRI LANKA.

27. *Orectochilus* (*Patrus*) *eberti* Ochs

Orectochilus (*Patrus*) *eberti* Ochs, 1966, *Ergebn. Forsch.—Unternehmen Nepal Himalaya*, 1(4): 245, 246. (T.L.—Nepal: Tampa, Kosi-Tal, 2600, Holotype, male—Z.S.B.S.M.)

Length: 7.0 mm. *Bredth* 4.0 mm. (male Holotype).

General: Oval, considerably broad in the humeral region and attenuated behind; dorsal surface faintly shining, black with green iridescence; lateral pubescence yellow; lateral margins of pronotum and elytra reddish with a black edge. Ventral surface brown-black, abdominal sternites and legs dark red and epipleura paler.

Head: black; reticulation somewhat stronger, than posterior area of clypeus, gradually with decreasing impression and becoming almost feeble on vertex, almost plain between the eyes. Clypeus reddish, slightly convex along anterior margin; frontoclypeal suture fine, not very distinct; reticulation fine rounded areoles/meshes; punctation, moderate, distinct, irregular, stronger posteriorly and less impressed anteriorly. Labrum reddish, transverse, about four times as broad as long, anterior margin a little convex and furnished with yellow cilia; reticulation distinct, punctation strong and fine and additional punctures large and with bristles.

Pronotum: black; lateral pubescence extending to middle of eyes, quite broad and then narrowed backwards to 2/3rd of its breadth, forming a quarter circle on inner side. Reticulation subtle, rounded areoles; punctation fine and diffuse (sparse); lateral margins reddish with black edges.

Elytra: black; lateral pubescence continued from pronotum on elytra, dilated behind middle inclined to suture and meeting it at about 3/4th its length; glabrous area corioform anteriorly, slightly undulatory and acuminate posteriorly. External angle blunt, sutural angle right angled, apex slightly concave on the outer side. Reticulation and punctation as on pronotum.

Sexual characters: Anterior tibiae in male somewhat 2 1/2 times longer than broad, apex strongly broadened, outer edge straight, external apical angle rounded with denticles, posteriorly truncated and somewhat concave. Protarsi slightly less broad than tibiae

and twice longer than broad, oval, reduced anteriorly. Aedeagus with penis somewhat smaller than parameres at base, gradually reducing, towards apex with slight constriction about middle of its length and terminating into roundish apex; upper side with a longitudinal furrow to apex.

Remarks: This species comes close to *O. metallicus* but differs from it by (i) rather depressed shape (ii) more robust anterior legs (iii) glabrous area of the elytra being acuminate posteriorly.

Distribution: NEPAL.

28. *Orectochilus* (*Patrus*) *cribratellus metallescens* Régimbart
(Text figs. 20B, 38A, 47D)

Orectochilus cribratellus metallescens Régimbart, 1907, *Ann. Soc. ent. Fr.*, 76: 206 (T.L.—'Pedong, Kurseong, Bhutan'—Paris Mus.); Zimmermann, 1917, *Ent. Mitt.*, 6: 168.

Orectochilus (*Patrus*) *cribratellus*: subsp. Ochs, vrcj, *Cat. Indian Ins.*, pt. 19: 23 (Assam: Garo hills above Tura, Z.S.I.).

Orectochilus (*Patrus*) *cribratellus metallescens*: Vazirani, 1977, *Newsl. Zool. Surv. India*, 3(5): 292.

Length: 6.0—6.5 mm.

Head: bluish black with clypeus brown; frontochopeal suture distinct; anterior margin of clypeus slightly concave; reticulation very strong, punctation moderate and remote, both giving surface mat appearance. Labrum brown, about four times as broad as long, punctate pubescent.

Pronotum: bluish black; lateral margins yellow, slightly oblique, substraight; punctation and reticulation as on head, giving glabrous area mat appearance, both almost equally well impressed; lateral pubescence broad anteriorly, reaching almost inner margin of eyes, abruptly reduced in width to almost half in middle, posteriorly as broad as, pubescence on elytra at base. Scutellum in male twice broader than long; in female very small, elongate, triangular.

Elytra: bluish black; lateral margins yellow; reticulation less impressed than on pronotum; punctation moderate, strong and very close, separated by less than its own diameter, giving surface

dull appearance. Lateral pubescence as broad at base as pronotal pubescence, only slightly dilated posteriorly, reaching suture just before apex. Truncature of apex substraight; sutural angle right angled; epipleural angle obtuse, hardly prominent.

Ventral surface: ferruginous with legs and epipleura reddish.

Sexual characters: Anterior tibiae in male moderately broad, external angle rather obtuse and denticulate; protarsi moderately broad, a little narrower than width of tibiae; protarsi in female, rather narrower and subparallel. Aedeagus with penis quite broad at base, somewhat constricted in apical 3/4th portion and gradually acuminate towards apex.

Remarks: This species comes close to *metallicus* but can be separated from it as below:

<i>cribratellus metallescence</i>	<i>metallicus</i>
i) darker in colour, (bluish-black).	bronze-black.
ii) Head-reticulation strong, more impressed than punctation which is moderate and remote.	Head-reticulation and punctation equally strong, moderate, quite close.
iii) Pronotum-punctation and reticulation distinct, equally strongly impressed; surface dull.	Pronotum-punctation as strong as on head, reticulation feeble; surface shining.
iv) Elytra-punctation moderate, strong and very close giving the surface dull and chiseled appearance.	Elytra-punctation more distinct than reticulation moderate and very close but does not give the surface chiseled appearance. Reticulation more impressed.
v) Penis quite broad at base, somewhat constricted in the apical three-fourth portion and gradually acuminate towards apex.	Penis quite broad at base, not constricted but gradually acuminate in the apical portion.
vi) Scutellum different in both sexes.	Scutellum similar in both sexes.

Distribution: INDIA: West Bengal: Kalimpong, Kurseong, Pedong, Arunachal Pradesh: Siang Division. Assam: Garo hills above Tura. Sikkim: Pashok, Ghumti, Sitong. BHUTAN.

29. *Orectichilus* (*Patrus*) *metallicus* Régimbart

(Text figs. 20C, 38B, 47C)

Orectochilus metallicus Régimbart, 1883, *Ann. Sco. ent. Fr.*, (6) 3: 418 (T.L.—India—1 female Paris Mus.); 1886, *Ann. Soc. ent. Fr.*, (6) 6: 262 (1 male, Pedong); 1891, *Ann. Soc. ent. Fr.*, 15, pl. 18, f. 11; 1907, *Ann. Soc. ent. Fr.*, 76: 206; Zimmermann, 1917, *Ent. Mitt.*, 6: 168; Peschet, 1923, *Opusc. Inst. Scient. Indoch.*, 1: 13.

Orectochilus (*Patrus*) *metallicus*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 29; 1966, *Ergebn Forsch-Unterchman Nepal Himalaya*, 1(4): 246; Ochs and Chujo, 1966, *J. Coll. Arts and Sciences, Chiba Univ.*, (Nepal), 4(4): 539, f. 2.

Length: 6.0—6.5 mm.

Head: black with bronze metallic iridescence; strongly and closely punctate, punctures separated by 1-2 times their own diameter; reticulation distinct, as strong as punctation, giving surface dull appearance; frontoclypeal suture distinct, clypeus brown, moderately punctate but reticulation indistinct. Labrum brown, short transverse, four times as broad as long; hardly punctate-pubescent, anterior margin almost straight.

Pronotum: black, with bronze metallic iridescence; punctation as strong as on head, but reticulation feeble, surface a little shining not as dull as on head; with some longitudinal striations. Lateral margins reddish yellow, oblique and very slightly arched. Lateral pubescence reaching almost inner margin of eyes and abruptly reduced in width to less than half. Scutellum in both sexes twice as broad as long.

Elytra: black with bronze metallic iridescence; reticulation more impressed than on pronotum; punctation strong, very close, more so than on pronotum, more apparent than reticulation; lateral margins reddish yellow; lateral pubescence almost uniformly wide, posteriorly abruptly inclined towards suture and reaching it just before apex. Truncature of apex substraight sutural angle right

angled slightly rounded, epipleural angle somewhat obtuse, hardly prominent.

Ventral surface: black; anal sternite, legs and epipleura reddish.

Sexual characters: Anterior tibiae in male, moderately broad, triangular; external apical angle obtuse and having minute denticules; protarsi moderately broad, subparallel. Anterior tibiae in female, somewhat less broad and protarsi narrow and parallel. Aedeagus with penis a little shorter than the parameres, slightly constricted at about middle and regularly narrowed to pointed apex.

Remarks: This species is closely related to *cribratellus metalescens* and can be separated from it as shown under that species.

Distribution: INDIA: Uttar Pradesh: Kumaon Dist.; Bhowali, Dehra Dun, Chakrata, Bodyar. West Bengal: Kurseong, Pedong. Sikkim: Gangtok, Sureil, Ghoom, Between Ghoom and Sonada, Mangpoo, Pashok, Ghumti. NEPAL, LAOS?

30. *Orectochilus* (*Patrus*) *choprai* Ochs

(Text figs. 20D, 37E, 47B)

Orectochilus choprae Ochs, 1925, *Rec. Indian Mus.*, 27: 197 (T.L.— Assam: Garo hills, Siju caves, 1 male 'Type' and 2 female 'Cotypes' in Z.S.I. Reg. No. 8187/H2-8193/H2, 2 female 'Cotypes' in Ochs colln.—Senckenberg Mus.).

Orectochilus (*Patrus*) *choprai*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 21; Vazirani, 1977, *Newsl. Zool. Surv. India*, 3(5): 292.

Length: 6.25—6.75 mm.

Head: black with clypeus ferruginous; frontoclypeal suture distinct, anterior margin truncate; reticulation distinct, rounded speckled areoles anteriorly, somewhat transverse areoles posteriorly, giving the surface a little dull appearance; punctation fine and punctures separated by 3-4 times their own diameter. Labrum, ferruginous, short, transverse, about four times as broad as long; punctate pubescent.

Pronotum: black, lateral margins reddish yellow, oblique and

slightly arched; lateral pubescence moderately broad and almost reaching inner margin on eyes; reticulation less impressed than on head; punctation very fine and very remote on head. Scutellum—broad, triangular.

Elytra: black; lateral margins reddish yellow; epipleural angle obtuse not prominent; lateral pubescence behind shoulders regularly dilated towards suture, somewhat attenuated before apex and giving smooth area cordiform appearance narrowed posteriorly; reticulation subtle, areoles rather transverse and very feeble; punctation very fine and quite sparse. Truncature of apex substraight; sutural angle right angled, somewhat rounded; epipleural angle somewhat obtuse, hardly prominent.

Ventral surface: dark brown; abdominal sternites and legs reddish, epipleura reddish yellow.

Sexual characters: Anterior tibiae in male broadly triangular, external side straight, abruptly narrowed towards base on inner side; external apical angle rounded with a row of minutedenticles; protarsi oval as broad as tibiae at base, slightly narrower anteriorly; anterior tibiae in female less broad and protarsi narrower and subparallel. Aedeagus with penis about 5/6th length of parameres and almost equally broad at base; regularly tapering towards base in apical two third portion; apex pointed.

Distribution: INDIA: Meghalaya: Garo hills, Siju caves. West of Tura Garo hills. Orissa: Angul.

31. *Orectochilus (Patrus) cameroni* Ochs

(Text figs. 21A-D)

Orectochilus cameroni Ochs, 1925, *Rec. Indian Mus.*, 27: 195 (T.L.—Uttar Pradesh: Dehra Dun, Kaligad and Mussorie, Arnigad—1 male and 3 female 'Type' in Forest Research Institute, Dehra Dun and 1 male, 1 female 'Cotype' in Ochs colln.—Senckenberg Mus.).

Orectochilus (Patrus) cameroni: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 20.

Length: 6.0—6.5 mm.

Head: dark brown; reticulation distinct, of rounded aroles, punctation fine and sparse more so than on clypeus, frontoclypeal

suture distinct; clypeus finely punctate, reticulation indistinct; labrum short, very transverse, about 6 times as broad as long, with large punctures.

Pronotum: dark brown, lateral margins concolorous, sides moderately arched; lateral pubescence quite broad, extending beyond the middle of eyes on the inner side, slightly narrowed posteriorly; reticulation distinct, rounded areoles as on head, punctation finer and a bit closer than on head. Scutellum triangular and distinctly reticulate.

Elytra: dark brown, sides concolorous; lateral pubescence at base slightly narrower than on pronotum, in male, regularly and slightly dilated just behind base and reaching suture just before apex, inner margin of pubescence just oblique and forming an acute angle with suture posteriorly, in female inner margin of pubescence forming an abrupt lobe, posteriorly parallel to suture and further down, bent towards suture and attenuated just before apex; smooth area in male forming an elongate triangle; reticulation distinct, somewhat transverse areoles; punctation very fine and very remote, almost obsolete. Truncature of apex slightly oblique, external angle obtuse, epipleura not produced into spine.

Ventral surface: reddish brown; legs paler.

Sexual character: Anterior tibiae in male short, broad, triangular, straight on outer side, external apical angle almost right angled, without any denticles, tarsi broadly oval. Aedeagus with penis as long as parameres, quite narrow, slightly broader at basal one third, with a median carina; narrower and canaliculate in apical two-third, apex narrow spoon shaped; a little before apex on ventral side, slightly swollen.

Remarks: This species comes close to *figuratus* in size as well as lateral pubescence on elytra being dilated before the middle but can be easily separated by (i) its very fine and remote punctation on the elytra (ii) slightly larger size (iii) darker colour (iv) shape of penis.

Ochs (l.c.) has stated that 1 male and 3 female 'Type' speci-

ments are in the F.R.I. collection, but only 2 female examples labelled as 'Type' from Kaligad Dehra Dun are available at present in these collections. This is obviously 'Syntype' material as no specimen was labelled as Holotype by the author. Ochs had studied material from Arnigad near Mussorie and Bhowali Kumaon hills. Besides the 2 'Type' specimens mentioned above the specimens from Arnigad and Bhowali are also available, determined by Ochs and bearing his handwriting but no 'Type' label. In all, 7 examples bear labels in Ochs handwriting and another 7 examples, including 4 from Kaligad bear the determined label of S. N. Chatterji. The specimens bearing labels in Ochs handwriting appear to be determined by him at the time of describing the species. The above description and drawings are made on the specimens from 'Kaligad'. No lectotype is selected since, it is felt that this must be selected out of the male specimens in Ochs collection and labelled by him as 'Type'. The type-locality can only be fixed with reference to this specimen.

Distribution: INDIA: Uttar Pradesh: Dehra Dun, Kaligad, Mussorie-Arnigad, Kumaon-Bhowali. Himachal Pradesh: Valley of Sutlej below Simla.

32. *Orectochilus* (*Patrus*) *figuratus* Régimbart

(Text figs. 23B, 38E, 47E)

Orectochilus figuratus Régimbart, 1891, *Ann. Soc. ent. Fr.*, 60: 698, pl. 18, f. 10 (T.L.—Pedong—Paris Mus.); Mimmermann, 1917, *Ent. Mitt.*, 6: 166; Peschet, 1923, *Opusc. Inst. Scient. Indoch.*, 1: 11.

Orectochilus oblongiusculus var. *figuratus*: Régimbart, 1907, *Ann. Soc. ent. Fr.*, 76: 199.

Orectochilus (*Patrus*) *figuratus*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 25; 1966, *Ergebn. Forsch. Unternehmen Nepal Himalaya*, 1(4): 245.

Length: 6.0—6.25 mm.

Head: brown, punctation fine, quite remote; reticulation subtle; clypeus reddish, anterior margin straight; frontoclypeal suture rather feeble; punctation fine, feeble and quite sparse; reticulation subtle, less sparse than on head. Labrum reddish, short, transverse, 4-5 times broader than long.

Pronotum: brown, punctation fine but more impressed and closer than on head; reticulation as on head; lateral margins reddish/brown; pubescence moderately broad, extending a little beyond middle of eyes but not reaching inner margin of eyes, narrowed posteriorly and continued on elytra. Scutellum moderate; triangular as broad as long similar in both sexes.

Elytra: brown, sutural row of black dots indistinct; lateral margins reddish; reticulation well impressed rounded meshes but somewhat transverse, punctation almost indistinct; lateral pubescence dilated just before middle and continued towards suture with a light convexity in middle and touching suture just before apex; smooth area cordiform in anterior portion but acuminate posteriorly. Truncature of apex substraight; sutural angle right angled; epipleural angle obtuse, hardly prominent.

Ventral surface: ferruginous, with legs, abdominal sternites and epipleura reddish.

Sexual characters: Anterior tibiae in male triangular, with external side straight; external apical angle somewhat rounded and very feebly denticulate, protarsi elongate oval, slightly narrower than tibiae; anterior tibiae in female slightly narrower than in male and protarsi subparallel. Aedeagus with penis subparallel, as wide and nearly as long as parameres and acuminate at apex.

Remarks: This species is closely related to *oblongiusculus* Reg. and *horni* Ochs but can be separated from the former by (i) its slightly larger size (ii) penis subparallel and as wide and nearly as long as the parameres as against penis shorter than the parameres. From the latter it is separated by (i) the smooth area of elytra less acuminate (ii) reticulation on elytra with areoles more transverse (iii) elytra without any traces of scattered minute punctures (iv) penis a little more slender and having the apex strongly curved in the form of a hook in lateral view.

Distribution: INDIA: Himachal Pradesh: Solan. West Bengal: Kurseong, Pedong, Sikkim: Singla, Pashok. NEPAL.

33. *Orectochilus* (*Patrus*) *horni* Ochs

(Text figs. 22A-D)

Orectochilus horni Ochs, 1933, *Rec. Indian Mus.*, 35: 21—22 (T.L.—W. Bengal: Darjeeling Dist., Pedong., 'Type' male in Deutsche Entomologische Institut, Berlin and 1 male and 1 female paratype in Ochs colln. Senckenberg Mus.).

Orectochilus (*Patrus*) *horni*: Ochs, 1966, *Ergebn. Forch Unternehm. Nepal Himalaya*, 1(4): 244 (Nepal).

Length: 6.0—6.5 mm.

Head: brown, labrum and clypeus reddish, frontoclypeal suture distinct; reticulation moderately impressed of rounded areoles with a tendency to become transverse; punctation fine, irregular getting obsolete posteriorly. Labrum short, transverse about 41/ times broader than long, reticulation moderate, punctation and pubescence sparse. Reticulation on clypeus indistinct, punctation fine and moderately close.

Pronotum: reddish brown, with black dots along its anterior margin, posterior margin and in middle, lateral sides yellow, slightly arched; reticulation more impressed than on head, lateral pubescence extending to middle of the eyes on inner side, reduced to half posteriorly.

Elytra: reddish brown, with sutural and subsutural lines of black dots, reticulation even more impressed than on pronotum; areoles distinctly transverse in anterior half but rounded in posterior half. Lateral pubescence moderate in anterior half, then dilated posteriorly and obliquely towards suture, slightly undulating in middle, touching suture just before apex, glabrous portion cordiforme and acuminate posteriorly. Truncature of apex substraight, very slightly oblique, sutural angle right angled, epipleural angle obtuse, neither produced into a spine nor very prominent. Pygidium yellow.

Ventral surface: ferruginous; abdominal sternites paler, legs and epipleura yellow.

Sexual characters: Anterior tibiae in male quite broad, almost straight on outer side, quite abruptly slender at base of inner side, external apical angle right angled, somewhat rounded and dis-

tinctly denticulate; protarsi oblong oval, as broad as tibiae. Anterior tibiae in female less broad, external apical angle obtuse more rounded but denticulate, protarsi subparallel. Aedeagus with penis as long as parameres, abruptly tapering to nearly pointed apex which is very slightly bent downwards.

Remarks: It strongly resembles *O. oblongiusculus* and *O. figuratus*. In the shape of the smooth portion of elytra it is stated to be intermediate between the two. In this species there is superficially impressed reticulation of slightly transverse meshes with traces of a few scattered punctures while in the other two species the microsculpture is more strongly impressed, with round meshes and strong punctures in *oblongiusculus* more transverse meshes and no punctures in *figuratus*. The penis of this species is subparallel, about as wide and nearly as long as the parameres and acuminate at apex. In *figuratus* the shape of penis is very similar but a little more slender and in the lateral view its apex appears strongly curved in the form of a hook. In *oblongiusculus* the penis is shorter than parameres, slightly constricted at about two-third of its length with a narrowly rounded tip; the longitudinal furrow which almost reaches the apex and has a different shape in the other two species, is much shorter in *oblongiusculus*. The description is based on the 2 examples borrowed from Ochs collection, in Senckenberg Museum, Frankfurt a Main.

Distribution: INDIA: West Bengal: Pedong, Kurseong. NEPAL.

34. *Orectochilus* (Patrus) *oblongiusculus* Régimbart

(Text figs. 20F, 38D, 47G)

Orectochilus oblongiusculus Régimbart, 1886, *Ann. Soc. ent. Fr.*, (6) 6: 262, pl. 4, fig. 11 (T.L.—Pedong—Paris Mus.); 1891, *Ann. Soc. ent. Fr.*, 60: 698; 1907, *Ann. Soc. ent. Fr.*, 76: 199; Zimmermann, 1917, *Ent. Mitt.*, 6: 166; Peschet, 1923, *Opusc. Inst. Scient. Indoch.*, 1: 11.

Orectochilus feae Régimbart, 1888, *Annali Mus. civ. Stor. nat. Giacomo Doria*, (2) 621 (T.L.—Tennasserum—Mus. Civ. Genova); 1891, *Annali Mus. civ. Stor. nat. Giacomo Doria*, (2) 10: 551.

Orectochilus oblongiusculus var *feae*: Régimbart, 1891, *Ann. Soc. ent. Fr.*, 60: 697; 1907, *Ann. Soc. ent. Fr.*, 76: 199; Zimmermann, 1917, *Ent. Mitt.*, 6: 166.

- Orectochilus (Patrus) oblongiusculus*: Ochs, 1930, *Cat. Indian. Ins.*, pt. 19: 30.
- Orectochilus (Patrus) oblongiusculus feae*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 30, 1966, *Ergebn. Forsch Unternchman Nepal Himalaya*, 1(4): 244.
- Orectochilus (Patrus) oblongiusculus* subsp.? Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 30 (Khasi hills).
- Orectochilus oblongiusculus oblongiusculus*: Vazirani 1958, *Rec. Indian Mus.*, 53: 16.
- Orectochilus parkeri* Ochs, 1925, *Rec. Indian Mus.*, 27: 196 (T.L.—Uttar Pradesh: Almora Dist., Gonai 'Types' 1 male, 4 female in F.R.I. and in Ochs Colln. Senckenberg Mus.).
- Orectochilus (Patrus) oblongiusculus parkeri*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 31; Vazirani, 1958, *Rec. Indian Mus.*, 53: 16, Ochs, 1966, *Ergeba. Forsch.—Unterpehmen Nepal Himalaya*, 1(4): 244.

Length: 5.0—6.0 mm.

Head: bronze-black with the clypeus ferruginous; reticulation well impressed but less so than on clypeus; punctation fine, punctures separated by 2-4 times their own diameter but closer on the clypeus. Labrum short, transverse, ferruginous, 4-5 times broader than long, punctate pubescent, anterior margin hardly arched.

Pronotum: bronze-black; reticulation less impressed than on head; punctation similar to that on head but more apparent due to less impressed reticulation. Lateral margins yellow, oblique, slightly arched. Lateral pubescence, moderately broad, almost reaching inner margin of eyes, slightly reducing in width posteriorly. Scutellum in male twice broader than long, in female almost invisible.

Elytra: dark brown with a sutural row of black dots; reticulation and punctation almost equally impressed, punctation finer and more remote than on head and pronotum, reticulation subtle. Lateral pubescence as broad at base as on the pronotum, continued backwards and dilated postmedianly and meeting the suture well before the apex; the glabrous area semicordiform; lateral margin reddish yellow. Truncature of apex substraight, sutural angle subright-angled, epipleural angle somewhat obtuse, not prominent.

Ventral surface: dark brown; legs, abdominal sternites and epipleura ferruginous.

Sexual characters: Anterior tibiae in male, anteriorly broad, external side striaght, inner side abruptly narrowed posteriorly; external apical angle rounded, somewhat rounded but without denticles; protarsi conical, equally broad at base as tibiae; protarsi in female slender and subparallel. Aedeagus with penis only a little shorter than parameres; somewhat constricted in middle of apical half, apex regularly narrowed, somewhat spatulate.

Remarks: This species is closely related to, *horni*, *figuratus*, *cavernicola* and *choprai* among the species in this region and can be distinguished as shown in the key. From *cavernicola* it can be separated by (i) its larger size 5.0—6.0 v/s 4.25—4.75 mm. (ii) lateral pubescence on the pronotum extending to inner margin of the eyes as against to the middle (iii) penis only a little shorter than parameres as against about two-third the length of parameres. From *choprai* it is smaller in size, (5.0—6.0 v/s 6.25—6.75 mm.), the lateral pubescence on the pronotum extends upto the inner margin of the eyes as against upto the middle, penis is comparatively a little longer and pointed at apex as against rounded at apex and the smooth area on the elytra is semicordiformis.

Distribution: INDIA: Punjab: Kangra valley. Himachal Pradesh: Solan, Simla hills, Barogh. Uttar Pradesh: Kumaon, Bhimtal, Almora Dist., Gonai. West Bengal: Kalimpong, Kurseong, Teesta valley. Sikkim: Pedong, Singla, Sukna, Pashok, Ghumti. Meghalaya: Khasi hills. NEPAL, BURMA, LAOS, VIETNAM.

35. *Orectochilus* (*Patrus*) *cavernicola* Ochs

(Text figs. 23A, 38C, 47F)

Orectochilus cavernicola Ochs, 1925, *Rec. Indian Mus.*, 27: 196-197 (T.L.—Assam: Garo hills, Siju Cave 2 male and 3 female in Z.S.I. Reg. No. 8206-8207/H2 and 1 male and 1 female in Ochs colln. Senckenberg Mus.).

Orectochilus (*Patrus*) *cavernicola*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 21.

Length: 4.25—4.75 mm.

Head: black with clypeus ferruginous; frontoclypeal suture distinct; anterior margin of clypeus straight; reticulation distinct, well impressed but less so on the clypeus; punctation moderate, quite sparse but closer than on the clypeus. Labrum short, transverse, ferruginous, four times as broad as long, punctate-pubescent.

Pronotum: bronze-black; reticulation and punctation as on head but somewhat less impressed; lateral margins reddish yellow, somewhat oblique and slightly arched; lateral border of pubescence moderately broad reaching to middle of eyes on inner side, abruptly narrowed posteriorly to half its width. Scutellum is similar in both sexes, small triangular, a little broader than long.

Elytra: brownish-black; reticulation distinct but less so than on head and pronotum; punctation fine and more remote than on pronotum; lateral margins reddish yellow; epipleural angle straight, hardly prominent. Lateral border of pubescence, as broad at base as on pronotum posteriorly, continued backwards and dilated about middle and reaching suture at about 1/5th or 1/6th of length of elytra, giving glabrous dorsal surface somewhat cordiform appearance. Truncature of apex substraight; sutural angle right angled, epipleural angle somewhat obtuse, hardly prominent.

Ventral surface: dark brown; abdominal sternites, legs and epipleura paler.

Sexual characters: Anterior tibiae in male moderately broad, external side almost straight; external apical angle somewhat rounded, with a few denticles; on inner side, abruptly narrowed from middle to base; protarsi elongate oval, narrower than width of tibiae. In female, anterior tibiae somewhat narrower and protarsi slender and subparallel. Aedeagus with penis about two-third length of parameres slightly constricted at about apical third portion and truncate at apex.

Remarks: This species is similar to *oblongiusculus* but can be separated by (i) its much smaller size 4.25—4.75 *vs* 5.0—5.5 mm. (ii) more convex form and darker colour (iii) smooth portion of the elytra is less cordiform specially in the female (iv) external apical angle of anterior tibiae with a few denticles *vs* smooth, (v) penis shorter and truncate at apex.

Distribution: INDIA: Meghalaya: Garo hills, Siju caves.

36. *Orectochilus (Patrus) rivularis* Régimbart

Orectochilus rivularis Régimbart, 1883, *Ann. Soc. ent. Fr.*, (6) 3: 427
(T.L.—Indochina: Phu-Quoc-Paris Mus.).

Orectochilus (Patrus) rivularis: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 33.

Orectochilus (Patrus) rivularis: subsp.? Ochs, 1930, *Cat. Indian Ins.*,
pt. 19: 33 (Assam: Cherrapunji—location not indicated).

The following characters are based on the Régimbart's description of the species.

Length: Nearly 5.0 mm.

General: Oval, nearly elongate, posteriorly slightly attenuated, convex; dorsal surface, shining, black, iridescent, with reddish margins; ventral surface brown-black, abdominal sternites and legs reddish, epipleura yellow. Labrum short, anteriorly moderately arched; head anteriorly subtly reticulate; lateral pubescence on pronotum sufficiently broad; on elytra, dilated before middle and meeting suture a little before apex; truncature of apex fairly straight; external apical angle obtuse hardly produced. Anterior tibiae in female with external apical angle straight, hardly produced.

Male: not known.

Remarks: Ochs (1930) has reported some examples from Cherrapunji as belonging to a doubtful but undescribed subsp? This collection is not in the Zoological Survey of India at present. The original description of this species was based only on female specimens.

Distribution: INDIA: Meghalaya: Cherrapunji; INDOCHINA.

KEY TO THE SPECIES OF GROUP 3.

1. Inner line of pubescent margin on the elytra concave, not sinuate or lobed.....*marginiennis*
angustilimbus
- Inner line of pubescent margin on the elytra, undulating or lobed.....2

2. Inner line of pubescent margin on the elytra with one lobe, elongate, directed upwards and inwards; penis a little shorter than parameres; size 4.5—4.6 mm.....*orissaensis*
 Inner line of pubescent margin on the elytra with one lobe, small and rounded; penis as long as the parameres; size 4.6—4.8 mm.....*andamanarum*

37. *Orectochilus* (*Patrus*) *marginipennis angustilimbus* Ochs

(Text figs. 24A, 39C)

Orectochilus marginipennis angustilimbus Ochs, 1925, *Rec. Indian Mus.*, 27: 202 (T.L.— Uttar Pradesh: Dehra Dun: Lachiwala—1 male 'Type' in F.R.I. Dehra Dun; 1 male and 1 female 'Cotypes' in Ochs colln. Senckenberg Mus.; other examples female from Assam in Ochs colln.).

Orectochilus (*Patrus*) *marginipennis angustilimbus*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 29.

Length: 4.75—6.00mm.

Head: black; reticulation distinct consisting of rounded areoles; punctation fine moderately close, frontoclypeal suture distinct; reticulation on clypeus as well impressed as on head, punctation similar but closer. Labrum yellow, twice as broad as long, semicircular, finely punctate-pubescent.

Pronotum: black, reticulation subtle; punctation indistinct; lateral margins yellow, oblique not sinuate; lateral pubescence quite narrow, dilated anteriorly behind eyes and reaching to middle of eyes on inner side. Scutellum small, triangular in male and very small in female.

Elytra: bronze-black; lateral margin yellow; reticulation indistinct, punctation very fine and very remote. Lateral pubescence quite narrow in humeral region, slightly dilated from posterior one-third and inclined towards apex of suture, inner margin concave. Truncature of apex substraight, a little sinuate on outer side, epipleural angle a little obtuse and not pointed; sutural angle almost straight.

Pygidium: black with large yellow spot.

Sexual characters: Anterior tibiae in male, elongate triangular, with external side straight, inner side obliquely narrowed posteriorly; external apical angle almost right angled, rounded and somewhat denticulate, protarsi elongate oval, less broad than tibiae; protarsi in female narrow subparallel. Aedeagus with penis as broad at base and a little shorter in length, than parameres, a little constricted behind middle to apex which is rather spatulate.

Remarks: This above description is based on the examples collected near the type-locality and compared with 'Type' specimens in F.R.I. These are however a little smaller in size viz. 5.0—5.5 mm. In the character of yellow labrum, yellow spot on pygidium and very narrow lateral pubescence, on the elytra, in the humeral region, this species comes very close to *parvulus*, *orissaensis* and *andamanarum* but can be easily separated from them by the absence of any lobe formed by the lateral pubescence on the elytra. The F.R.I. colln, has 1 ex female, loc. Lachiwala Siwaliks, Dr. Cameron colln., 7.i.23 determined by Ochs 1924 and labelled by him as *marginipennis* Aubé. Obviously it is the 'Type' specimen of the subspecies *angustilimbus* described by him, with which locality details agree. The F.R.I. collection also contains 1 male ex. with the same particulars but determined by S. N. Chatterji. The comparison of these specimens with those from Burma (nominotypical form) indicate that the nominotypical form is smaller in size and has the inner margin of lateral pubescence on elytra more concave than in this subspecies.

Distribution: INDIA: Uttar Pradesh: Dehra Dun Dist., Lachiwala. Assam.

38. *Orectochilus (Patrus) orissaensis* Vazirani

(Text figs. 24B, 39A)

Orectochilus orissaensis Vazirani, 1958, *Rec. Indian Mus.*, 53: 13 (T.L.—
India: Orissa: Mayurbhanj Dist., Simlipal hills, Chahala Nulla—
male Holotype, 20 paratypes Z.S.I. Calcutta Reg. No. 9657-9659/H4
and 9677/H4); 1977, *Newsl. Zool. Surv. India*; 3(5): 252.

Length: 4.5—4.6 mm.

Head: black with clypeus ferruginous; reticulation distinct, of

rounded areoles, more impressed on clypeus and anterior part of head, becoming obsolete posteriorly; punctation moderate but sparse on clypeus, and remote on head. Labrum yellow, about twice as broad as long; moderately and sparsely pubescent-punctate.

Pronotum: black; lateral sides yellow; reticulation indistinct, punctation very fine and remote. Lateral pubescence, not as broad posteriorly dilated anteriorly, extending to middle of eyes, inner line of pubescent margin concave. Scutellum small and triangular in male and broadly triangular in female.

Elytra: bronze-black; reticulation indistinct; almost impunctate; epipleural angle, subobtuse, not rounded, pointed; sutural angle almost a right angle. Lateral pubescence narrow in the humeral region, suddenly dilating into a lobe, directed upward and inwards, at about one-third from posterior end of elytra, inner pubescent margin deeply concave beyond lobe, touching suture at apex. Truncature of apex substraight; sutural angle subobtuse, slightly rounded; epipleural angle somewhat obtuse, not at all prominent.

Sexual characters: Anterior tibiae in male subparallel, narrowing posteriorly. Aedeagus with penis a little longer than three-fourth length of parameres, somewhat broader than parameres at base, narrowing towards apex and a little constricted before apex which is slightly acuminate.

Remarks: This species belongs to the *scalaris* group of species which occur from Java to India in the oriental region, and is characterised by yellow labrum, yellow antenna, yellow pygidium, and lateral pubescence on elytra with a single lobe. Régimbart 1891 noted three different forms of this complex, one each from Indonesia, Andamans and Burma. Ochs (1925) named and considered these forms as subspecies. Ochs 1927, considered *andamanarum* as full species. From *andamanarum* this species can be separated by (i) the lobe of elytral pubescence is more elongate and directed inwards as against small and rounded lobe (ii) penis a little shorter than parameres and only a little constricted before apex as against penis as long as the parameres and more constricted (iii) lateral pubescence on elytra, somewhat

less broad behind the lobe (iv) labrum more semicircular. The two species are very similar in reticulation and punctation.

Distribution: INDIA: Orissa: Mayurbhanj Dist: Simlipal hills. Madhya Pradesh: Jabalpur.

39. *Orectochilus* (*Patrus*) *andamanarum* Ochs

(Text figs. 24C, 39B, E)

Orectochilus scalaris andamanarum Ochs, 1925, *Rec. Indian Mus.*, 27: 200 (T.L.—Andaman Islands 1 male and 1 female 'Cotype' Z.S.I. Reg. No. 7586/H4, 3396/20-3398/20 and 3390/20).

Orectochilus scalaris Régimbart, 1883, *Ann. Soc. ent. Fr.*, (6) 3: 430, pl. 12, f. 134 a (in part), 1891, *Ann. Soc. ent. Fr.*, 60: 705 (in part); Zimmermann, 1917, *Ent. Mitt.*, 6: 168.

Orectochilus andamanarum: Ochs, 1927, *J. fed. Malay St. Mus.*, 13: 244.

Orectochilus (*Patrus*) *andamanarum*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 19.

Length: 4.6—4.8 mm.

Head: black with clypeus ferruginous; reticulation distinct of rounded areoles, more impressed on the clypeus and anterior part of head, becoming obsolete posteriorly; punctation moderate but sparse on clypeus, and remote on head. Labrum yellow about two and a half times as broad as long, moderately and sparsely pubescent-punctate.

Pronotum: bronze-black; lateral sides yellow; reticulation indistinct, punctation very fine and remote. Lateral pubescence, not so broad posteriorly, dilated behind eyes and reaching middle of eyes on inner side.

Elytra: bronze-black, shining; reticulation indistinct, almost inpunctate; lateral pubescence quite narrow in anterior half, angularly dilated behind middle forming a small lobe directed inwards, pubescent margin concave behind lobe and then meeting suture just before apex. Truncature of apex straight, sutural angle very slightly obtuse, epipleural angle somewhat obtuse, not at all prominent.

Pygidium: yellow.

Sexual characters: Anterior tibiae in male, somewhat broad anteriorly, external apical angle rounded with very minute denticles; protarsi equally broad at base as tibiae. Aedeagus with penis as long as parameres slightly narrowed in apical one-third region, apex spathulate/triangular.

Remarks: It was Régimbart (1883, 1891) who referred the above specimen to *scalaris* and pointed out that there were certain differences in the lateral pubescent margin of this specimen as compared to specimens from Indonesia and Burma. Ochs (1925) placed these specimens as a subspecies of *scalaris* and subsequently raised it to the specific level. However, besides its affinities with *scalaris*, it is closely related to *orissaensis*. From *scalaris* it is larger in size and also differs in the shape of lateral pubescence as illustrated by Régimbart (1883) fig. 134 and 134A pl. xii. From *orissaensis*, it differs (i) in shape of lateral pubescence; the size of pubescent lobe being smaller and width of pubescence posterior to the lobe, somewhat broader (ii) in shape of penis, which is as long as the paramers vs shorter than parameres in *orissaensis*.

The specimens in Z.S.I. bear 'R' label i.e. determined by Régimbart and 'Co-type' Ochs did not put any label on his labels have been lost but the label 'Co-type' was definitely placed by him as similar labels are borne on other species described by him. The male example is selected as 'Lectotype'

Distribution: INDIA: Andaman Islands.

KEY TO THE SPECIES OF GROUP 4

1. Non pubescent area of elytra with six striae of fine punctures, labrum a little over twice as broad as long.....*coronatus*
 Non pubescent area of elytra without any striae of fine punctures, labrum less than twice as broad as long.....2
2. Labrum semi-circular; epipleural angle not prominent; size less than 6.0 mm.....3
 Labrum semi-elliptical; epipleural angle prominent; size more than 6.0 mm.....4
3. Inner line of pubescent margin on elytra with 3 lobes.....*haemorrhous*

- Inner line of pubescent margin on elytra
with a single lobe.....*fletcheri*
4. Inner line of pubescent margin on elytra
with two lobes.....5
Inner line of pubescent margin on elytra
with three lobes.....*ritsemai*
5. Lateral margin of pubescence on pronotum,
reaching middle of eyes on inner side, size
6.5—6.8 mm.....*ribeiroi*
Lateral margin or pubescence on pronotum
broad reaching inner margin of eyes; size
7.5 mm.....*cylindricus*

40. *Orectochilus* (*Patrus*) *coronatus* Ochs

(Text figs. 25C, 48A)

Orectochilus coronatus Ochs, 1925, *Rec. Indian Mus.*, 27: 203 (T.L.—
Assam: Sadiya, Dikrang R.—1 female 'Type' Z.S.I. Reg. No
3056/20).

Orectochilus (*Patrus*) *coronatus*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 22.

Length: 6.0 mm.

Head: bronze-black, reticulation well impressed, consisting of rounded areoles, giving the surface mat appearance; punctation fine and remote; frontoclypeal suture distinct; clypeus with similar reticulation and punctation, anterior margin slightly concave. Labrum anteriorly reddish, short, a little over twice as broad as long, semicircular, pubescent-punctate.

Pronotum: bronze-coloured; reticulation as on head but somewhat less impressed, almost impunctate; lateral margins yellow; lateral pubescence quite narrow, dilated anteriorly behind eyes and hardly reaching middle of eyes on inner side. Scutellum hardly visible in female.

Elytra: bronze-black; reticulation similar to that on pronotum; with six feeble striae of fine punctures; lateral margins yellow; lateral pubescence quite narrow in humeral region, strongly dilated inwards at about middle, inner margin undulated, forming a small lobe at about posterior quarter, slightly produced and

directed inwards and then inclined to suture and meeting it before apex. Truncature of apex, convex, sinuate on outer side, epipleural angle acute and slightly prominent.

Ventral surface: blackish; mesosternum, abdominal sternites and legs reddish, epipleura yellowish.

Sexual characters: Anterior tibiae in female, somewhat triangular, tapering on either side, external apical angle obtuse and rounded. Male not known.

Remarks: Oche (l.c.) has stated that this species which is based on the female sex only resembles the same sex of *vitalisi* Peschet, from Laos, Meleong River but is more elongate and strongly attenuated towards apex. He further stated that this species approaches in form *undulans*, *cylindricus* and *gangeticus*. It however differs from all these latter species in the shape of the labrum which is not as long or protruding. Further, due to its reddish labrum with semicircular shape and a little over twice as broad as long, this species is closer to the *scalaris* complex and appears to constitute a link between the two groups. However it can be very easily distinguished by its characteristic shape of the elytral pubescence and six feeble striae of fine punctures, which are also discernible in *gangeticus*.

Distribution: INDIA: Assam: Sadiya.

41. *Orectochilus* (Patrus) *haemorrhous* Régimbart

(Text figs. 25B, 40B, 48C)

Orectochilus haemorrhous Régimbart, 1891, *Ann. Soc. ent. Fr.*, 60: 706, pl. 18, F. 13 (T.L.—Madras—Helsingfors Mus. and Paris. Mus.); Zimmerman, 1917, *Ent. Mitt.*, 6: 168; Ochs, 1929, *Rec. Indian Mus.*, 31: 242; Vazirani, 1958, *Rec. Indian Mus.*, 53: 17.

Orectochilus (Patrus) *haemorrhous*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 26; Vazirani, 1947, *Newsl. Zool. Surv. India*, 3(5): 252, 280.

Orectochilus haemorrhous lobifer Régimbart, 1907, *Ann. Soc. ent. Fr.*, 76: 214 (Base of himalaya—Paris Mus.).

Orectochilus (Patrus) *haemorrhous lobifer*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 26.

Length: 5.0—5.5 mm.

Head: bronze-black; reticulation distinct consisting of rounded areoles, very well impressed, giving surface a mat appearance; punctation fine and remote frontoclypeal suture rather feeble; reticulation on clypeus stronger than on head, anterior margin slightly concave. Labrum brownish black, one and a half times as broad as long, punctate-pubescent, semicircular, protruding.

Pronotum: bronze-black; reticulation distinct, a little less impressed than on head; impunctate; feeble, small longitudinal striations along anterior margin; lateral margins yellowish, moderately broad, a little dilated anteriorly and reaching middle of eyes on inner side. Scutellum moderate triangular.

Elytra: bronze-black; reticulation feeble, transverse; punctation moderate, irregular, quite remote but rather strongly impressed; lateral sides yellow; lateral pubescence quite narrow in anterior half, dilated and undulated in posterior half, forming 3 lobes before apex, 1st lobe just at middle, 2nd lobe at three-fourth of length of elytron and 3rd lobe just before meeting suture. Truncature of apex slightly oblique, subsinuate, both angles almost straight, hardly prominent.

Ventral surface: ferruginous; legs, abdominal sternites and epipleura reddish yellow.

Sexual characters: Anterior tibiae in male triangular, not so broad, both sides tapering at base, inner side more so, external apical angle obtuse, rounded with a few small denticles. Aedeagus with penis slightly less broad at base and almost as long as parameres, uniformly tapering to apex.

Remarks: Régimbart (l.c.) stated this species appeared to be allied to *scalaris* which is however quite different and constitutes a separate complex of species with yellow labrum. Among the species occurring in this region it is very close in form, size etc., to *O. fletcheri* Ochs from which it can be easily separated by (i) its slightly larger size of (ii) lateral pubescence on elytra trilobed as against monolobed. Régimbart (1907) described a subspecies *lobifer*, from 'base of Himalayas.' Two female examples in Paris Museum, are hardly distinguishable from the nominotypical form which shows certain variations. Specimens from Maharashtra are a little darker than those from Kerala: Alleppey.

Distribution: INDIA: Bihar: Pusa, Chaibasa, Chakradharpur, Santal Parganas. West Bengal: Brahmani R. Madhya Pradesh: Jabalpur Dist., Jabalpur, Hoshangabad, Narsinghpur, Rewa Dist., Mandla Dist., Nerbudda R., Burhner R. Maharashtra: Naginaghat at Nanded, Nasik Dist.: Kalwam. Karnatak: Bangalore, Alleppey. Tamil Nadu: Madras.

42. *Orectochilus (Patrus) fletcheri* Ochs

(Text figs. 25A, 40A, 48B)

Orectochilus fletcheri Ochs, 1925, *Rec. Indian Mus.*, 27: 201 (T.L.—S. Malabar, Kollengode—'Types' 2 male and 6 female in I.A.-R.I. colln. Delhi and 'Cotypes' 1 male, 2 female, in Ochs colln. Senckenberg Mus.); 1929, *Rec. Indian Mus.*, 31: 243; Vazirani, 1958, *Rec. Indian Mus.*, 53: 17.

Orectochilus (Patrus) fletcheri: Ochs, 1980, *Cat. Indian Ins.*, pt. 19: 25, Vazirani, 1977, *Newsl. Zool. Surv. India*, 3(5): 252, 280.

Length: 4.5—5.0 mm.

Head: brown, strongly reticulate with rounded areoles, giving the surface semimat appearance; punctation moderate and remote; clypeus concolorous, with reticulation and punctation more impressed than on head and the anterior margin slightly concave. Labrum brown, semicircular, less than twice as broad as long, moderately punctate-pubescent.

Pronotum: bronze coloured; reticulation less impressed than on head; almost impunctate; lateral margins yellow, slightly oblique, straight; lateral pubescence reaching the middle of eyes, obliquely and strongly narrowed posteriorly. Scutellum broadly triangular in male and very small in female.

Elytra: bronze-coloured, sutural margin with a row of black dots; reticulation very feeble consisting of small transverse areoles, punctation fine and remote; lateral pubescence sufficiently narrow at base, just before the middle dilated into a small lobe, directed inwards, posteriorly regularly and concavely dilated and reaching the suture just before apex in male, less dilated in female. Lateral margins yellow. Epipleural angle subobtuse, sutural angle straight, truncature of apex fairly straight, slightly sinuate on the outer side.

Ventral side: dark brown, with abdomen and legs reddish, epipleurae yellow.

Sexual characters: Anterior tibiae in male, straight subparallel, external apical angle rounded; protarsi dilated, oblong; in female subparallel. Aedeagus with penis, at base somewhat broader than and almost as long as the parameres, slightly constricted before the apex, acuminate and pointed at apex.

Remarks: As stated by Ochs (l.c.) this species is closely related to *haemorrhous* Régimbart, but a little less elongate and rather broader in shape. The two species can however be separated by (i) different shape of the elytral pubescence which has only one lobe situated at about one-half of the length of elytra while in *haemorrhous* the pubescence of elytra is trilobed (ii) penis constricted/narrowed in the middle vs uniformly narrowed. Only 3 examples are now available in I.A.R.I. collection without any 'Type' label. The lectotype may subsequently be selected from specimens in Ochs colln. in Senckenberg Museum.

Distribution: INDIA: Bihar: Chaibasa, Singhbhum Dist., Santal Parganas, West Bengal: Brahmani R. Madhya Pradesh: Jabalpur Dist., Jabalpur, Narsinghpur, Hoshangabad. Kerala: Kollengade. Maharashtra: Nasik Dist.: Kalwam.

43. *Orectochilus* (*Patrus*) *ritsemai* Régimbart

(Text figs. 26C, 40C, 48D)

Orectochilus ritsemae Régimbart, 1882, *Notes Leydon Mus.*, 4: 67 (T.L.—Java female, Leiden Mus.); 1883, *Ann. Soc. ent. Fr.*, (6) 3: 431, pl. 12, f. 136.

Orectochilus ritsemai: Peschet, 1923, *Opusc. Inst. Scient. Indoch.*, 1: 13; Ochs, 1929, *Rec. Indian Mus.*, 31: 243 (India); Vazirani, 1958, *Rec. Indian Mus.*, 53: 17.

Orectochilus (*Patrus*) *ritsemai*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 33, Vazirani, 1977, *Newsl. Zool. Surv. India*, 3(5): 252, 280.

Length: 6.5—7.5 mm.

Head: bronze-black; reticulation distinct, not so well impressed, consisting of rounded areoles, giving the surface dull appearance punctation fine and remote; frontoclypeal suture feeble; clypeus

with reticulation similar as on head, anterior margin a little concave. Labrum one and a half times as broad as long, semi-elliptical, punctate-pubescent.

Pronotum: bronze-black; reticulation very subtle; punctation very fine and remote, lateral margins yellow, slightly oblique, straight; lateral pubescence moderately broad, a little dilated behind eyes and reaching middle of eyes on inner side. Scutellum broad, triangular.

Elytra: bronze-black shining, reticulation indistinct; punctation moderate and irregular; lateral margins yellow; lateral pubescence quite narrow in basal quarter, dilated abruptly and transversely, forming two small equal lobes, directed upwards, then declined downwards and again dilated to form a small third lobe about middle of elytron and then abruptly and obliquely directed towards suture and meeting it about $3/4$ th of its length. Truncature of apex, slightly oblique, a little convex, somewhat sinuate on either sides, both angles straight but pointed.

Ventral surface: brownish-black; abdominal sternites, legs and epipleura reddish.

Sexual characters: Anterior tibiae in male triangular, external apical angle straight but rounded; protarsi, oblong, slightly broadened. Anterior tibiae in female similar and protarsi narrow and parallel. Aedeagus with penis $5/6$ th length of elytra, quite strongly constricted before apex which is elongate oval.

Remarks: Among the species occurring in India, it comes quite close to *ribeiroi* and *cylindricus* in the undulation of inner pubescent margin of elytra. It can however be separated from both by the trilobed shape of elytral pubescent margin which is very narrow in basal quarter and has 3 lobes on the inner side as against broader pubescent margin at base and 2 lobes of the inner line of pubescent margin. The dilatation of pubescence also begins comparatively nearer the base. The penis is comparatively longer and has a different shape at apex.

Ochs (1929) has pointed out that the type-locality 'Java' appears to be erroneous, though however the species extends from India: Maharashtra, Madhaya Pradesh, Uttar Pradesh, Bihar, Burma.

Vietnam: Tonkin to Indonesia. Its first definite record is from Madhya Pradesh: Koilari, Mandla, Ratlam, Barham Kalan, Sandia. It is now being recorded from Maharashtra: Aurangabad and Orissa: Balassore. The specimens from Maharashtra are darker than the specimens from Madhya Pradesh.

Distribution: INDIA: Uttar Pradesh: Mirzapur. Bihar: Morel R., Santal Parganas. Madhya Pradesh: Koilari, Mandla, Hoshangabad, Ratlam, Barham Kalan, Sandia, Rewa Dist. Maharashtra: Aurangabad, Nanded. Orissa: Balassore. BURMA. VIETNAM. INDONESIA.

44. *Orectochilus* (*Patrus*) *ribeiroi* Vazirani

(Text figs. 26A, 40D, 48E)

Orectochilus ribeiroi Vazirani, 1958, *Rec. Indian Mus.*, 53: 14 (T.L.—W. Bengal: Brahmani R.—Holotype male and 13 Paratypes—Z.S.I. Reg. No. 9678/H4—9689/H4, 3898/H4).

Length: 6.0—6.8 mm.

Head: black, reticulation consisting of rounded areoles strongly impressed, more so on clypeus and on head anteriorly, getting less impressed posteriorly; sparsely and finely punctate; anterior margin of clypeus slightly concave.

Pronotum: black, reticulation less impressed than on head, very sparsely and finely punctate; lateral margins yellow; lateral pubescence reaching middle of eyes on inner side, moderately broad posteriorly and only slightly dilated anteriorly, inner margin oblique and straight. Scutellum small and triangular.

Elytra: black; reticulation feeble, much less impressed than on pronotum, punctation very fine and very sparse; lateral pubescence as broad at base as on pronotum, uniformly wide in anterior one-third, dilated and undulating on inner side, forming two lobes and meeting suture at posterior quarter, anterior lobe convex beyond which inner pubescent margin slightly obliquely directed backwards to suture, second lobe much smaller than first, rounded in male and angular in female. The truncature of apex moderately sinuate on external side, epipleural angle strongly prominent and sharp, sutural angle straight.

Ventral side: black; abdominal sternites and legs ferruginous, epipleura yellow.

Sexual characters: Anterior tibiae in male almost subparallel, broadened anteriorly, external apical angle straight, rounded without denticles; protarsi only slightly broader than in female. Aedeagus with penis constricted in middle one-third narrowing towards apex and rounded at apex, about four-fifth length of parameres.

Remarks: When described, this was stated to resemble closely *ritsemai* but in fact it is more closely related to *cylindricus* Régimbart, species not examined by the author at that time. This species can be distinguished by the smaller size and the lateral pubescence of elytra meeting the suture more anteriorly.

Distribution: INDIA: Uttar Pradesh: Mirzapur. Bihar: Muzaffarpur. West Bengal: Brahmani R.

45. *Orectochilus* (*Patrus*) *cylindricus* Régimbart

(Text figs. 26B, 41A, 48F)

Orectochilus cylindricus Régimbart, 1891, *Ann. Soc. ent. Fr.*, 60: 713 (T.L.—W. Bengal: Murshidabad, 1 male, Paris Mus.); Ochs, 1925, *Rec. Indian Mus.*, 27: 202.

Orectochilus (*Patrus*) *cylindricus*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 23.

Length: 7.5 mm.

Head: bronze-black, reticulation very distinct, consisting of fine rounded areoles.

Labrum: black; semi-elliptical; sparsely punctate; reticulation distinct, consisting of rounded areoles.

Pronotum: bronze-black; lateral pubescence moderately broad, hardly broader anteriorly, reaching the middle of eyes on the inner side; lateral margins yellow, oblique, substraight. Reticulation subtle, punctation fine and sparse.

Elytra: bronze-black; reticulation subtle, transeverse; punctation fine and sparse; lateral pubescence as broad at base as on

pronotum, continued as such in basal one-third then dilated upwards and downwards forming a small lobe, again dilated and forming a smaller, second, convex lobe and obliquely inclined to meet suture at posterior one-third. Truncature of apex sufficiently sinuate on outer side, epipleural angle strongly prominent and sharp, sutural angle straight.

Ventral side: black; abdominal sternites, legs and epipleura, reddish brown.

Sexual characters: Anterior tibiae in male somewhat straight, external apical angle straight, protarsi elongate, hardly dilated. Aedeagus with penis about 4/5th the length of parameres, apex broadly apathulate.

Remarks: Among the Indian species it comes close to *ritsemai* and *ribeiroi* but can be easily distinguished from *ritsemai* by different shape of elytral pubescence e.g., in *ritsemai* the lateral pubescence is much narrower at base and meets the suture comparatively posteriorly. From *ribeiroi* it can be separated by (i) larger size (ii) the lateral pubescence meets the suture more posteriorly. Régimbart (l.c.) considered this species to be near to *undulans* Régimbart from Tonkin, from which he separated it by distinct reticulation, covered with rounded areoles, less profound areoles on elytra as well as the different size of the two lobes of the elytral pubescence and its junction with the suture. Régimbart (l.c.) who based his description on the single male example also predicted that there may be sexual differences in the shape of elytral pubescence but this has not proved to be true as already pointed out by Ochs (1925).

Distribution: INDIA: Bihar: Pusa. West Bengal: Murshidabad.

GROUP 5

46. *Orectochilus* (*Patrus*) *gangeticus* (Wiedemann)

(Figs. 25E, 27A-D, 41B)

Gyrinus gangeticus Wiedemann, 1821, in Germar, *Magazin d' Ent.*, 4: 119 (T.L.—'Ganges'); Perty, 1831, *Ogs. Col. Ind.*, p. 12.

Orectochilus gangeticus: Aubé, 1838, *Species Coleopteras*, 6: 740;

Régimbart, 1883, *Ann. Soc. ent. Fr.*, (6) 3: 434, pl. 12, f. 137, 137a, 137b; 1891, *Ann. Soc. ent. Fr.*, 60: 714; Nowrojee, 1912, *Mem. Dept. Agric. India.*, (*Ent. Ser.*) 2: 179; Vazirani, 1958, *Rec. Indian Mus.*, 53: 17.

Orectochilus (Patrus) gangeticus: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 25.

Length: 7.5—10.00 mm.

Head: black; reticulation very well impressed, consisting of rounded areoles and giving surface somewhat dull appearance; frontoclypeal suture feeble, anterior margin of clypeus concave in middle, punctation very fine and sparse but somewhat stronger and less sparse on clypeus. Labrum black, one and a half times as broad as long, semi-elliptical.

Pronotum: black; reticulation as on head, almost impunctate; lateral pubescence moderately broad, a little dilated behind eyes and reaching middle of eyes on inner side. Scutellum very small, triangular.

Elytra: black; reticulation as on pronotum; lateral margins black; lateral pubescence somewhat broad in humeral region, dilated inwards at about two-third of its length, undulated and forming three lobes before touching suture just before apex; in the female dilation begins behind middle and the longitudinal carina marks inner line of pubescence before commencement of undulations. Six feeble striae of very fine punctures present in female. Truncature of elytra slightly oblique and convex in male and epipleural angle pointed and produced into a small spine; in female very oblique and externally much more sinuate.

Sexual characters: Anterior tibiae in male triangular, narrowing towards base on either side, external apical angle obtuse and rounded with very feeble denticles, protarsi oblong oval, as broad as the tibiae. Anterior tibiae in female less broad not so triangular and tarsi subparallel. Aedeagus with penis a little shorter than parameres but somewhat narrower, almost uniformly broad but abruptly narrowed towards apex.

Remarks: This species is quite close to the species placed in group 6, but constitutes a separate group by having the lateral margins of pronotum and elytra black *vs* yellow. The presence

of the carina on the elytra in females is a unique character of this species. The identification presents no difficulty.

Distribution: INDIA: Uttar Pradesh: Mirzapur, Allahabad, Bihar: Pusa, Santal Dist. West Bengal: 'Ganges', Murshidabad, Darjeeling Dist., Teesta R., Jalpaiguri, Berhampore, Birbhum. Assam: Kairchana. Sikkim. BANGLA DESH, INDONESIA: JAVA (?).

KEY TO SPECIES OF GROUP 6

1. Lateral pubescence on elytra dilated before middle.....2
 Lateral pubescence on elytra dilated at or behind middle.....4
2. Lateral pubescence on elytra, dilated before middle, and inner line of pubescent margin meeting suture at its junction with apex, size 7.0—8.0 mm.....3
 Lateral pubescence on elytra, dilated before middle but inner line of pubescent margin meeting suture at about one third before apex; size 9.66—10.00 mm.....*aenipennis*
3. Lateral pubescence on elytra abruptly dilated before middle; inner margin somewhat oblique and subparallel to outer margin, meeting suture at its junction with apex; size 7.0 mm.....*cardoni*
 Lateral pubescence on elytra, only slightly dilated posteriorly, till it assumes width of pubescence on pronotum at 2/3rd length to elytra, then abruptly dilated and undulating on inner side, slightly lobular, inclined in a curve posteriorly, and reaching apex almost at sutural angle, size 8.00 mm.....*brincki*
4. Inner margin of lateral pubescence on elytra touches suture at its junction with apex or a little before it, epipleura produced into a large spine.....5
 Inner margin of lateral pubescence on elytra does not touch suture at its junction with apex but it touches truncature of its apex and rarely prolonged towards suture, only in one sex; epipleura produced into a small spine.....6

5. Lateral pubescence on elytra, dilated just behind middle, inner margin of pubescence slightly convex; epipleura black; size 9.5 mm.....*ahlwarthi*
 Lateral pubescence on elytra dilated just behind middle but with inner margin slightly more convex; epipleura yellow; size 8.5 mm.....*andamanicus**
6. Size 8.0 mm. or more.....7
 Size less than 8.0 mm.....9
7. Lateral pubescence dilated at about middle of elytra.....8
 Lateral pubescence dilated at 3/4th length of elytra; size 9.5 mm.....*volubilis*
8. Elytral margin with a distinct concavity before apex; strong sexual dimorphism in inner margin of lateral pubescence in male dilated behind middle in the shape of '5'; apex of penis more pointed with longitudinal carina; size 9.0 mm.....*nathani*
 Elytral margin without and concavity before apex; without sexual dimorphism in inner margin of lateral pubescence; apex of penis more rounded and without longitudinal carina; size 8.0—8.75 mm.....*annandalei*
9. Inner margin of lateral pubescence of elytra, narrower and oblique after its dilation; size 7.0 mm.....*assimilis*
 Inner margin of lateral pubescence on elytra nearly parallel to the suture; size 7.25 mm.....*indicus*

47. *Orectochilus* (*Patrus*) *cardoni* Régimbart

Orectochilus cardoni Régimbart, 1891, *Ann. Soc. ent. Fr.*, 60: 714, pl. 18, fig. 17 (T.L.—Bengal: Tetara—Paris Mus.); 1892, *Ann. Soc. ent. Belg.*, 36: 121.

Orectochilus (*Patrus*) *cardoni*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 21; 1966, *Mitt. munch. ent. Ges.*, (5) 56: 184*; Vazirani, 1977, *Newsl. Zool. Surv. India*, 3(5): 253.

* *spiniger* does not occur in India, it has been wrongly reported. In the female the elytra are not covered with distinct rounded areoles giving the surface a dull appearance as in *andamanicus*,

Length: 7.0 mm.

Form: elongate oval, anteriorly and posteriorly attenuated, very convex.

Head: bronze-black, labrum semi-circular, distinctly densely reticulate.

Pronotum: black, shining; lateral margins reddish; lateral pubescence moderately broad anteriorly, narrowed posteriorly.

Elytra: black, shining; reticulation very subtle, tranverse areoles hardly visible; lateral pubescence very narrow in humeral region, abruptly dilated before middle and then oblique, and straight (subparallel to outer margin) to suture and meeting at its apical junction. Truncature of apex slightly oblique, subsinuate, external apical angle rounded; epipleura produced into a moderate spine.

Ventral surface: black; abdominal sternites and legs rufous-ferruginous. Anterior tarsi in male broadly oval; external apical angle of tibiae rounded and not projecting.

Remarks: Régimbart (l.c.) considered this species to be close to *O. indicus* and *O. spiniger*. It can be separated from both in the character of lateral pubescence on elytra whose dilation begins before the middle of elytra in this species while it begins behind the middle in the other two species. In this character it is similar to *aenipennis* in which the dilation begins before the middle but the inner margin of the pubescence meets the suture at about one-third from its apex while in this species it meets the suture at the junction of suture and apex. It has not been possible to examine any male specimen.

Distribution: INDIA: West Bengal: Tetara.* Madhya Pradesh: Hoshangabad.

* Ochs 1966 states that this species is confined to 'Bengal-Tetara' & Ochs 1930 example from Nilgiris belong to *brincki*.

* There is no such place in Gazetteer of India and Pakistan. However being Rev. Cardon collection, it is presumed to be in Bihar where there are several villages e.g. Tetarhat, Tetaria, Tetari.

48. *Orectochilus* (*Patrus*) *brincki* Ochs

Orectochilus brincki Ochs, 1948, *Opus Ent.*, 13: 162 (T.L.— Tamil Nadu: Mettupalaivam, Bhavani R., foot of Nilgiri hills, Alt. 1100 ft, Holotype, female, in Senckenberg Mus.).

Length: 8.0 mm., breadth 3.75 mm.

Head: black with blue iridescence; frontoclypeal suture distinct, clypeus with reticulation of rounded areoles, and diffused/sparse punctation; reticulation and punctation strong anteriorly and feeble posteriorly. Labrum black, semi-circular, reticulation of rounded areoles, pubescent-punctate and with a median, flat, longitudinal carina; elongate, yellow, cilia along the anterior margin.

Pronotum: black with blue iridescence, lateral margins, reddish yellow; reticulation somewhat transeverse and otherwise similar to posterior part of head, punctation also similar to posterior part of head; lateral pubescence reaching middle of eyes, posteriorly reduced to half in width and concave on inner side, in shape of a quarter circle.

Elytra: black with blue iridescence, lateral margins reddish yellow, strongly flat behind shoulders, epipleura produced into a spine, twisted, slightly curved on outer side, spine, darker than lateral margins. Lateral pubescence very narrow in humeral region, only slightly dilated posteriorly till it assumes width of pubescence on pronotum at about two-third length of elytra; inner margin of pubescence then abruptly dilated and becoming undulating, slightly lobular and inclined in a curve posteriorly, somewhat parallel to lateral margin and reaching apex almost at sutural angle. The smooth area of elytral surface with reticulation of fine transeverse meshes anteriorly but rounded meshes posteriorly; punctation fine and diffuse. Elytral suture, somewhat carinate in its posterior half, and parallel to that, there is indication of a longitudinal rib anteriorly. Truncature of apex, somewhat slanting, convex on inner and outer sides, sutural angle projecting into a small spine.

Remarks: This species would seem superfluously like *O. cardoni* Régimbart, which is very near to it, and can be separated by the

inner line of lateral pubescence on elytra neither being lobular nor as broad as in this species.

Distribution: INDIA: Tamil Nadu: Mettupalayam, Bhavani R., foot of Nilgiri hills.

49. *Orectochilus* (*Patrus*) *aenipennis* Régimbart

(Figs. 28A, 41C)

Orectochilus aenipennis Régimbart, 1907, *Ann. Soc. ent. Fr.*, 76: 217 (T.L. Kanara—Mus. de Boshi—also 1 male labelled 'Type' in B.N.H.S. in damaged condition, without head; 'Cotype' in I.A.R.I. New Delhi); Zimmermann, 1917, *Ent. Mitt.*, 6: 168.

Orectochilus (*Patrus*) *aenipennis*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 19, Vazirani, 1977, *Newsl. Zool. Surv. India*, 3(5): 280.

Length: 9.66—10.6 mm.

Head: black, labrum elongate semi-elliptical, punctate-pubescent.

Pronotum: bronze-black, shining; lateral margins yellow; lateral pubescence moderately broad, oblique reaching to middle of eyes, dilated behind eyes; reticulation and punctation indistinct.

Elytra: bronze-black, shining; lateral margins yellow; lateral pubescence very narrow at base, abruptly dilated before middle then slanting to suture and touching suture well before apex; reticulation indistinct; punctation very fine and very remote. Truncature of apex a little convex, outside somewhat sinuate, sutural angle subobtuse, epipleura produced into a small spine, almost right angled.

Ventral surface: piceous-black; abdominal sternites and legs reddish brown; epipleura yellow.

Sexual characters: Anterior tibiae in male sufficiently robust, external apical angle just produced, protarsi broad and sub-parallel. Lateral pubescence on elytra in female abruptly dilated before middle at an angle, and smooth area acuminate posteriorly. Aedeagus with penis, as broad at base as parameres and a little shorter than them, slightly tapering to apex, somewhat constricted before broadly triangular apex.

Remarks: The above description is based on the damaged example labeled 'Type' in B.N.H.S. colln. It resembles *cardoni* in the lateral pubescence on elytra being dilated before the middle but differs from it by its larger size viz. 9.66—10.00 mm. as against 7.0 mm. The lateral pubescence on elytra meets the suture well before the apex, at the posterior one-third of the elytral length as against at its juncture with apex, as in *cardoni*. There appears to be confusion about the exact status of 'Type' specimens available mentioned above. The above description is based on the male example in B.N.H.S. collection.

Distribution: INDIA: Karnataka: Kanara. Maharashtra: Ratnagiri.

50. *Orectochilus* (*Patrus*) *indicus* Régimbart

(Figs. 28B, 49A)

Orectochilus indicus Régimbart, 1883, *Ann. Soc. ent. Fr.*, (6) 3: 435, pl. 12, fig. 141 (T.L.—India, female, Sharp colln. B.M.) 1891, *Ann. Soc. ent. Fr.*, 60: 714; 1892, *Ann. Soc. ent. Belg.*, 36: 121; 1902, *Ann. Soc. ent. Fr.*, 71: 470; 1907, *Ann. Soc. ent. Fr.*, 76: 217; Zimmermann, 1917, *Ent. Mitt.*, 6: 168; Ochs, 1929, *Rec. Indian Mus.*, 31: 246. Vazirani, 1958, *Rec. Indian Mus.*, 53: 17.

Orectochilus (Patrus) indicus: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 27; Vazirani, 1977, *Newsl. Zool. Surv. India*, 3(5): 253.

Length: 7.25 mm.

Head: black, reticulation subtle consisting of rounded areoles; punctation moderate and close but more impressed on the clypeus; frontoclypeal suture distinct, anterior margin slightly concave. Labrum $2\frac{1}{2}$ times as broad as long, semicircular, pubescent-punctate.

Pronotum: black, shining; lateral margins yellow, substraight; lateral pubescence quite broad, reaching middle of eyes on inner side, inner pubescent margin slightly concave; reticulation and punctation indistinct.

Elytra: black, shining with bronze iridescence; lateral margins yellow; lateral pubescence very narrow in anterior two third and then dilated abruptly and obliquely and slanting down, almost

parallel to suture and then narrowly touching suture; reticulation and punctation indistinct. Truncature of apex substraight, outer portion sinuate, external angle subobtuse, epipleura produced into a small spine, sutural angle straight.

Ventral surface: black, with anal sternite and legs ferruginous; epipleura yellow.

Sexual characters: Anterior tibiae in male triangular, with external apical angle rounded and obtuse, protarsi oblong oval, as broad as tibiae. Aedeagus with penis only slightly shorter than parameres, apex pointed, very slightly tapering from base of apex.

Remarks: This species is very close to *assimilis* in its size and shape of the lateral pubescence on elytra but differs from it in inner margin of lateral pubescence narrow and oblique behind its dilation.

Distribution: INDIA: Madhya Pradesh: Barbam Kalan, Jabalpur Dist., Jabalpur, Narsinghpur, Mandla Dist. Orissa: Angul. Karnataka: Chikkangalwe, Bangalore. Tamil Nadu: Eastern Ghats. SRI LANKA.

51. *Orectochilus* (*Patrus*) *ahlwarthi* Ochs

(Figs. 29A, 42A)

Orectochilus ahlwarthi Ochs, 1957, *Senck. biol.*, 38: 320 (T.L.—Mangalore—Holotype, male, Paris Mus.).

(The following diagnosis is based on author's description)

Length: 9.5 mm. *Breadth* 4.5 mm.

Form: oval, considerably broadened behind shoulders, moderately convex. Dorsal surface shining, black; lateral margins reddish. Under surface black including legs and epipleura.

Head: black; reticulation consisting of rounded areoles, distinct anteriorly becoming obsolete posteriorly; frontoclypeal suture distinct. Clypeus anterior margin concave in middle; reticulation distinct, consisting of rounded areoles; punctation fine and sparse.

Labrum semicircular, projecting anteriorly; reticulate; pubescent-punctate, punctures large and shallow.

Pronotum: black and shining; reticulation less impressed than on head, with elongate striations; punctation fine and sparse. Lateral pubescence broad, reaching to middle of eyes on inner side, posteriorly gradually diminishing in width and reduced to one-third of its size anteriorly and a little broadened again before touching base.

Elytra: black, shining, reticulation and punctation as on pronotum; one or two striae of very fine punctures also present. Lateral pubescence very narrow in anterior half, at most one-third as broad as on pronotum, dilated at about middle, inner margin convex at times, then slanting in a straight line to apex and meeting it before suture. The truncature of apex slightly convex, slightly sinuate on outer side; a distinct notch between epipleural spine and truncature apex.

Sexual characters: Anterior tibiae in male slightly slender, subparallel, strongly constricted at base, broadened on inner side, outer margin slightly concave in basal half, external apical angle rounded, somewhat protruding. Aedeagus with penis considerably shorter than parameres, its basal 2/3rd subparallel, gradually reduced towards apex which is rounded; upper side of basal two-third with narrow longitudinal furrow and apical one-third slightly carinate. Female not known.

Remarks: As pointed out by Ochs (l.c.) this species can be at once distinguished from other species in this group by its black epipleura but reddish margin of the pronotum and elytra.

Distribution: INDIA: Karnataka: Mangalore.

52. *Orectochilus* (*Patrus*) *andamanicus* Régimbart

(Figs. 29B, 42B, 47E)

Orectochilus andamanicus Régimbart, 1883, *Ann. Soc. ent. Fr.*, (6) 3: 435, pl. 12, f. 138 (T.L.—Andaman Island, 1 male—Paris Mus., 1 female—B.M.), 1886, *Ann. Soc. ent. Fr.*, (6) 6: 265, pl. 4, f. 14 (O tibiae and tarsi); Ochs, 1924, *Ent. Bl. Biol. Syst.*, 20: 238; 1929, *J. fed. Malay St. Mus.*, 14: 403.

Orectochilus (Patrus) andamanicus: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 20; Vazirani, 1977, *Newsl. Zool. Surv. India*, 3(5): 292.

Orectochilus spiniger Vazirani, 1958 (nec Régimbart), *Rec. Indian Mus.*, 53: 17.

Length: 8.5 mm.

Head: bronze-black, shining. Labrum nearly semi-circular moderately projecting, anteriorly with long yellow cilia.

Pronotum: bronze-black, shining; reticulation indistinct, punctation fine and remote; lateral margins yellow. Lateral pubescence broad, dilated anteriorly behind eyes and reaching middle of eyes on inner side.

Elytra: bronze-black, shining; lateral margin yellow; reticulation and punctation indistinct; lateral pubescence very narrow, dilated abruptly at about posterior one-third inner margin slightly convex before it reaches suture at apex. Truncature of apex slightly oblique, sinuate, a little convex in middle, sutural angle pointed; epipleura produced into a spine, forming a right angle with apex.

Ventral surface: black; abdominal sternites and legs ferruginous; epipleura yellow.

Sexual characters: In male, the elytra, smooth and shining, in female entirely covered with fine reticulation consisting of rounded areoles, more impressed posteriorly and on sides than on disc. Aedeagus with penis broader at base and only a little shorter than parameres almost uniformly broad at basal two-third, slightly constricted just before apex.

Remarks: In the elytral pubescence it is quite near to *ahlwarthi* but can be separated from it at once by the yellow epipleura vs black epipleura in *ahlwarthi*.

Distribution: INDIA: West Bengal: Calcutta. Orissa: Mayurbhanj Dist. Arunachal Pradesh: Siang Dist. Andaman Islands. BURMA.

53. *Orectochilus* (*Patrus*) *volubilis* Ochs

(Figs. 29C, 42C, 49B)

Orectochilus volubilis Ochs, 1929, *Rec. Indian Mus.*, 31: 252 (T.L.—Meghalaya: Shillong—male, Holotype and female 'Paratype' in Z.S.I. Reg. No. 920/H4—921/H4)

Orectochilus (*Patrus*) *volubilis*: 1930, *Cat. Indian Ins.*, pt. 19: 35.

Length: 9.5 mm.

Head: black, shining; frontoclypeal suture feeble, slightly convex in the middle; clypeus brown, a little concave along anterior margin, reticulation feeble, punctation fine and remote. Labrum bronze-black, 3 times as broad as long, anterior margin semi-circular, punctate-pubescent.

Pronotum: bronze-black, lateral margins yellow; lateral pubescence moderately broad, reaching middle of eyes on inner side, abruptly narrowed posteriorly; reticulation and punctation indistinct. Scutellum small and triangular in both sexes.

Elytra: bronze-black; lateral margins yellow; reticulation and punctation indistinct; lateral pubescence very narrow in anterior three-fourth, then obliquely dilated and reaching about middle of apex but not reaching suture and forming a triangle with it. Truncature substraight, sinuate on outer side, sutural angle rounded, epipleura prolonged into quite a large spine, forming a notch with apex.

Ventral surface: bronze-black, with abdominal sternites and legs ferruginous; epipleurae yellow.

Sexual characters: Anterior tibiae in male triangular, external side almost straight, external apical angle almost right angled, only slightly rounded and a few minute denticles; protarsi somewhat broader at base than tibia, oval, attenuated anteriorly. Anterior tibiae in female almost similar, protarsi narrow and subparallel. Aedeagus with penis a little over 3/4th length of parameres, broader at base than parameres, almost uniformly wide for 3/4th its length, then regularly tapering apical portion subparallel, apex broad and notched in middle.

Remarks: This species belongs to a complex in which the inner margin of lateral pubescence on elytra does not reach the suture but reaches the apex before it. In its large size it resembles *nathani* and *annandalei*. In this species the inner margin of lateral pubescence on elytra is dilated three fourth the length of elytron as against at about the middle of elytron in the other two species. Both *nathani* and *annandalei* are reported from South India only.

Distribution: INDIA: Meghalaya: Shillong.

54. *Orectochilus* (*Patrus*) *nathani* Ochs

(Figs. 30A, 42D, 49C)

Orectochilus nathani Ochs, 1966, *Mitt. munch ent. Ges.*, Jahrgang, (5) 56: 182, (T.L.—Tamil Nadu: Anamalai hills, Cinchona—Holotype male and Allotype in Z.S.B.S.M.)

(The following diagnosis is based on author's description)

Length: 9.0 mm.

Form: oblong, oval, broader in humeral region and attenuated backwards. Dorsal surface black, shining, pronotum and elytra with yellow lateral margins. Ventral surface black, legs and abdominal sternites reddish, epipleura yellow.

Head: black; reticulation not well impressed; punctation very fine and very sparse; frontoclypeal suture distinct, clypeus with reticulation of partly roundish areoles and partly longitudinal areoles; punctation fine and sparse. Labrum semi-circular, anterior margin with long reddish yellow cilia, anterior portion impunctate, posterior portion pubescent-punctate; surface reticulate.

Pronotum: black, iridescent reticulation distinct, rounded areoles, punctation very fine and sparse; lateral pubescence moderate, extending to middle of eyes on inner side, then reducing in width to half, inner line of pubescence concave and then parallel to side margin. Scutellum transversely triangular, with reticulation of rounded areoles.

Elytra: black; reticulation less impressed than on pronotum, somewhat transverse areoles posteriorly; punctation irregular, very

fine and very remote anteriorly, getting obsolete posteriorly, faint lines of longitudinal striae of punctures also present. Lateral pubescence very narrow, about one-third width of pubescence on pronotum posteriorly; subparallel in anterior half; dilated behind in form of 'S', and reaching truncature of apex, in a slanting line, at its inner one third but not reaching suture. The flat yellow margin of elytra, gradually and slightly broader posteriorly than on pronotum; epipleura produced into a short spine. Truncature of apex almost horizontal, with a right angled notch on outside.

Sexual characters: Anterior tibiae in male, short, incised on base on inner side, undulating apex somewhat slanting in straight line; apical angle right angled, rounded and denticulate/spiked. Protarsi somewhat smaller in width than tibiae, elongate oval, slightly attenuated anteriorly. Aedeagus with penis approximately three fourth length of parameres; subparallel in basal portion, twice broader at base than in apical portion, gradually tapering to apex from one-third of its length, apex more rounded than apex of parameres; also with a longitudinal carina at apex. Female inner margin of elytral pubescence as in male but dilation begins posteriorly; somewhat angular anteriorly, the curvature more slanting, and touching truncature almost at its middle. The reticulation on elytra more impressed, rounded areoles near disc and transverse areoles posteriorly; truncature of elytral apex, on sutural side concave, angle rounded. Anterior tibiae feebly broadened, outer side straight at distal end.

Remarks: Ochs (l.c.) considered this species to be closely related *O. annandalei* but (i) somewhat broader behind the shoulders and more attenuated posteriorly, the elytral margin having a distinct concavity at the end of elytron (ii) in the shape of penis, the apex in this species is slightly reduced, more pointed and slightly carinate while in *annandalei* the apical portion is somewhat depressed. (iii) in this species there is strong sexual dimorphism in the lateral pubescence of the elytra; while in *annandalei* the posterior portion of lateral pubescence on elytra is only slightly slanting but in this species it is 'S' shaped. It also comes near to *assimilis* which is somewhat smaller and in which the dilation begins at posterior one-third as against at the middle

in this species. Penis in *nathani* is comparatively smaller and its apex is more roundish than in *assimilis*. In comparison to *indicus*, it is larger in size and also differs from it in the elytral margin which is broader in this species, especially in the apical portion.

Distribution: INDIA: Tamil Nadu: Annamalai Hills, Cinchona.

55. *Orectochilus* (*Patrus*) *annandalei* Ochs

(Figs 30B, 43A, 49D)

Orectochilus annandalei Ochs, 1925, *Rec. Indian Mus.*, 27: 203 (T.L.—Kerala: Tenmalai, Quilon Dist., 'Types' 3 male, 1 female, in Z.S.I. Reg. No. 3357/20—3361/20 and 1 male, 1 female 'Cotypes' in Ochs colln. Senckenberg Mus.)

Orectochilus (*Patrus*) *annandalei*: Ochs, 1930, *Cat. Indian Ins.*, pt. 19: 20.

Length: 8.0—8.75 mm.

Head: black, shining reticulation subtle, punctation fine and remote; frontoclypeal suture distinct; clypeus black, reticulation distinct but feeble, punctation moderate, quite close, anterior margin slightly concave. Labrum black, three times broader than long, semicircular, pubescent-punctate and reticulate.

Pronotum: black, shining, reticulation and punctation indistinct; lateral margin yellow, substraight; lateral pubescence moderately broad, reaching just about the middle of eyes and broader anteriorly, inner margin concave posteriorly.

Elytra: black, shining; reticulation and punctation indistinct; lateral margins yellow; lateral pubescence narrow, smaller in width than on pronotum, dilated behind middle, inner margin of pubescence slightly convex postmedianly and then obliquely inclined to the middle of apex. Truncature of apex sub-straight, epipleural angle subobtuse, rounded and produced into a distinct spine; sutural angle right-angled.

Ventral surface: black, legs ferruginous, epipleura yellow.

Sexual characters: Lateral pubescence on elytra broader near the apex in female, and then extending in a narrow line but still not reaching suture. Aedeagus with penis broader at base than

parameres and four-fifth of its length, regularly tapering to moderately rounded apex; anterior tibiae in male subparallel; strongly narrowed at base, external apical angle obtuse and denticulate.

Remarks: This species resembles *assimilis* and *indicus*. It can be separated from both by its larger size *viz.* 8.0—8.75 mm. *vs* 7.0—7.25 mm. and the distinct shape of the inner line of pubescence on the elytra as well as shape of the penis.

Distribution: INDIA: Kerala: Tenmalai.

56. *Orectochilus* (*Patrus*) *assimilis* Ochs

(Text figs. 30C, 43B)

Orectochilus assimilis Ochs, 1957, *Senckenb. biol.*, 38: 318 (T.L.—Karnataka: Mysore, Bhadrawati—Holotype, male, Senckenberg Mus.)

Orectochilus (*Patrus*) *assimilis*: Vazirani, 1977, *Newsl. Zool. Surv. India*, 3(5): 280.

(The following diagnosis is based on author's description)

Length: 7.0 mm. Breadth 3.00 mm.

Form: elongate, convex, attenuated behind the shoulders. Upper surface black, shining, lateral margins yellow. Pronotum and elytra with lateral pubescence. Ventral surface black, shining; legs and abdominal sternites reddish; epipleura yellow.

Head: black; reticulation consisting of rounded areoles, with fine sparse punctation; frontoclypeal suture distinct clypeus reddish, anterior margin concave in the middle; reticulation distinct, with fine sparse punctation.

Labrum: black and semi-circular with reddish anterior margin; reticulation distinct, posterior portion coarsely pubescent-punctate; anterior margin with reddish yellow cilia.

Pronotum: black; reticulation almost indistinct; punctation very fine and more sparse than on head; lateral pubescence moderately broad, reaching to middle of eyes on inner side, abruptly narrowed at one-third of its length, then parallel to margin. Scutellum transversely triangular.

Elytra: black; reticulation almost indistinct but somewhat impressed on the posterior portion; punctation very fine and sparse on head. Lateral pubescence very narrow at base, less than half width of pubescent margin on pronotum, dilation begins at 2/3rd length of elytron, inner line of pubescence somewhat concave, then slanting to apex, meeting it at one-third before suture and then in a very narrow streak along apex to suture but does not touch it. Truncature of apex almost horizontal, slightly sinuate in outer portion sutural angle straight, rounded; epipleura produced into a short spine.

Sexual characters: Anterior tibiae in male robust, straight at base; external apical angle rectangular, rounded and denticulate/spiked; protarsi smaller in width than tibiae, elongate, oval, tapering towards apex. Aedeagus with penis shorter than parameres and at base as wide as parameres; basal half gradually reducing in width, apical half subparallel, apex rounded.

Remarks: This species resembles *annandalei* and *indicus*. From *annandalei* it can be distinguished by (i) smaller size 7.0 mm. vs 8.0—8.75 mm. (ii) the dilation of lateral pubescence on elytra begins at posterior one-third instead of behind the middle. It is closer to *indicus* from which it can be separated by (i) smaller size 7.0 mm. as against 7.25 mm. (ii) the inner margin of lateral pubescence, after its dilation is narrower and oblique in this species as against broader and nearly parallel in *indicus*; further it touches the suture in the male of *indicus* but not in this species.

Distribution: INDIA: Karnataka: Bhadrawati. Maharashtra: Poona, Jog hill.

Family HALIPLIDAE

INTRODUCTION

The family Haliplidae comprises a small group of aquatic beetles, first recorded from India by Régimbart (1892) who described *Haliphus angustifrons* from Konbir, Bihar. The same author, in 1899, reported yet another species from Bihar *Haliphus pulchellus* Clark var. *indicus*. Much later Guignot (1936) described the third species *H. arrowi* from Calcutta. Until 1966, the situation remained static. The present author studied the unnamed collection that was present in the Zoological Survey of India. Besides new locality records, the number of known species was raised to five by the addition of two new species. In 1974 the author, received a collection of aquatic beetles from Western Regional Station, which contained one more undescribed species and its account was published in 1975. In the course of further collections made available to the author, some more species were studied including one new species belonging to the *africanus* group. While all other species belong to the *maculipennis* group, it is interesting to report this *africanus* group from India, which shows that the Haliplid fauna has more Ethiopian affinities than previously presumed.

PHYLOGENY

The family Haliplidae belongs to the suborder Adephaga. (Mani) 1974 divides this suborder into 3 superfamilies viz. Caraboidea, Gyrinoidea & Paussidea and places Amphizoidae, Dytiscidae and Haliplidae in the superfamily Caraboidea. It is at once distinguished by the enlargement of its hind coxal plates which cover at least the basal half of hind femora and the first two abdominal sternites, also the antennae are inserted closer to the area between the eyes than in Carabidae.

The short terminal joint of the palpi appears to have a close link with Carabidae through the group Bembidiinae which are placed at end of Carabidae, as pointed out by Fowler (1887). Balfour-Browne (1940) does not find any connecting link in this

but also finds nothing to indicate where Haliplidae comes into Hydrodephaga.

Before Thomson (1860), the Haliplidae were included along with Dytiscidae, but the two families are very distinct. Matheson (1912) regarded the Haliplidae as a transition group between Carabidae & Dytiscidae.

The family is a homogenous one in the sense that there is comparatively little variation of form, unlike in Dytiscidae. As pointed out by Balfour-Browne (1940: 5) the family might be described as having evolved along a single main line.

There has been controversy about the number of antennal segments. Mani (1974) and Hatch (1953) mention the number of antennal segments as 10, where as the Adephaga have 11 antennal segments. Van Emden (1922) showed the existence of 11 segments. Balfour-Browne (1940) states. In Haliplids, however, the bulb alone is developed, the scapus being almost or entirely atrophied, so that the antenna consists of only 11 segments.

The most distinguishing character of the Haliplidae is the massive development of the hind coxae. In Adephaga, the hind coxae are fused along the posterior margin of the metasternum. As in Amphizoidae, Carabidae and Hydrobiidae, the Haliplidae have an antecoxal sclerite which is absent in Dytiscidae and Gyrinidae.

TAXONOMIC CHARACTERS

(Text figs. 50-57)

At the generic level the characters most useful are relative size of apical segment of palpi, the hind coxal plates which may expose the last one to three abdominal sternites, presence or absence of fine sutural striae on the elytra, metasternum reaching the apical epipleura or not; epipleura broad extending almost to the tips of elytra v/s epipleura narrow usually ending at the base of the last abdominal sternite never reaching the elytral apices; ventral side glabrous v/s pubescent; head narrower than pronotum v/s head broader than pronotum; and the shape of prosternal

process which may be evenly rounded or the median part may be raised.

At the specific level, it is very necessary to examine the male genitalia besides examining the width of the interocular space, anterior border of pronotum, relative size, colour and the relative abundance of striae and secondary punctures. The most important characters however are on the ventral side in the shape of the prosternal process whose anterior and lateral sides may or may not be margined, the process itself may be canaliculate or not, or with or without a pit at its apex. The metasternal process may be flat or inflated, with or without a median, small/large, shallow/deep pit. While the length of the setigerous striae on the upper face of hind tibiae has specific importance its presence or absence is a subgeneric character.

FOOD & FEEDING HABITS

Nothing has been recorded about Indian species. They are reported to feed upon both plant and animal material. Among the plant material they seem to prefer algae in whose association they occur, more often as collected by the author. They are preyed upon by fishes, but this has not been recorded in India.

Brocher (1922), Falkenstrom (1926) and Hickman (1931) indicate that animal food is taken only in the absence of suitable vegetation. Beier (1929) observed that animal food such as Oligochaets, Nematodes, larvae of *Anopheles*, *Culex* and *Chironomus* were easily accepted by these beetles in addition to Plant food. Balfour-Browne (1940) states that he frequently came across parts of chitin in the oesophagus. He also confirms the earlier observations of Beier (1929) that in an aquarium the beetles assemble around and feed upon animal matter.

LIFE HISTORY

Nothing is known about the life history of any species in India. But it may be safely believed that there is only one generation in India. Hickman (l.c.) thought there were two generations in year but this has been disputed by Balfour-Browne (l.c.). According to Leech and Chandler (1956) some species overwinter in the

larval stage, in North America, in the damp soil above the water line. They suspect that normally all species pass the winter in the adult stage.

LARVAE

The larvae of Indian species have not yet been described but the genus *Haliphus* being cosmopolitan, larvae of a number of species are known. It has the following diagnostic characters.

Abdomen with 10 segments, apical segments usually produced posteriorly in a fork. Abdominal segments with short projecting processes or tubercles but not long tracheated appendages; with or without conspicuous spines. If present, body spines (except in first instar) never stalked or much longer than length of a single body segment. Third antennal segment, 2-3 times as long as 2nd. Anterior legs weakly to moderately chelate, 4th segment more or less produced.

RESPIRATION

There are two places for air storage in these beetles (i) below the elytra as in Dytiscidae, (ii) below the large hind coxal processes. Under the elytra the tergites are soft and flexible capable of expansion upwards towards the elytra, and of contraction away from them. The air is drawn into this space through a small opening between the apices of the elytra and the tergites of the last abdominal segments. This opening is controlled by expanding and contracting the abdomen and lifting the elytral species.

The cavity below the massive hind coxal processes constitutes an additional air reservoir and is connected with the subelytral space. Hickman (1931) who has observed the respiration in these beetles, came to the conclusion that the adult must come to the surface for respiration. A beetle breaks the surface film with the tip of its abdomen. After obtaining fresh air supply, it dives. Below the surface of water, a large bubble of air is formed near the hind coxal cavity. It has been shown that this bubble has a respiratory function, it exchanges carbon dioxide with the diffused oxygen in water. Sufficient oxygen is not obtained by diffusion

from the coxal bubble. This bubble also has hydrostatic function, a beetle deprived of it cannot float up and break the surface film with its abdomen. Such an insect (deprived of the air bubble) must crawl out to obtain air.

OVIPOSITION

The ovipositor is a simple structure which is incapable of piercing ordinary plant tissue. Balfour-Browne (1940) states that *Peltodytes* lays eggs on the vegetation below the surface and that *Haliplus* deposits eggs in the plant-tissues and in the cells of filamentous algae. Matheson (1912), Blunck (1925) and Beier (1929) have recorded that these beetles bite into the plant tissue and they lay its egg/eggs in the hole. A similar statement has been made by Wilson (1923) but it is not clear if it is based on his own observations or if he is quoting earlier workers.

The larvae in their first two instars depend on cutaneous respiration, after which they develop spiracles and trachae. They do not come to the surface for respiration and use the air dissolved in water. In the final stage the *Haliplus* larvae have open spiracles, which are perhaps used only when the larvae leave the water to pupate.

SYSTEMATIC ACCOUNT

Family HALIPLIDAE

Haliplidae Kirby, 1837, *Fn. Bor. Amer.*, 4: 65; Régimbart, 1895, *Mem. Soc. ent. Belg.*, 4: 3; Zimmermann, 1917 (1919), *Arch. f. Naturgesch.*, 83 A 12: 68; 1920, *Col. Cat.*, 4: 297; Balfour-Browne, 1940, *British Water Beetles*, 1: 109; Hatch, 1953, *Univ. Wash. Publ. Biol.*, 16: 187; Leech & Chandler, 1956, in *Aquatic Insects of California*, p. 302; Guignot, 1959, *Ann. Mus. R. Congo Belge*, (8): 70: 18.

Diagnostic Characters: Antennae filiform, 11-segmented, inserted below the eyes. Head quite small. Base of pronotum directed backwards in the region of scutellum. Punctuation on elytra very distinct. Prosternal process large, generally projecting. Metasternum large and triangular, antecoxal sclerite present; metacoxal plates large, covering base of hind femora and at least three abdominal sternites. Inferior face of elytra with a ligula and a

subelytral fold except in *Peltodytes*. Male with 2-4 basal segments of protarsi and mesotarsi furnished with small groups of white hairy suckers/dense pad of short hairs. Penis asymmetrical, palameres dissimilar. Female: ovipositor primitive, consisting of one or two rudimentary sclerites. Larvae: abdomen of 9 or 10 segments with or without tracheal branchiae.

The family is comprised of five genera distributed as below

<i>Haliphus</i> Latreille	(Cosmopolitan)
<i>Peltodytes</i> Régimbart	(Nearctic, Palaearctic, Ethiopian)
<i>Brychius</i> Thomson	(Nearctic & Palaearctic)
<i>Algophilus</i> Zimmermann	(Ethiopian)
<i>Apteraliphus</i> Chandler	(Nearctic)

KEY TO GENERA OF HALIPLIDAE

1. Last segment of palpi cone shaped, as long as or longer than the preceding segment; hind coxal plates large, only last abdominal sternite completely exposed; elytra with fine sutural striae at least in apical half.....**Peltodytes**
- Last segment of palpi subulate, shorter than the preceding segment; hind coxal plates smaller, leaving the last 3 abdominal sternites exposed; elytra without fine sutural striae.....2
2. Pronotum with sides of basal two-thirds nearly parallel; epipleura broad, extending almost to tips of elytra; metasternum reaching epipleura.....**Brychius**
- Pronotum with sides widest at base, convergent anteriorly, epipleura evenly narrowed, usually ending at base of last abdominal sternite, never reaching elytral apices; episternum completely separating metasternum from epipleura.....3
3. Ventral side of body glabrous; head narrower than the pronotum; metacoxal plates large, reaching the epipleura.....4
- Ventral side of body pubescent; head broader than the pronotum; metacoxal plates narrow, not reaching the epipleura.....**Algophilus**

4. Median part of prosternum and base of prosternal process forming a plateau-like elevation, at least in part angularly separated from sides of prosternum.....**Haliplus**
 Prosternum evenly rounded from side to side.....**Apteraliplus**

Only the genus *Haliplus* occurs in India.

Genus *Haliplus* Latreille

Type of genus—*Dytiscus obliquus* Fabricius (vide Balfour-Browne, F., 1938, *Syst. Nat. Brit. Aquat. Col.*, London, p. 7).

Haliplus Latreille, 1802, *Hist. Nat. Crust. Ins.*, 3: 77; Ganglbaur, 1892, *Kaf. Mittel.*, 1: 424; Zimmermann, 1920, *Col. Catal.*, 4: 312; 1924, *Ent. Blatt.*, 20: 67; Guignot, 1928, *Ann. Soc. ent. Fr.*, 97: 133, 1930; *Bull. Soc. ent. Fr.*, p. 73; 1932; Hydrocanthares France, p. 209; 1939, *Bull. Soc. ent. Fr.*, p. 176; 1959, *Ann. Mus. R. Congo Belge*, (8) 70: 27/; Hatch, 1953, *Univ. Wash. publ. Biol.*, 16: 189; Leech & Chandler, 1956 in *Aquatic Insects of California* p. 304.

Hoplitus Clairville, 1806, *Ent. Helv.*, 2: 218.

Halipus Gyllenhal, 1808, *Faun. Suec.*, 1: 545.

Diagnostic Characters: Apical segment of palpi subulate, shorter than preceding segment, head narrower than pronotum; ventral side glabrous; hind coxal plates leaving last 3 abdominal sternites exposed, not rebordered behind, quite broad and reaching epipleura; pronotum with sides widest at base, convergent anteriorly; epipleura evenly narrowed, usually ending at base of last abdominal sternite, never reaching elytral apices; episternum completely separating metasternum from epipleurae; median part of prosternum and base of prosternal process forming a plateau-like elevation, at least in part angularly separated from sides of prosternum.

The genus has been divided by Guignot (1955) into six subgenera. Guignot (1959) estimated the number of species placed in this genus at about 140. While the genus is cosmopolitan, most of the species are holarctic in distribution. Only eight species occur in India and all the species are placed in the subgenus *Liaphlus* Guignot.

Subgenus **Liaphlus** Guignot

Type of subgenus—*Dytiscus fulvus* Fabricius (by original designation).

Haliphus (*Liaphlus*)—Guignot, 1928, *Ann. Soc. ent. Fr.*, 97: 139; 1930, *Bull. Soc. ent. Fr.*, p. 71; 1932, *Hydrocanthares France* p. 228; 1959, *Ann. Mus. R. Congo Belge*, (8) 70: 3.

Diagnostic Characters: Latero-basal striae on pronotum absent, a setigerous stria present on the upper face of each metatibia, and in males, parameres are narrowly appendiculate.

The subgenus has been divided by Guignot (1959) into 5 groups.

KEY TO GROUPS

1. Elytra with 2 types of longitudinal rows of punctures; principal and secondary punctures unequal.....2
 Elytra with 2 types of longitudinal rows of punctures, punctures of both rows subequal except at base.....gr. *africanus*
2. Prosternal process without any pit/depression at apex.....3
 Prosternal process with a pit at apex or canaliculate.....gr. *maculipennis*
3. Metasternal process plane; the setigerous row of punctures on metatibiae very long; twice longer than in other species; elytra without any spots.....gr. *mucronatus*
 Metasternal process with pits/fovea; the setigerous row of punctures on metatibiae short; elytra with spots.....4
4. Metasternal process with one fovea.....gr. *fubus*
 Metasternal process with two fovea.....gr. *methneri*

All our species except the *H. agarwali* n.sp. belong to the group *maculipennis*. *H. agarwali*, however, belongs to the *africanus* group because the principal and secondary rows of elytral punctures are almost subequal in the posterior half and elytral border is also serrated towards the apex.

The fine sutural stria, which is present in *Peltodytes* is absent in this genus. However, the sutural row of punctures described by the author (1954) represents the first row of punctures nearest to the suture which is quite different from the other primary and secondary rows of punctures. This condition is represented in all the Indian species; and these punctures are generally larger than the secondary row of punctures and closer together than the punctures of the primary rows, but do not form any striae.

Group *africanus*

57. *Haliphus* (*Liaphlus*) *agarwali* n.sp.

(Text figs. 52 A-F)

Length: 2.9 mm.

Head: testaceous, punctation moderate and irregular, stronger behind eyes; antennae with apical five segments stouter than others, segments 7—10 subequal, 11th (apical) elongate.

Pronotum: testaceous with median ferruginous spot touching anterior border; anterior angles not extending beyond middle of margin, subright angled; lateral margins substraight; punctation moderate, irregular, closer along anterior & posterior borders and on disc than elsewhere but not arranged in distinct longitudinal median rows on disc.

Elytra: testaceous, with distinct ferruginous markings along suture, extending inwards at middle and subapical regions, 3 sublateral spots arranged in a row—subbasal, median and subapical. Punctation arranged in two serial rows at base becoming confused with each other behind middle; punctures of stria row (principal) moderate, separated by more than their own diameter; those of interstria rows small and not so numerous, consequently separated by 4—5 times their own diameter at base; row of punctures near suture as well impressed as stria row but punctures not separated by more than their own diameter; external border rather serrated in apical portion.

Ventral side: testaceous, with legs a little darker, prosternal process margined laterally and at base, neither canaliculate nor

pitted strongly but roughly punctate; metasternum with a large median pit divided into 2 by a feeble ridge; metasternum not swollen anteriorly, quite strongly and closely punctate; metacoxal plates touching epipleura at about basal $\frac{1}{3}$ rd, also quite strongly and closely punctate. Dorsal surface of metatibia with setigerous row as in (Text fig. 51F) Aedeagus with penis as per (Text fig. 51D).

Remarks: In the key to species of *africanus* group vide Guignot (1959: 38), this species runs to couplet 8, while it has the black longitudinal spot on the disc of pronotum (as in *natalensis*) Régimbart, the metasternum does not have a large smooth pit. The metasternal pit in this species is more or less bifoveate as in *alluaudi* Régimbart. So this species is considered as intermediate between these two species. It has more superficial resemblance with *natalensis* in the elytral spots. This is the first record of a species belonging to the *africanus* group of species from India.

Holotype: 1♂, INDIA: Madhya Pradesh: Jabalpur, 19.viii, 1966. H. P. Agarwal—in the collection of Zoological Survey of India, Calcutta (Regn. No. 8532/H4A).

Distribution: INDIA: Madhya Pradesh: Jabalpur.

Group *maculipennis*

KEY TO INDIAN SPECIES

1. Prosternal process canaliculate.....2
 Prosternal process not canaliculate.....3
2. Prosternal process without any distinct pit at apex; elytra ferruginous along suture and with 4 dilations, 2 on either side.....*pulchellus indicus*
 Prosternal process, with a distinct pit at apex; elytra narrowly ferruginous along suture but without any dilations; having small variable spots.....*kapuri*
3. Pronotum with a notch on lateral sides, before posterior angles.....*angustifrons*
 Pronotum without a notch before posterior angles.....4

4. Elytra with sutural ferruginous line quite broad.....*manipurensis*
 Elytra with sutural ferruginous line indistinct or not so broad.....5
5. Pronotum with a ferruginous spot on disc, coinciding with 2 medium longitudinal rows of punctures. Prosternal process with a large pit at apex.....*pruthii*
 Pronotum without any ferruginous spot on disc; prosternal process with a very small pit at apex.....*arrowi*

58. *Haliphus* (*Liaphlus*) *pulchellus indicus* Régimbart

(Text figs. 51-A-F)

Haliphus pulchellus var. *indicus* Régimbart, 1899, *Ann. Soc. ent. Fr.*, 68: 188—189 (T.L.—Bihar, Ranchi Dist., Konbir—Nowatoli).

Haliphus (*Liaphlus*) *pulchellus*: Guignot, 1955, *Mem. Soc. R. ent. Belg.*, 27: 295.

Haliphus (*Liaphlus*) *pulchellus indicus*: Vazirani, 1966, *Proc. zool. Soc. Calcutta*, 19: 133; 1977, *Newsl. Zool. Surv. India*, 3(4): 169.

Length: 2.5—3.5 mm.

Form: mostly regularly oval, feebly attenuated posteriorly.

Head: testaceous; punctation moderately strong, sparse and irregular.

Pronotum: testaceous with a median black spot anteriorly and a paler spot posteriorly. Punctation moderate, irregular and rather close, sparse on disc, deeper and denser along posterolateral margins. Posterior angles almost right-angled; anterior angles only slightly projecting beyond middle of anterior border of pronotum. Sides oblique, slightly convex posteriorly and nearly straight anteriorly.

Elytra: testaceous with following ferruginous markings: sutural band with four dilations, one at base, second about middle, third near third quarter and fourth at apex, first two being prolonged at apices into rounded spots, third being flanked by two external spots, a median rounded and another smaller marking somewhat

variable in between. Punctures of sutural row deep, small and dense, more numerous than strial punctures. Strial punctures moderate, shallow and quite closely placed, not separated by their own diameter. Each interstrial space with a row of much smaller and deeper punctures, but not more numerous than punctures of striae.

Ventral side: largely testaceous, with prosternal process, mid-metasternum and legs, reddish brown. Prosternal process canalliculate moderately margined laterally and very narrowly margined anteriorly without any distinct pit at apex; very slightly narrowed adjacent to the front coxae and not inflated in middle; anteriorly not wider than at apex; lateral margins with fine punctures; apex not pitted. Anterior part of metasternum a little inflated and pitted. Metasternum very finely and sparsely punctate in middle, but punctures more dense on sides. Metacoxal plates with moderate punctation, rather irregular, punctures, separated by their own diameter. Aedeagus with penis as per (Text fig. 52 D) setigerous row/striae on upper face of metatibiae as in (Text fig. 52 F).

Remarks: It can be distinguished from the other five species as shown in the key. It differs from the nominate subspecies (from Thailand) in having a black band on the pronotum reduced, a small anterior rounded spot and a basal spot (more or less extended). The present record from Rajasthan indicates that the species is more widely spread than known hitherto. The elytral markings are variable, the lateral spots may be reduced and not connected with the sutural band.

Distribution: INDIA: Bihar: Ranchi Dist. West Bengal: Calcutta. Orissa: Cuttack. Rajasthan: Jodhpur.

59. *Haliphus* (*Liaphlus*) *kapuri* Vazirani

(Text figs. 53 A-F)

Haliphus (*Liaphlus*) *kapuri* Vazirani, 1975, *Oriental Ins.*, 9(3): 317, (T.L.—Maharashtra: Fritzgerald, Satara District, Holotype, Z.S.I. Calcutta, Reg. No. 8450/H4A); 1977, *Newsl. Zool. Surv. India*, 3(4): 169.

Length: 3.4—3.5 mm. ♂ Holotype.

Head: testaceous; punctation moderate and irregular, stronger on the vertex; antennal segments 3 and 4 rather thinner than others; 7th segment slightly longer than the 8th segment.

Pronotum: testaceous; punctation larger than on the head, larger and stronger anteriorly and posteriorly, less strong on disc, generally irregular, two longitudinal rows of fine punctures discernible on disc; lateral margins of pronotum rebordered. Elytra pale testaceous without any markings; punctation quite regular except in apical portion, both strial and interstrial punctures black; row of 'sutural' punctures moderate, less strong but more dense than strial punctures, interstrial punctures less strong than strial punctures but not more numerous than them.

Ventral side: testaceous with legs ferruginous, mesosternum darker, metacoxal plates and epiplura paler. Prosternal process not rebordered laterally but canaliculate, and with a small pit at its apex, strongly punctate more so on lateral borders, a little narrowed in between procoxae and mesocoxae, anteriorly bordered by a fine ridge; anterior part of metasternum (behind prosternal process) distinctly swollen/inflated, with a large median pit, punctation on metasternum irregular, except a transverse row of strong punctures behind large median pit and a row of fine punctures along posterior border of metasternum; metacoxal process moderately punctate, punctures irregular and separated by 2-3 times their own diameter. Aedeagus with penis (Text fig. 53 E) rather strongly curved, rounded at apex and narrowed in middle.

Remarks: This species resembles *pulchellus indicus* in the canaliculate nature of prosternal process than to *arrowi* as stated earlier. From *pulchellus indicus* it can be distinguished by (i) the presence of a pit at the apex of the prosternal process (ii) elytra very narrowly ferruginous along suture, but without any dilations and spots being small and variable; also setigerous row/striae on upper face of metatibiae as in (Text fig. 53 G). The species was described from a single male example from Maharashtra, Satara District. It is now being reported from Madhya Pradesh: Jabalpur.

The two small lateral pits on the anterolateral corner of the metasternum as stated in the original description are common to

all the species and have no significance in distinguishing the species.

Distribution: INDIA: Maharashtra: Satara District, Madhya Pradesh: Jabalpur.

60. *Heliplus* (*Liaphlus*) *angustifrons* Régimbart

(Text figs. 54 A-G)

Heliplus angustifrons Régimbart, 1892, *Ann. Soc. ent. Belg.*, 36: 112
(Konbir¹—Nowatoli, Ranchi Dist. Bihar) *Ann. Soc. ent. Fr.*, 68: 187.

Heliplus (*Liaphlus*) *angustifrons*: Guignot, 1954, *Ark. Zool.* (N.S.) 6: 563, Vazirani, 1966, *Proc. zool. Soc., Calcutta*, 19: 128; 1977, *Newsl. Zool. Surv. India*, 3(4): 169.

Length: 2.9—3.8 mm.

Head: testaceous, punctation fine, sparse, rather irregular; seventh antennal segment longer than sixth or eighth.

Pronotum: testaceous, more or less concolorous, with irregular dull ferruginous markings. Punctation irregular, fine, sparse on disc, larger and deeper along postero-lateral margins; on disc two irregular longitudinal rows of punctures discernible. Posterolateral angles prominent, slightly notched, just before thoraco-elytral angles; sides oblique, almost straight.

Elytra: testaceous with irregular and indistinct ferruginous markings, sutural ferruginous band distinct and moderately broad. Punctation on elytra quite regular in anterior half; 'sutural' row of punctures of elytra profoundly marked and dense, punctures more numerous than strial (primary row) punctures. Strial punctures moderate, rather shallow, not black. Each interstrial space with a row (secondary) of small deep punctures not more numerous than punctures of striae.

Ventral side: testaceous, epipleura pale, prosternum and mesosternum darker; prosternal process not canaliculate, margined

¹The correct name of the place is Konbira. Nowatoli means new colony.

anteriorly and laterally, moderately narrowed anteriorly adjacent to procoxae, apex subequal to base; lateral margins a little roughened, irregularly punctate; median area slightly inflated, with a moderate pit at apex. Anterior part of metasternum inflated and with a large shallow pit. Punctuation of metasternum moderate, irregular and sparse. Metacoxal plates moderately and more or less regularly punctate. Abdominal sternites with a single transverse row of moderately large punctures. Apical sternite with a group of posterolateral punctures, smooth in middle and at base. Setigerous row/stria on upper face of metatibia as in Text fig. 54 F.

Male: Aedeagus with penis strongly curved and rounded at apex.

Remarks: Régimbart (1892) described this species on the basis of a collection made by Rev. P. Cardon from Konbira. There is one example in the collection of the Zoological Survey of India bearing the label 'Knobir, June 1890, P. Cardon', donated and determined by Régimbart. It appears that this particular example belongs to the syntypic series. The enumeration of the above characters (excepting antennae and penis) is based on this example.

Régimbart described this species with the interocular width being narrow. This character has been subjected to statistical analysis and it was found that with respect to the ratio A/B between the minimum width of the head at the interocular level and the maximum width of the head at the same level, this species is significantly different from *H. arrowi* at 0.1% level of probability and from *H. manipurensis* and *H. pruthii* at 1.0% level of probability, whereas no significant difference is not between *H. arrowi* and *H. manipurensis*; *H. arrowi* and *H. pruthii* and *H. manipurensis* and *H. pruthii*.

This species can be easily separated from the related species as shown in the key, and is now being reported from Madhya Pradesh: Jabalpur for the first time.

Measurements² of minimum width of head at interocular level

² Measurements were taken with ocular micrometer at 40 magnification.

(A) and maximum width of head at same level (B), and their ratio A/B of 17 examples are given below:—

	A	B	A/B
Range	28—33	8—11	3.10—3.75
Mean \pm S.E.	30.62 \pm 0.446	9.31 \pm 0.223	+3.38 +0.046
Standard Deviation			0.191

Distribution: INDIA: Punjab; Himachal Pradesh: Simla hills; Bihar: Ranchi Dist.; Hazaribagh Dist.; Santhal Parganas Dist.; West Bengal: Calcutta; Orissa: Cuttack Dist.; Balasore Dist.; Mayurbhanj Dist.; Madhya Pradesh: Jabalpur; Rajasthan: Pilani.
BURMA.

61. *Haliphus* (*Liaphlus*) *manipurensis* Vazirani

(Text figs. 55 A-F)

Haliphus (*Liaphlus*) *manipurensis* Vazirani, 1966, *Proc. zool. Soc. Calcutta*, 19: 132—(T.L.—Manipur, Imphal, Z.S.I. Reg. No. 3980/H4A—3983/H4A.

Length: 3.2—3.5 (Holotype 3.2) mm.

Form: oval, feebly attenuated posteriorly.

Head: testaceous, finely and moderately punctate, punctures on the vertex separated by their own diameter. Antennal segments 7—11 subequal and broader than the sixth.

Pronotum: testaceous, paler towards sides; punctation moderate and irregular, stronger along anterior and posterior margins, sparse on disc; a few punctures on posterolateral margins strong and confluent. Anterior angles very slightly projecting beyond middle of anterior margin. Sides moderately rebordered, slightly convex, posterior angles slightly prominent, not projecting beyond thoracoclytral angles.

Elytra: testaceous with irregular ferruginous markings, moreso along the suture and extending laterally at base. Sutural line of punctation irregular, not so closely punctate; punctures separated

by twice their own diameter. Strial punctures moderate, shallow, black; on disc quite close and not separated by their own diameter. Each interstrial space with a row much smaller and deeper, but not more numerous, black punctures.

Ventral side: testaceous, epipleura paler; sternum and legs darker. Prosternal process margined laterally but not anteriorly, not canaliculate, with a small pit at apex, slightly narrowed adjacent to front coxae; anterior end a little wider than apex; lateral margins punctate but not roughened, punctures fine, separated by more than their own diameter. Apical part of metasternum almost flat, pitted, moderately but irregularly punctate. Metacoxal plates with moderate, shallow and dense punctures; punctures separated by half of their own diameter. *Male* with anterior tarsi moderately broadened and furnished with 'ciliae' underneath; claws broken. Aedeagus with penis (of paratype very slightly curved, rounded at apex. Setigerous row/striae on upper face of metatibiae as in (Text fig. 55 F).

Remarks: This species resembles *angustifrons*, *pruthii* and *arrowi* in the prosternal process not being canaliculate. It resembles *angustifrons* in elytral markings. It can be easily distinguished by the absence of a notch on the sides of pronotum before the posterior angle. The penis is also very much less curved than in all the other three species.

Distribution: INDIA: Manipur: Imphal.

62. *Haliphus* (*Liaphlus*) *pruthii* Vazirani

(Text figs. 56 A-F)

Haliphus (*Liaphlus*) *pruthii* Vazirani, 1966 *Proc. zool. Soc., Calcutta*, 19: 130. (Madhya Pradesh: Rewa District; Khetagao—Z.S.I. Reg. No. 3984/H4A).

Length: 3.0 (Holotype)—3.2 mm. Paratype.

Form: most regularly oval, feebly attenuated posteriorly.

Head: testaceous; punctuation on the vertex fine, moderately close; antennal segments 7-11 subequal, segment 7 not significantly broader than preceding segment.

Pronotum: testaceous, with two ferruginous longitudinal parallel lines on disc coinciding with punctures; punctation irregular, moderate, rather effaced on disc (excepting those coinciding with ferruginous markings); sides narrowly rebordered, a little oblique, very slightly convex; posterior angles obtuse. Anterior angles acute, extending a little beyond middle of anterior margin of pronotum.

Elytra: testaceous, with irregular and indeterminate ferruginous markings, more prominent along suture and at base. Sutural line of punctures regular, punctures almost separated by their own diameter, more numerous than strial punctures. Strial punctures moderate, rather close and shallow, narrowly black. Each interstitial space with a row of small deep punctures not more numerous than strial punctures.

Ventral side: testaceous; sternum and legs ferruginous. Prosteral process not canaliculate, moderately margined laterally, narrowly margined anteriorly, moderately narrowed adjacent to front coxae, base and apex subequal, lateral margins punctate, median area hardly inflated, moderately large pit at apex; punctation indistinct. Apical part of metasternum slightly inflated and pitted. Metasternum finely and sparsely punctate. Abdominal sternites with a single transverse row of punctures. Apical abdominal sternite with a few posterolateral punctures (less than in *angustifrons* or *arrowi*). Metacoxal plates more or less regularly and finely punctate, separated by two to three times their own diameter.

Male: with protarsi moderately dilated and furnished with 'cilia' underneath. Protarsal claws thin, slightly curved and more than half apical segment in length. Aedeagus with penis (of paratype) moderately curved. Setigerous row/striae on upper face of metatibiae as in (Text fig. 56 F).

Remarks: Among the species dealt with here, *pruthii* comes close to *arrowi* but it can be easily separated from *aroni* on the basis of characteristic longitudinal ferruginous markings on the pronotum, and the prosternal process having a much larger pit at apex. This species is named after its collector Dr. H. S. Pruthi.

Distribution: INDIA: Madhya Pradesh: Rewa Dist.

63. *Haliphus* (*Liaphlus*) *arrowi* Guignot

(Text figs. 57 A-F)

Haliphus arrowi Guignot, 1936, *Bull. Soc. ent. Fr.*, 41: 115—118 (T.L.—Calcutta)

Haliphus (*Liaphlus*) *arrowi*: Guignot, 1955, *Mem. Soc. R. ent. Belg.*, 27: 292; Vazirani, 1966, *Proc. zool. Soc. Calcutta*, 19: 131.

Length: 3.0—3.8 mm.

Head: testaceous: punctation on vertex moderate rather irregular.

Pronotum: testaceous, paler towards sides, punctation irregular, fine and sparse on disc, larger along base, without any longitudinal rows of punctures on disc. Posterior angles slightly prominent just before thoraco-elytral angles; sides very narrowly rebordered, very slightly convex and sufficiently oblique.

Elytra: testaceous, with indistinct and irregular ferruginous markings, more so along sutural margins and extending laterally midway along base. Sutural line of punctures regular, punctures small, fine, more closely placed than strial punctures. Strial punctures moderate, rather shallow and black. Each interstrial space with a row of small, deep punctures, not more numerous than punctures of the striae.

Ventral side: testaceous, epipleura paler. Prosternal process not canaliculate, slightly margined, narrowed adjacent to front coxae, anterior end not wider than posterior end, with a very small pit, (size of a large puncture) at apex. Anterior part of metasternum not swollen but with large pit. Metacoxal plates moderately punctate, anteriorly smaller punctures, more or less irregularly arranged. Aedeagus with penis moderately strongly curved and rounded at apex. Setigerous row/striae on upper face of metalibia as in (Text fig. 57 F).

Remarks: Guignot (1939) did not give a detailed description of this species, but merely compared it with *H. angustifrons* Régimbart. Later, he (1955) placed it under the species group

maculipennis on the basis of the prosternal process not being laterally margined, a character not mentioned in the original description. It is however, now found to be closer to *pruthii* from which it can be separated by (i) pronotum without any ferruginous spot on the disc and (ii) prosternal process with a very small pit at apex.

Distribution: INDIA: West Bengal: Calcutta; Bihar: Ajay River; Tamil Nadu: Palni hills. PAKISTAN: Jhillum.

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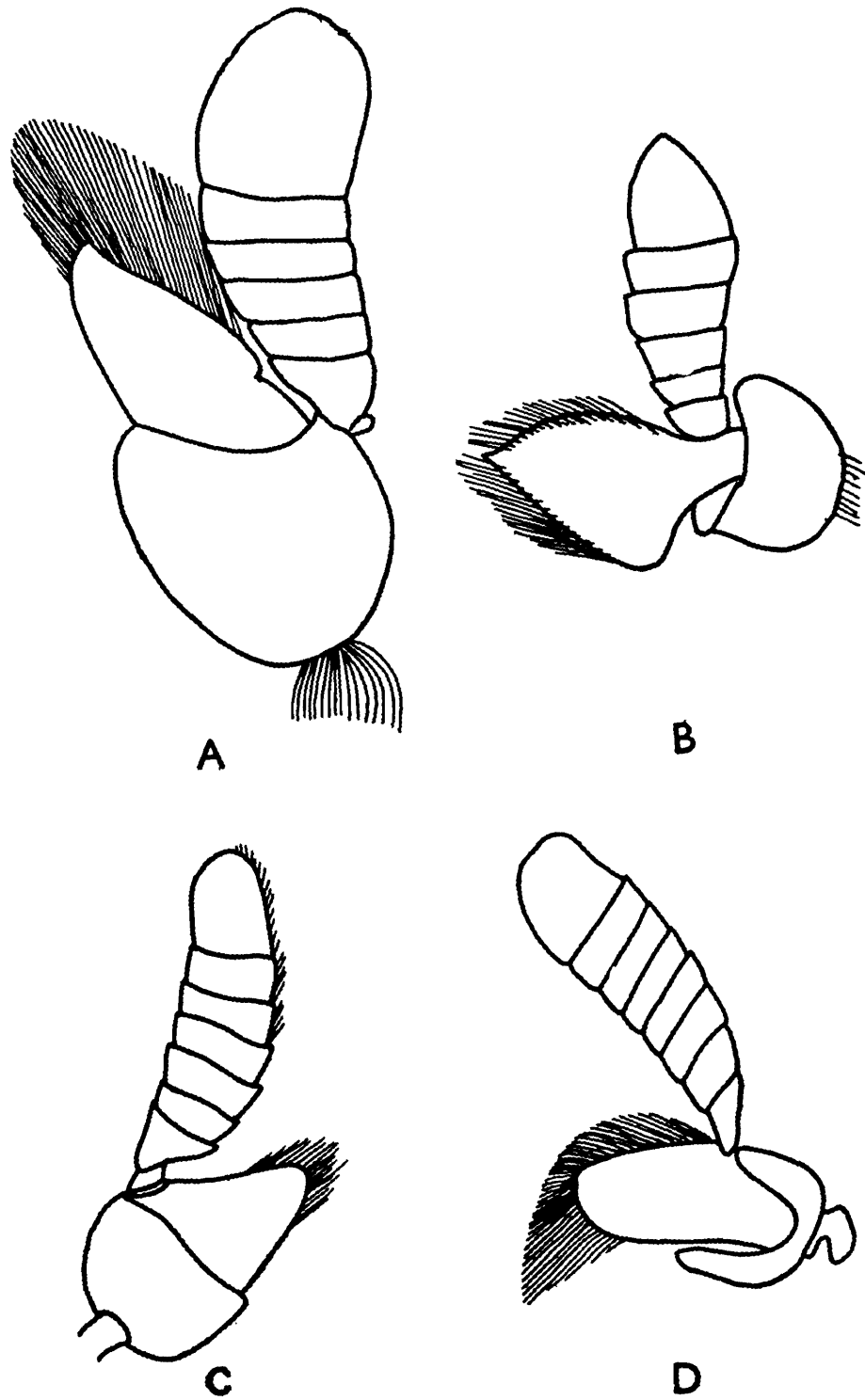
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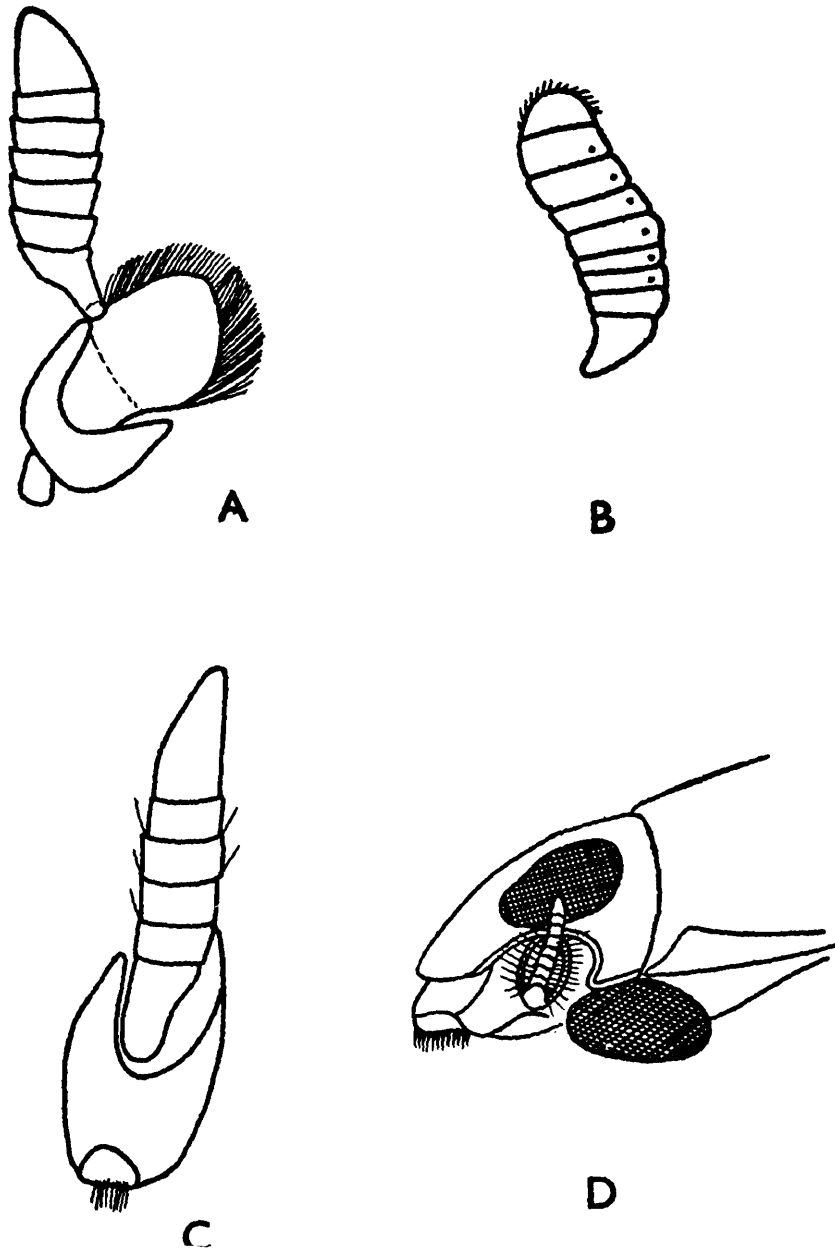
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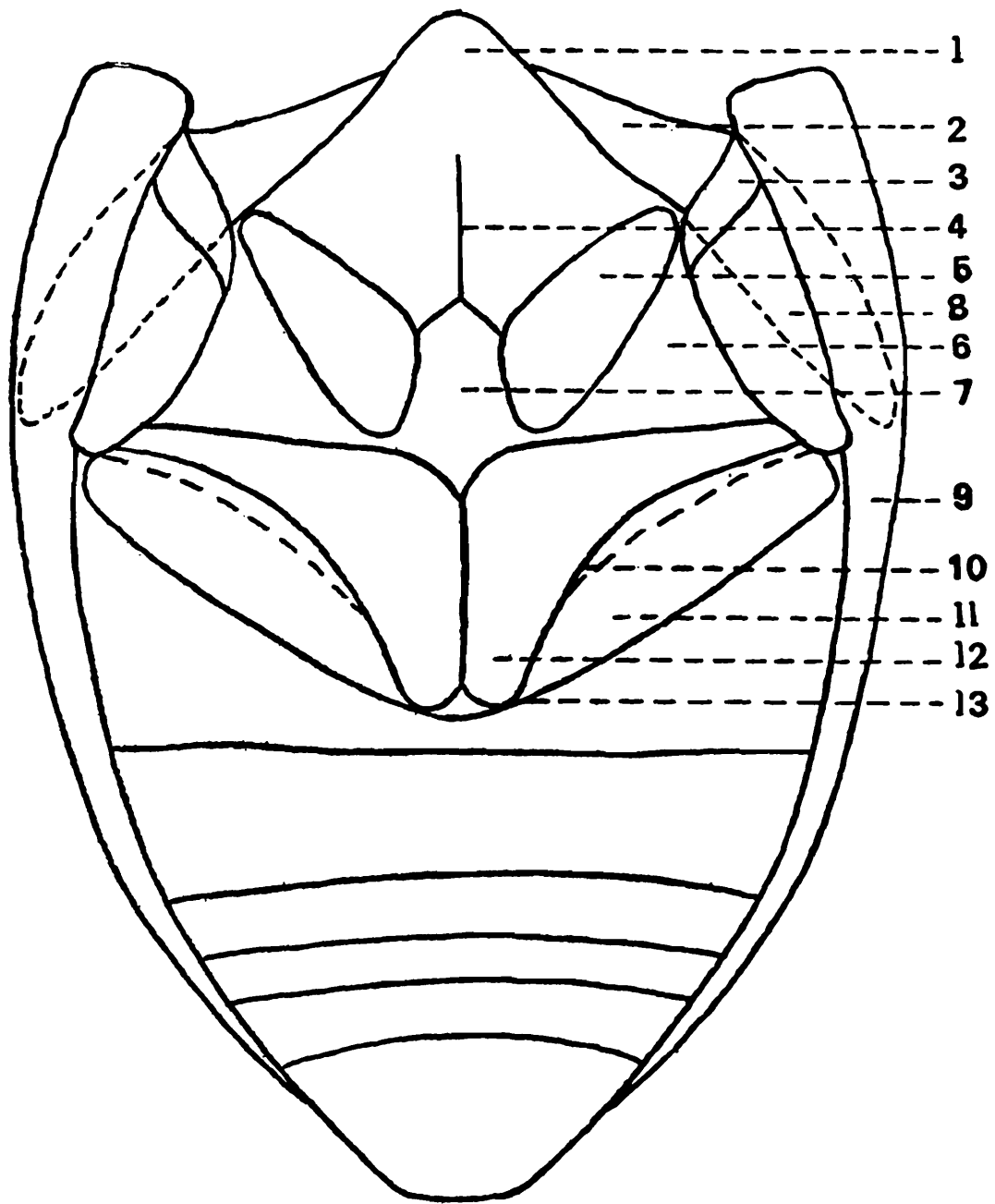
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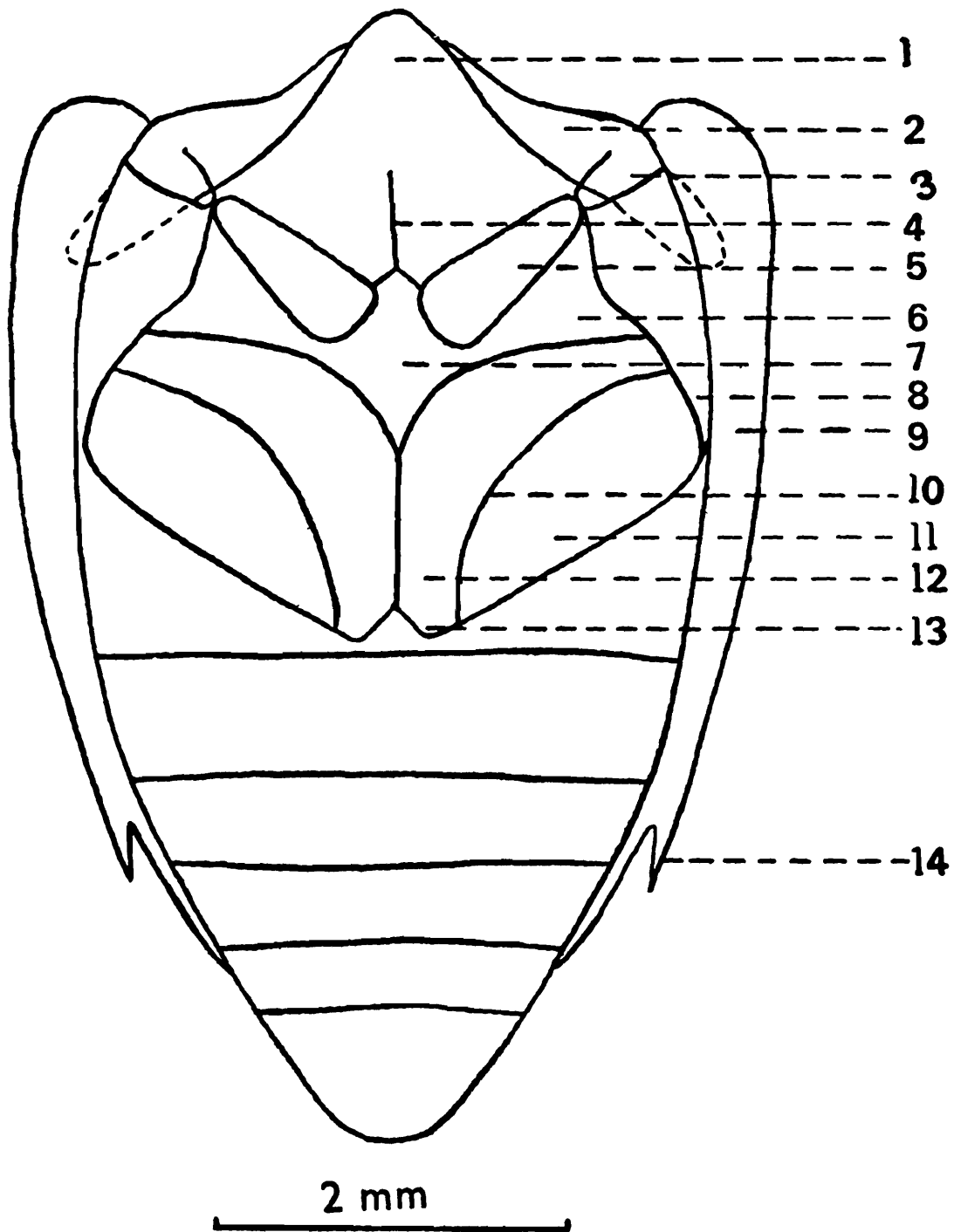


Text fig. 2—Antennal segments of—A. *Gyrinus convexiusculus* B. *Orectochilus murinus* C. *O. indicus* D. lateral view of head of *Metagyrimus arrowi*

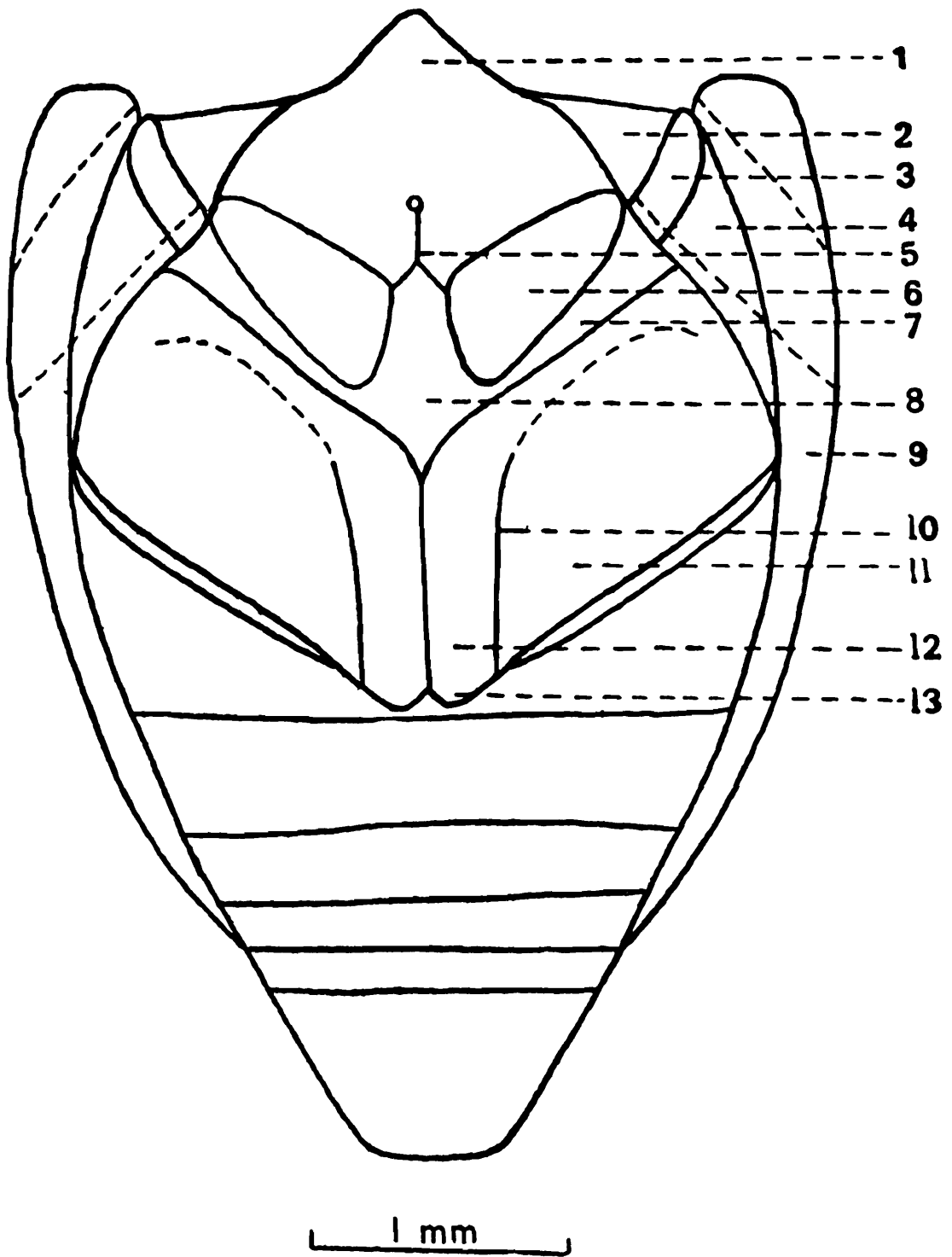


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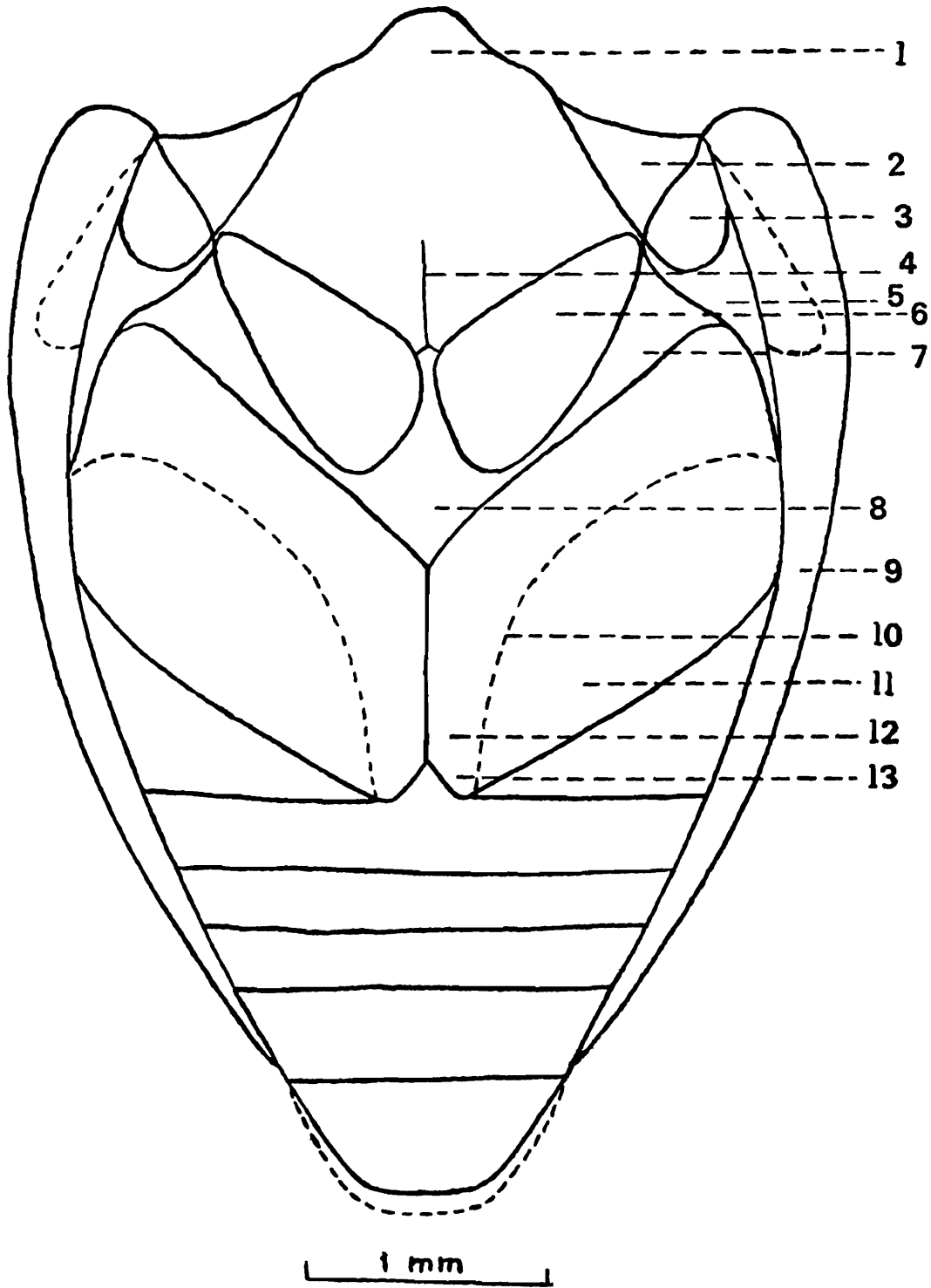
Text fig. 3—Ventral side of meso- and metathorax of *Dineutus indicus*
 1 = mesosternum, 2 = mesoepisternum, 3 = mesoepimeron,
 4 = mesoternal suture, 5 = mesocoxe, 6 = metasternal,
 wing, 7 = metasternum, 8 = metaepisternum, 9 = elytral
 epipleuron, 10 = metacoxal ridge, 11 = outerpart (depressed)
 of metacoxa, 12 = metacoxa, 13 = meta coxal process



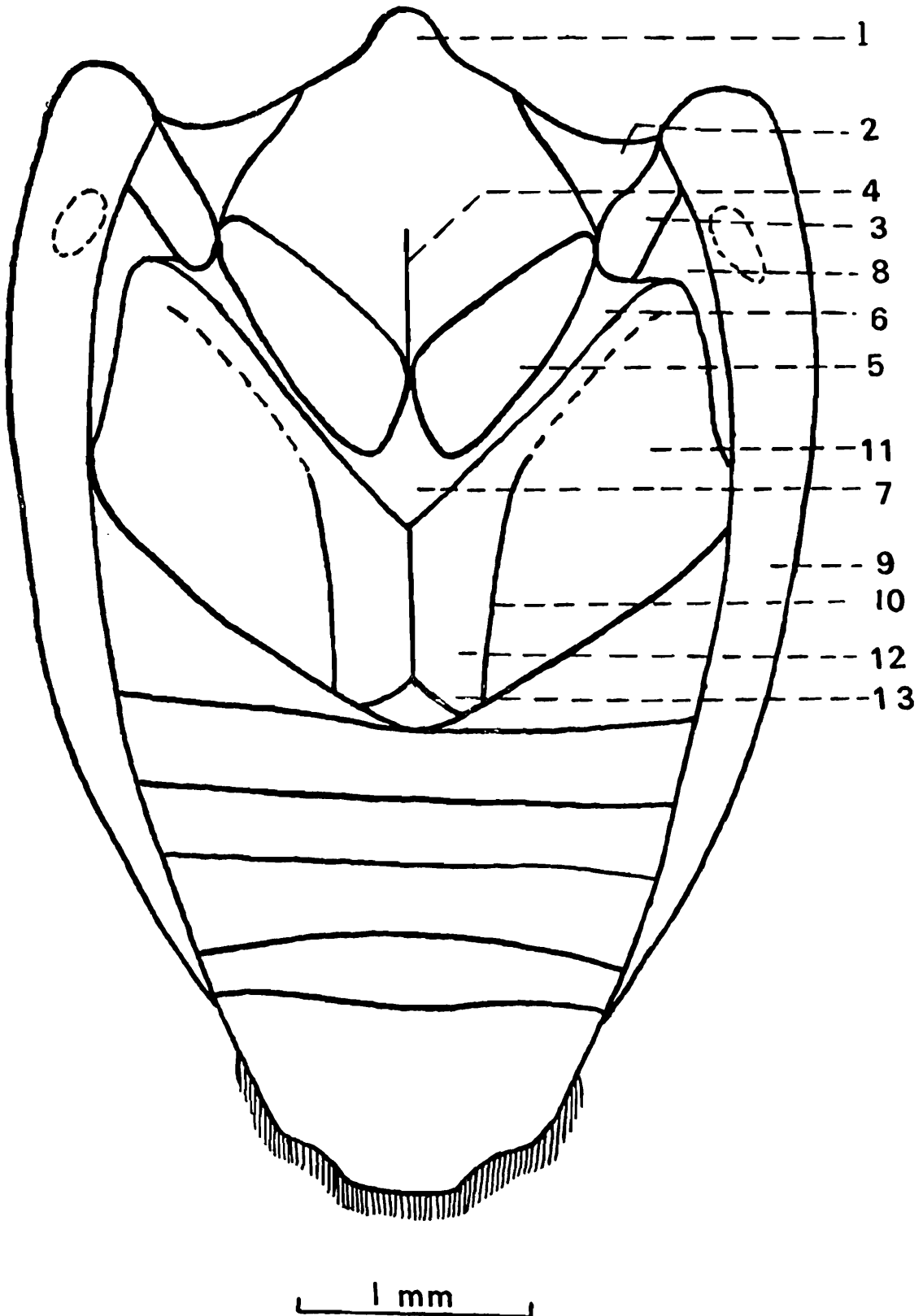
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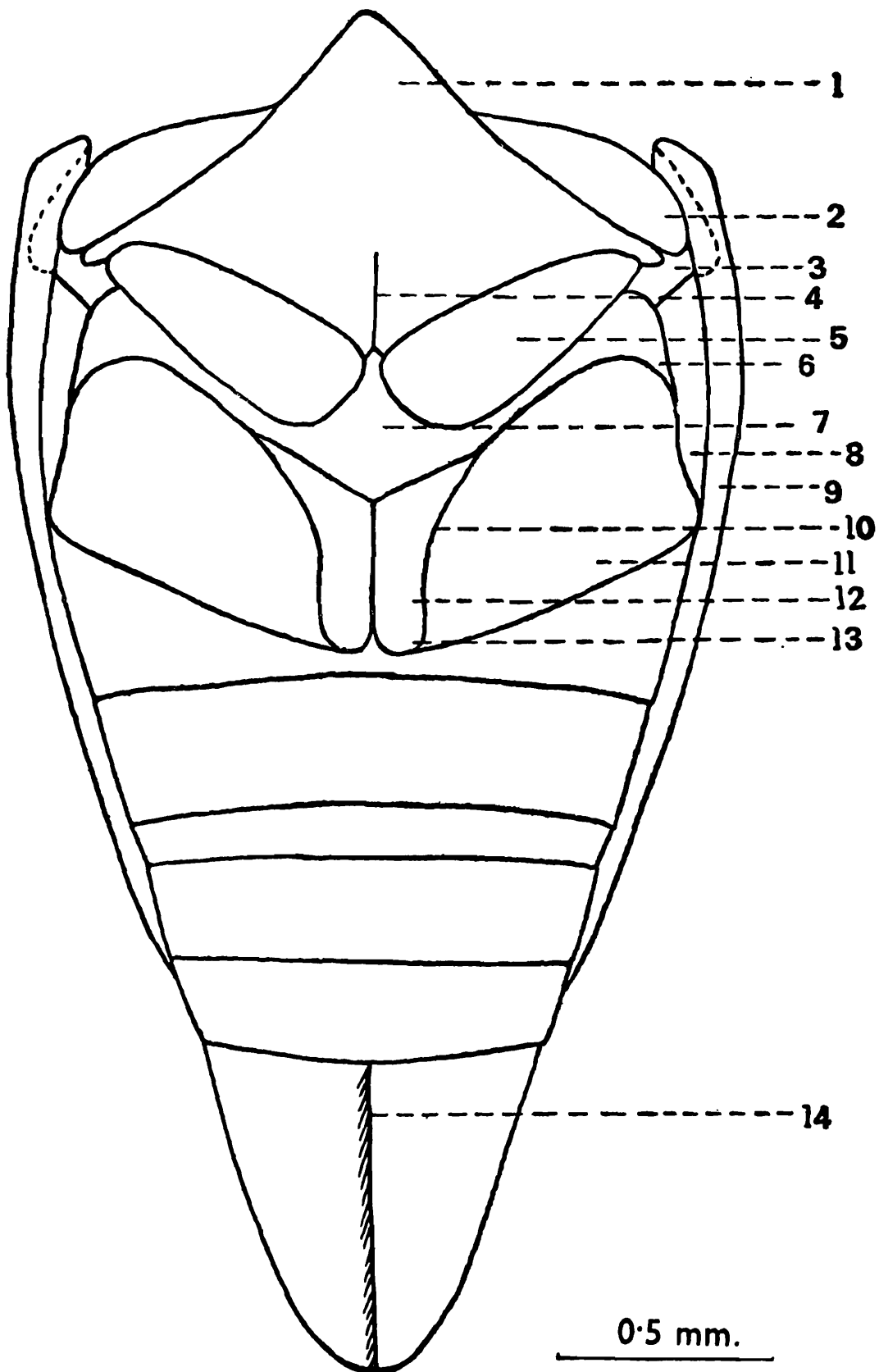
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Text fig. 6—Ventral side of meso- and metathorax of *Aulonogyrus obliquus* Explanation as in Text fig. 3

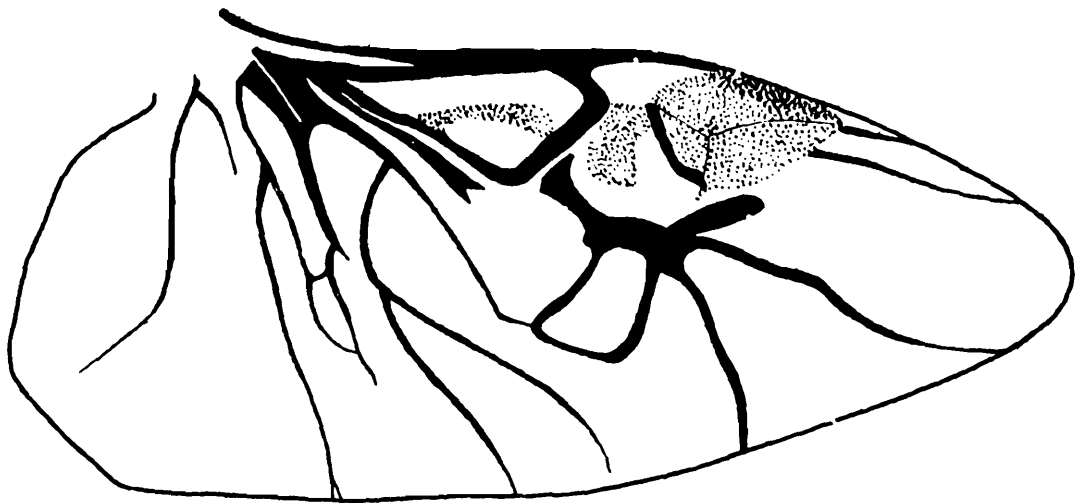


Text fig. 7—Ventral side of meso- and metathorax of *Metagyrius arrowi*
 Explanation as in Text fig. 3



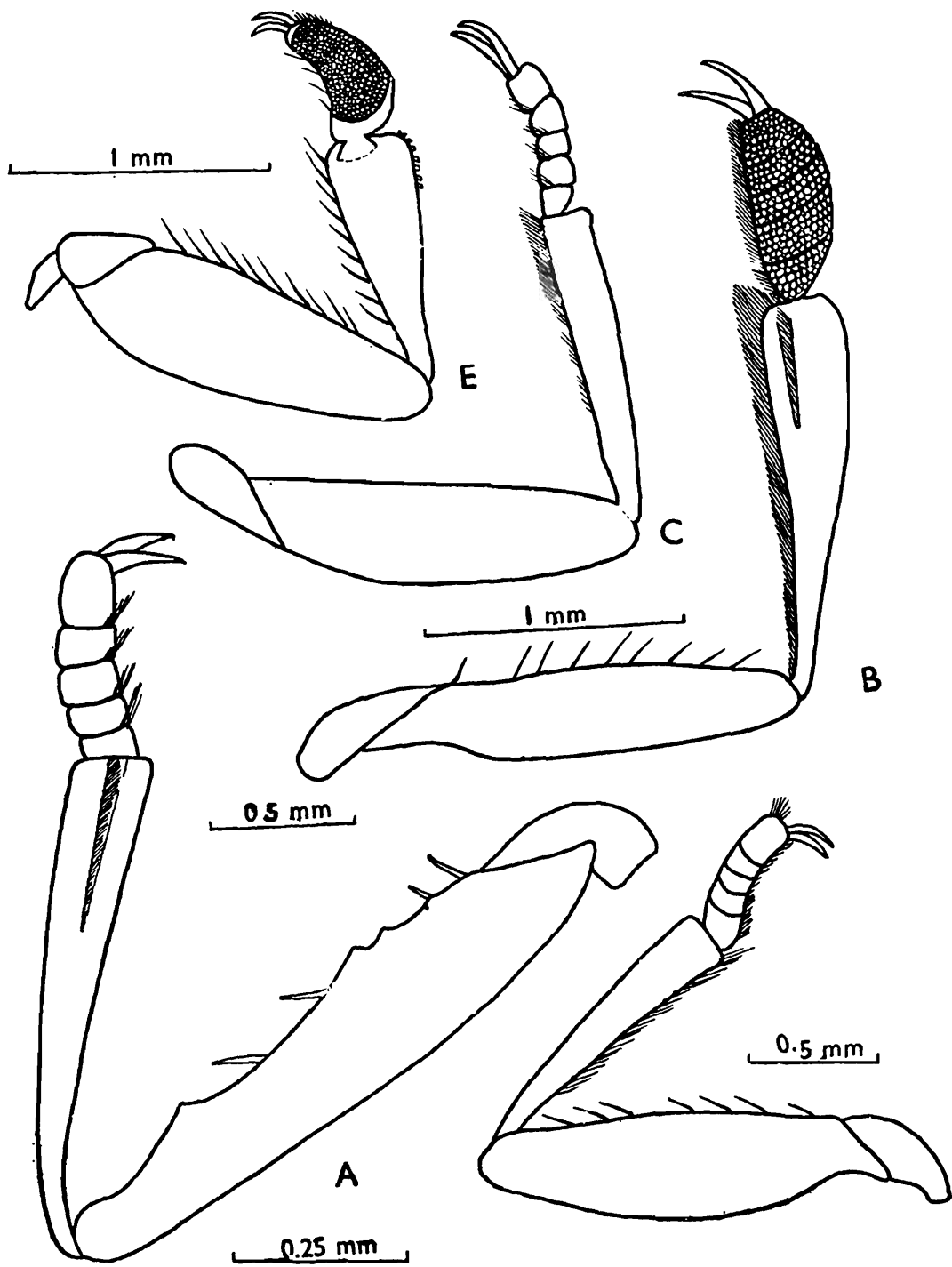
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1 = mesosternum, 2 = mesoepisternum, 3 = mesoepimeron,
 4 = mesoternal suture, 5 = mesocoxa, 6 = metasternal,
 wing, 7 = metasternum, 8 = metaepisternum, 9 = elytral
 epipleuron, 10 = metacoxal ridge, 11 = outerpart (depress-
 ed) of metacoxa, = metacoxa, 13 = metacoxal process,
 14 = row of hairs

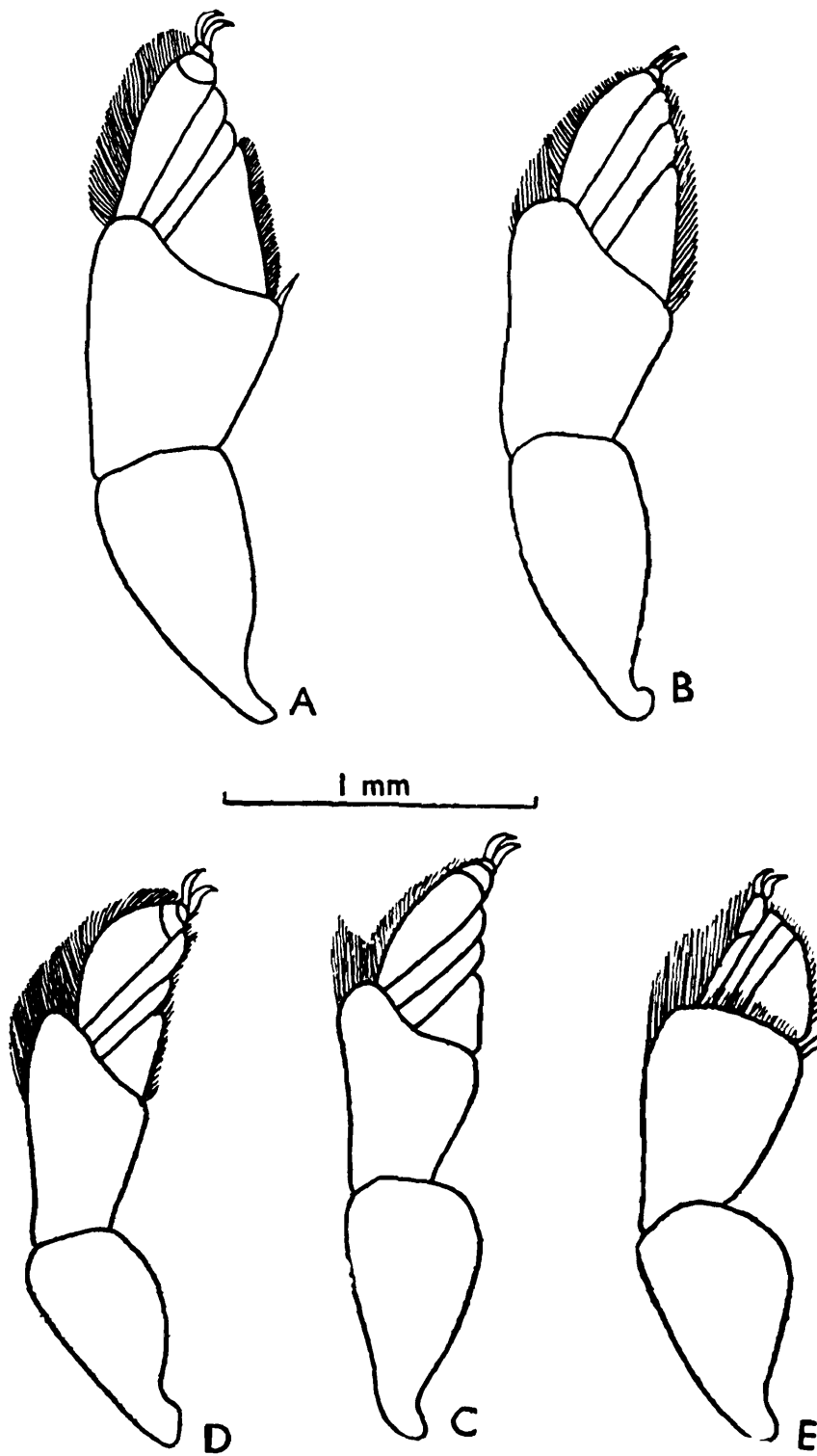


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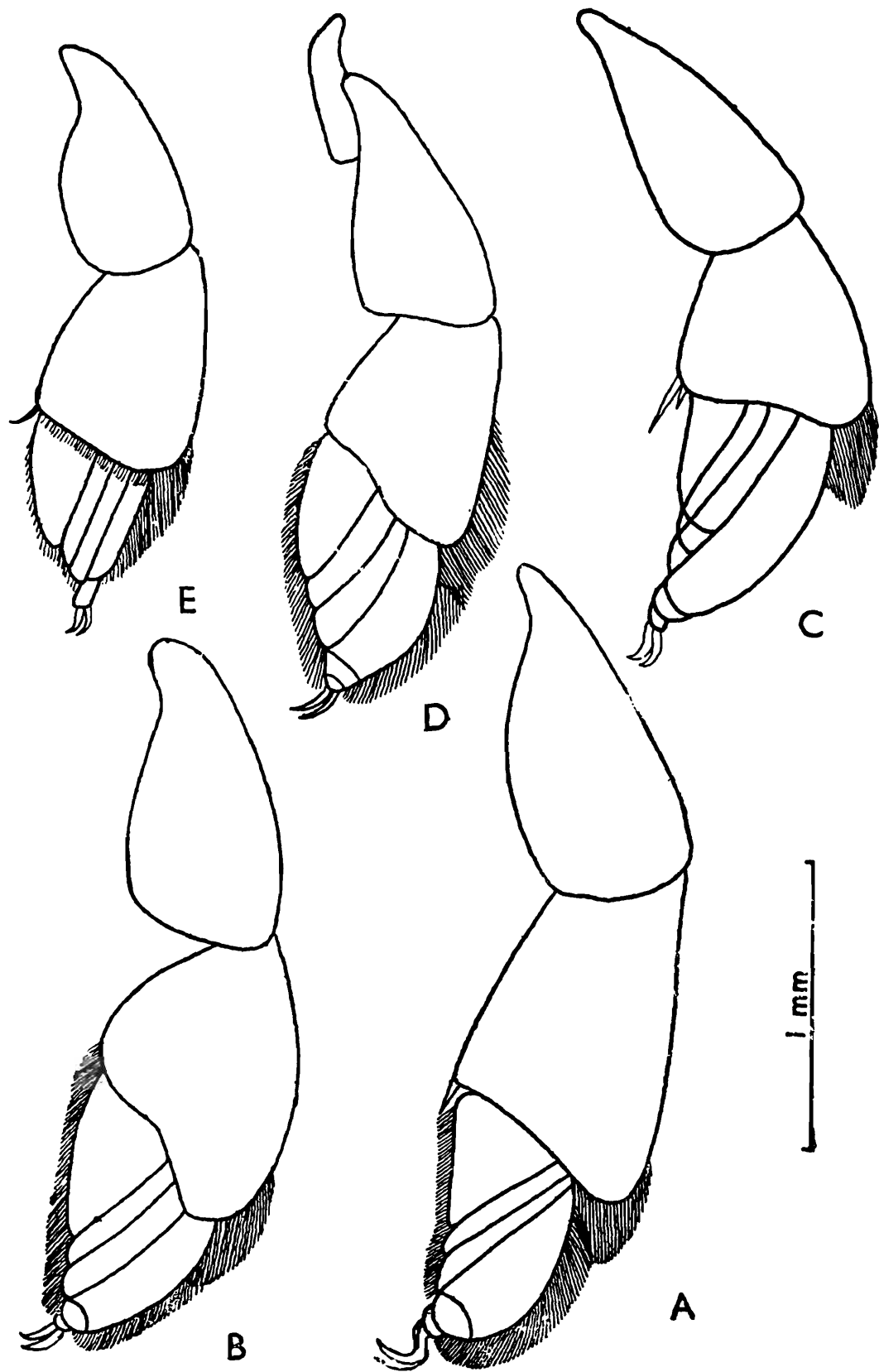
Text fig. 9—Wing venation of *Dineutus indicus*



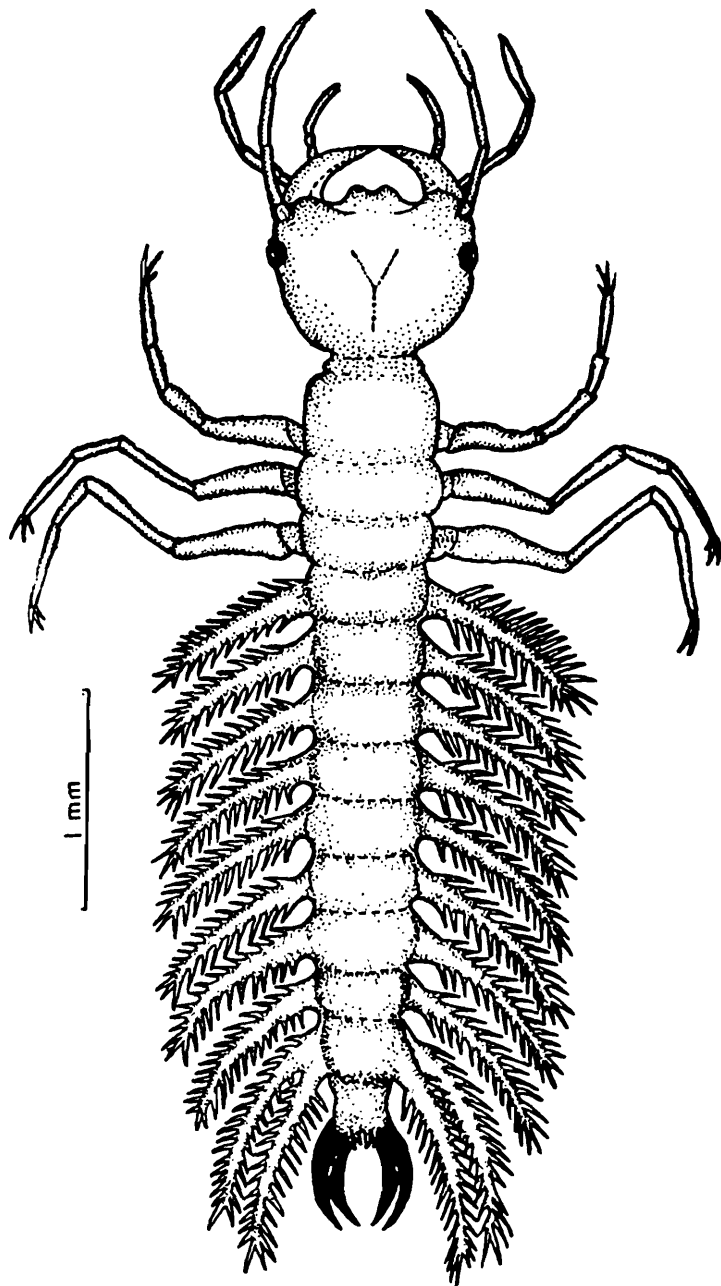
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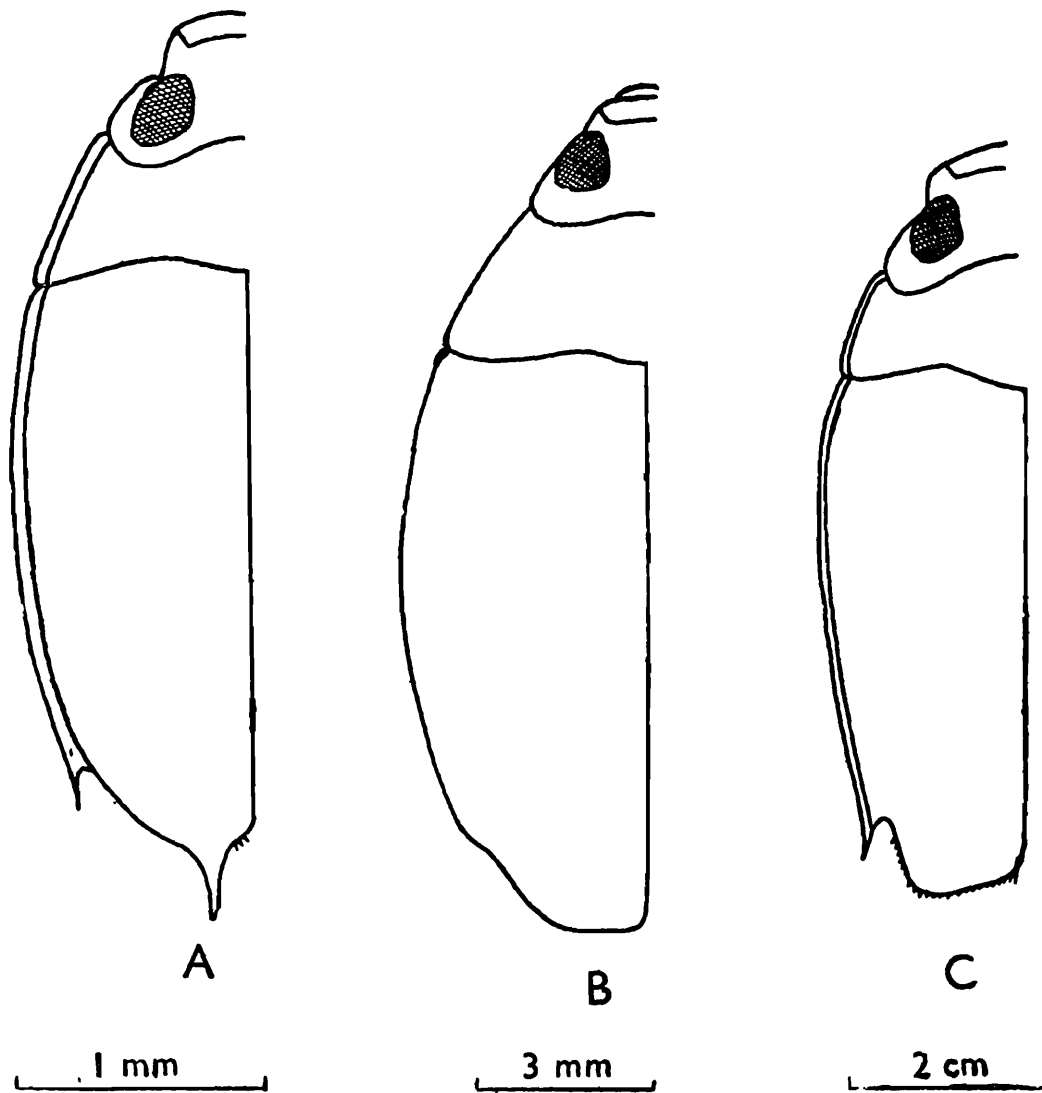
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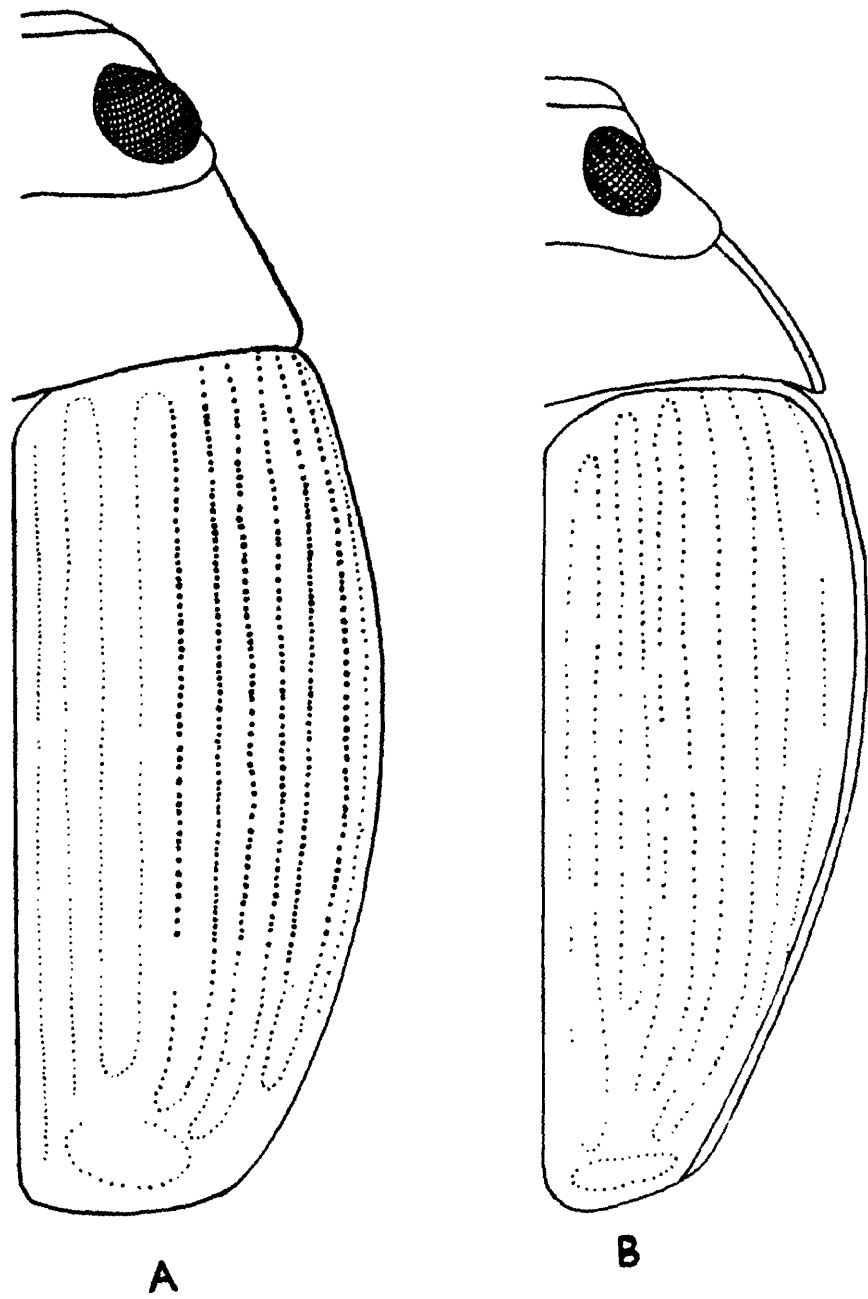
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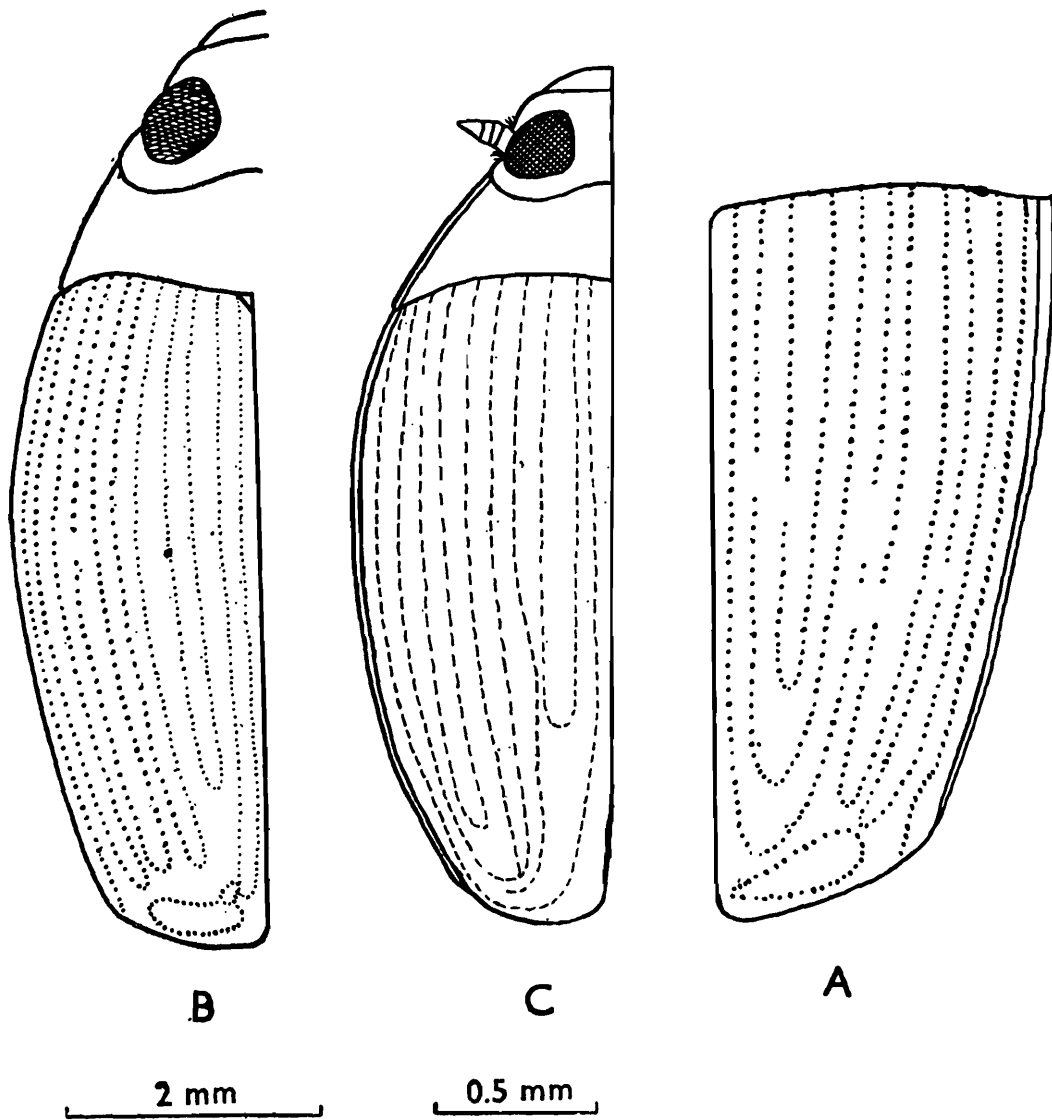
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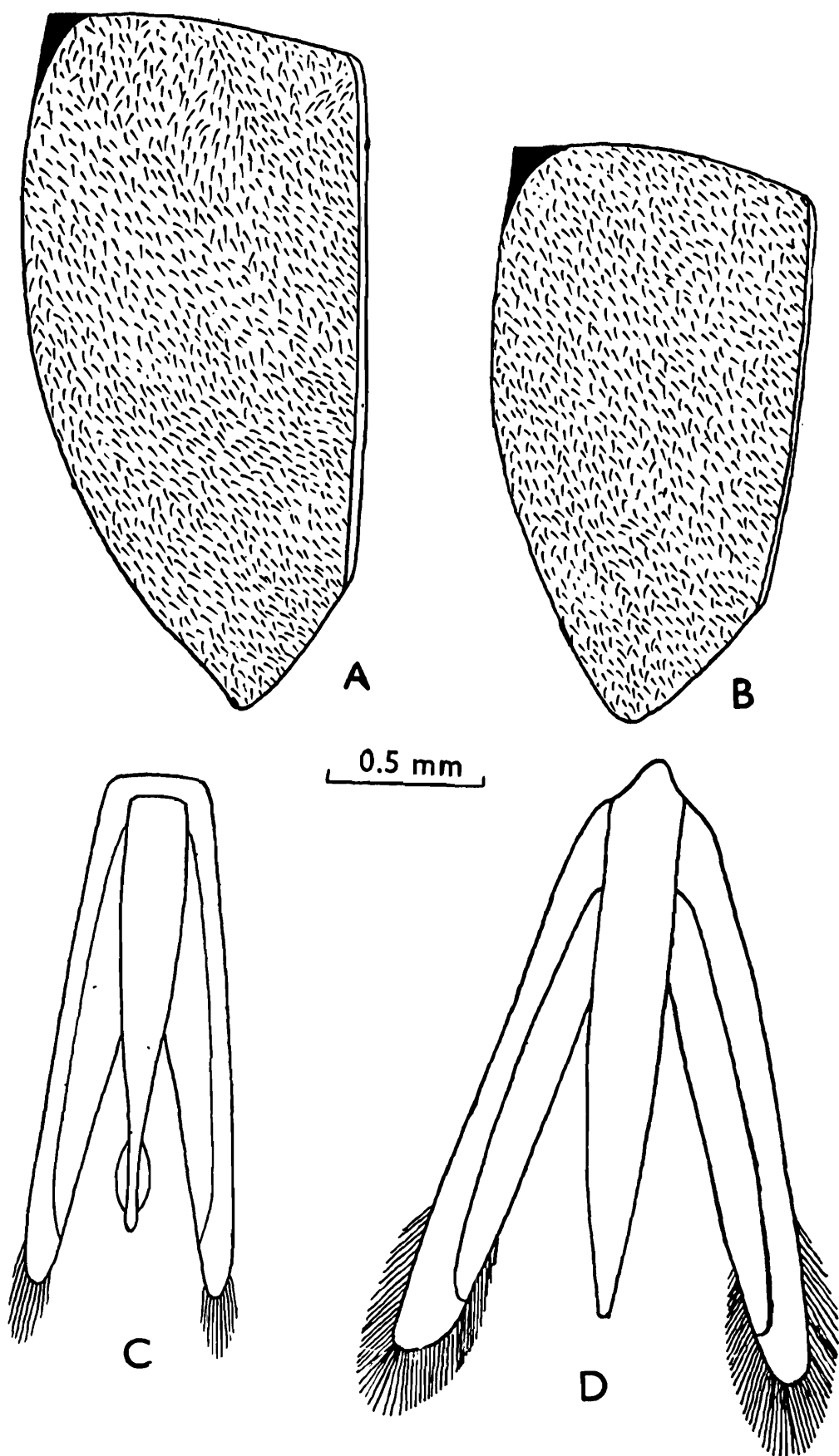
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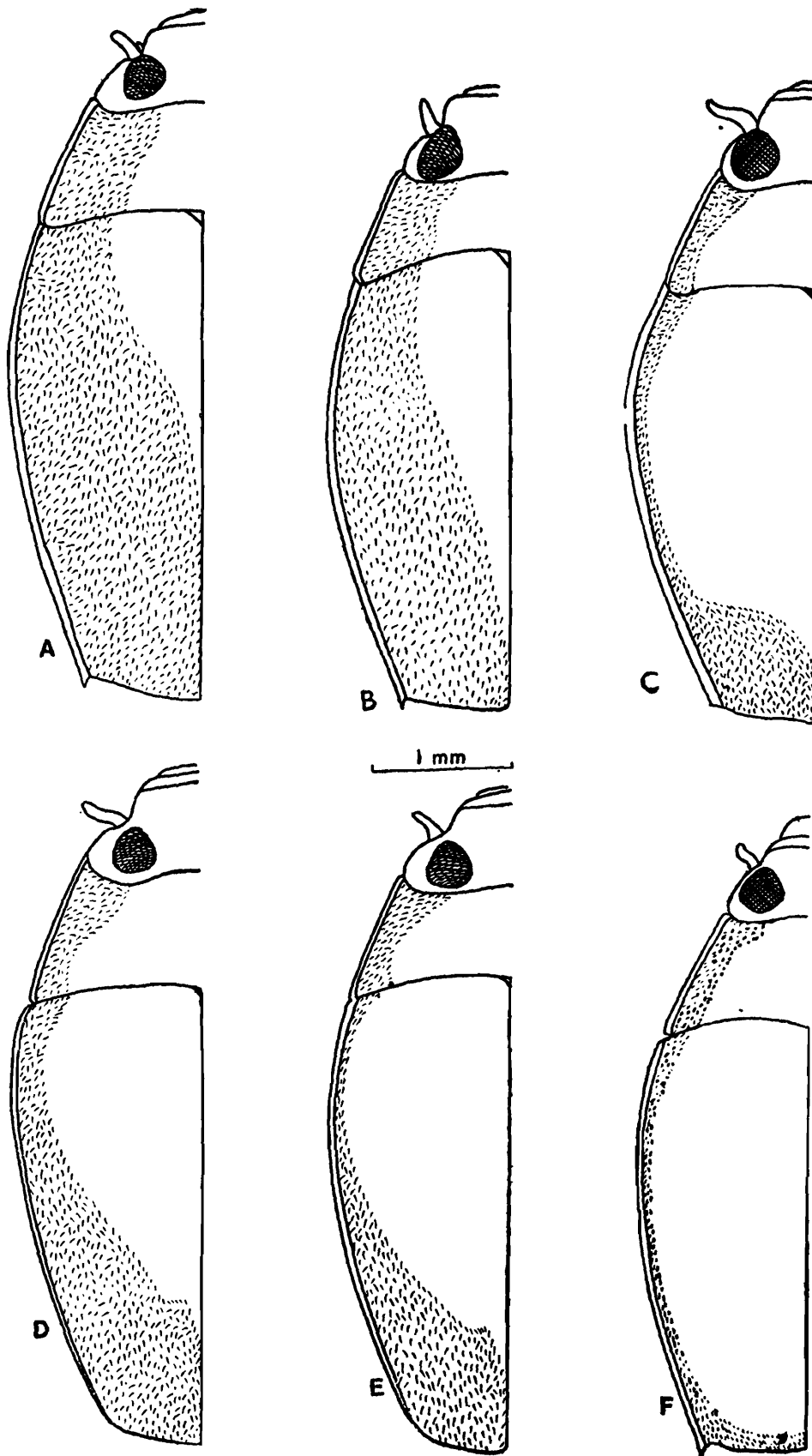
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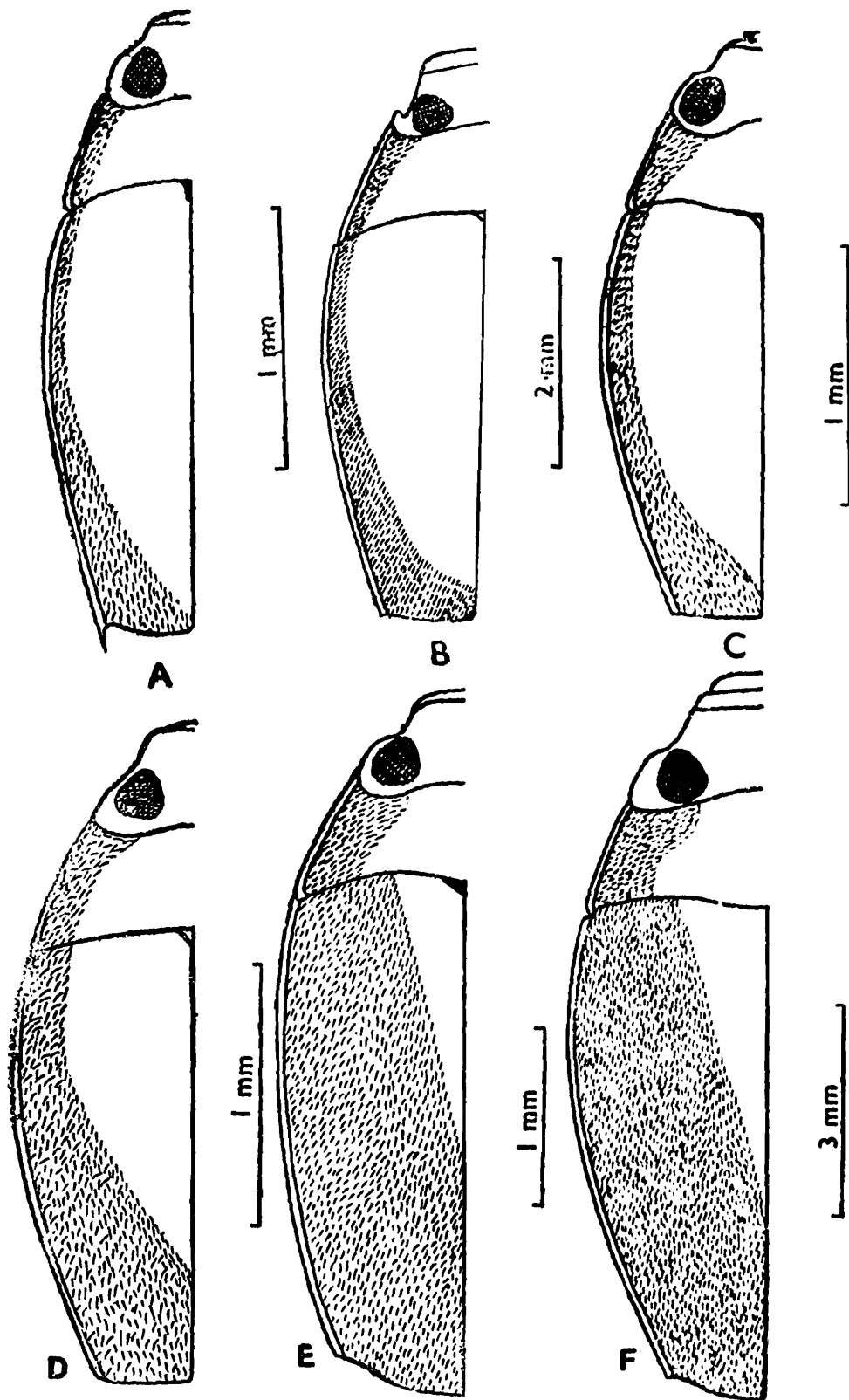
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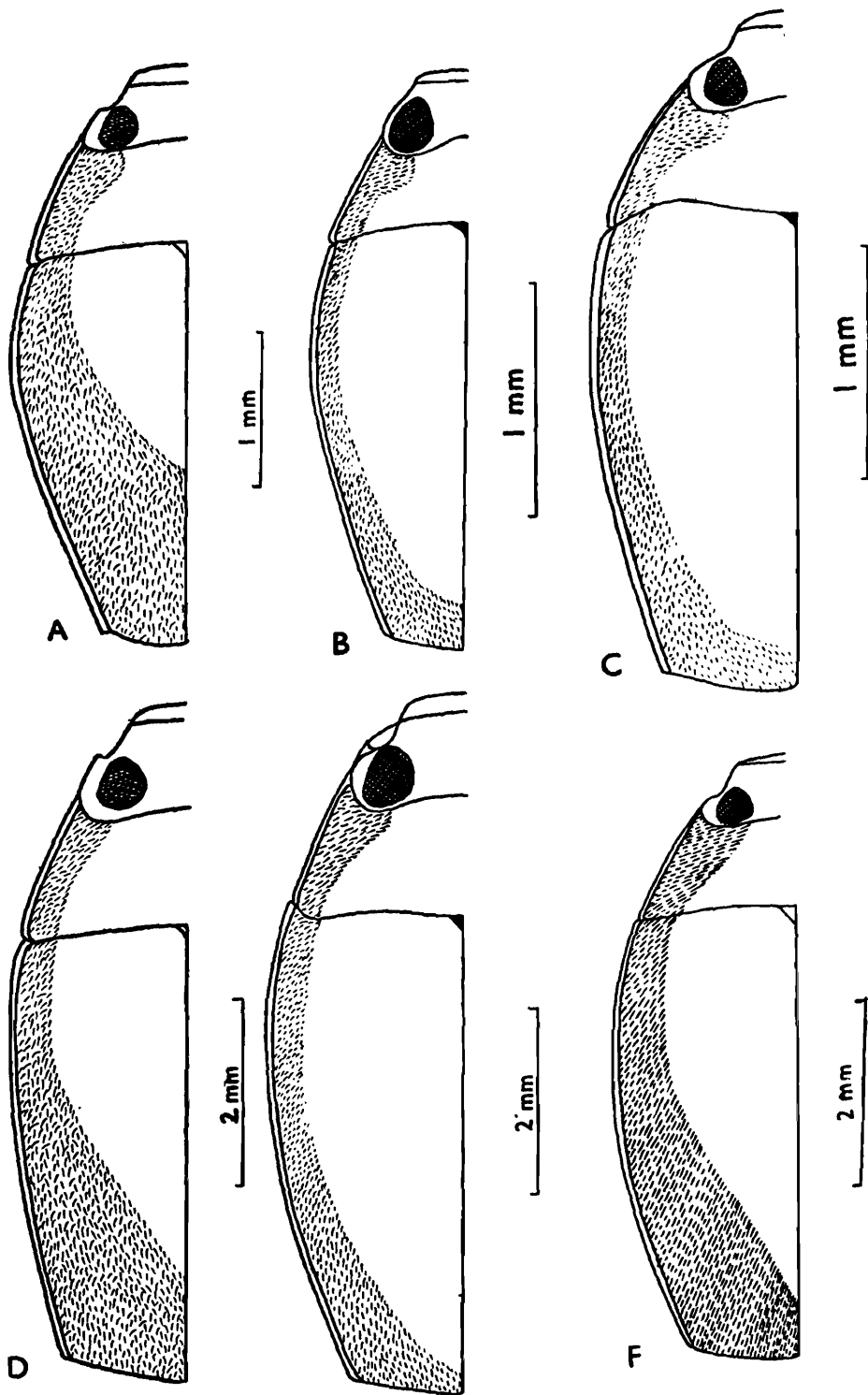
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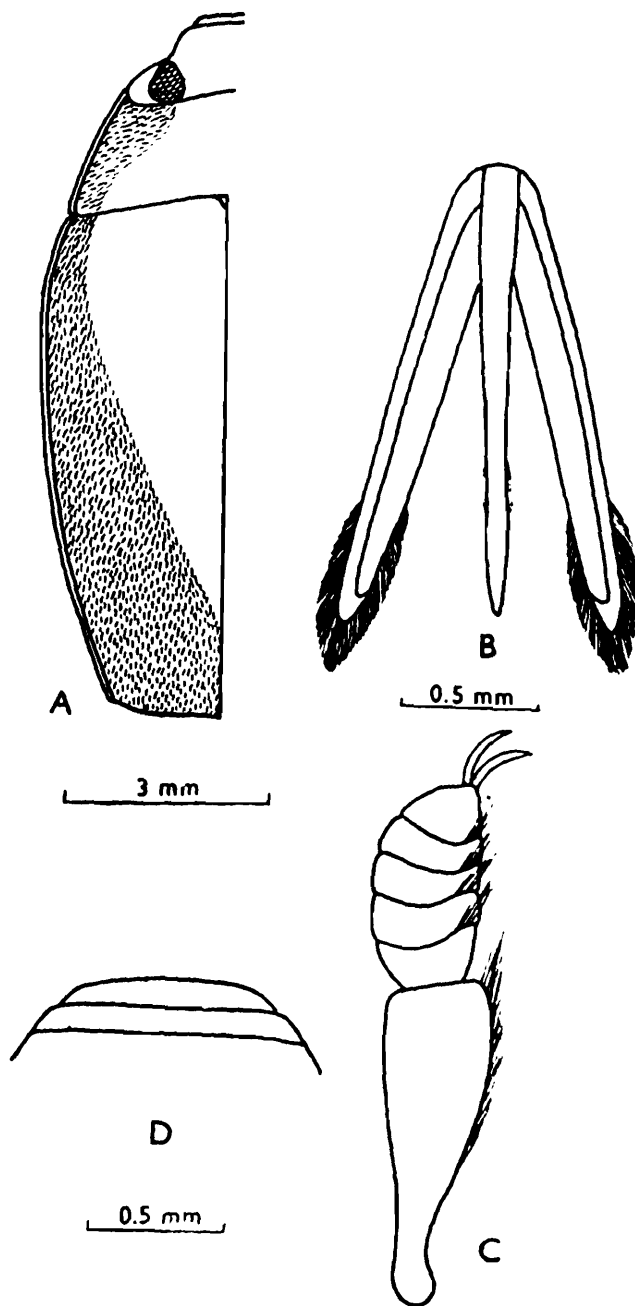
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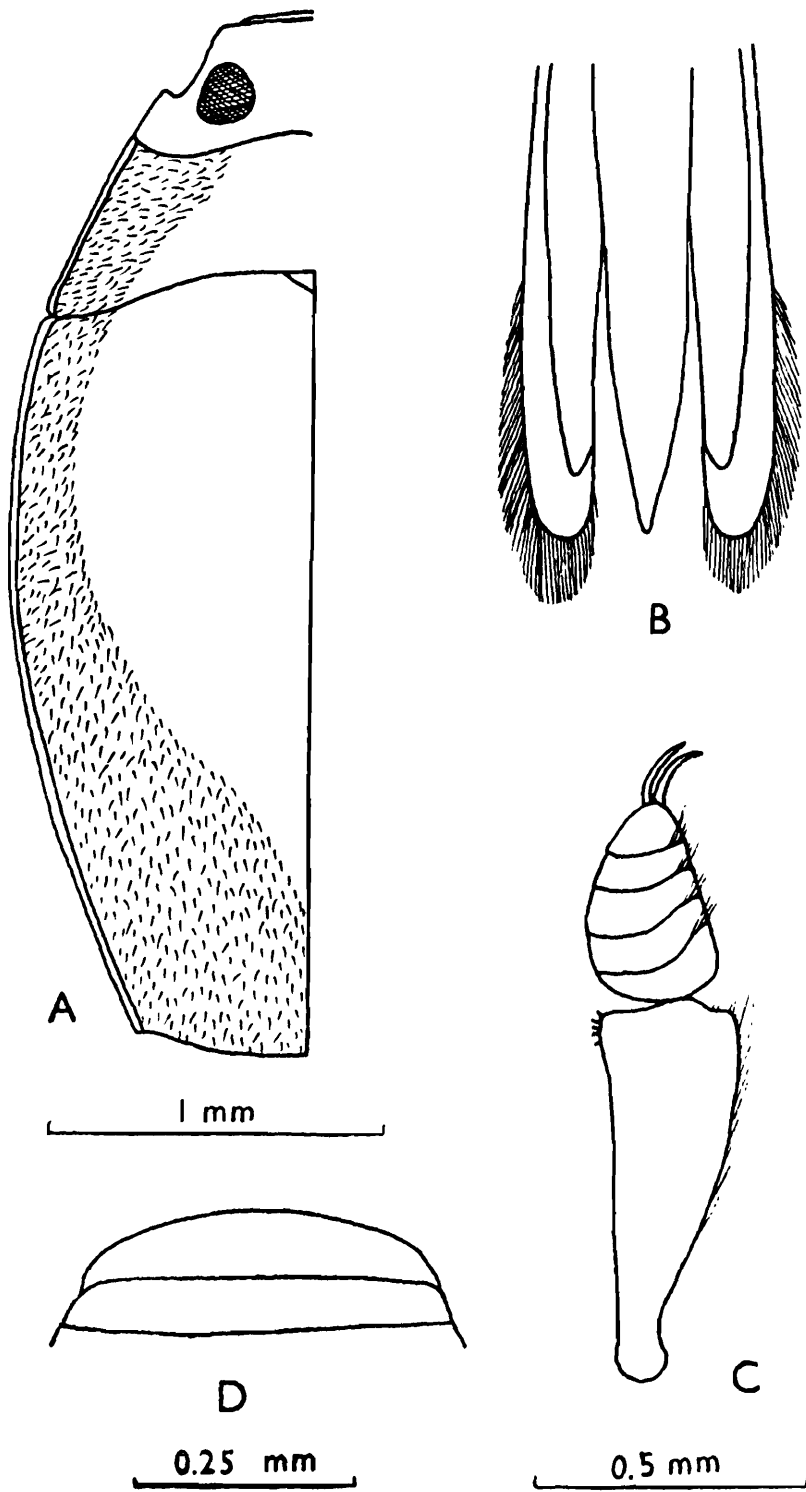
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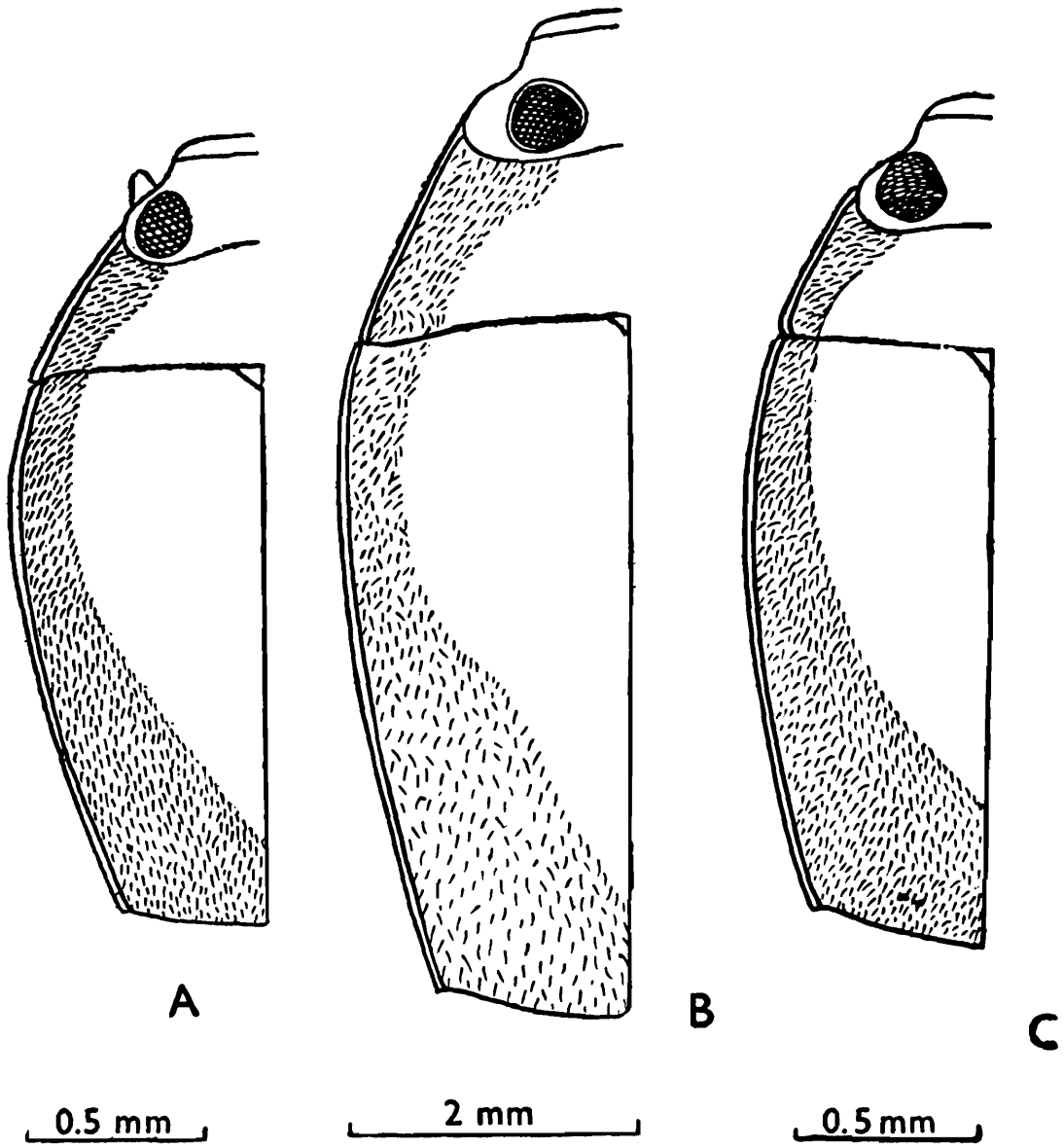
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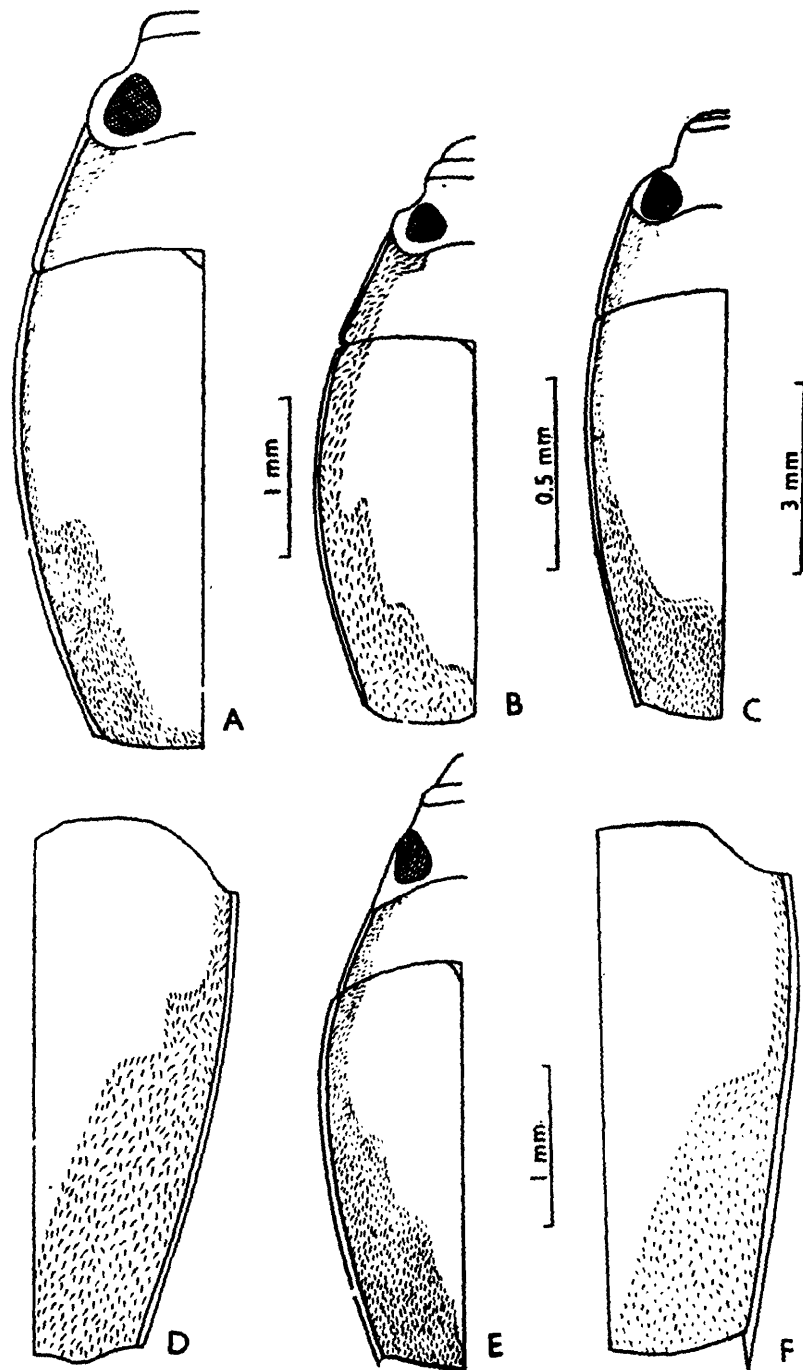
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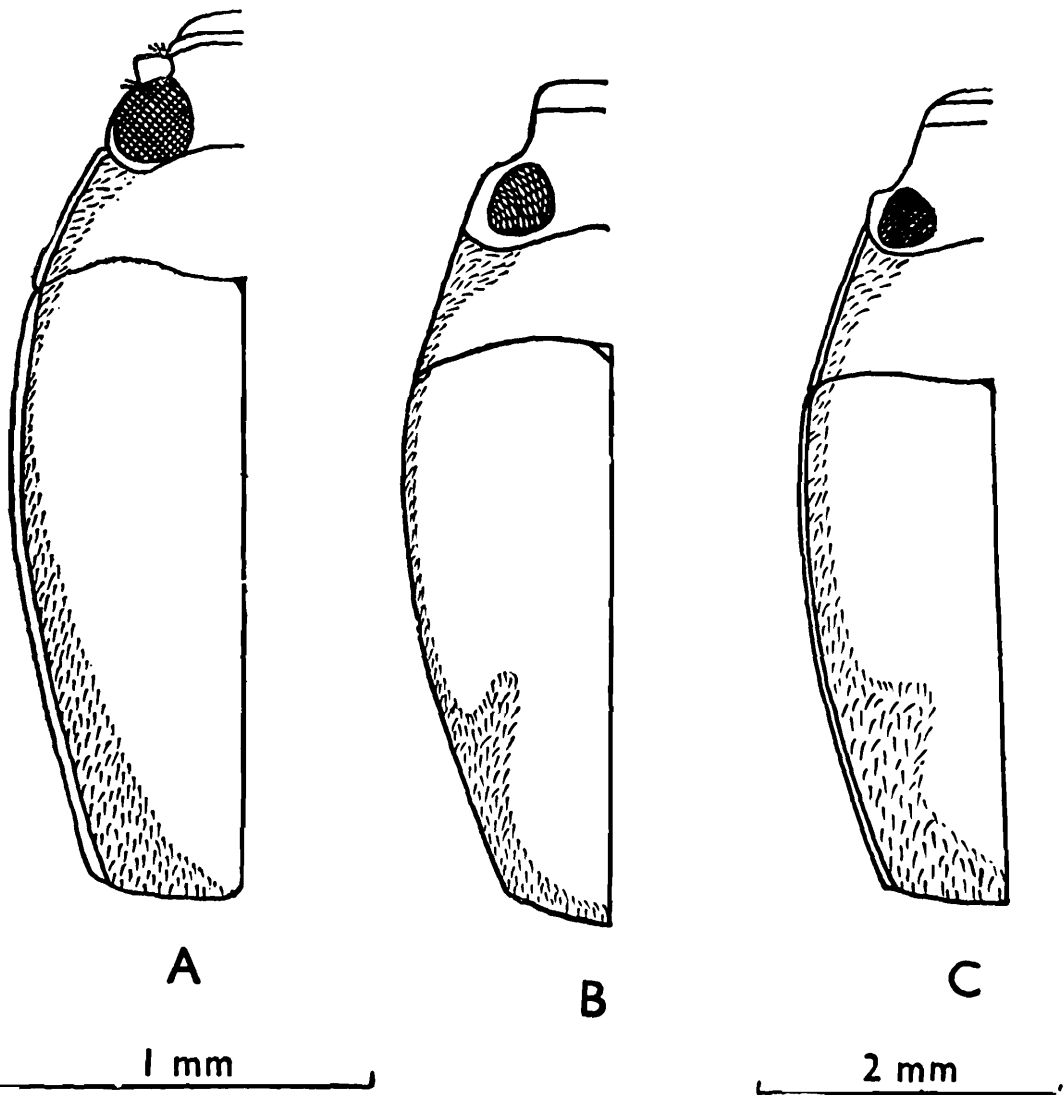
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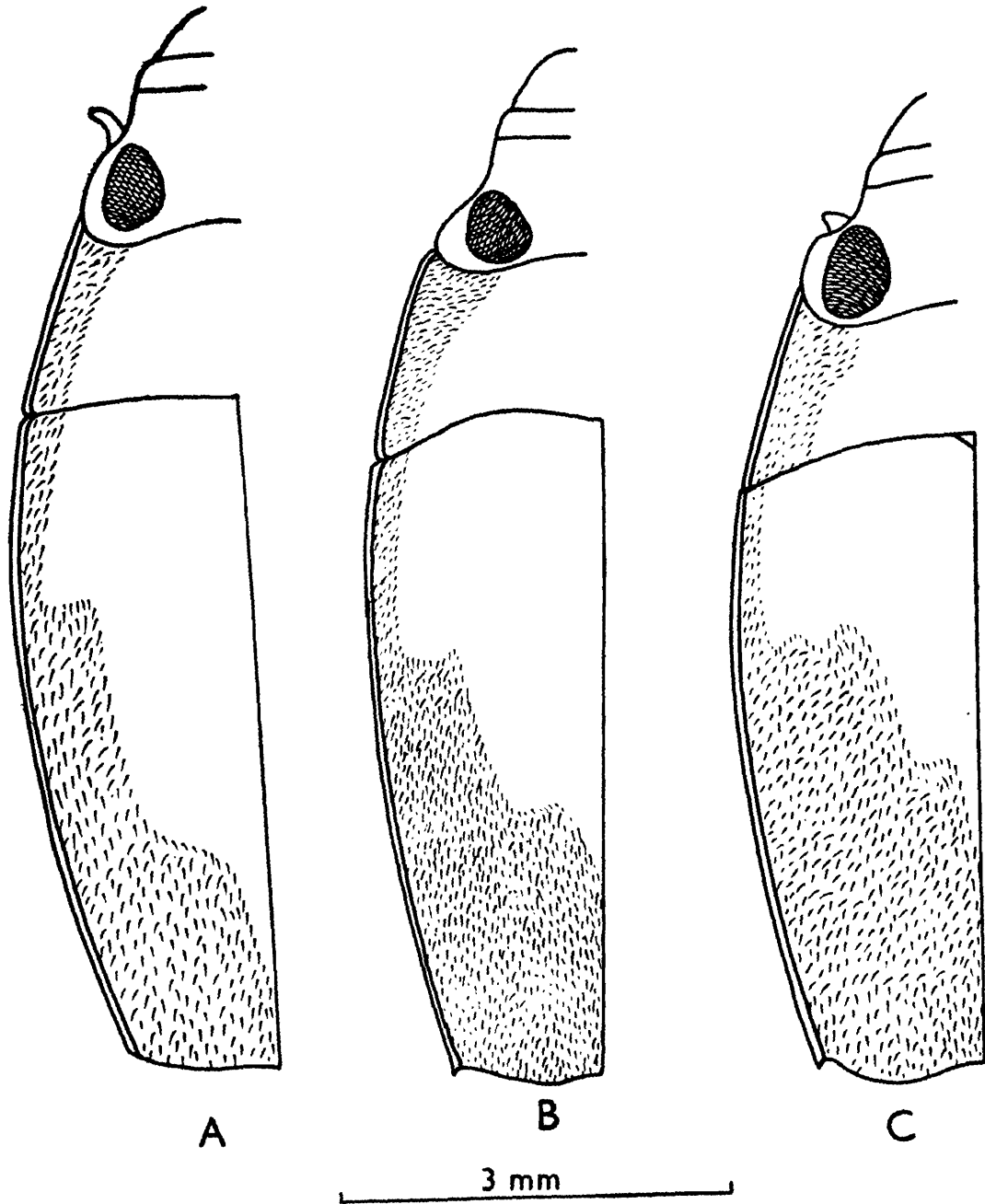
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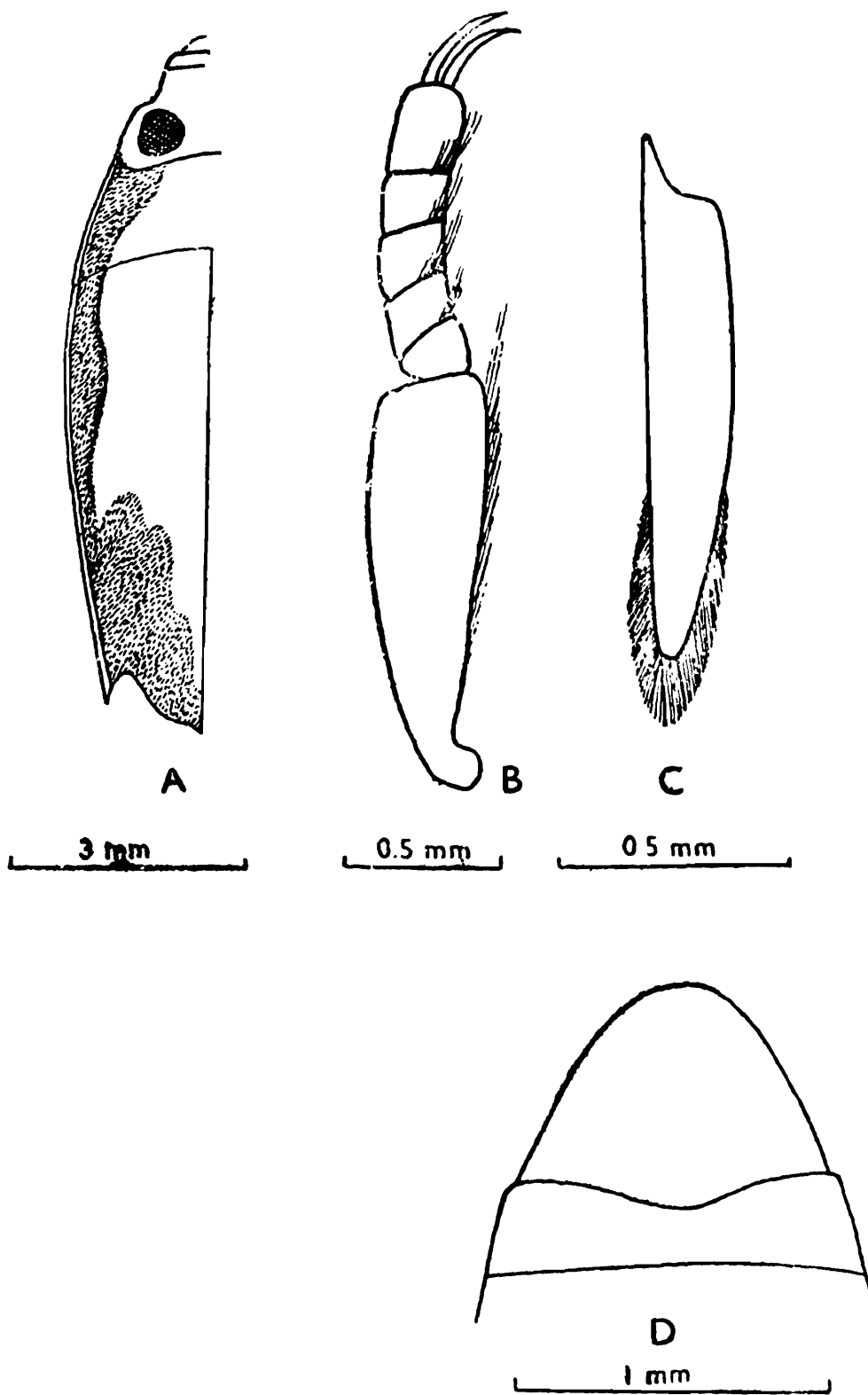
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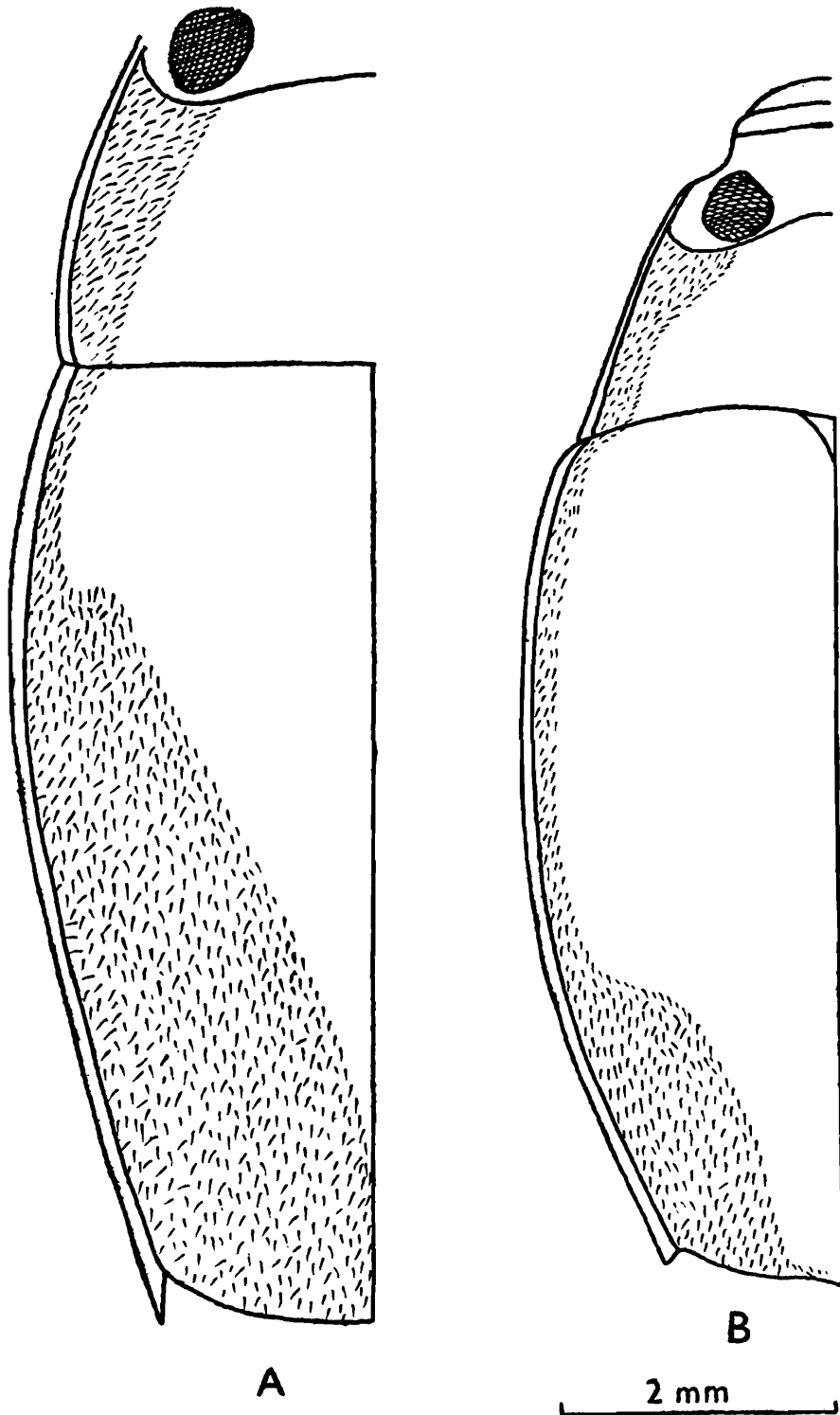
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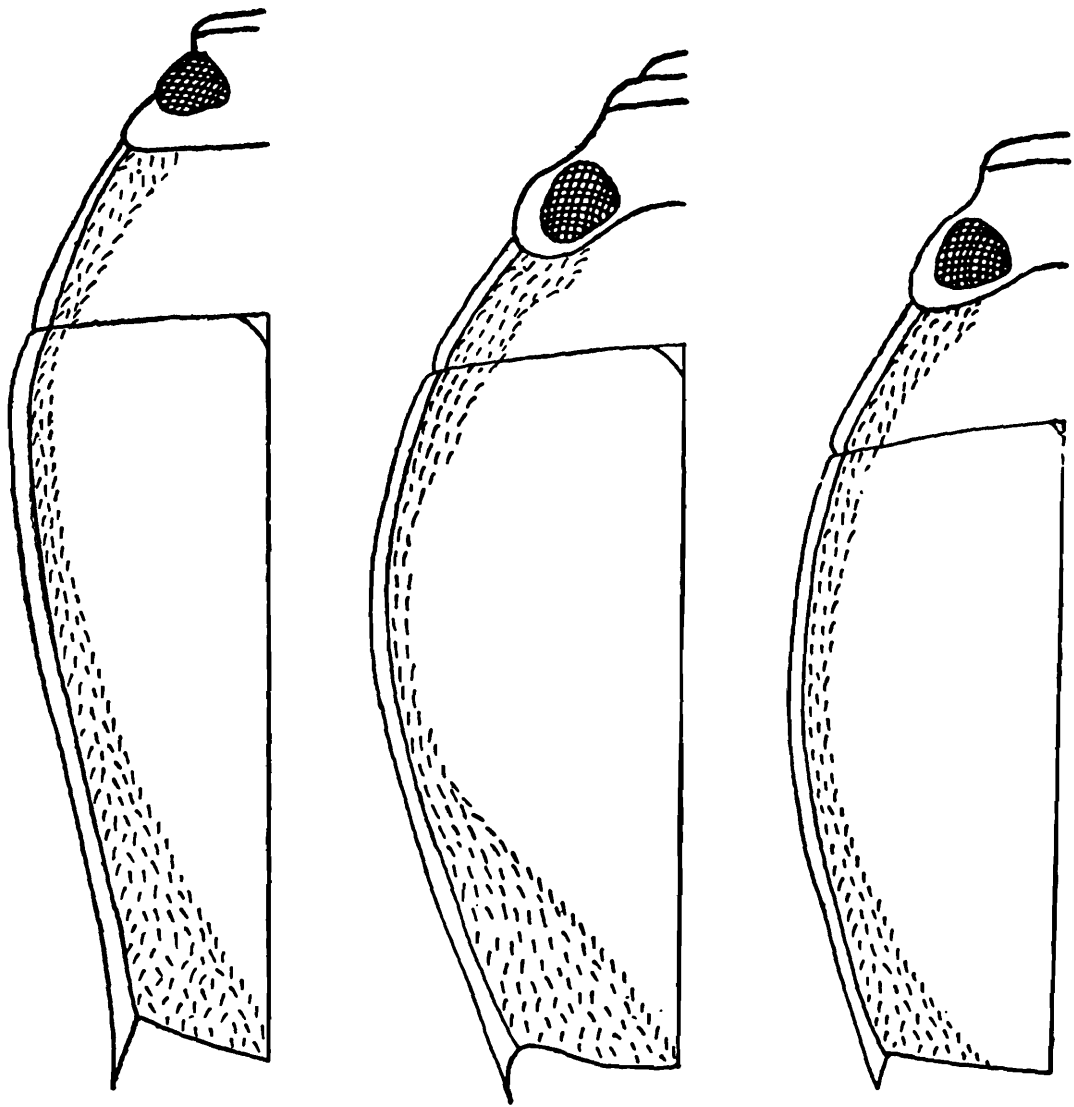
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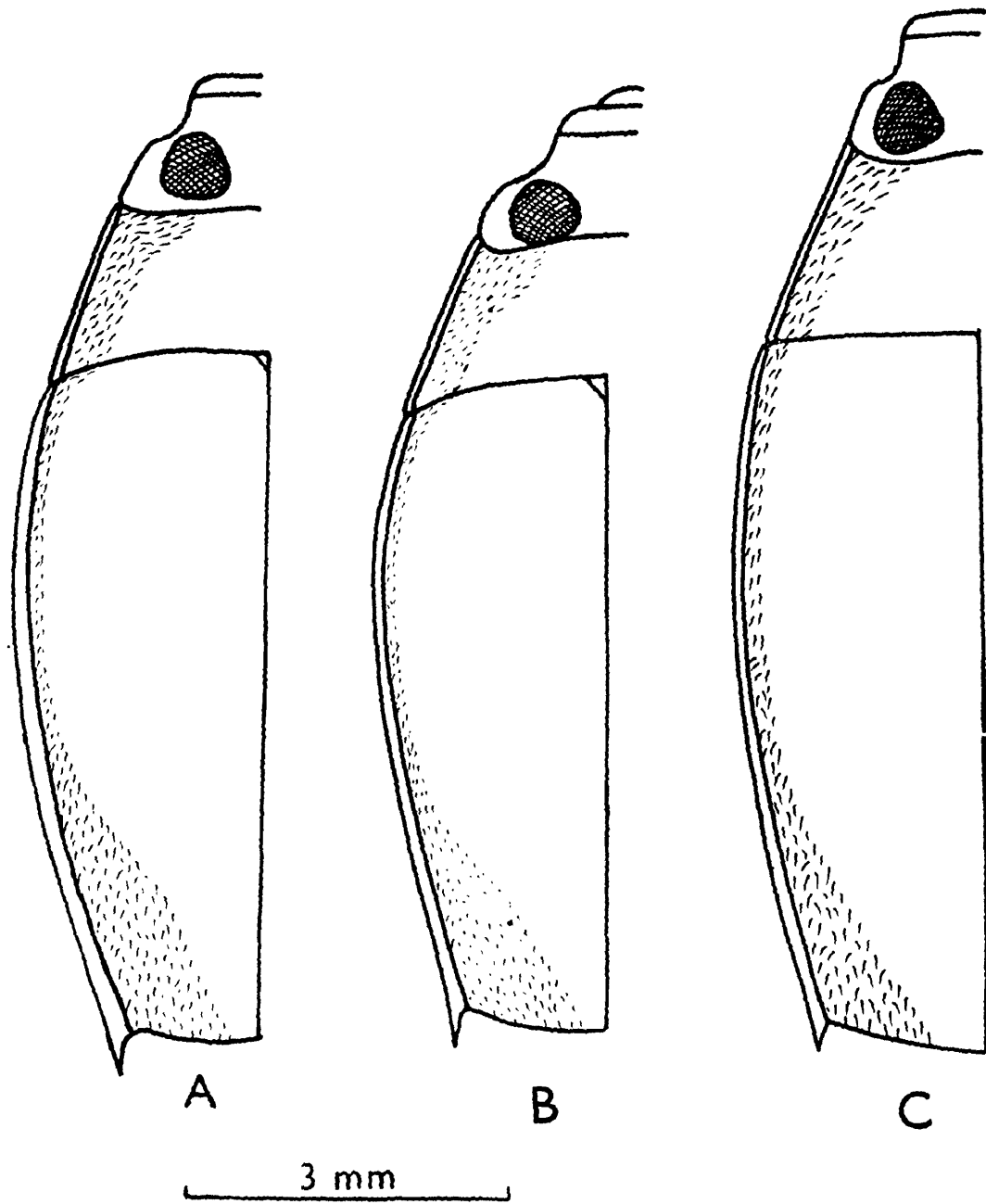
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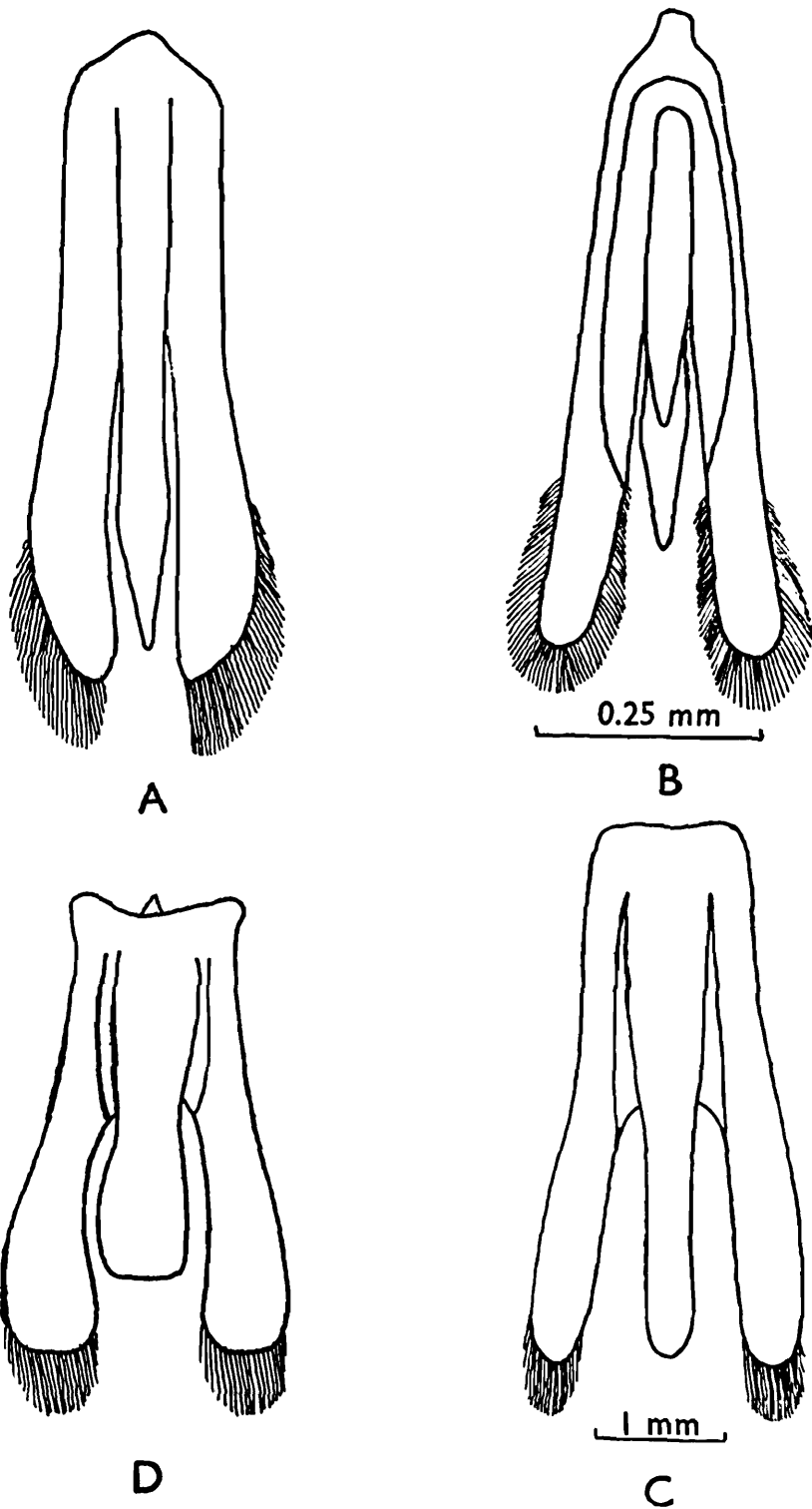
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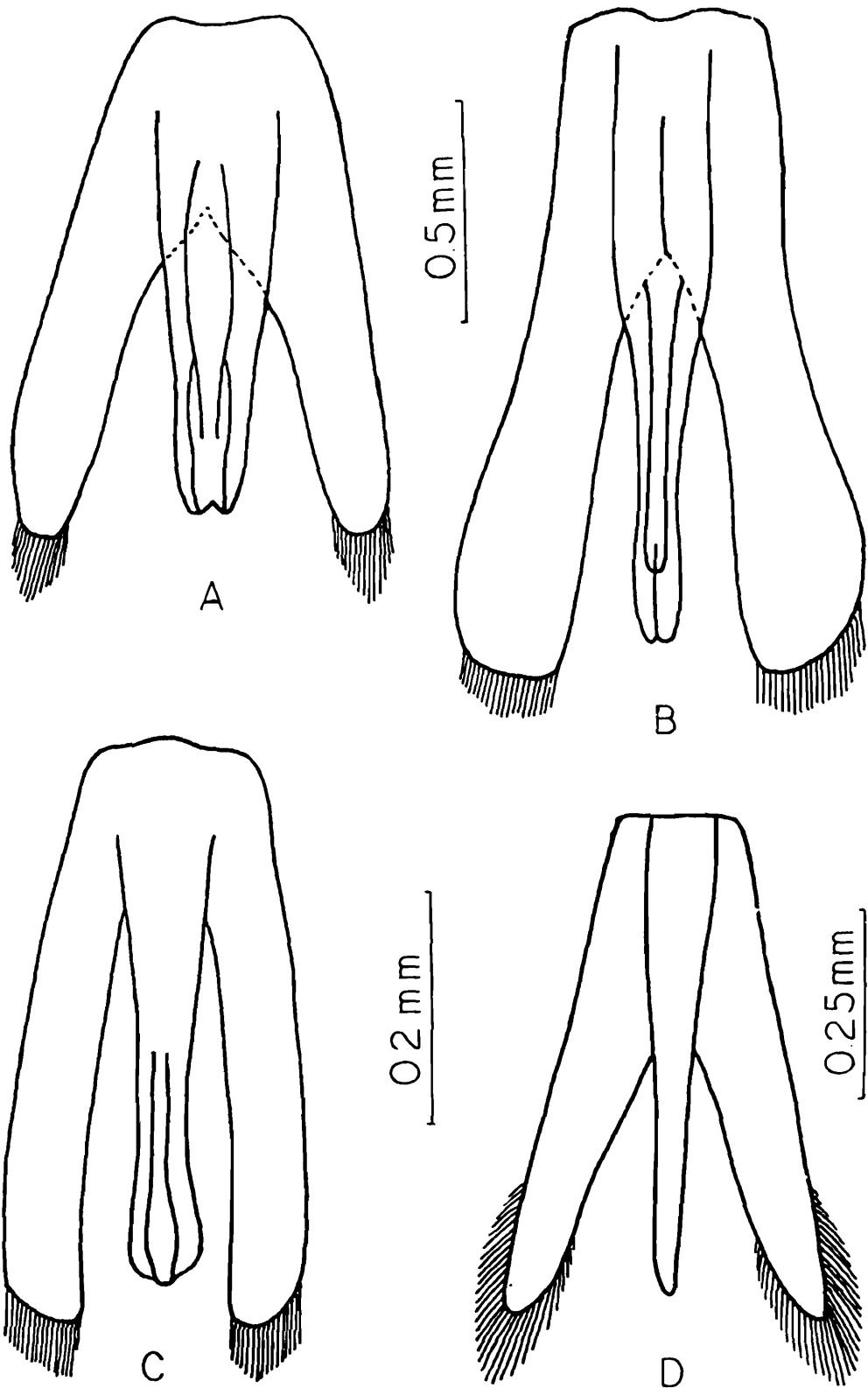
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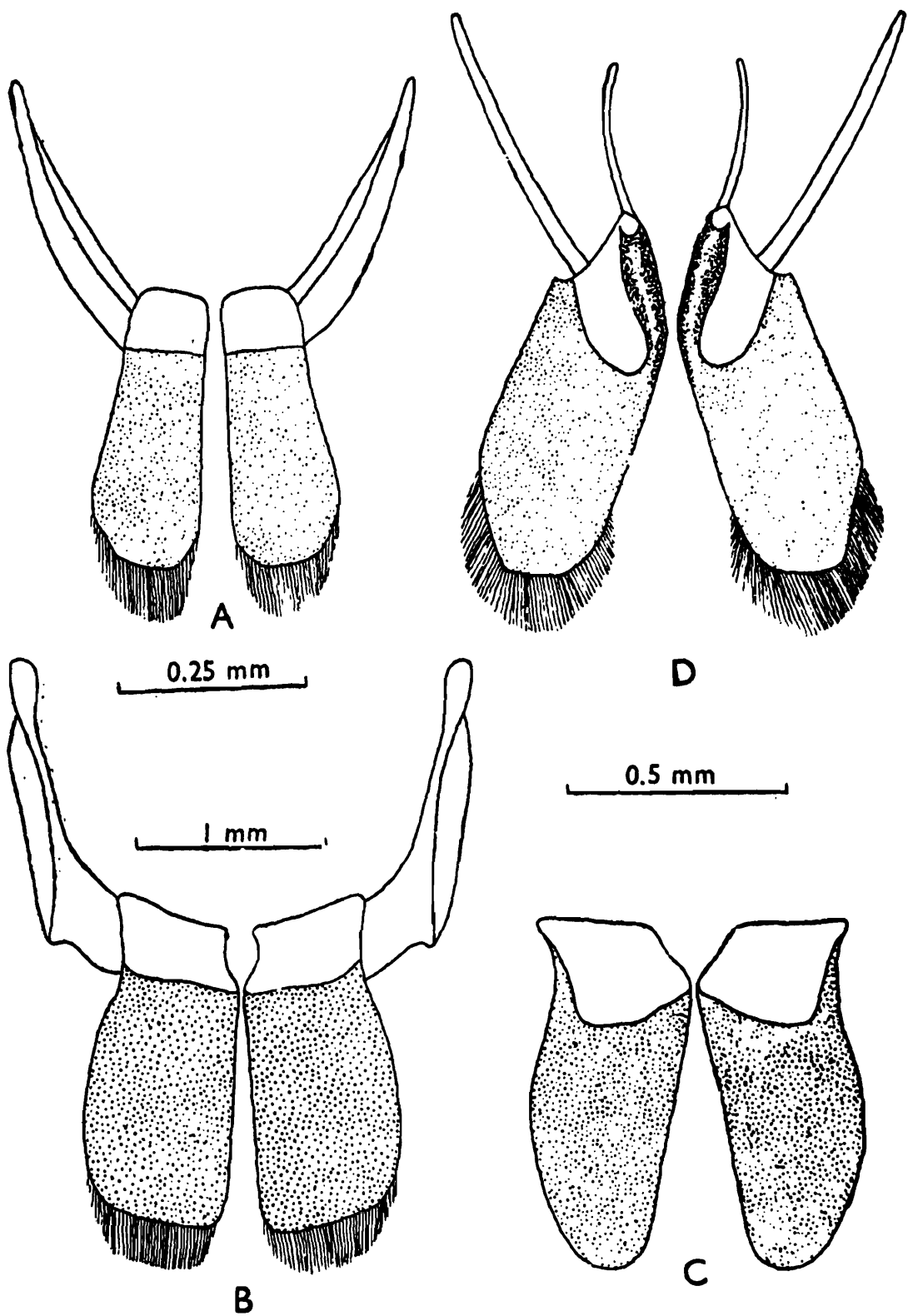
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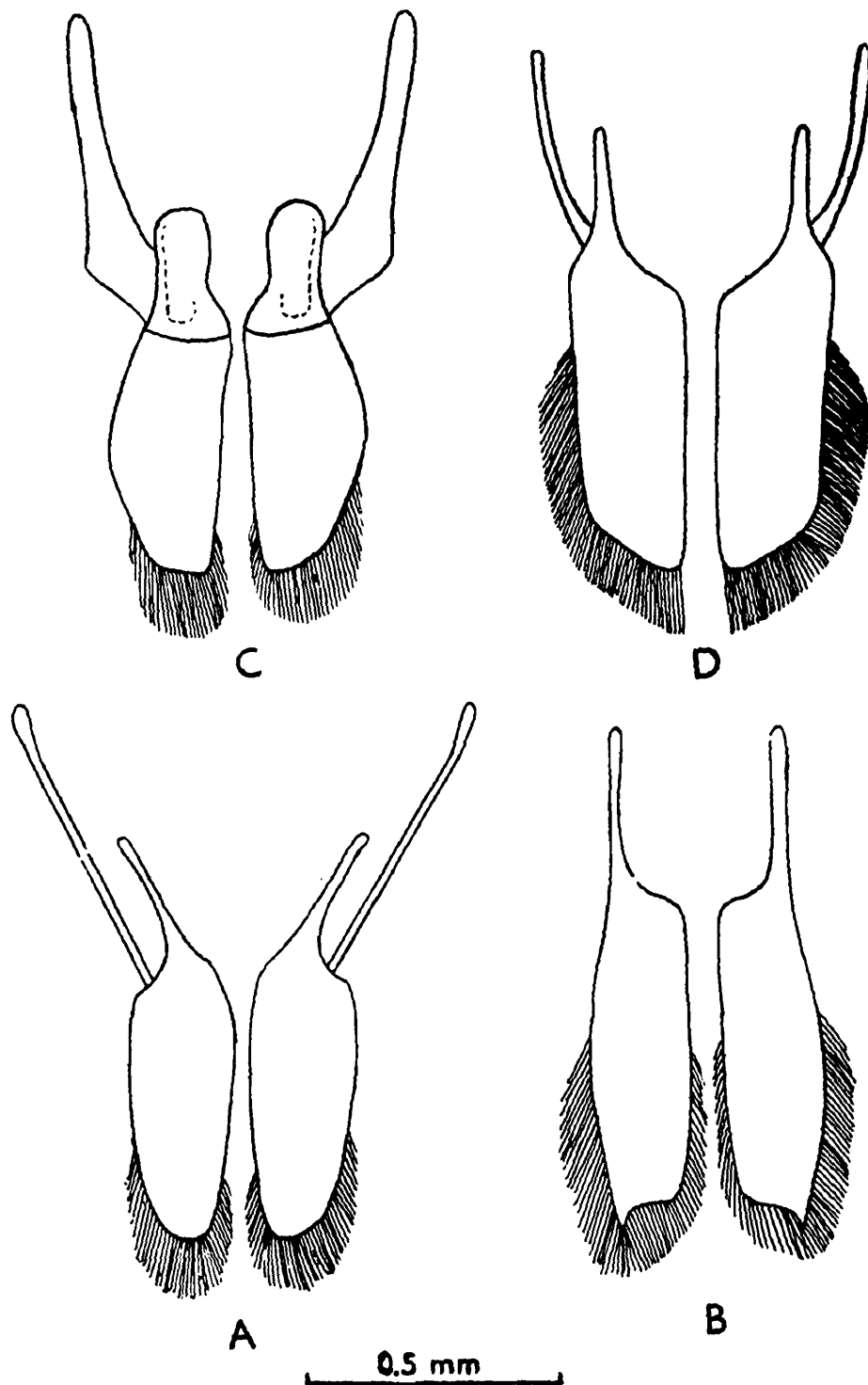
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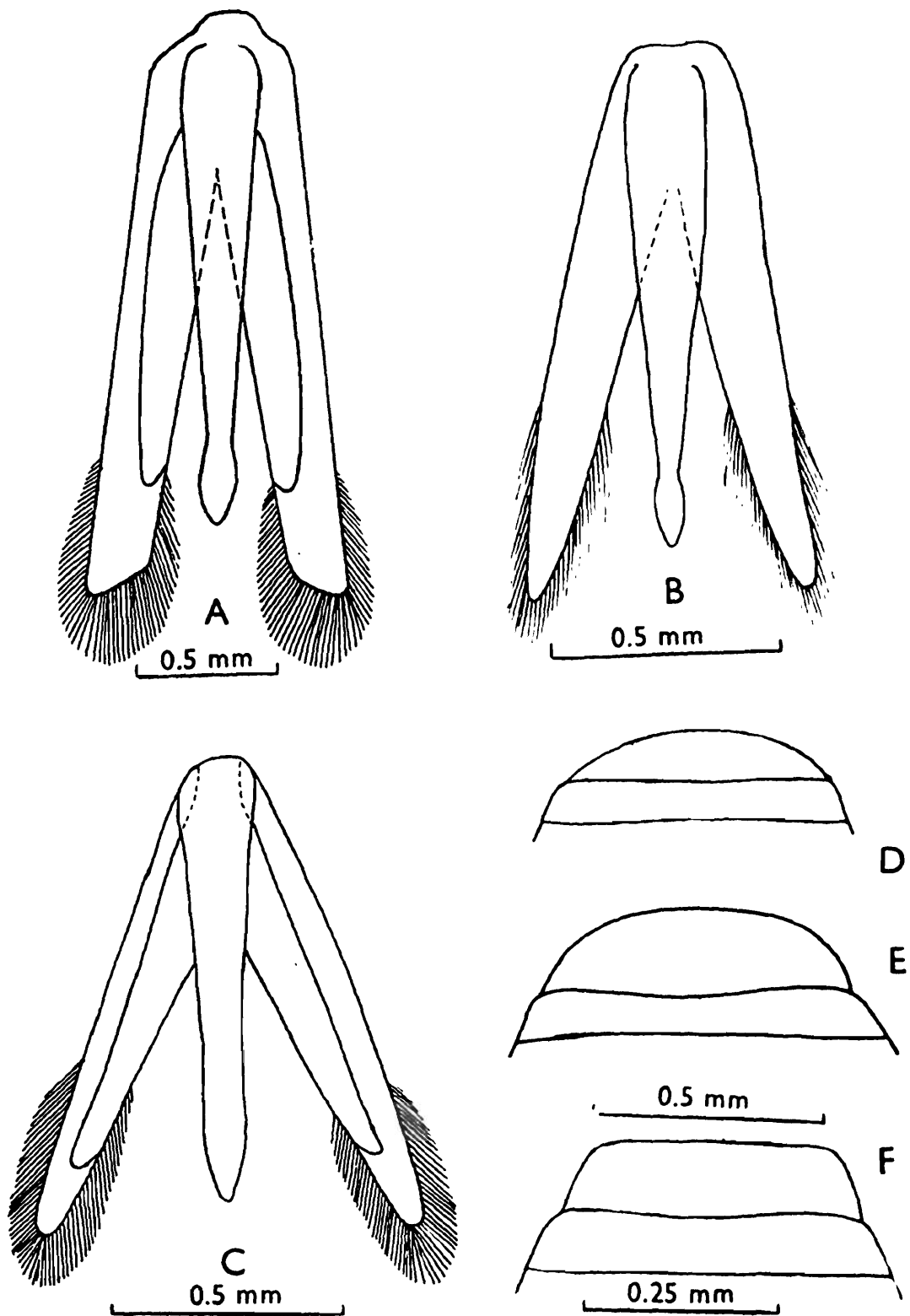
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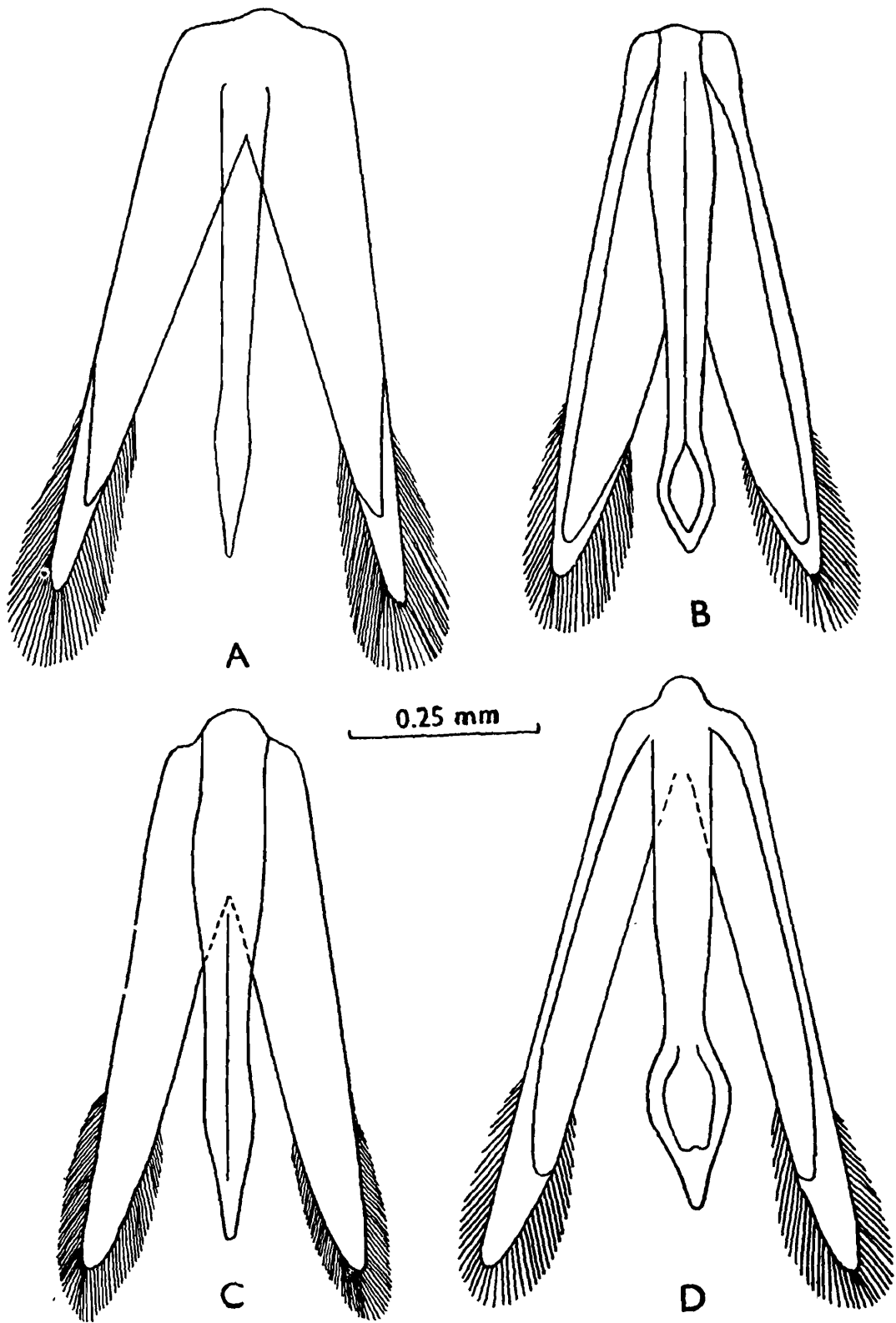
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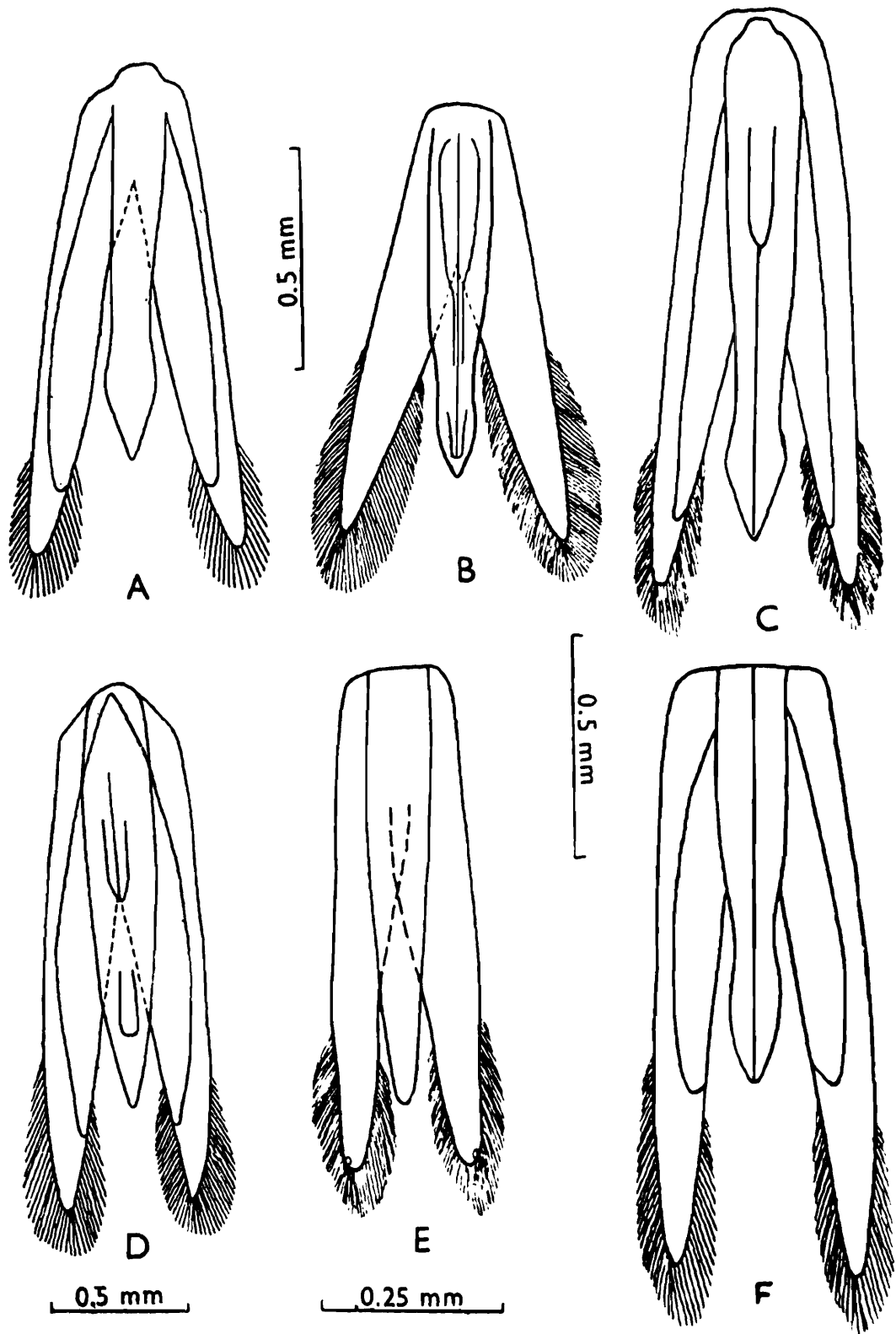
Text fig. 34—Female ovipositor of—A. *Dineutus spinosus* B. *D. unidentatus* C. *Aulonogyrus obliquus* D. *Metagyrius arrowi*



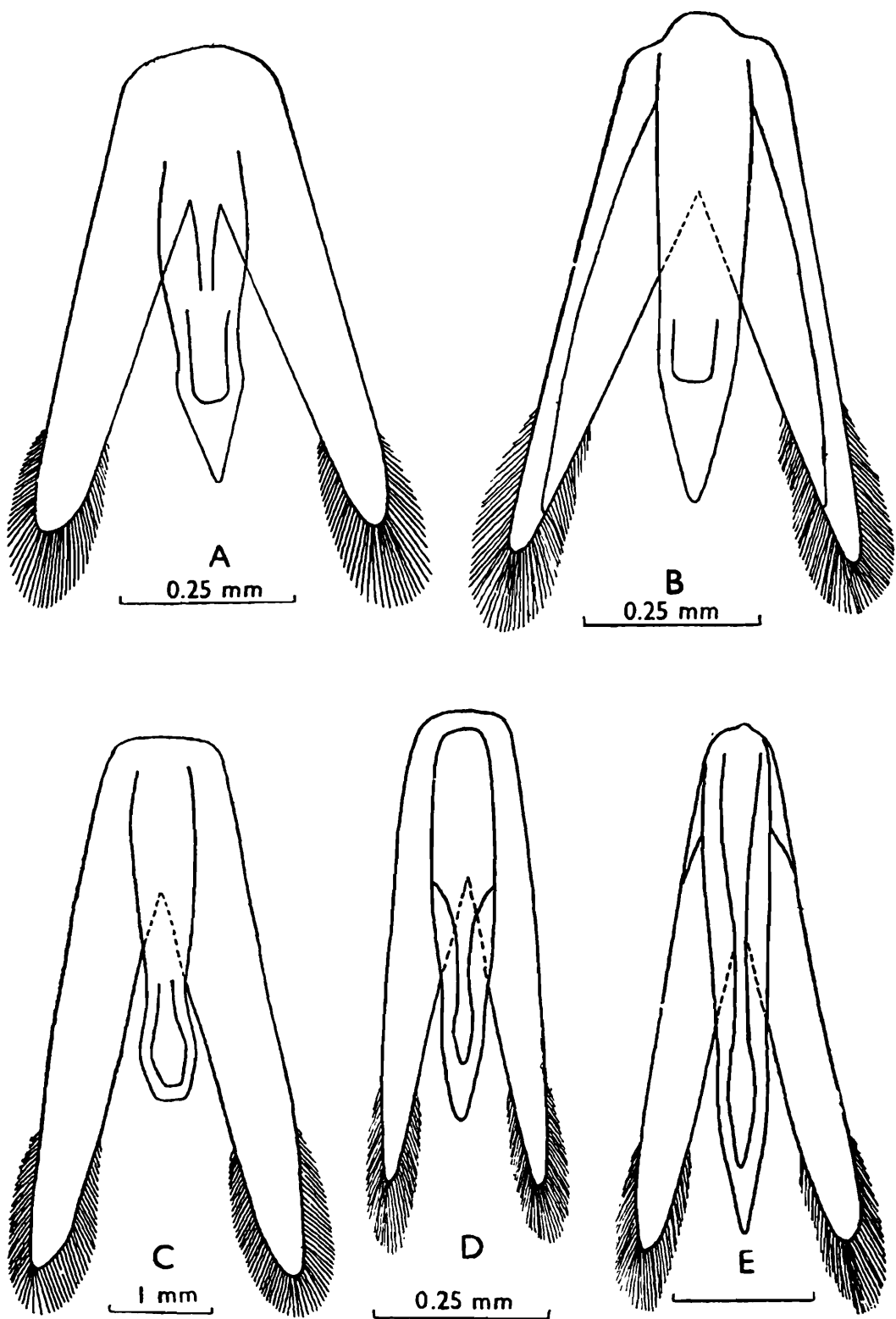
Text fig. 35—Aedeagus of—A. *O. semivestitus* B. *O. desgodinsi desgodinsi*
 C. *O. similis*—labrum & fronto-clypeus of D. *O. desgodinsi desgodinsi* E. *O. similis* F. *O. semivestitus*



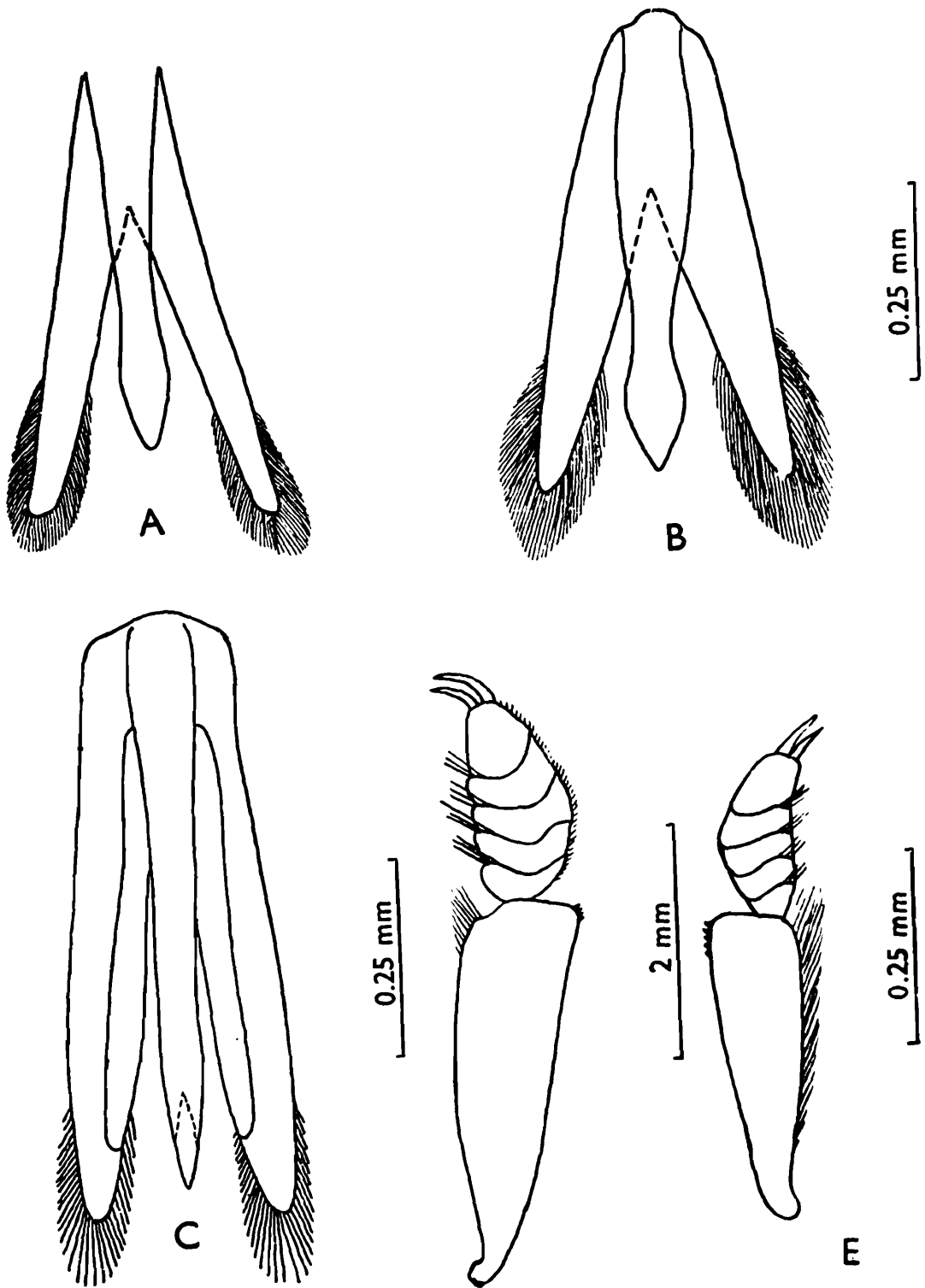
Text fig. 36—Aedeagus of—A. *O. productus* B. *O. limbatus* C. *O. neglectus* D. *O. punctulatus*



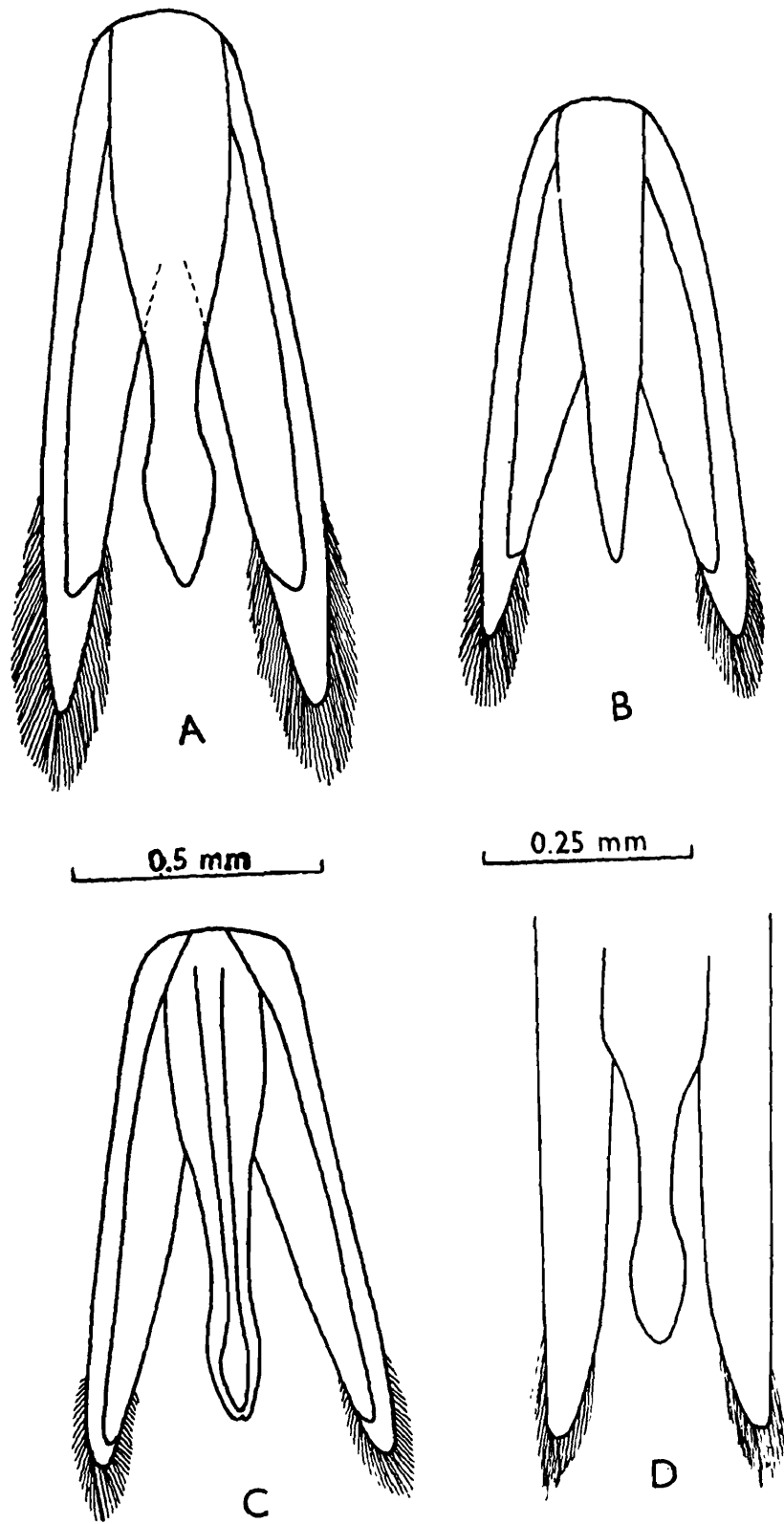
Text fig. 37—Aedeagus of—A. *O. cuneatus* B. *O. himalayansis* n. sp. C. *O. dilatatus* D. *O. kempi* E. *O. choprai* F. *O. discifer*



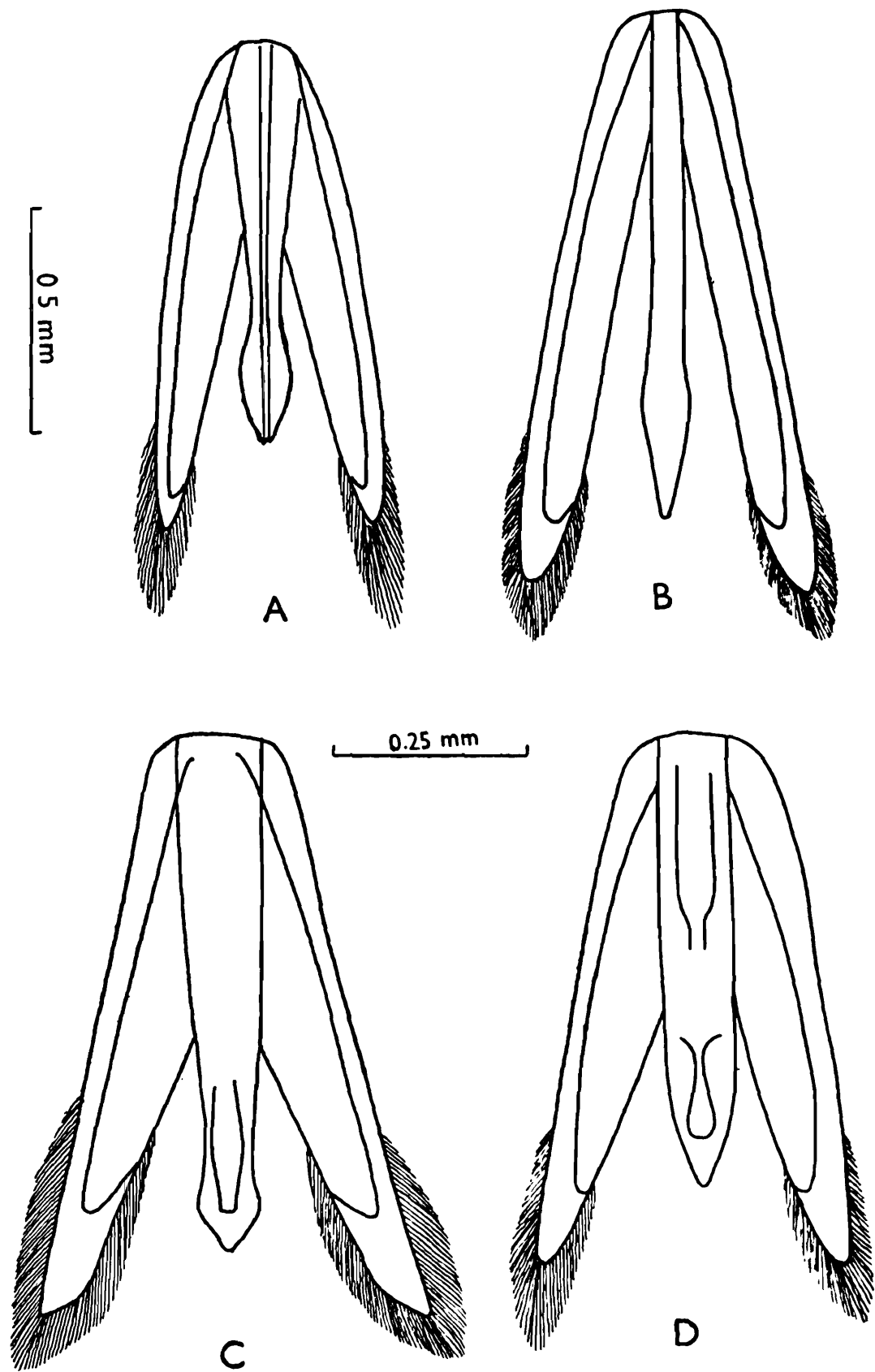
Text fig. 38—Aedeagus of—A. *O. cribratellus metallescens* B. *O. metallicus* C. *O. cavernicola* D. *O. oblongiusculus* E. *O. figuratus*



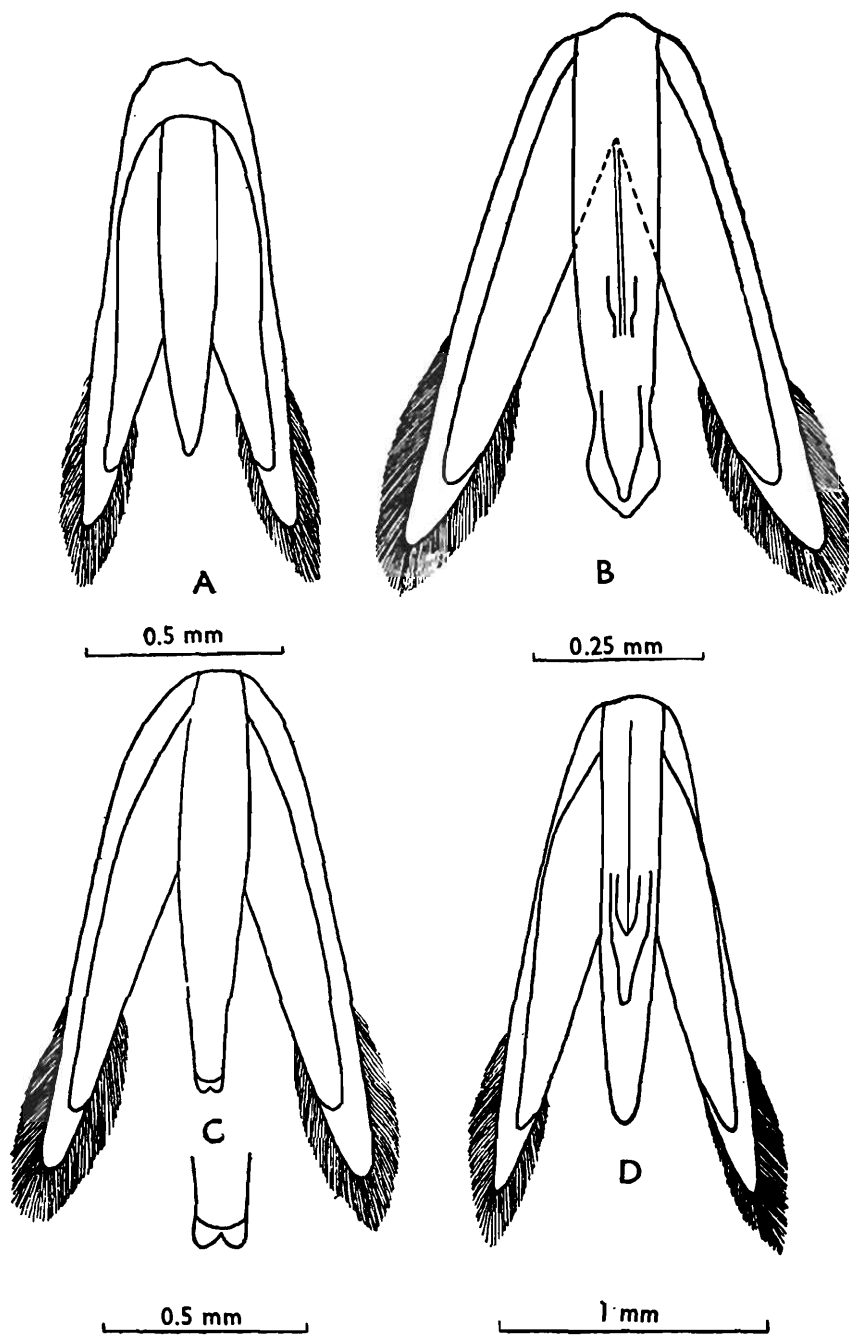
Text fig. 39—Aedeagus of—A. *O. orissaensis* B. *O. andamanarum* C. *O. marginipennis angustilimbus* D. protarsi & protibia in of same E. same in *andamanarum* (lectotype)



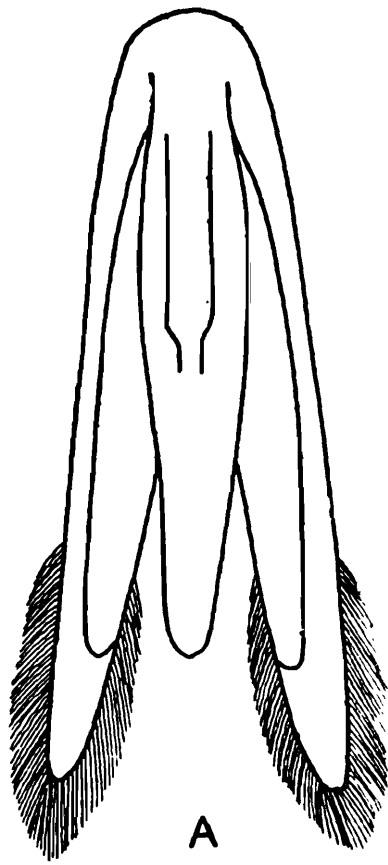
Text fig. 40—Aedeagus of—A. *O. flatchari* B. *O. haemorrhous* C. *O. ritsemai* D. *O. rebeiroi*



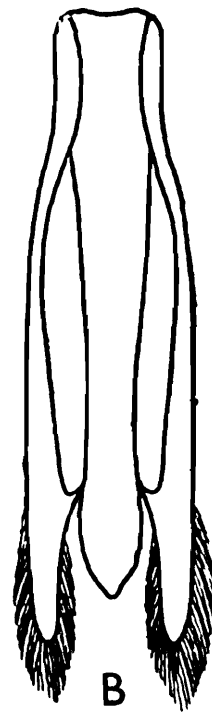
Text fig. 41—Aedeagus of—A. *O. cylindricus* B. *O. gangeticus* C. *O. aenipennis* D. *O. indicus*



Text fig. 42—Aedeagus of—A. *O. ahlwarthi* B. *O. andamanicus* C. *O. volubilis* D. *O. nathani*

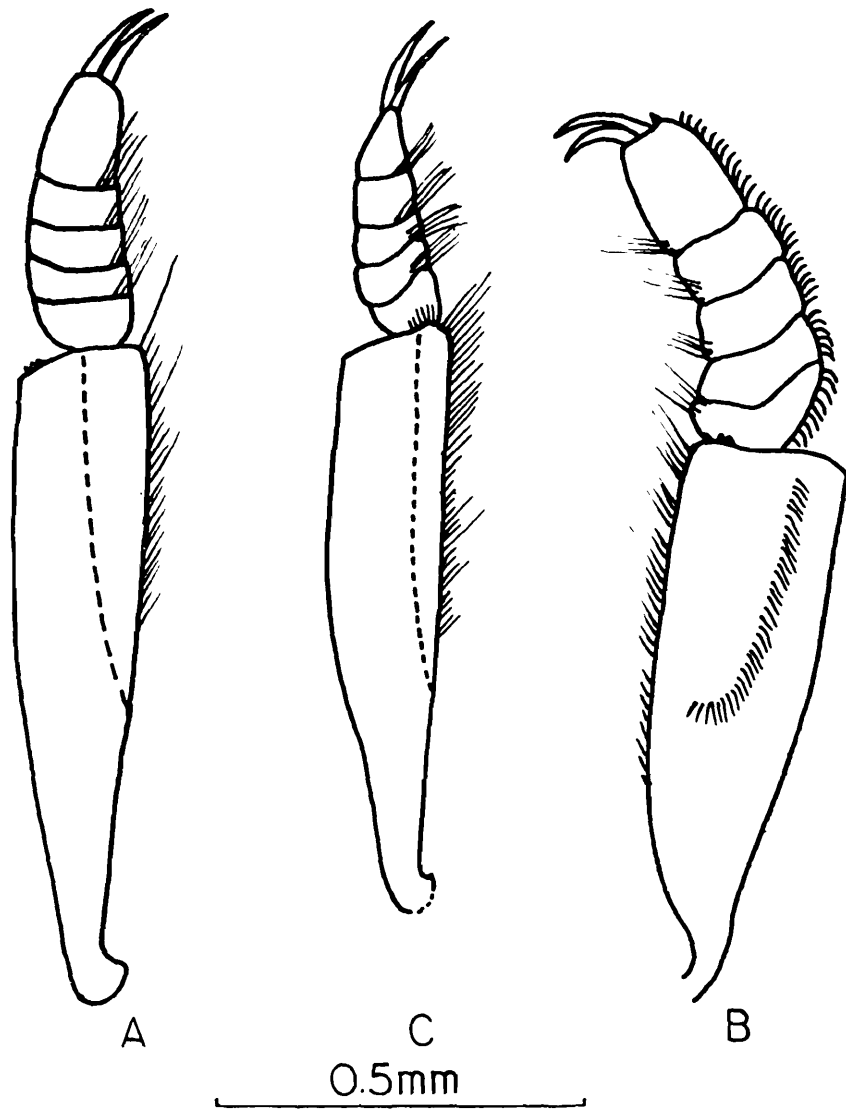


0.25 mm

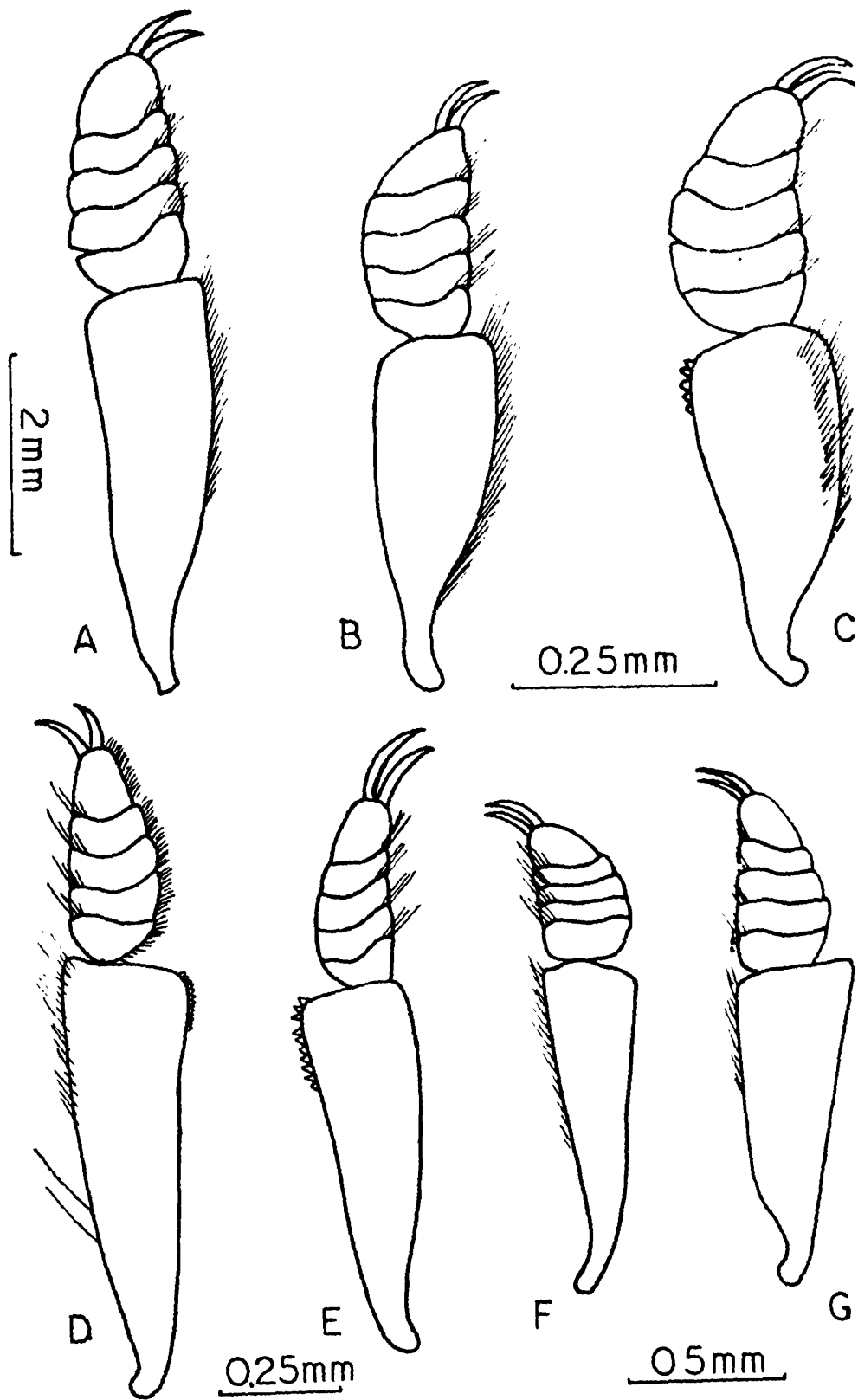


0.5 mm

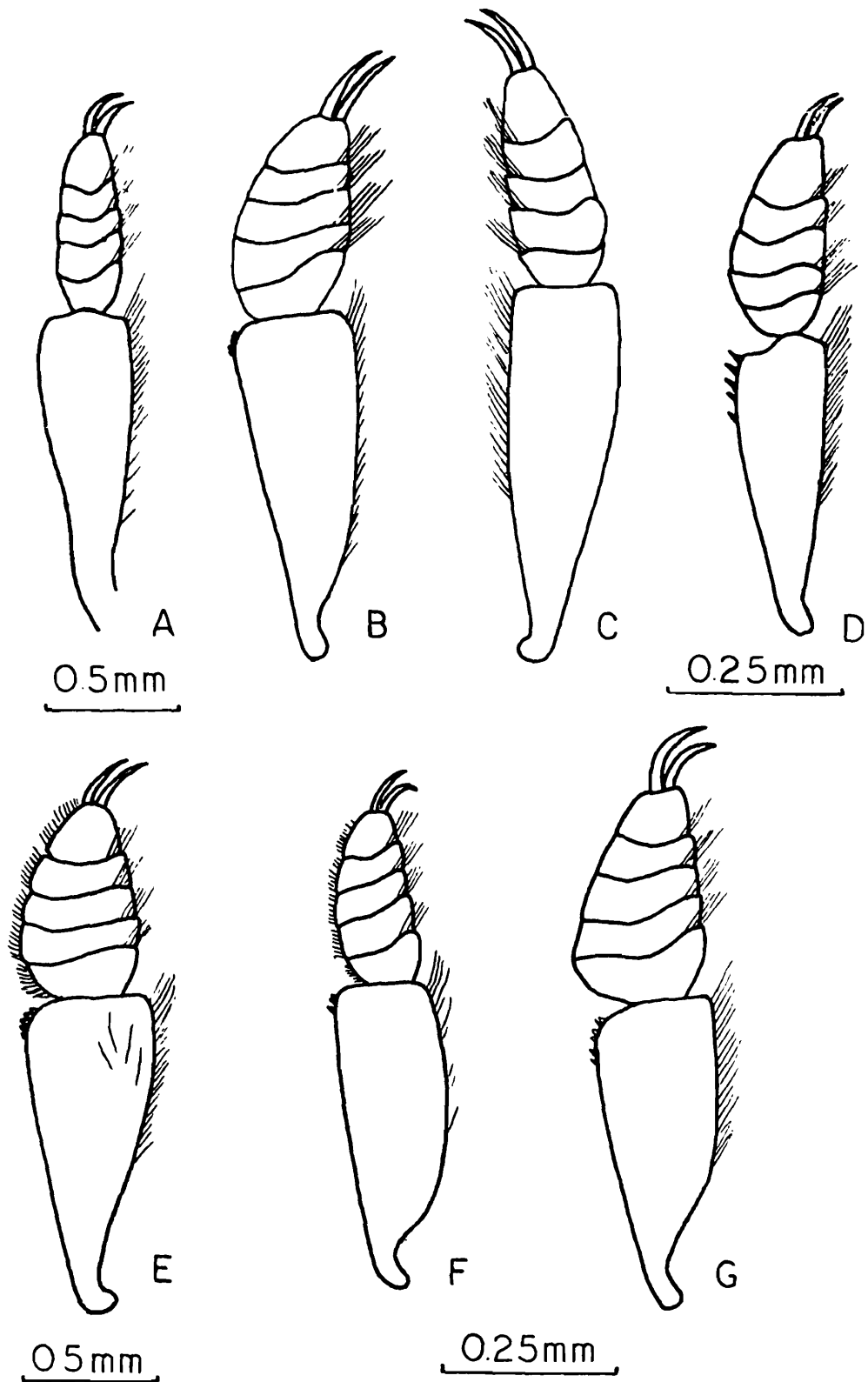
Text fig. 43—Aedeagus of—A. *O. annandalei* B. *O. assimilis*



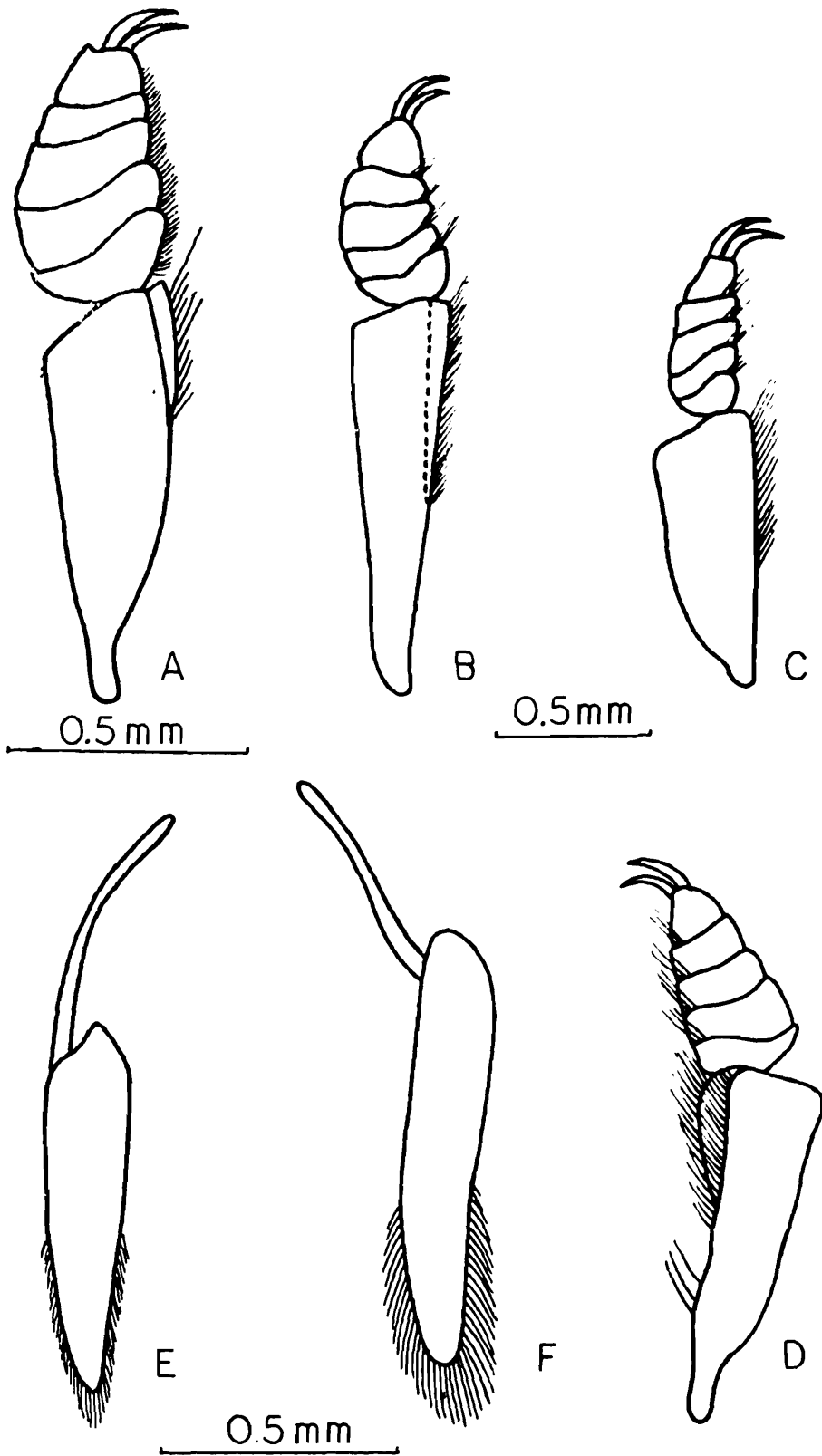
Text fig. 44—Anterior tibia & tarsus of—A. *Dineutus spinosus* B. *D. unidentatus* C. *Gyrimus convexiusculus*



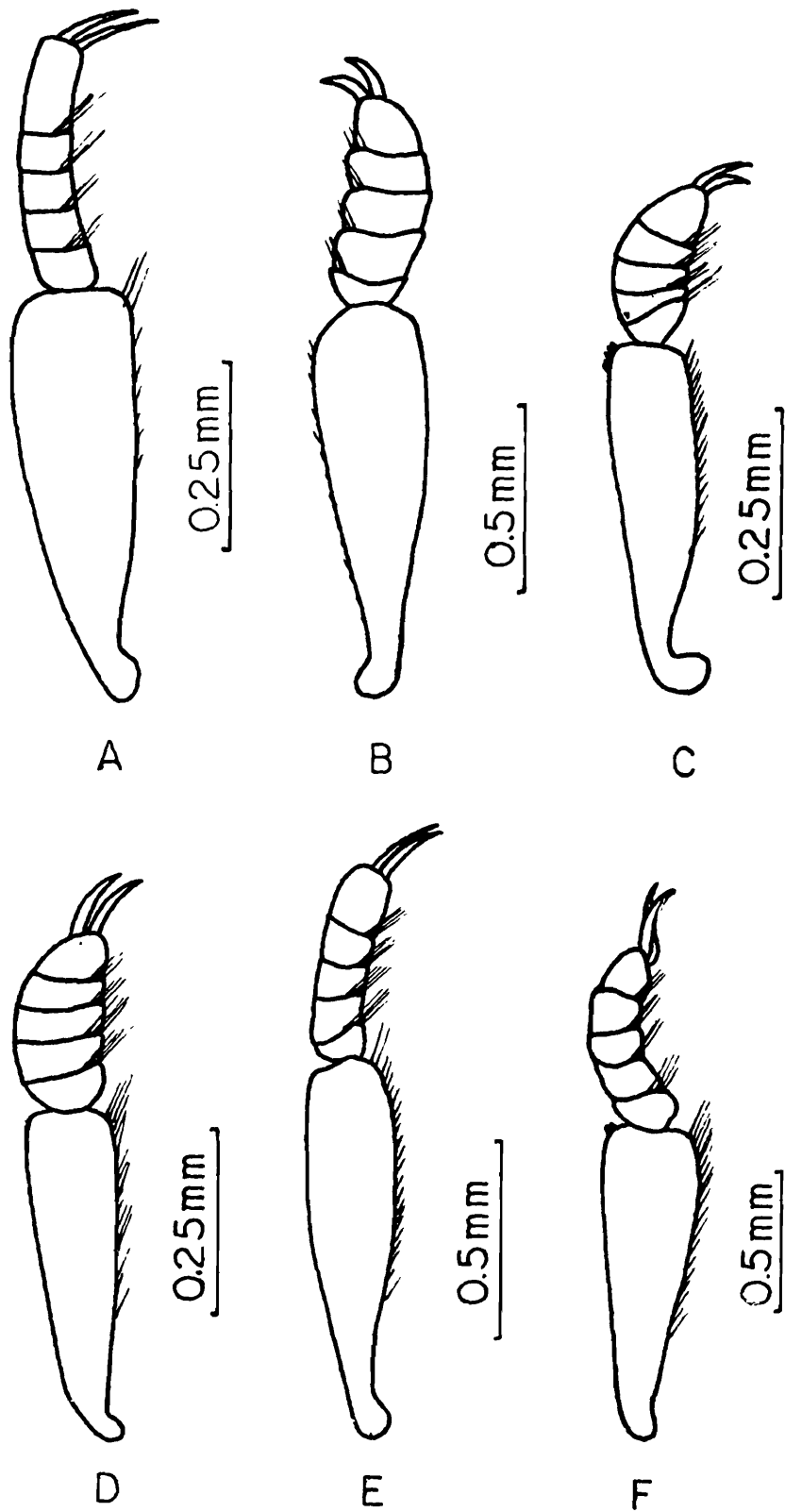
Text fig. 45—Protibia and protarsus of—A. *O. similis* B. *O. desgodinsi*
desgodinsi C. *O. coimboransis* D. *O. semivestitus* Ovipositor
 in E. *O. desgodinsi desgodinsi* F. *O. semivestitus*



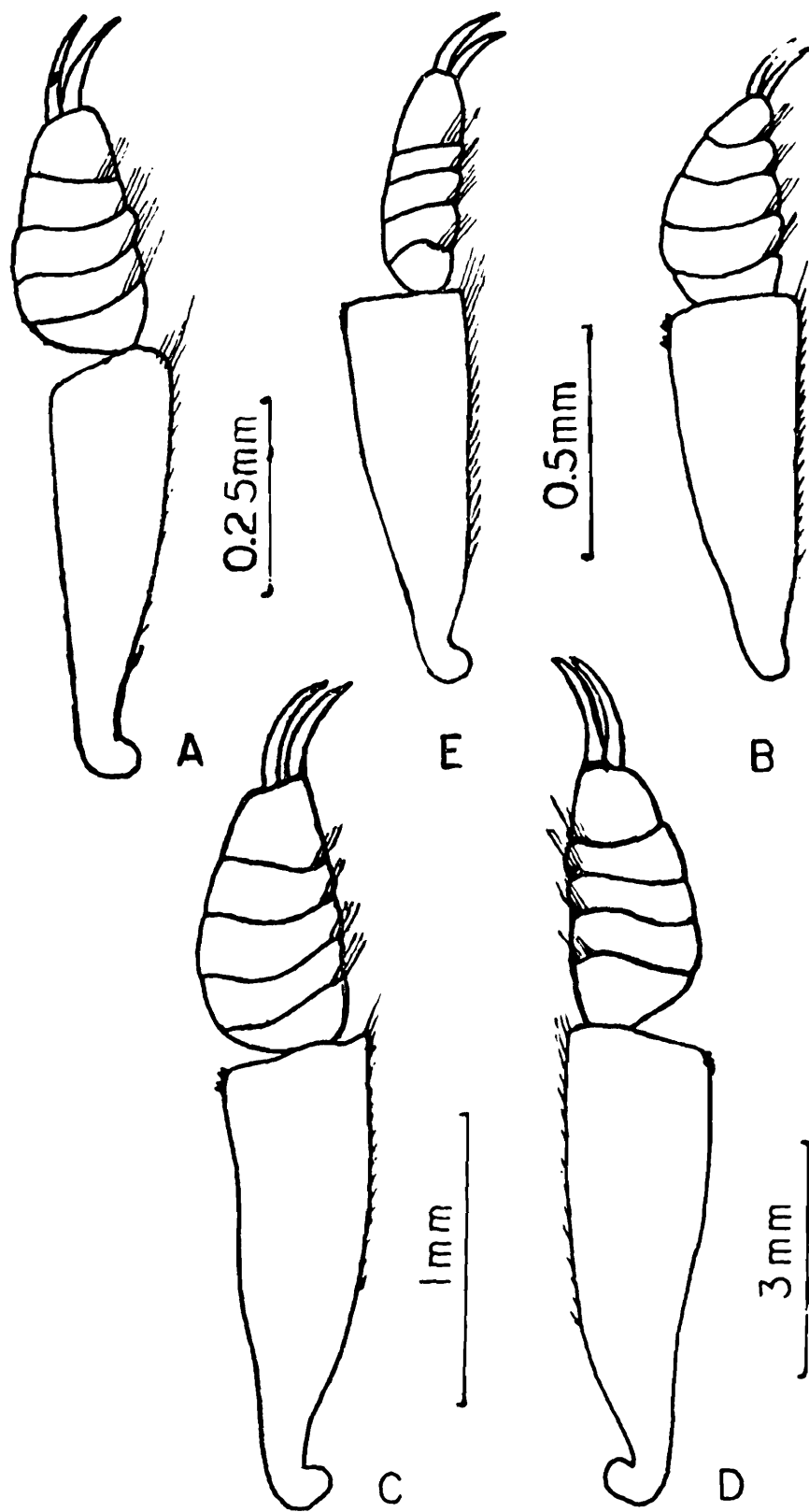
Text fig. 46--Protibia and protarsus in—A. *O. productus* B. *O. limbatus*
 C. *O. punctulatus* D. *O. himalayensis* n. sp. E. *O. cuneatus*
 F. *O. dilatatus* G. *O. discifer*



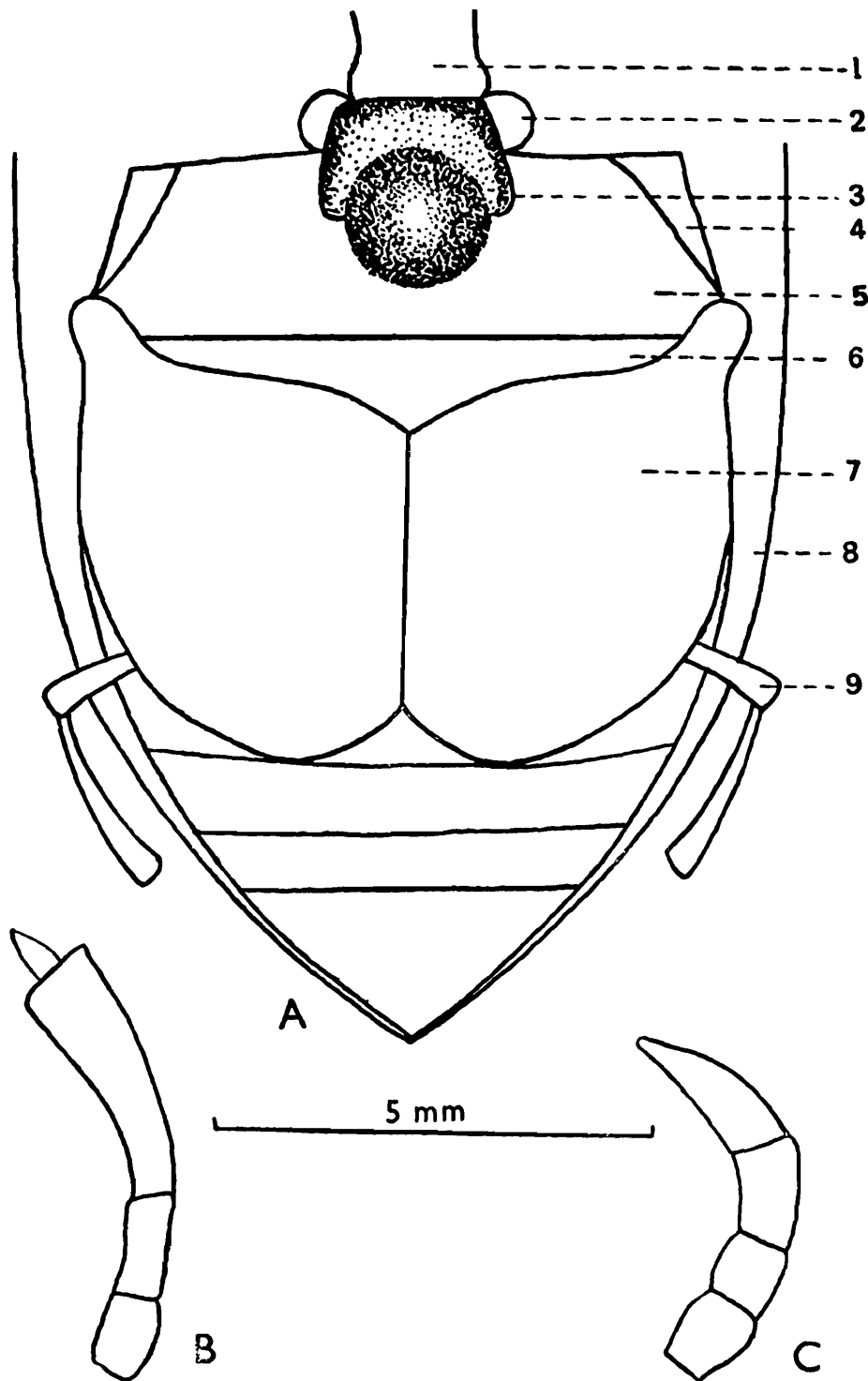
Text fig. 47.—Protibia and protarsus in of—A. *O. kempii* B. *O. choprai*
 C. *O. metallicus* D. *O. cribratellus metallescens* E. *O.*
figuratus F. *O. cavernicola* G. *O. oblongiusculus*



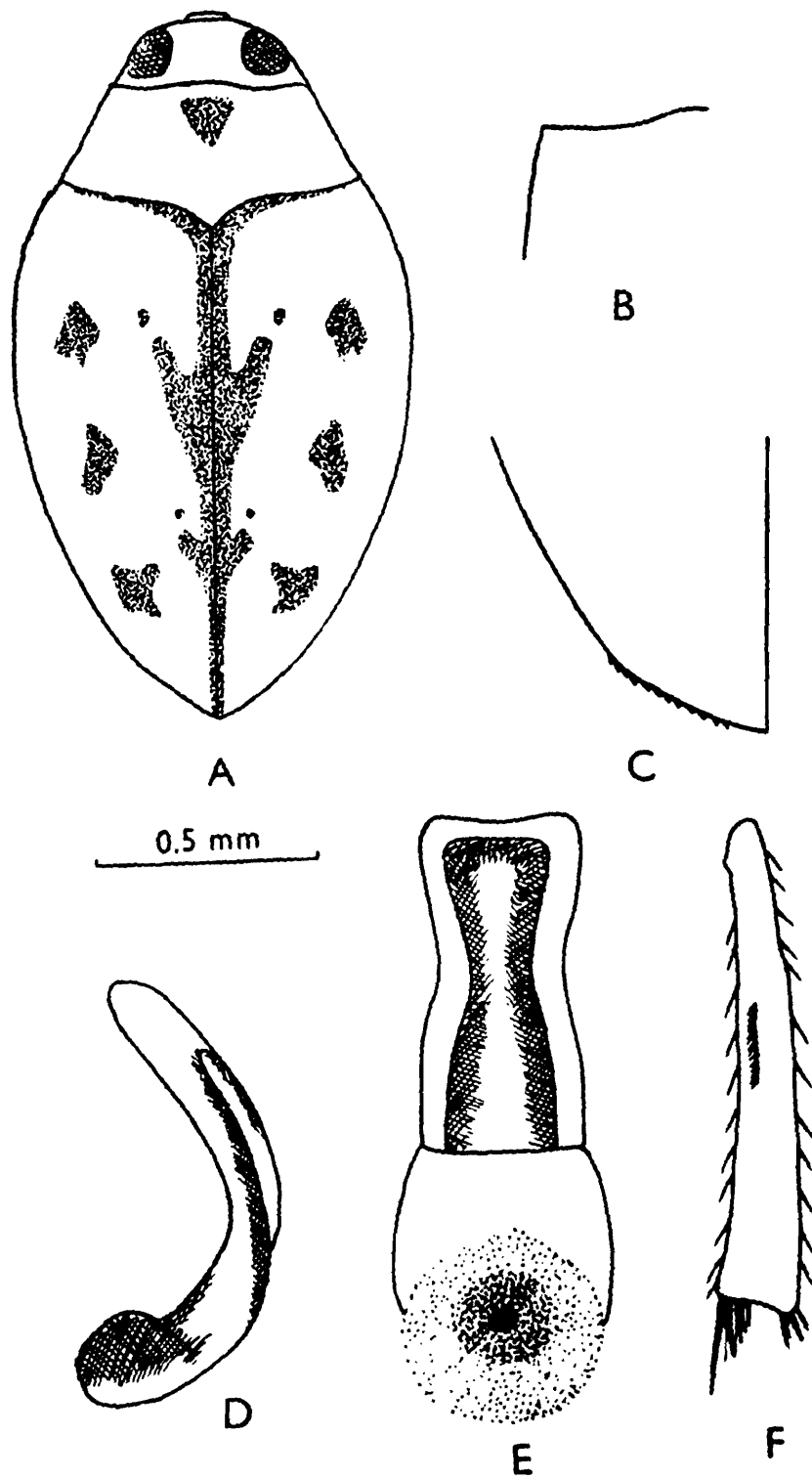
Text fig. 48—Protibia & protarsus of—A. *O. coronatus* B. *O. fletcheri*
 C. *O. haemorrhous* D. *O. ritsemai* E. *O. ribeiroi* F. *O. cylindricus*



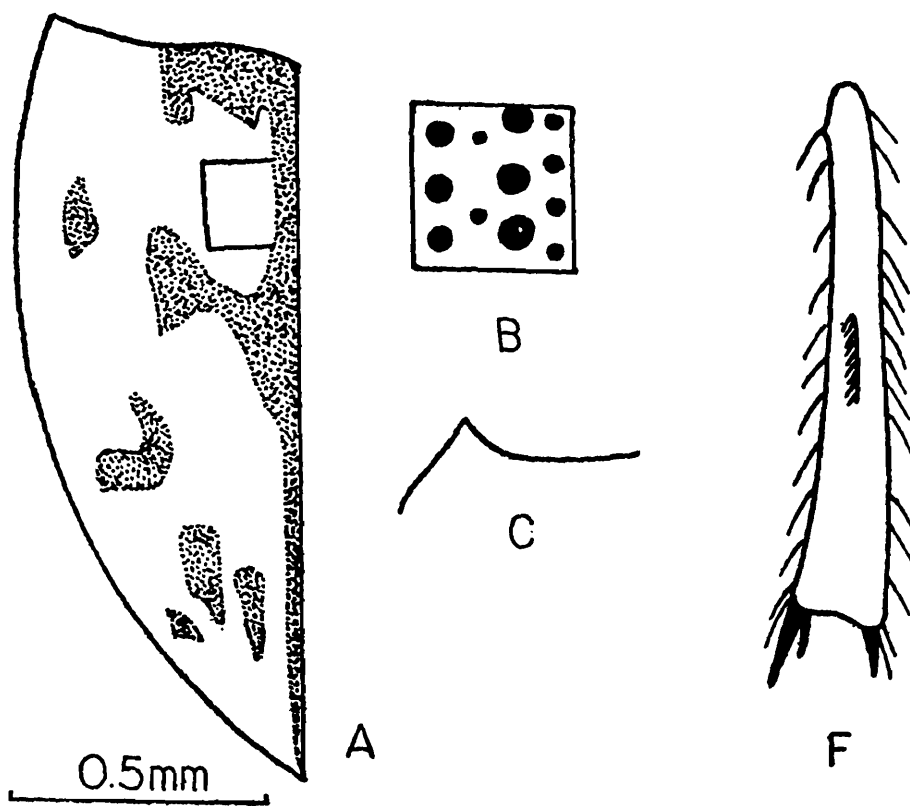
Text fig. 49—Protibia & protarsus in of—A. *O. indicus* B. *O. volubilis*
 C. *O. nathani* D. *O. annandali*; in of—E. *O. andamanicus*



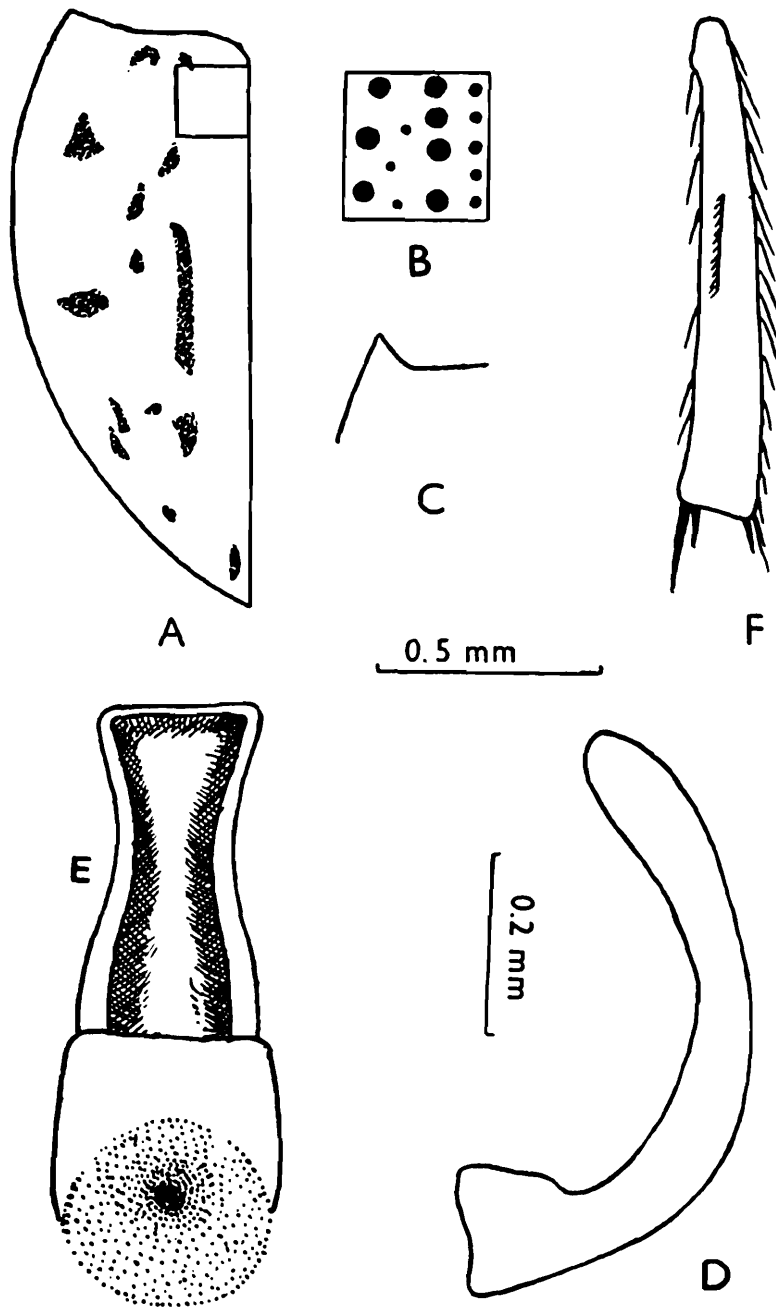
Text fig. 50—A. *Haliplus agarwali*—(ventral view in part) 1. portion of prosternal process 2. anterior coxa 3. metasternal pit 4. metaepisternum 5. metasternum 6. antacoxal sclerites 7. metacoxal plate 8. epipleurae 9. metafemora B. maxillary palp in *Peltodytes* C. same in *Haliplus*



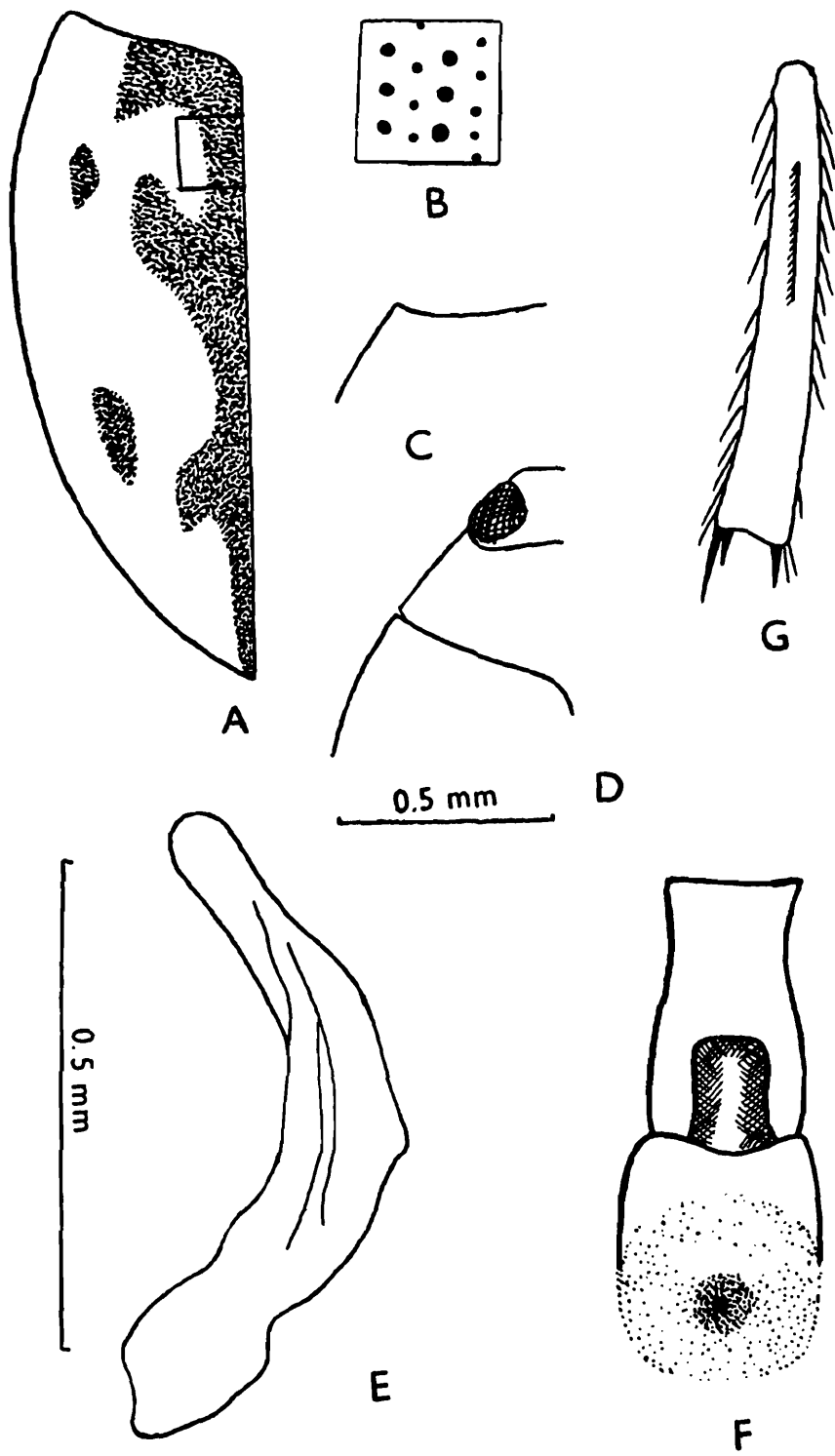
Text fig. 51—*Haliplus agrawali*—A. Dorsal view G. anterior pronotal angle
 C. apical portion of elytron D. penis E. prosternal process
 & metasternal pit F. internal face of metatibia showing
 setigerous striole



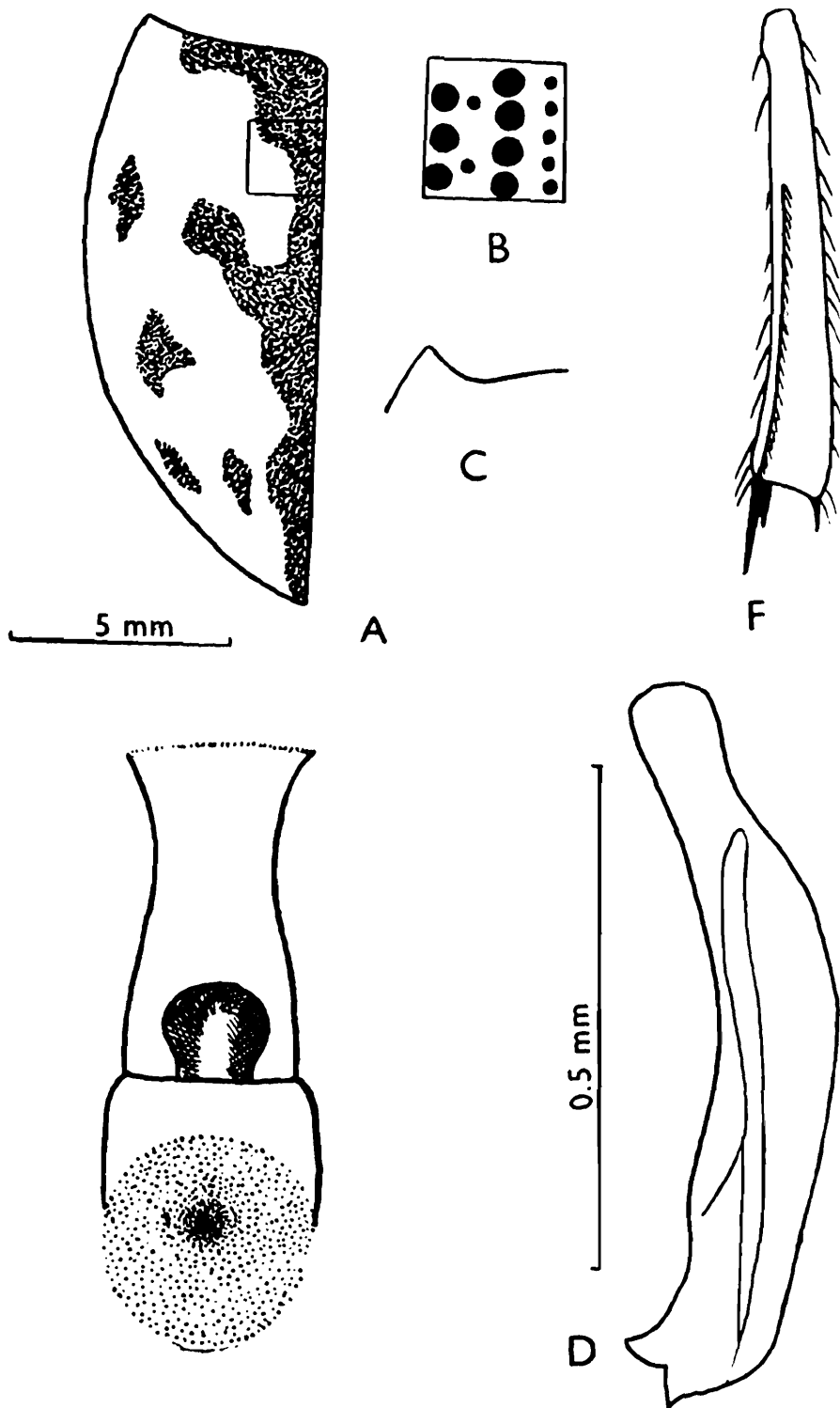
Text fig. 52—*Haliphus pulchellus indicus*—A. left elytron B. punctures on elytral disc C. anterior pronotal angle D. penis E. prosternal process and metasternal pit F. internal face of metatibiae showing setigerous striae



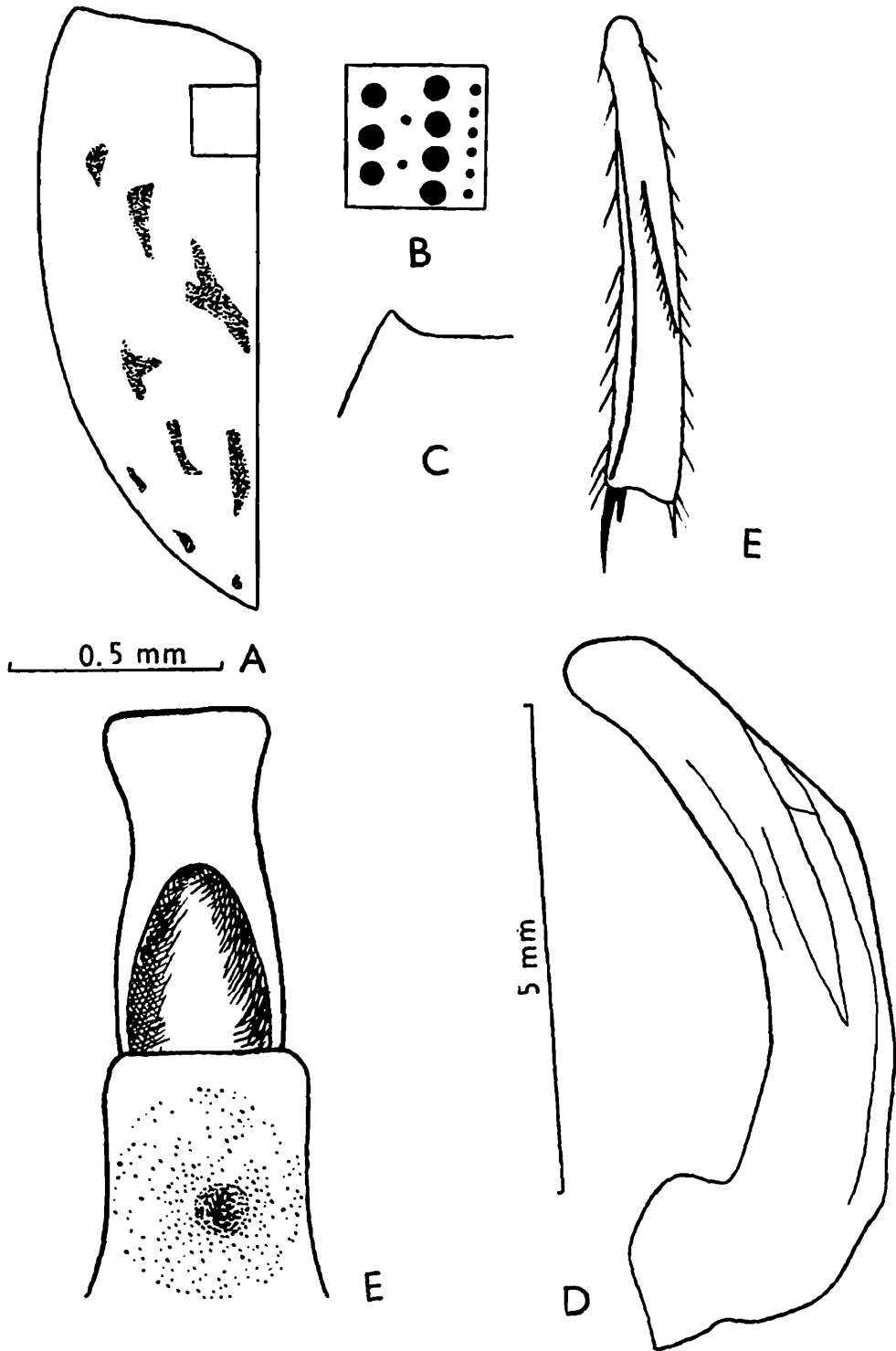
Text fig. 53—*Haliphus kapuri*—Explanation as in text fig. 52.



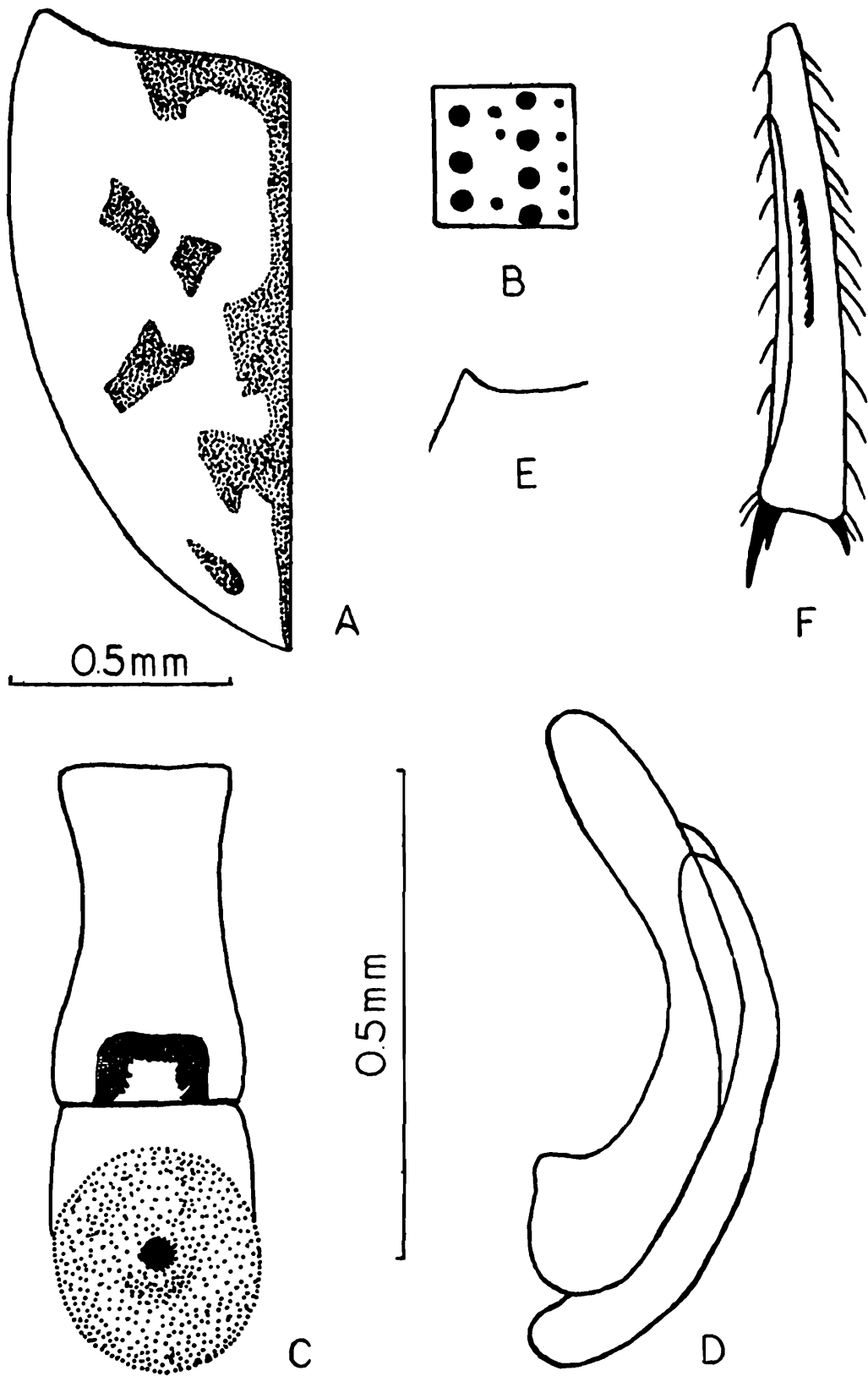
Text fig. 54—*Haliplus angustifrons*—A. left elytron B. punctures on elytral disc C. anterior pronotal angle D. posterior pronotal angle E. penis F. prosternal process & metasternal pit G. internal face of metatibiae showing setigerous striole



Text fig. 55—*Haliplus manipurensis*—Explanation as in text fig. 52



Text fig. 56—*Haliplus pruthii*—Explanation as in text fig. 52



Text fig. 57—*Haliplus arrowi*—Explanation as in text fig. 52

PLATE I

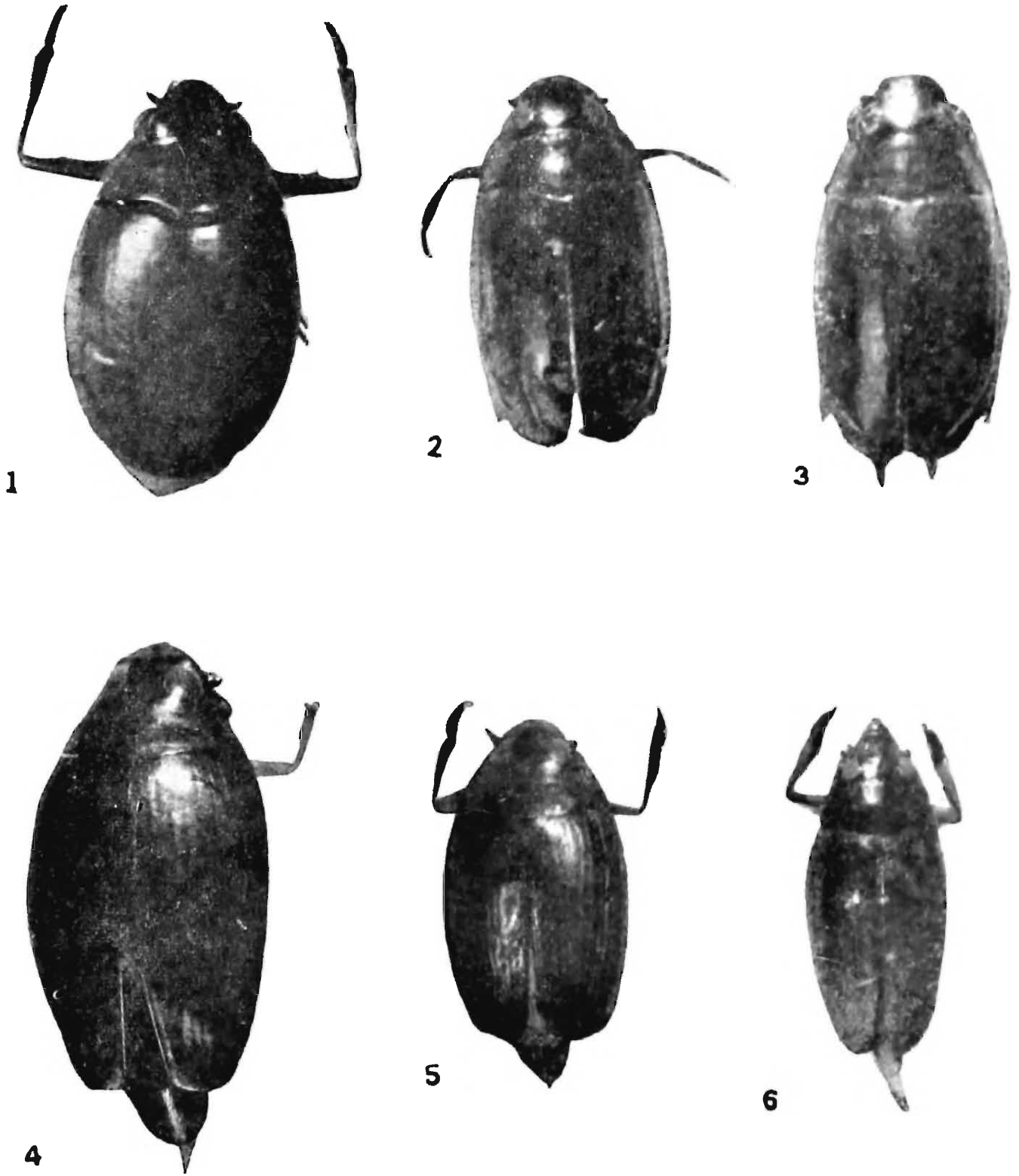


Plate I. Dorsal view of 1. *Dineutus indicus* 2. *D. unidentatus*
3. *D. spinosus* 4. *Aulongyrus obliquus* 5. *Gyrinus convexiusculus*
6. *Orectochilus murinus*

PLATE II



Plate II. Dorsal view of 1. *Haliplus angustifrons* 2. *H. kapuri*
3. *H. agarwali* 4. *H. arrowi*

PLATE III

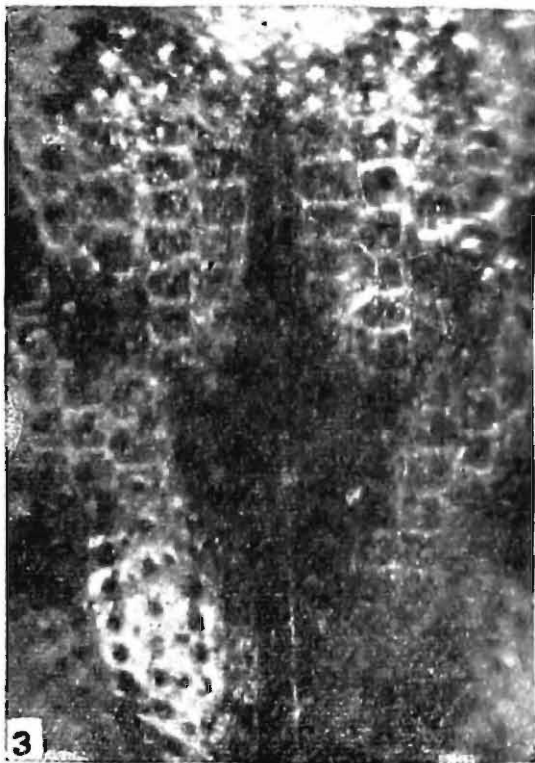
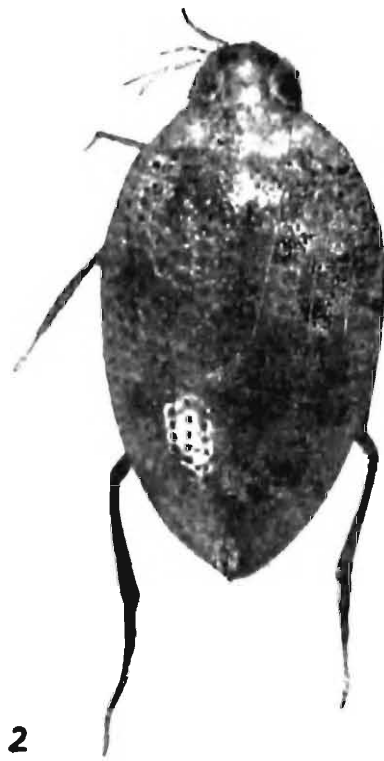
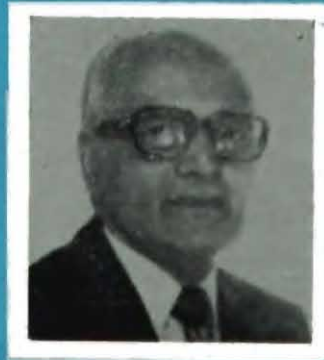


Plate III. Dorsal view of 1. *H. pulchellus indicus* 2. *H. manipurensis*
3. *H. pulchellus indicus* (showing punctation on elytra)
4. *H. manipurensis* (showing punctation on elytra)



Dr. Tahil Gianchand Vazirani was born on the 26th October, 1926 at Sukker, Sind, now in Pakistan. He was educated at the University of Bombay. He joined the Zoological Survey of India on 26.6.1948. He was an excellent worker in the Department and during his successful career he completed important studies on which the Bombay University awarded him the Ph.D. and D.Sc. degrees. He was a Fellow of the Royal Entomological Society of London and he established his name as an outstanding entomologist. He specialised in the taxonomy of aquatic beetles and although he was one of the best taxonomists on the Family Dytiscidae in the world, his grasp on the families Gyrinidae and Haliplidae is also acknowledged. He was promoted to the rank of Deputy Director and posted at the Desert Regional Station of the Survey at Jodhpur. Later he was selected as Research Officer (Coleoptera) in the Commonwealth institute of Entomology, London, where he joined in January, 1979. During the time of printing of this Volume it was learnt with shock that he is no more.

Dr. Vazirani published more than 100 papers in the reputed research journals of India and abroad.