

**Fauna of India
and
The Adjacent Countries**

**CALVICORNIA : COLEOPTERA
FAMILY SILVANIDAE**

Fauna of India and The Adjacent Countries

**CALVICORNIA : COLEOPTERA
FAMILY SILVANIDAE**

Fauna of India and The Adjacent Countries

**Calvicornia : Coleoptera
Family Silvanidae**

By

TAPAN SENGUPTA
Zoological Survey of India, Calcutta

and

TARUN KUMAR PAL
Zoological Survey of India, Calcutta



Zoological Survey of India, Calcutta

© Copyright, Govt. of India, 1996

Published July 1996

Price

Indian Rs. 450.00

Foreign £ 26.00 or \$ 40.00

Published by

The Director, Zoological Survey of India, Calcutta

Laser set by Neatpoint Photocomposers, 164/C/15, Lake Gardens,
Calcutta-700 0045 and printed by Sun Lithographing Co., 18
Hemchandra Nasker Road, Calcutta 700 010

EDITOR'S PREFACE

The silvanids are small flat beetles belonging to the family Silvanidae of the Order Coleoptera. A large number of them occur under the bark of (fallen or felled) trees and it is due to this habitat that they derive the name 'flat bark beetles'. Quite a few of them live in haystacks, many species infest stored grains and other products of vegetable origin, while some may be saprobinous or anthophilous. Silvanids as such form a group of economically important beetles under Coleoptera.

So far no *Fauna of British India* volume or a comprehensive treatise on the Indian Silvanidae has been published though they occur abundantly in India. '*Coléoptères de la Indienne*' and '*Notes sur les Silvanini*' incorporating Indian silvanids were compiled by A. Grouvelle as early as in 1908 and 1912 respectively. Subsequent work on Silvanids from Indian region remained scattered in research papers. In the present treatise, Drs. T. Sengupta and T. K. Pal have provided a comprehensive account of Andaman and Nicobar islands, Pakistan, Nepal, Bhutan, Bangladesh, Burma and Sri Lanka. Incidentally, from 1980 till-date, no Silvanid has been reported from these countries to warrant their inclusion in the present volume.

This volume of *Fauna of India* deals with the habitat, systematics, bionomics, distribution and phylogeny of Silvanids occurring in India and adjoining countries. The authors have dealt with adults and larvae separately. The taxonomic account of adults comprises 4 subfamilies, 14 genera and 69 species including new ones and new records, while that of larvae deals with 11 species under 10 genera and 4 subfamilies. The strength of the work lies in its utility and easy to use keys which would help to distinguish each taxon. It is expected that the present volume will serve as an excellent aid to the future workers in Silvanids taxonomy in the region.

February 28, 1996
Calcutta

A. K. GHOSH
Director

ACKNOWLEDGEMENTS

This work was carried out in Zoological Survey of India, Calcutta. We are grateful to Director, Zoological Survey of India for laboratory facilities. We are indebted to following Scientists and Institutions, from whom we have taken loan of specimens and *types*, and advices for this study. Dr. D. G. H. Halstead of Ministry of Agriculture Fisheries of Food, Slough Laboratory, U.K.; Dr. E. Ratti of Museo Civico di Storia Naturale, Venezia, Italy; Mr. R. D. Pope of British Museum Natural History, London; Dr. S. A. Slipinski of Institute of Zoology, Polish Academy of Sciences, Poland; Dr. R. A. Crowson of Department of Zoology, Glasgow University, U.K.; Dr. J. F. Lawrence of CSIRO, Canberra City, Australia; Ms. Nicole Berti of Museum national d'Histoire Naturelle, Paris; Dr. W. Wittmer of Naturhistorischen Museum, Basel; Dr. I. Löbl of Museum d'Histoire Naturelle, Geneve, Switzerland; Late Dr. Z. Kaszab of Termeszettudományi Múzeum, Budapest, Hungary; Dr. E. Gaedike of Deutsches Entomologisches Institut, Eberswalde (DDR); Dr. S. Hisamatsu of Ehime University Matsuyama, Japan; Dr. R. B. Madge of Commonwealth Institute of Entomology, London. We received fullest facilities while visiting British Museum Natural History, London; Museum National d'Histoire Naturelle, Paris; Naturhistorischen Museum, Basel; Museum d'Histoire Naturelle, Geneve (by T. Sen Gupta); and Institute of Zoology, Polish Academy of Sciences (by T. K. Pal).

We are grateful to all staff of Coleoptera Section from whom we received constant help and co-operation.

CONTENTS

INTRODUCTION	...	...	...	1
HISTORICAL REVIEW	...	...	...	1
HABIT-HABITAT AND BIONOMICS	...	...	...	3
ECONOMIC IMPORTANCE	...	...	...	5
DISTRIBUTION AND ZOOGEOGRAPHY	...	...	...	7
PHYLOGENETIC CONSIDERATION	...	...	...	22
CHARACTERS STUDIED	...	...	...	25
ADULT	...	...	...	25
LARVA	...	...	...	32
SYSTEMATIC ACCOUNT	...	...	...	34
CHARACTERS OF FAMILY SILVANIDAE	...	...	...	34
ADULT	...	...	...	34
LARVA	...	...	...	40
TAXONOMY OF ADULTS	...	...	...	40
Key to the adults of Silvanid subfamilies	...	...	...	40
Key to the adults of Silvanid genera from India	...	...	...	41
Subfamily I Silvaninae	...	...	...	44
Genus 1. <i>SILVANUS</i> Latreille	...	...	...	44
Key to the species of <i>Silvanus</i> Latreille from India	...	...	...	46
1. <i>lewisi</i> Reitter	...	...	...	48
2. <i>imitatus</i> Pal and Sengupta	...	...	...	50
3. <i>familiaris</i> sp. nov.	...	...	...	52
4. <i>recticollis</i> Reitter	...	...	...	53
5. <i>rossi</i> Halstead	...	...	...	55
6. <i>difficilis</i> Halstead	...	...	...	57
7. <i>bidentatus</i> (Fabricius)	...	...	...	59
8. <i>nigrans</i> Pal and Sengupta	...	...	...	61
9. <i>robustus</i> Halstead	...	...	...	63

10. <i>andamanicus</i> sp. nov.	...	...	...	64
11. sp.	...	...	...	66
12. <i>bhutanicus</i> sp. nov.	...	...	...	67
Genus 2. <i>SILVANOPRUS</i> Reitter	...	...	...	75
Key to the species of <i>Silvanoprus</i> Reitter from India	...	...	...	77
13. <i>scuticollis</i> (Walker)	...	...	...	79
14. <i>idnicus</i> Pal and Sengupta	...	...	...	81
15. <i>cephalotes</i> (Reitter)	...	...	...	82
16. <i>angusticollis</i> (Reitter)	...	...	...	84
17. <i>prolixicornis</i> sp. nov.	...	...	...	86
18. <i>nepalensis</i> sp. nov.	...	...	...	88
19. <i>longicollis</i> (Reitter)	...	...	...	89
20. <i>distinguendus</i> sp. nov.	...	...	...	90
21. <i>palnicus</i> sp. nov.	...	...	...	92
Genus 3. <i>SILVANOIDES</i> Halstead	...	...	...	96
22. <i>cribricollis</i> (Grouvelle)	...	...	...	100
Genus 4. <i>PROTOSILVANUS</i> Grouvelle	...	...	...	102
Key to the species of <i>Protosilvanus</i> Grouvelle from India	...	...	...	103
23. <i>lateritius</i> (Reitter)	...	...	...	103
24. <i>dehradunicus</i> Pal and Sengupta	...	...	...	106
25. <i>granosus</i> (Grouvelle)	...	...	...	108
Genus 5. <i>AHASVERUS</i> Gozis	...	...	...	111
26. <i>advena</i> (Waltl)	...	...	...	113
Genus 6. <i>SILVANOLOMUS</i> Reitter	...	...	...	116
Key to the species of <i>Silvanolomus</i> Reitter from India	...	...	...	118
27. <i>denticollis</i> (Reitter)	...	...	...	118
28. <i>halsteadi</i> sp. nov.	...	...	...	120
Genus 7. <i>SILVANOPSIS</i> Grouvelle	...	...	...	122
Key to the species of <i>Silvanopsis</i> Grouvelle from India	...	...	...	123
29. <i>simoni</i> Grouvelle	...	...	...	123

30. <i>nepalensis</i> Pal and Sengupta	...	...	...	125
Genus 8. <i>ORYZAEPHILUS</i> Ganglbauer	...	...	...	128
Key to the species of <i>Oryzaephilus</i> Ganglbauer from India			...	130
31. <i>surinamensis</i> (Linnaeus)	...	...	...	131
32. <i>mercator</i> (Fauvel)	...	...	...	133
33. <i>acuminatus</i> Halstead	...	...	...	135
34. <i>genalis</i> Halstead	...	...	...	136
Genus 9. <i>MONANUS</i> Sharp	...	...	...	139
Subgenus <i>MONANUS</i> (S. STR.)	...	...	...	140
Key to the species of <i>Monanus</i> (s. str.) from India			...	141
35. <i>concinulus</i> (Walker)	...	...	...	141
36. <i>longicornis</i> (Grouvelle)	...	...	...	143
Subgenus <i>MONANOPS</i> Grouvelle	...	...	...	146
37. <i>rambicus</i> Pal	...	...	...	148
Genus 10. <i>AIRAPHILUS</i> Redtenbacher	...	...	...	150
Key to the species of <i>Airaphilus</i> Redtenbacher from India			...	151
38. <i>serricollis</i> Reitter	...	...	...	152
39. <i>andrewesi</i> Grouvelle	...	...	...	154
40. <i>abnormis</i> Grouvelle	...	...	...	155
Subfamily II PSAMMOECINAE	...	...	...	158
Genus 11. <i>PSAMMOECUS</i> Latreille	...	...	...	158
Key to the species of <i>Psammoecus</i> latreille from India			...	161
41. <i>andrewesi</i> Grouvelle	...	...	...	164
42. <i>ksasia</i> Pal	...	...	...	165
43. <i>decoratus</i> Grouvelle	...	...	...	167
44. <i>lepidus</i> Grouvelle	...	...	...	168
45. <i>harmandi</i> Grouvelle	...	...	...	170
46. <i>delicatus</i> Grouvelle	...	...	...	172
47. <i>complexus</i> Pal	...	...	...	173
48. <i>wittmeri</i> Pal and Sengupta	...	...	...	175

49. <i>bhutanicus</i> Pal	...	...	...	176
50. <i>trilochana</i> Pal	...	...	...	178
51. <i>simoni</i> Grouvelle	...	...	...	179
52. <i>bambusae</i> Pal	...	...	...	181
53. <i>gratiosus</i> Grouvelle	...	...	...	182
54. <i>nitidus</i> Grouvelle	...	...	...	184
55. <i>impressicollis</i> Grouvelle	...	...	...	185
56. <i>trimaculatus</i> Motschulsky	...	...	...	186
Genus 12. <i>INDOPHANUS</i> Pal	...	...	...	191
57. <i>dakshinus</i> Pal	...	...	...	194
Subfamily III CRYPTAMORPHINAE	...	...	...	195
Genus 13. <i>CRYPTAMORPHA</i> Wollaston	...	...	...	195
Key to the species of <i>Cryptamorpha</i> Wollaston from India	...	...	...	197
58. <i>infans</i> Grouvelle	...	...	...	199
59. <i>abnormis</i> sp. nov.	...	...	...	200
60. <i>sculptifrons</i> Reitter	...	...	...	202
61. <i>kaszabi</i> Pal and Sengupta	...	...	...	204
62. <i>nepalensis</i> sp. nov.	...	...	...	205
63. <i>bhutanensis</i> Pal and Sengupta	...	...	...	207
Subfamily IV ULEIOTINAE	...	...	...	211
Genus 14. <i>ULEIOTA</i> Latreille	...	...	...	211
Key to the species of <i>Uleiota</i> Latreille from India	...	...	...	213
64. <i>spinicollis</i> (Gory)	...	...	...	214
65. <i>serricollis</i> (Candeze)	...	...	...	217
66. <i>alticola</i> Pal, Sengupta and Crowson	...	...	...	219
67. <i>indica</i> (Arrow)	...	...	...	221
68. <i>puberula</i> (Reitter)	...	...	...	223
69. <i>fallax</i> (Grouvelle)	...	...	...	224
TAXONOMY OF LARVAE	...	...	...	229
Key to the larvae of Silvanid subfamilies	...	...	...	229

Key to the larvae of Silvanid genera known from India	...	...	230
Subfamily I SILVANINAE	...	...	233
Genus 1. <i>SILVANUS</i> Latreille	...	...	233
1. <i>difficilis</i> Halstead	...	...	233
Genus 2. <i>SILVANOPRUS</i> Reitter	...	...	235
2. <i>angusticollis</i> (Reitter)	...	...	235
Genus 3. <i>PROTOSILVANUS</i> Grouvelle	...	...	237
3. <i>lateritius</i> (Reitter)	...	...	237
Genus 4. <i>AHASVERUS</i> Gozis	...	...	240
4. <i>advena</i> (Waltl)	...	...	240
Genus 5. <i>ORYZAEPHILUS</i> Ganglbauer	...	...	242
5. <i>mercator</i> (Fauvel)	...	...	242
6. <i>surinamensis</i> (Linnaeus)	...	...	243
Genus 6. <i>MONANUS</i> Sharp	...	...	245
7. <i>concinnulus</i> (Walker)	...	...	245
Genus 7. <i>AIRAPHILUS</i> Redtenbacher	...	...	247
8. <i>serricollis</i> Reitter	...	...	247
Subfamily II PSAMMOECINAE	...	...	249
Genus 8. <i>PSAMMOECUS</i> Latreille	...	...	249
9. <i>trimaculatus</i> Motschulsky	...	...	249
Subfamily III CRYPTAMORPHINAE	...	...	251
Genus 9. <i>CRYPTAMORPHA</i> Wollaston	...	...	251
10. <i>brevicornis</i> (White)	...	...	251
Subfamily IV ULEIOTINAE	...	...	253
Genus 10. <i>ULEIOTA</i> Latreille	...	...	253
11. <i>indica</i> (Arrow)	...	...	253
REFERENCES	...	...	255
INDEX	...	...	260

INTRODUCTION

The family Silvanidae belongs to the section Clavicornia of the superfamily Cucujoidea under the suborder Polyphaga (Coleoptera : Insecta). The representatives of Silvanidae are commonly known as 'flat bark beetles', some are called 'saw-toothed grain beetles' [*Oryzaephilus surinamensis* (L.)], 'merchant grain beetles' [*Oryzaephilus mercator* (Fauvel)], 'foreign grain beetles' [*Ahasverus advena* (Waltl)] and 'square-necked grain beetles' [*Cathartus quadricollis* (Guérin Méneville)]. The silvanids are usually small (1.30 - 4.50 mm.) and rarely large (11.50 mm.), flat, usually reddish-brown, rarely with elytral markings, and elytral puncturations are arranged in regular rows. Distinct superficial diversity is exhibited by adult silvanids and some are confused in preliminary observations as they resemble members of other families, namely, Cucujidae, Cryptophagidae and a few Languriidae. The Silvanidae can be recognised by its tarsal formula being 5 - 5 - 5 in both sexes with penultimate segment smallest, front coxal cavities usually closed behind externally, mesocoxal cavities opened outwardly, antennae usually short, thick and distinctly clubbed or maxillary palpi securiform or elytra often with a scutellary stria.

Silvanidae includes a few well-known insects that attack almost every stored food products of vegetable origin. Despite its economic importance and abundance in India, the group has received relatively little attention from the taxonomists, and no comprehensive work on this group from India has ever been published.

The aim of the present attempt is firstly, to explore the Indian silvanid fauna, secondly, to improve the characterization of the suprageneric and subgeneric segregates of the family and thirdly, to find out the phylogenetic interrelationships and zoogeography of the group. Moreover, the present account includes bionomics and habits of Indian Silvanidae.

HISTORICAL REVIEW

The first described species of the family Silvanidae is *Dermestes surinamensis* by Linnaeus in 1767. Latreille (1804) erected the genus *Silvanus* for *Ips unidentata* Olivier and defined the genus in 1807. Sturm (1826) transferred *Dermestes bidentatus* (Fabricius) to *Silvanus* and subsequently many species were described under this genus, mainly by Reitter and Grouvelle. The first important attempt to arrange the genera of the present day Silvanidae into groups was made by Erichson in 1846. He grouped *Silvanus* Latreille, *Psammoecus* Latreille, *Telephanus* Erichson and *Platamus* Erichson together with *Dendrophagus* Schönherr and *Brontes* Fabricius under 'Brontini' of the family 'Cucujipes'. The first suprageneric divisions were proposed by Lacrodair (1854) in his "Genera des Coléoptères". He proposed the tribe 'Silvanides' under the family 'Cucujipes' and included the genera, *Silvanus* Latreille, *Psammoecus* Latreille, *Laemophloeus* Dejean, *Phloestichus* Redtenbacher and *Oma* Newmann under this tribe and placed the genus *Telephanus* Erichson together with *Dendrophagus* Schönherr and *Brontes* Fabricius under the tribe 'Brontides'. Leconte (1861), and Leconte and Horn (1883) in "Classification of the Coleoptera of North America" characterized the family Cucujidae and split the family into five subfamilies, namely, Silvaninae, Passandrinae, Cucujinae, Hemipeplinae and

Telephaninae. They placed the genera, *Silvanus* Latreille and *Nausibius* Redtenbacher under Silvaninae, and *Telephanus* Erichson and *Psammoecus* Latreille under Telephaninae. Casey (1884) in his "Revision of Cucujidae North of Mexico" erected two tribes, namely, Telephanini and Cryptamorphini under the subfamily Telephaninae. Sharp (1899) in "Biologia Centrali-Americana" did not make any notable alteration to Casey's classification regarding Cucujidae, though he brought Rhizophaginae to Cucujidae and transferred *Hemipeplus* Latreille to Heteromera. He placed the genera, *Silvanus* Latreille, *Platamus* Erichson, *Euplatamus* Sharp, *Nausibius* Redtenbacher, *Synobius* Sharp, *Cathartus* Reiche and *Telephanus* in a single subfamily Silvaninae. Ganglbauer (1899) in his "Die Käfer von Mitteleuropa" subdivided Cucujidae into four subfamilies, namely, Silvaninae, Cucujinae, Passandrinae and Monotominae; considered two tribes, namely, Silvanini and Psammoecini under Silvaninae; and recognised Casey's tribe Cryptamorphini, and dealt with *Uleiota* Latreille and *Dendrophagus* Schönherr under Uleiotini : Cucujinae. Reitter (1912) considered seven tribes, namely, Silvanini, Psammoecini, Uleiotini, Cucujini, Laemophloeini, Prostomini and Phloestichini under Cucujinae : Cucujidae. Böving (1921) was the first author who established the group (subfamily Silvaninae *sensu* Ganglbauer) as distinct family Silvanidae, on the basis of larval characters and subdivided it into two subfamilies, Silvaninae and Telephaninae (= Psammoecini *sensu* Ganglbauer). Wilson (1930) studied the male genitalia and wing venation and also considered the group as distinct family. Though Hetschko (1930) in Junk's "Coleopterorum Catalogus" continued to deal with silvanids under the subfamily Silvaninae : Cucujidae, he subdivided Silvaninae into three tribes, namely, Silvanini, Psammoecini and Cryptamorphini, and listed 312 species under 38 genera of this subfamily. Crowson (1955) in his "Natural classification of the families of Coleoptera" restored the independent family status of Silvanidae and subdivided the family into two subfamilies, Silvaninae and Psammoecinae. Sengupta and Crowson (1966) excluded *Hymaea* Pascoe from the Silvanidae and later (1969) attributed this genus to the family Phloestichidae. Arnett (1968) in "The beetles of the United States" followed Hetschko's system and dealt with silvanids under Silvaninae : Cucujidae. Halstead (1973) while revising *Silvanus* Latreille gave generic status to Grouvelle's subgenera, *Protosilvanus*, *Parasilvanus* and *Cathartosilvanus*; described the genera *Calpus*, *Pensus* and *Silvanoides*; and indicated several erroneous entries under *Silvanus* in Junk's "Coleopterorum Catalogus". Crowson (1973) opined that Uleiotinae (= Hyliotinae), previously placed in Cucujidae, should be included in Silvanidae. Halstead (1980), while revising *Oryzaephilus* Ganglbauer and related genera, described 6 genera, viz., *Australonausibius*, *Pseudonausibius*, *Corimus*, *Acorimus*, *Afrocorimus* and *Afronausibius*. Recently, Pal, Sengupta and Crowson (1984), while dealing with the systematic position of *Uleiota* Latreille, considered four subfamilies, viz., Silvaninae, Psammoecinae, Cryptamorphinae and Uleiotinae under Silvanidae.

Westwood (1839) described the larva of *Oryzaephilus surinamensis* (L.) and ?*Nausibius dentatus* (Marsh). Erichson (1845) and Candeze (1861) described the larvae of *Uleiota planata* (L.) and *U. serricollis* (Candeze) respectively. Perris (1877) described the larva of *Ahasverus advena* (Waltl). Gravely (1915) described the larva of *Uleiota indica* (Arrow). Böving (1921) described the larvae of *Coccidotrophus socialis* Schwarz and Barber and *Eunausibius wheeleri* Schwarz and Barber. Roberts (1930) provided key to the tribes of Cucujidae. Böving and Craighead (1931) in "An illustrated synopsis of the principal larval

forms of the order Coleoptera" described the larva of *Telephanus pallidus* Chevrolat, and gave description of larval characters of Silvanidae and its subfamilies. Pal (1981, 1985) described the larvae of *Monanus concinnulus* (Walker) and *Psammoecus trimaculatus* (Motschulsky), and Pal and Sengupta (1984) described the larva of *Protosilvanus lateritius* (Reitter). Altogether 12 larvae of Silvanidae have so far been described.

The first available record of Indian Silvanidae is of Reitter's description of *Airaphilus serricollis* and *Uleiota puberula* in 1818. Arrow (1901) described *Uleiota indica* and recorded *U. spinicollis* (Gory) from India. Grouvelle (1903) recorded 4 species from Darjeeling : West Bengal and later he (1908 - 1919) described several species from other parts of India. His publications in 1908 and 1912 entitled "Coléoptères de la region indienne" and "Notes sur les Silvanini" still remain to be the notable among the important works so far published on the Indian Silvanidae. Halstead (1973) described 2 species of *Silvanus* from India and cited detailed distribution of other indian species. Pal and Sengupta (1977), while revising Indian *Silvanus*, described 5 species, and they (1979) described 5 more species and recorded 1 species from India. Halstead (1980) described 2 species of *Oryzaeophilus* from India. Pal (1981 a, b) described 1 species while dealing with Indian *Monanus* Sharp, and described *Indophanus* with a new species from South India. Pal (1984) recorded one Sri Lankan species of *Psammoecus* from South India. Pal, Sengupta and Crowson (1984) described 1 species while revising Indian *Uleiota*. Pal (1985) while revising Indian *Psammoecus* Latreille, described 5 species and the larva of this genus. Pal and Sengupta (1984) described 1 species and the larva of *Protosilvanus*. Hitherto 55 species belonging to 12 genera are recorded from India.

HABIT-HABITAT AND BIONOMICS

Habit-habitat :

The Silvanidae are found in a wide variety of habitats and commonly feed on fungus. Most of the Silvanidae are subcorticolous, inhabiting the bark of fallen trees. Monophagy, corresponding to strict host plant specificity is rare in them. Halstead (1973) detected fungal spores in the gut of specimens, thereby suggesting that mould occurring in the subcorticolous habitat may form part of their diet. The genera found under bark are *Silvanus* Latreille, *Protosilvanus* Grouvelle, *Silvanoides* Halstead and *Uleiota* Latreille exclusively, and *Silvanoprus* Reitter very rarely. Halstead (*loc. cit.*) noted that in Europe and North America the species of *Silvanus* are usually prevalent beneath bark of deciduous trees, chiefly Oak (*Quercus* spp.), sweet chestnut (*Castanea* spp.) and occasionally under bark of Pine (*Pinus* sp.); whereas African and Oriental species of *Silvanus* are found under bark of *Ficus* sp. The Indian species of *Silvanus* have been found under bark of a number of plant species, viz., *Shorea robusta*, *Bombax malabaricum*, *Sterculia campanulata*, *Terminalia bialata*, *Terminalia tomentosa*, *Boswellia serrata*, *Odina woodifer*, *Diospyros paniculata*, *Canarium euphyllum*, *Pterocarpus dalbergioides*, *Artocarpus chaplasi*, *Planchonia andamanica*, *Dipterocarpus turbinatus*, *Hopea odorata*, *Mangosa* sp., *Pinus* sp. and several unknown trees. Among the species of *Silvanus*, *difficilis* Halstead has the most wide range of host plants and has been collected under bark of almost all the tree species mentioned above.

Protosilvanus is the most widely distributed genus in India and found under bark of *Shorea robusta*, *Cinnamomum*, *Gmelina arborea*, *Amoora wallichii*, *Artocarpus chaplasha*, *Lagerstroemia perviflora*, *Terminalia belerica*, *Tamarindus indica*, *Bombax malabaricum*, *Mangosa* sp. and logs of several unknown trees. Of the species of *Protosilvanus*, *lateritius* (Reitter) has the most wide range of host species and has been recorded beneath bark of all the above tree species. Two species of *Silvanoprus*, viz., *angusticollis* (Reitter) and *longicollis* (Reitter) have so far been found under bark of fallen logs in a few occasions in higher altitude only. *S. angusticollis* is recorded under bark of *Schimma wallichii* in Eastern Himalaya and *S. longicollis* beneath bark of *Shorea robusta* and *Mallotus philippinensis* in North-western Himalaya. The occurrence of *Silvanoprus* in subcortical habitat seems to be a secondary one from the primary habitat as a temporary shelter.

Several species are saprobionts and are associated with vegetable debris such as, piles of grass clipping, leaf garbage, haystack etc. The genera *Silvanoprus*, *Monanus* Sharp, *Airaphilus* Redtenbacher and *Psammoecus* Latreille occur commonly under haystack and leaf garbage. A few species, viz., *Cryptamorphus infans* Grouvelle, *Silvanolomus denticollis* (Reitter) and *S. halsteadii* are anthophilous or flower inhabiting. *Monanus* (*Monanops*) *rambicus* Pal and *Psammoecus bambusae* Pal have been found under bamboo (*Bambusa aurandaceae*) leaf sheath.

A few species, viz., *Oryzaephilus surinamensis* (Linnaeus), *O. mercator* (Fauvel) and *Ahasverus advena* (Waltl) are known to infest stored products. *Silvanopsis simoni* Grouvelle is often associated with lac insects and found to inhabit brood lac.

Biomimics :

i) Species living in subcortical habitat : Knowledge on the biology of the species living in subcortical habitat is meagre. This is only little known behavioural aspects with special reference to *Protosilvanus lateritius* (Reitter), *Silvanus difficilis* Halstead and *S. lewisi* Reitter. These species spend almost their entire life beneath or around bark of fallen or felled logs or rarely they may come out on to near by twigs due to overcrowding. The hind wings are developed and the species are capable of short flight. Both adults and larvae feed upon fungal spores. They are normally gregarious and found almost in all the seasons, but in post-monsoon period they may congregate in large numbers on newly formed fungal mass. Copulation takes place beneath bark. The couples are generally disturbed with the exposition of bark. The egg-laying period is long resulting in overlapping of generations. The larvae are cylindrical, lightly pigmented and upon hatching they show moderate movement. Life history of *P. lateritius* possesses at least four larval instars. The teneral adults usually come over the bark with sunrise and by two weeks they become fully pigmented.

ii) Species living in haystack : Of the species living in haystack, the behavioural aspects of *Silvanoprus scuticollis* (Walker), *S. cephalotes* (Reitter), *Monanus concinnulus* (Walker), *Airaphilus serricollis* Reitter and *Psammoecus trimaculatus* Motschulsky are considered. These species spend almost their entire life in haystack and sometimes they have been found to take short range flight. *M. concinnulus* is comparatively a good flier and occasionally

attracted to light sources. Both adults and larvae feed upon fungal spores grown within the haystack. *Silvanoprus* spp., *M. concinnulus* and *A. serricollis* are normally gregarious. *M. concinnulus* is a fast-moving species, *Silvanoprus* spp. and *A. serricollis* show moderate movement, whereas *P. trimaculatus* has a sluggish movement. *Silvanoprus* spp., *P. trimaculatus* and *M. concinnulus* inhabit semimoist portion of haystack adhering to the ground, whereas *A. serricollis* normally prefers the less humid upper stratum of the haystack. They are found almost in all seasons. By midsummer in most areas, large colonies lie within older haystacks but in the post-monsoon autumn they may congregate in large numbers. Although the population is smaller and the rate of development declining during winter, larvae and adults occur throughout the year. Copulation takes place in darkness within haystack. The couples are disturbed if exposed to sunlight. The egg-laying period is long resulting in overlapping of generations. The larvae of *Silvanoprus* are lightly pigmented, *M. concinnulus* is whitish, whereas those of *A. serricollis* are with dark transversely pigmented band on each tergite. These larvae show moderate movement. The teneral adults prefer sunlight.

iii) Species infesting stored materials : Among the species attacking stored food and similar articles, *Oryzaephilus surinamensis* (Linnaeus) and *O. mercator* (Fauvel) are of most common occurrence, and less frequent infestation by *Ahasverus advena* (Waltl). Dried fruits, oil seeds and cereals stored for considerable period before packing often become infested by *Oryzaephilus*. Of the two species of *Oryzaephilus*, *mercator* shows a general propensity for the oil seeds and similar products even in the packaged condition. The beetle's flattish form allows it to penetrate tightly wrapped packages. Both these species are gregarious, resent direct light and generally found hidden under or inside the food material. *A. advena* occurs in a wide variety of food stuffs and it infests in large number when the food stuff is mouldy. In heavily infested fruits of *Zizyphus jujuba* its attack is found associated with a species each of Cleridae and Nitidulidae. *Silvanopsis simoni* (Grouvelle) is found inhabiting brood lac and associated with a mycetophagid, *Berginus maindroni*.

ECONOMIC IMPORTANCE

The representatives of Silvanidae are of considerable economic importance as a number of species are associated with stored products. Hinton (1945) mentioned that 600 species of beetles are associated with stored grain products, and among them included are a few more notorious pests from the Silvanidae. Aitken (1975) has listed 22 species of Silvanidae which are recorded from stored material. The most serious and commonly known of these pests all over the World are *Oryzaephilus surinamensis* and *O. mercator*. *Ahasverus advena* is also frequently found in various food stuffs and Aitken (*loc. cit.*) has mentioned that this species is of secondary importance. Both adults and larvae cause serious damage to stored grains especially, rice, wheat, maize, barley, bread, dried fruits, oil seeds and rarely, in sugar, starch, drugs, tobacco, snuff, dried meats. The presence of these beetles in food stuffs particularly in cereal products and breakfast food cause damage by rendering the food unsalable or unpalatable. The saw-toothed grain beetle has sometimes proved to be the chief offender in grain shipments. *Nausibius clavicornis* (Kugelann) is well known as a

cosmopolitan storage species often associated with sugar. Several workers have worked on the bionomics of these pests, chief works are : Woodroff (1962) and Hill (1964) on *Ahasverus advena*, Breese and Wise (1959) on *Nausibius clavicornis*, Howe (1956) on *Oryzaephilus surinamensis* and *O. mercator*. *Silvanopsis simoni* has been found as a scavenger of brood lac and was pointed out by Imms and Chatterjee (1915) as an enemy of lac insect. Stebbing (1914) noted that *Ahasverus advena* makes gall in the teak leaf (*Tectona grandis*) causing defoliation in India. This species has been found infesting seriously the fruits of *Zizyphus jujuba*. *Monanus concinnulus* has been found infesting stored grain products in Africa (Cornes, 1964). Recently, Sengupta, Mukhopadhyay and Sengupta (1984) in the publication entitled "Major beetle pests of stored food products in India" dealt with three pest speices, *Oryzaephilus surinamensis*, *O. mercator* and *Ahasverus advena*.

Table 1.

Analysis of records of silvanid speices found in stored
and other economic products in India.

<i>Species</i>	<i>Locality</i>	<i>Pest of/habitat</i>
<i>Oryzaephilus surinamensis</i> (L.)	Calcutta : West Bengal	Arhar pulses, Rice (unboiled), Dried walnut, Ship biscuit, Date fruit, Dry flower of nutmeg, Cotton, Neem oil cake, <i>Datura</i> seed, <i>Shorea robusta</i> seed, Pomegranate seed
	Chaibasa : Bihar	Rice (unboiled)
	Gorakhpur: Uttar Pradesh	Rice (unboiled)
	Delhi	Rice (unboiled)
	Madras : Tamil Nadu	Sorghum seed
<i>O. mercator</i> (Fauvel)	Calcutta : West Bengal	Corn flake, Cashew nut, Wheat, Rice (unboiled), Neem oil cake, Coconut oil cake
	Chaibasa : Bihar	Wheat
<i>Ahasverus advena</i> (Waltl)	Calcutta : West Bengal	Copra consignment, Mahua oil cake, Groundnut seed, <i>Shorea robusta</i> seed,
	Chaibasa : Bihar	<i>Zizyphus jujuba</i> fruit
	Madhya Pradesh	Teak leaf
	Maharastra	Teak leaf

	Tamil Nadu	Teak leaf
	Vellyani : Kerala	Stored rice
<i>Silvanopsis simoni</i> Grouvelle	Namkum : Bihar	Brood lac
	Silchar : Assam	Cotton

DISTRIBUTION AND ZOOGEOGRAPHY

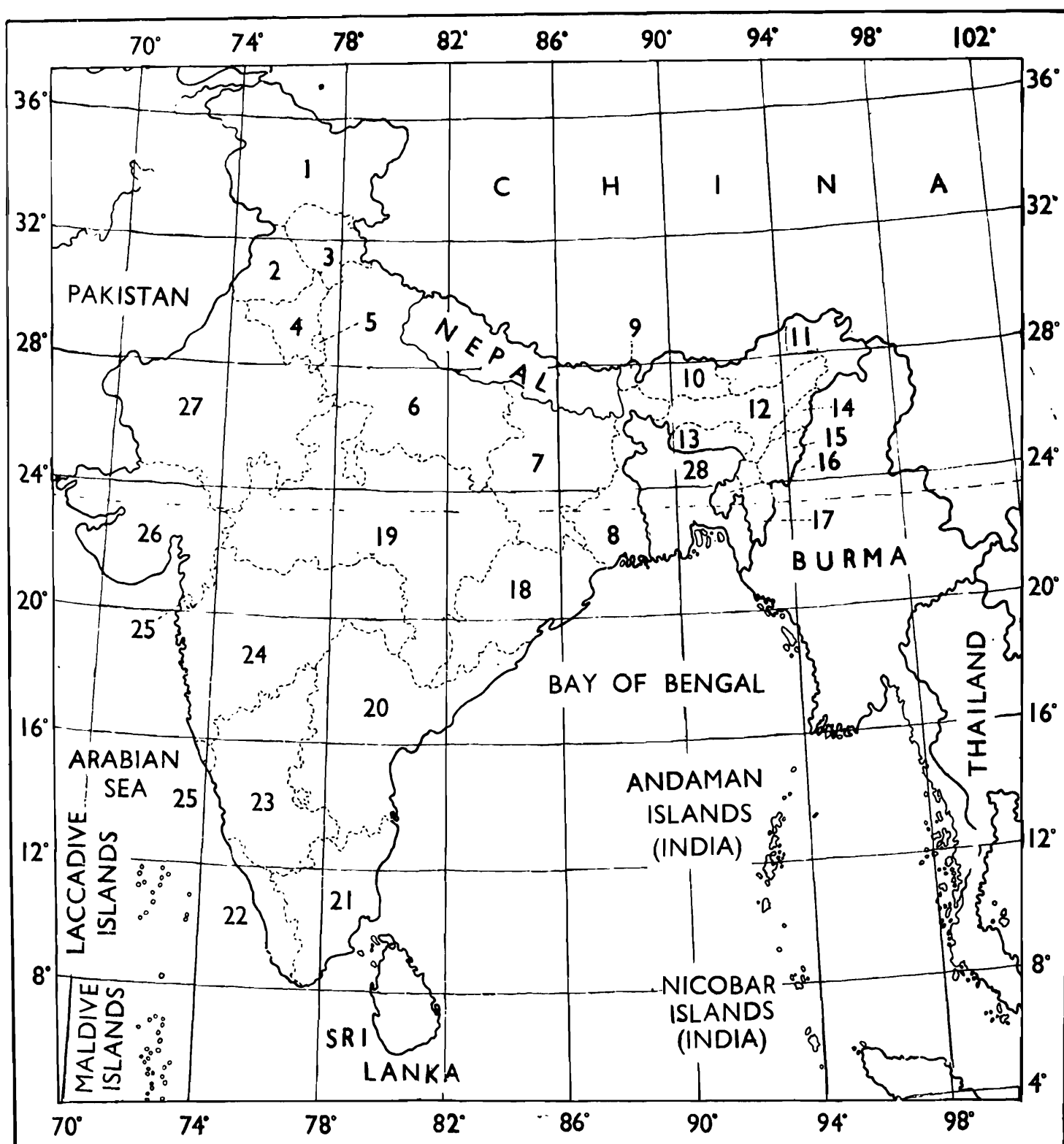
The Silvanidae seems to be more diversely represented in the tropical and subtropical climates than in the temperate zones. The representatives of the family occur in all the main continental areas of the World, but so far a few species have been recorded from New Zealand and the oceanic islands.

The two large subfamilies, viz., Silvaninae and Psammoecinae occur predominantly in the warmer parts of the World and are well represented in the Oriental region including India. The Uleiotinae is distributed to all the major faunal regions of the world but is diversely represented in the tropical and subtropical areas with a few species extending to the temperate zones. The fourth subfamily, Cryptamorphinae occurs mainly in the temperate climate and is also represented in India, especially in the higher altitudes.

The Silvaninae comprises a number of genera and of which, *Silvanus* Latreille, *Silvanoprus* Reitter, *Monanus* Sharp, *Airaphilus* Redtenbacher are comparatively larger than others. Among these genera, *Silvanus* and *Silvanoprus* are widely distributed and are abundantly occurring in India. Of these two genera, *Silvanus* is more diversely represented in the Oriental, Ethiopian and Australian regions and only a few species are known from the New World; whereas *Silvanoprus* is predominant in the Oriental region, recorded also from Madagascar, tropical Africa and only a single species is known from the New World.

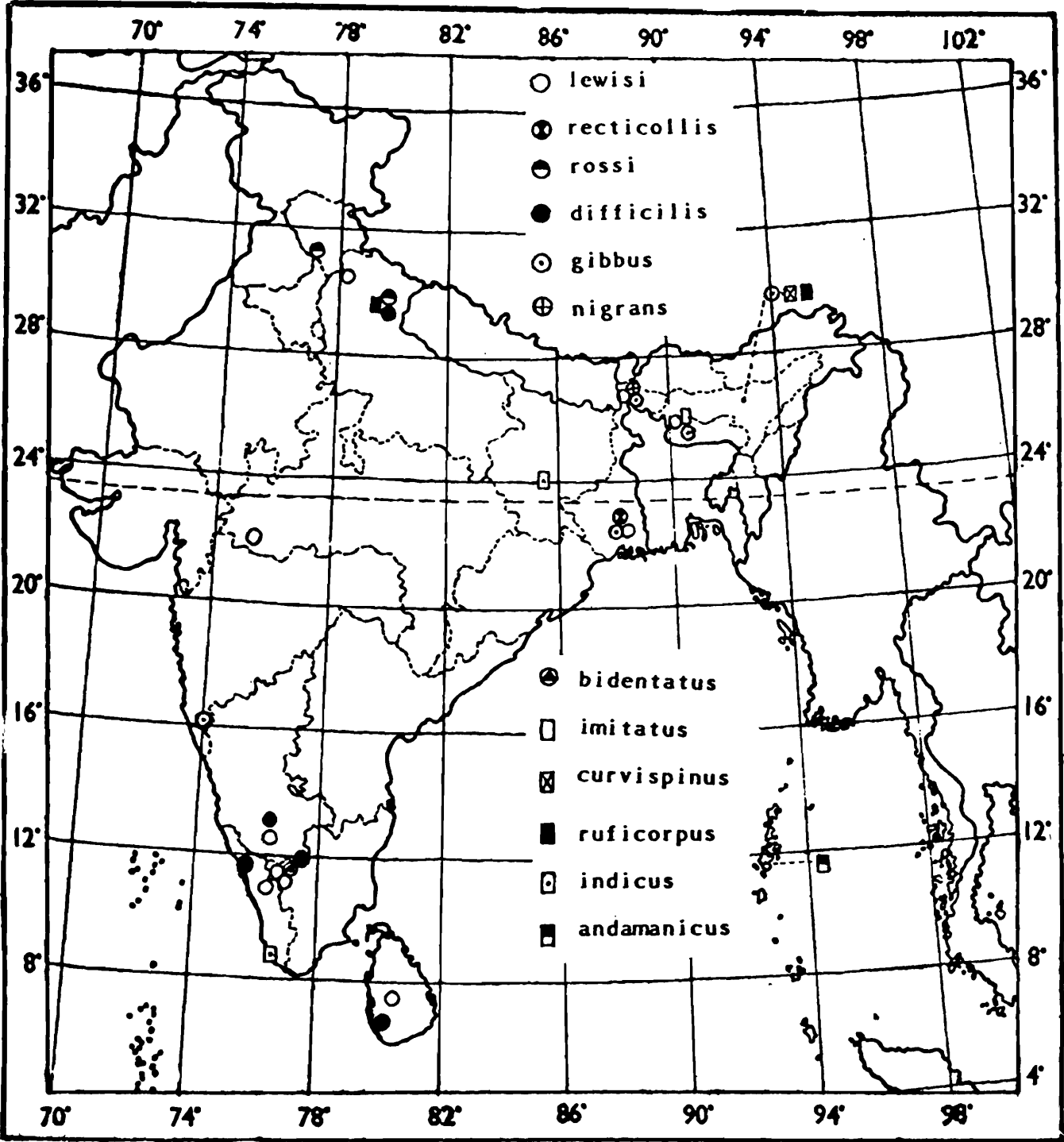
Twelve species of *Silvanus* are recorded from India (Map 2). Of these, *S. lewisi* Reitter and *S. difficilis* Halstead are widely distributed in India, recorded also from various parts of the Oriental region and extending upto the Australian region. *S. lewisi* is known also from Africa. *S. robustus* Halstead and *S. rossi* Halstead are known from the North-eastern and North-western Himalayas respectively with a wider distribution in various far eastern countries. *S. recticollis* Reitter is recorded from the Gangetic West Bengal of India, and is known also from South-east Asia and Africa. *S. familiaris* sp. nov. (in present study) is known from both North and South India. *S. bidentatus* (Fabricius) is truly a Palaearctic species, recorded as far as 66° N and seems to be introduced to Orient (Halstead, 1973). This species is recorded from the Nilgiri hills in South India. Rest of the Indian species of *Silvanus* have restricted distribution viz., *imitatus* Pal and Sengupta (Assam), *andamanicus* sp. nov. (in present study) (Andaman), *nigrans* Pal and Sengupta (Darjeeling Himalaya), *Silvanus* sp. (in present study) (Kashmir), and *bhutanicus* sp. nov. (in present study) (Bhutan).

Silvanoprus is fairly a large genus with 9 species are described from India (Map 3), *S. scuticollis* (Walker), *S. cephalotes* (Reitter) and *S. longicollis* (Reitter) are commonly occurring throughout India, widely distributed in the Oriental region and adjacent Palaearctic countries. *S. scuticollis* and *S. longicollis* are known also from Madagascar and tropical

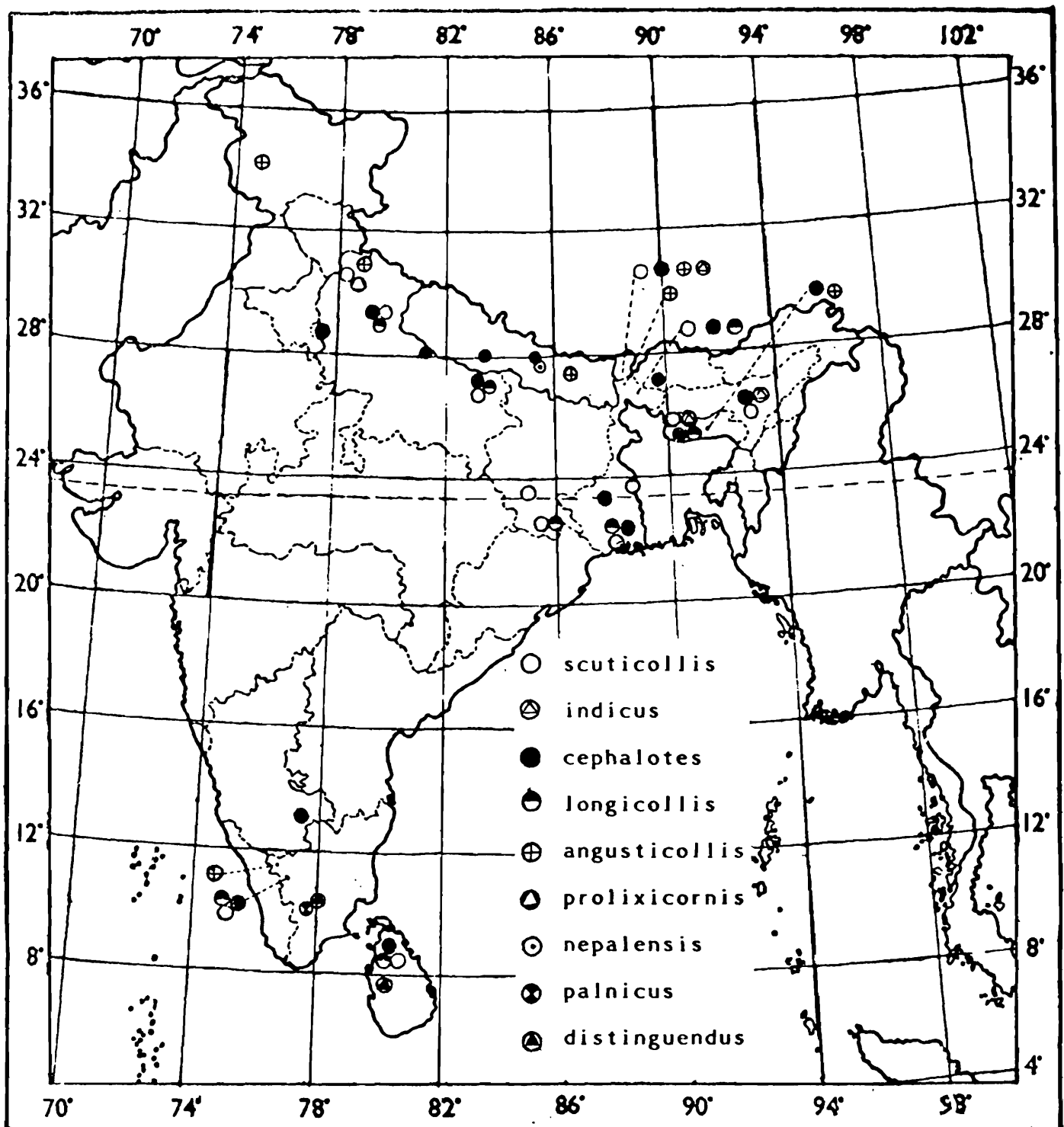


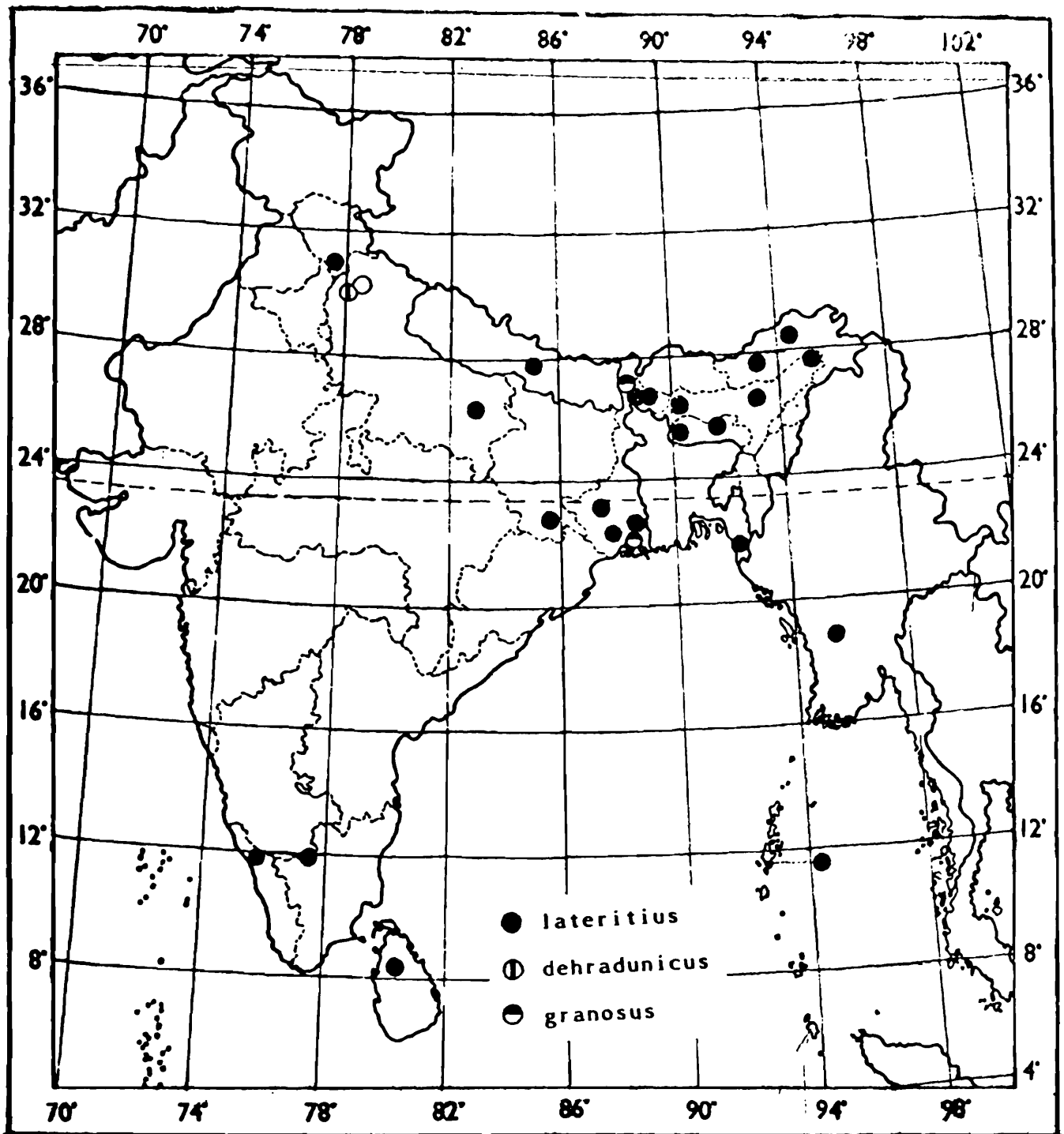
- | | | | |
|---------------------|-----------------------|--------------------|---------------------|
| 1. Jammu & Kashmir | 8. West Bengal | 15. Manipur | 22. Kerala |
| 2. Punjab | 9. Sikkim | 16. Mizoram | 23. Karnataka |
| 3. Himachal Pradesh | 10. Bhutan | 17. Tripura | 24. Maharashtra |
| 4. Haryana | 11. Arunachal Pradesh | 18. Orissa | 25. Goa Daman & Diu |
| 5. Delhi | 12. Assam | 19. Madhya Pradesh | 26. Gujrat |
| 6. Uttar Pradesh | 13. Meghalaya | 20. Andhra Pradesh | 27. Rajasthan |
| 7. Bihar | 14. Nagaland | 21. Tamil Nadu | 28. Bangladesh |

Map 1. Showing states, Union Territories and neighbouring countries of India.

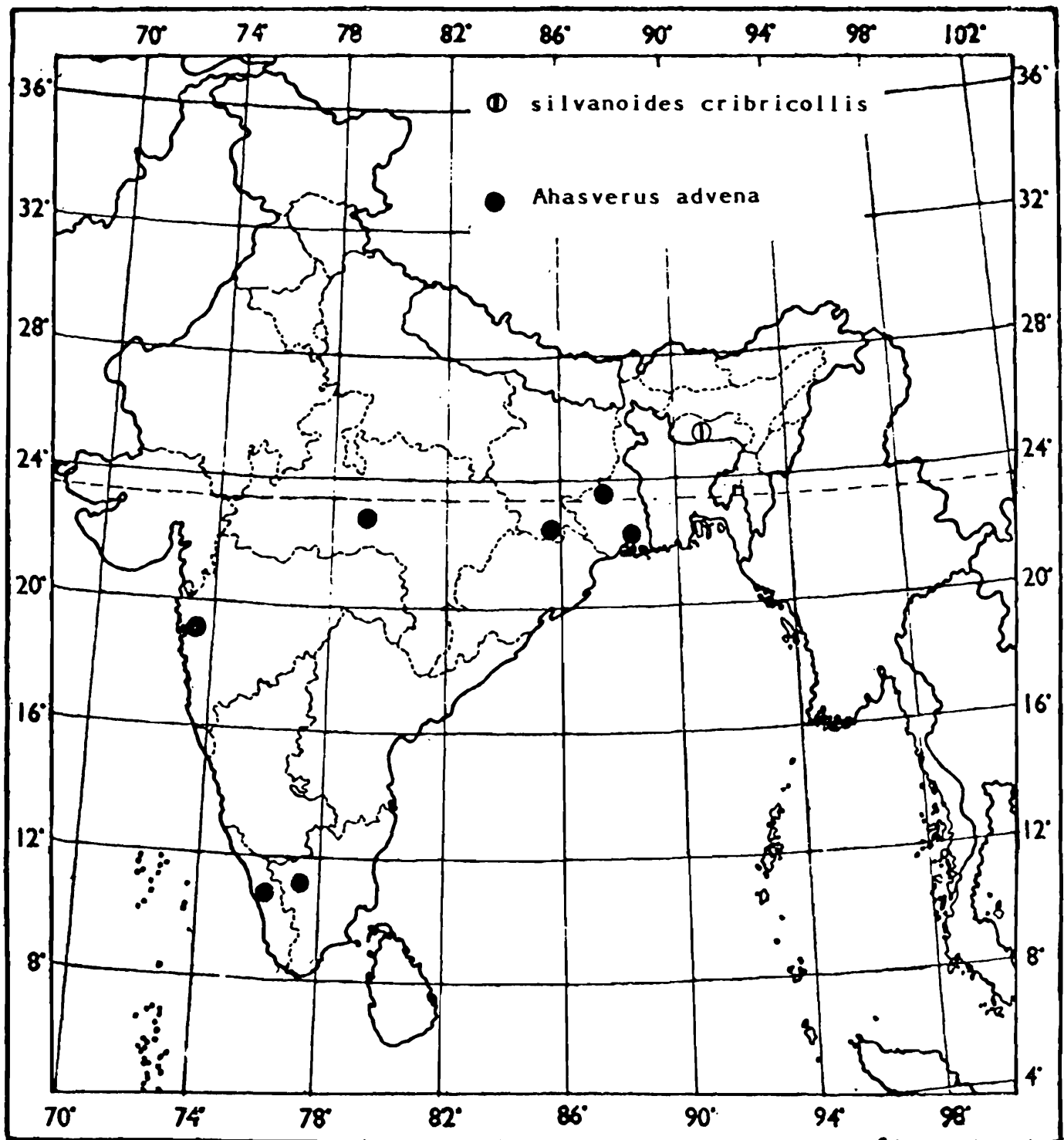


Map 2. Distribution of Indian species of *Silvanus* Latreille ['pahalgamicus' denotes *Silvanus* sp. from Pahalgam (in present study)].

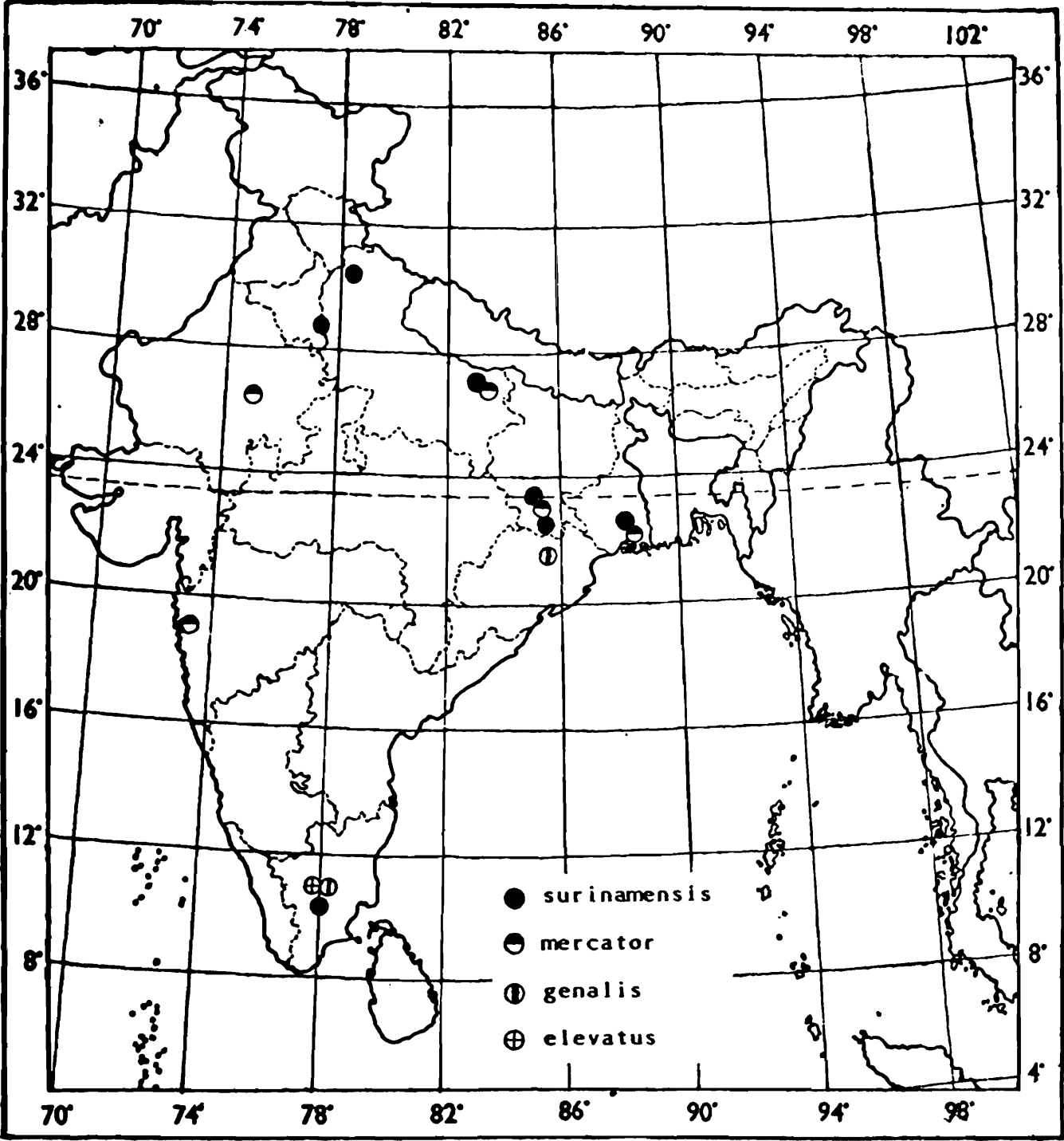
Map 3. Distribution of Indian species of *Silvanoprus* Reitter



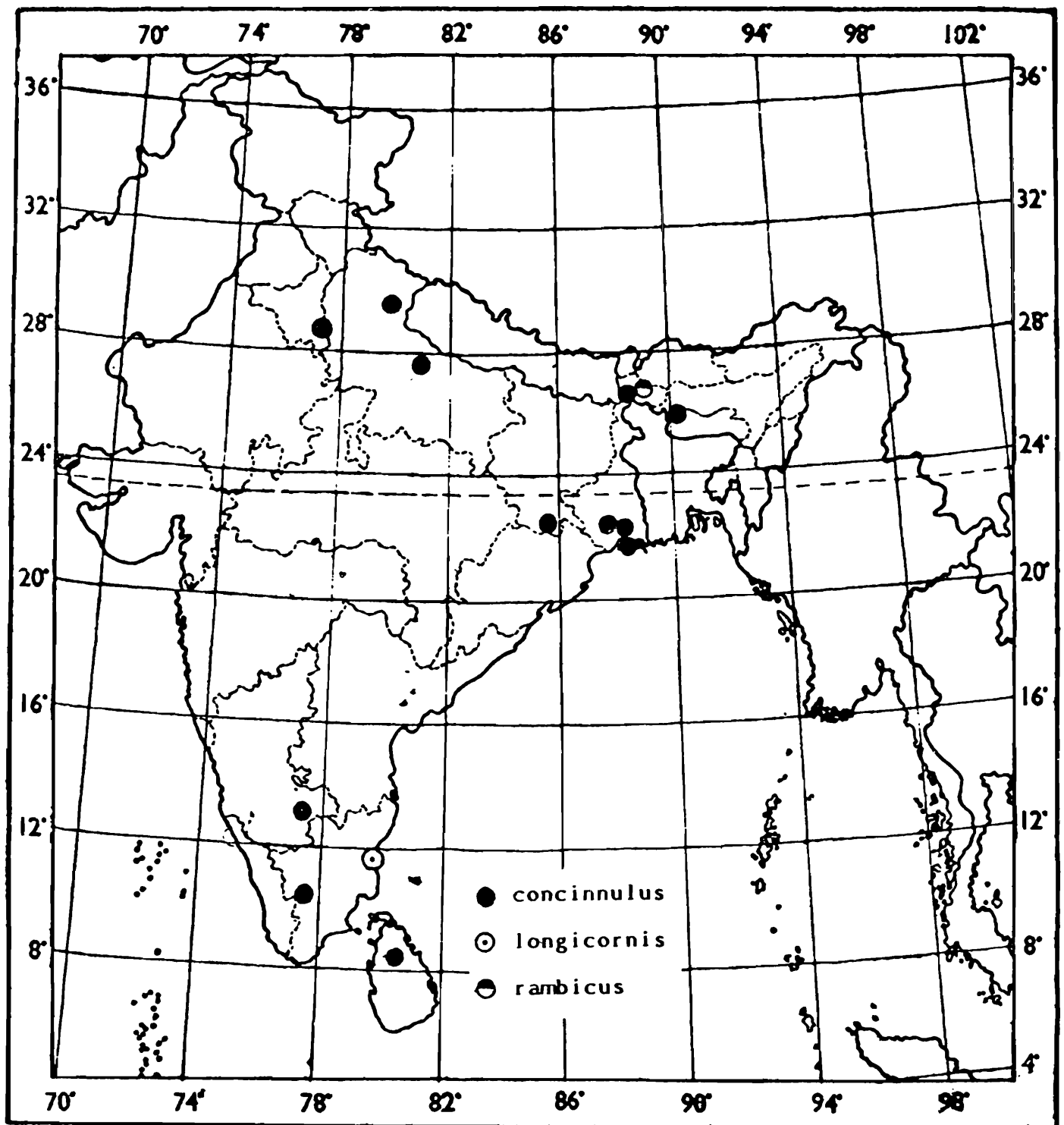
Map 4. Distribution of Indian species of *Protosilvanus* Grouvelle.



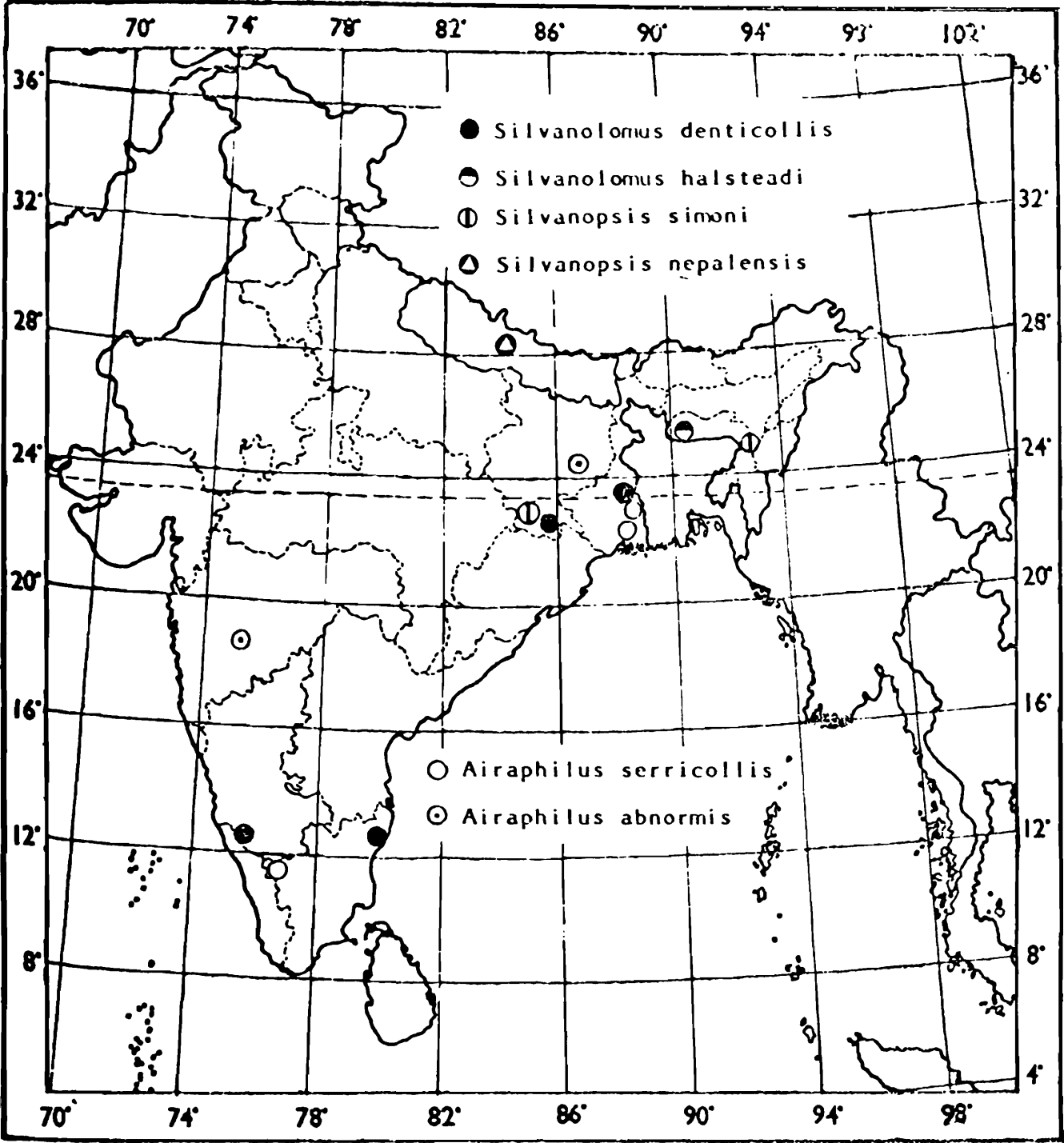
Map 5. Distribution of Indian species of *Silvanoides* Halstead and *Ahasverus* Gozis.



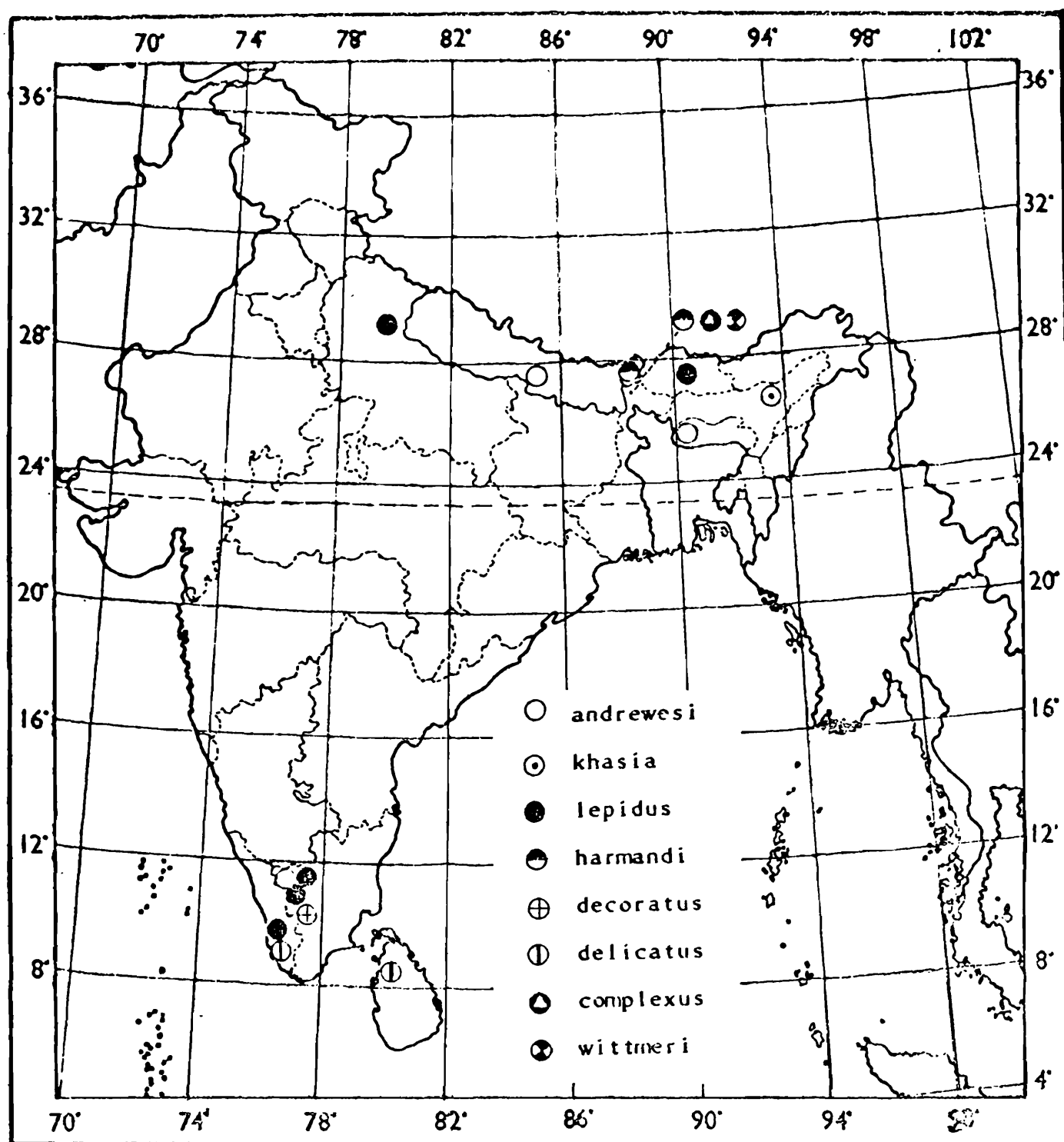
Map 6. Distribution of Indian species of *Oryzaephilus* Ganglbauer.



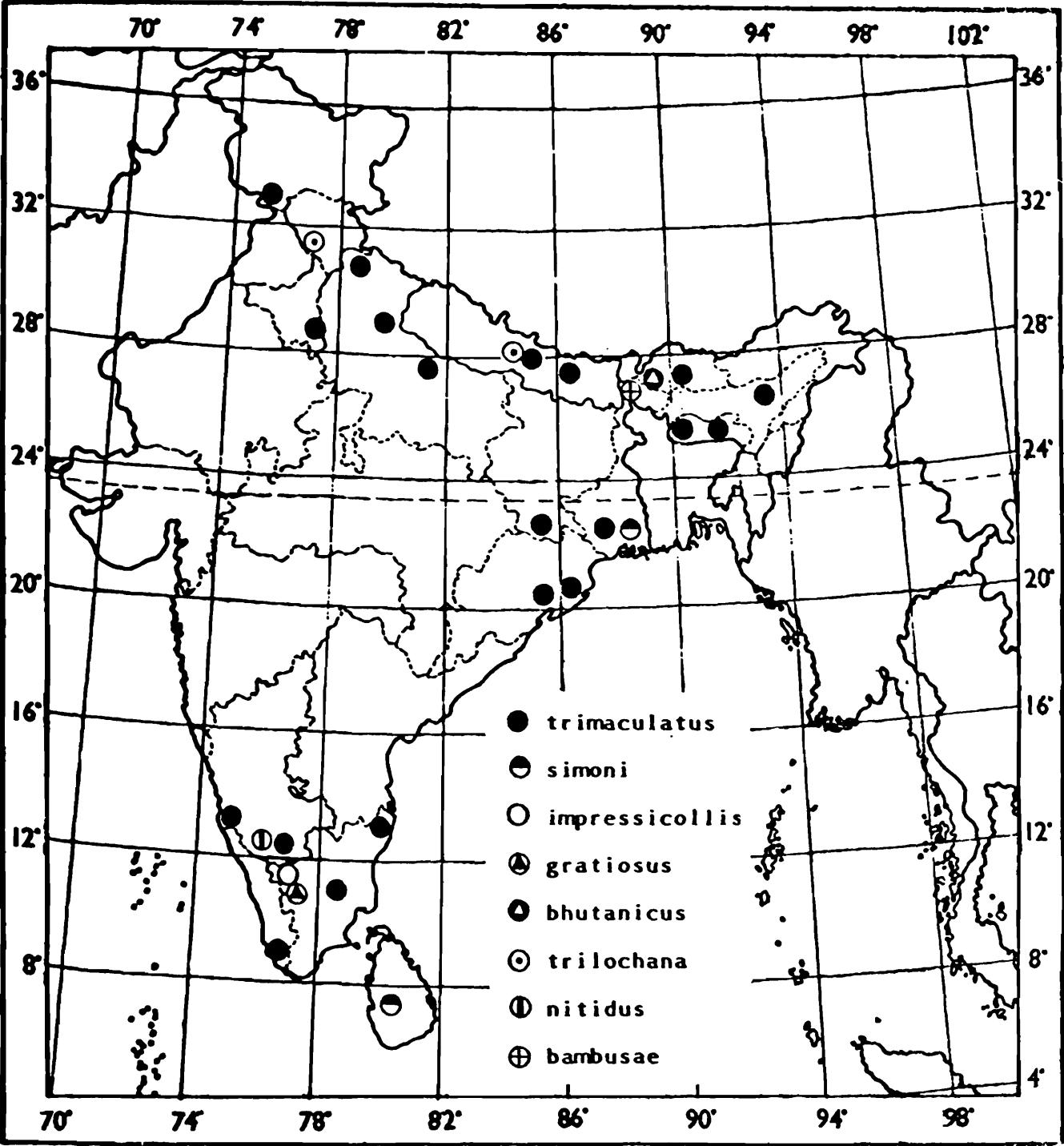
Map 7. Distribution of Indian species of *Monanus* Sharp.



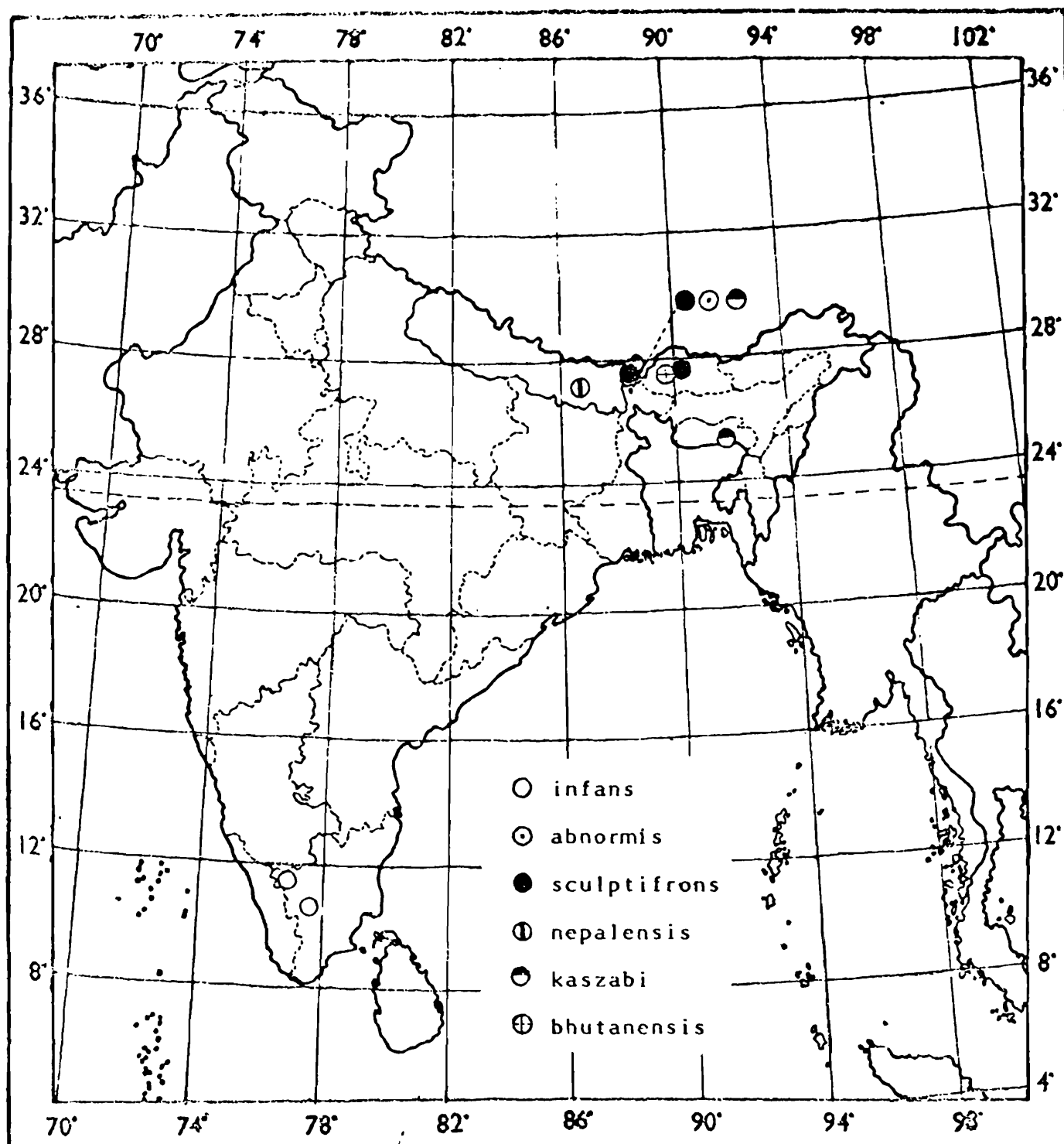
Map 8. Distribution of Indian species of *Silvanolomus* Reitter *Silvanopsis* Grouvelle and *Airaphilus* Redtenbacher.



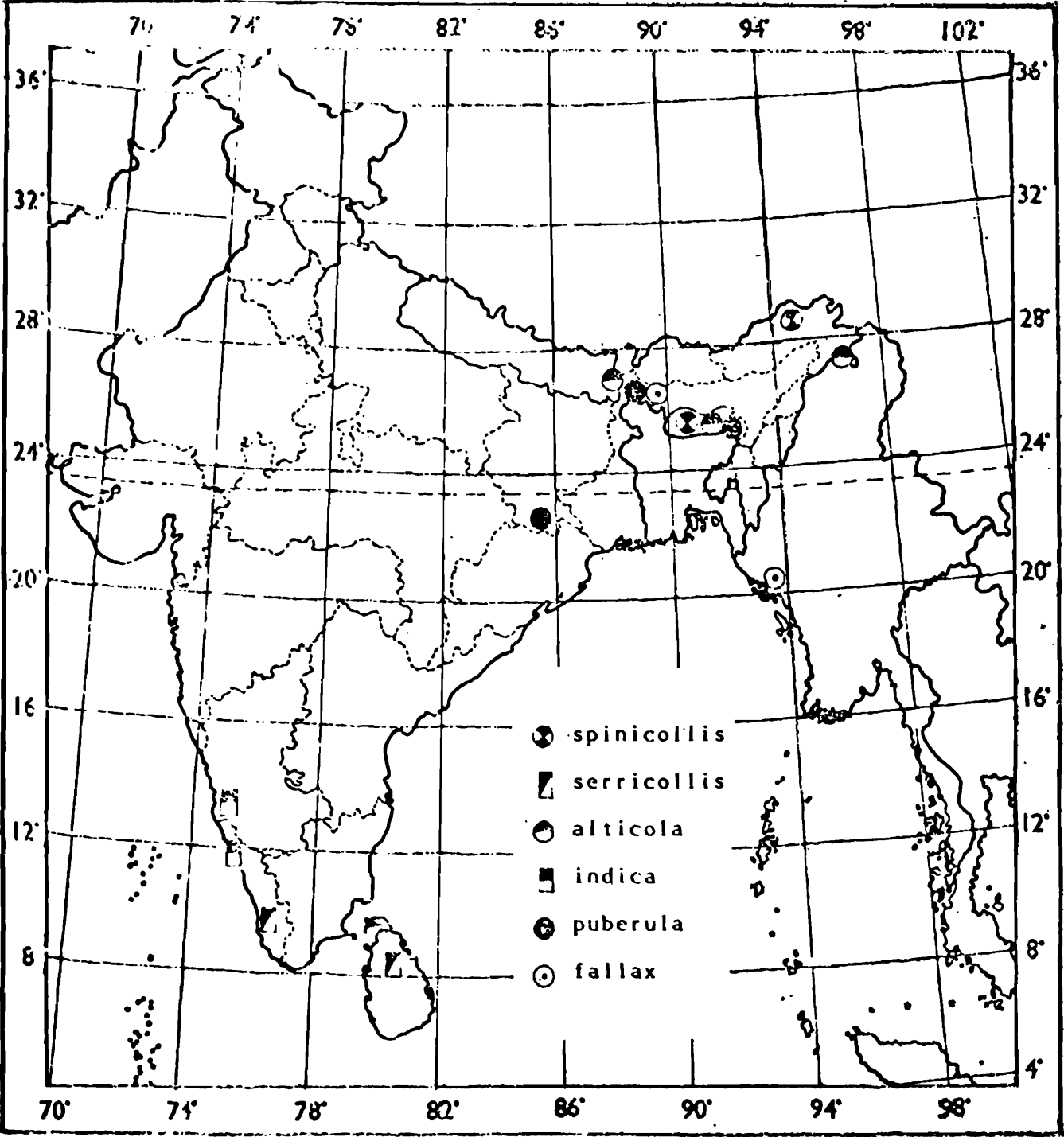
Map 9. Distribution of 8 Indian species of *Psammoecus* Latreille.



Map 10. Distribution of 8 Indian species of *Psammoecus* Latreille.



Map 11. Distribution of Indian species of *Cryptamorpha* Wollaston.



Map 12. Distribution of Indian species of *Uleiota* Latreille.

Africa with the former species records its distribution as far as the Neotropical region. *S. angusticollis* (Reitter) is recorded in India from Himalayas and Nilgiri hills, and also from Japan. The remaining species, viz., *indicus* Pal and Sengupta, *S. nepalensis* sp. nov., *S. prolixicornis* sp. nov., *S. palnicus* sp. nov. and *S. distinguendus* sp. nov. (all in present study) are occurring at higher altitude, of which the first three are found in the northern parts whereas the rest two are found in South India. *S. distinguendus* is recorded also from Sri Lanka.

Majority of the species of *Monanus* (*s. str.*) Sharp are represented in the Oriental region with a few are known from Australia and some Palaearctic countries. Of the two species of *Monanus* (*s. str.*) found in India, *concinulus* (Walker) is occurring abundantly all over India, whereas *longicornis* (Grouvelle) is known only from the south-western coast (Malabar). *Monanus* (*Monanops*) Grouvelle is predominantly occurring in Sumatra and extending as far as Seychelles and some Pacific islands. This subgenus is represented in India only by *M. (M.) rambicus* Pal from the Darjeeling Himalaya (Map 7).

Airaphilus is more diversely represented in the temperate zones than in the tropics, commonly found in Europe, Mongolia and China with a few species in Africa. This genus is represented in India by three species viz., *andrewesi* Grouvelle (Tamil Nadu), *serricollis* Reitter (West Bengal) and *abonrmis* Grouvelle (Maharashtra and Bihar) (Map 8).

Protosilvanus Grouvelle is comparatively a small genus, widely distributed in the Oriental region and extending as far as some islands within the Australian region. Of three Indian species, *P. lateritius* (Reitter) is common and occurring abundantly throughout India. *P. granosus* (Grouvelle), with a fairly wide distribution in Southeast Asia and Pacific islands is recorded in India from West Bengal only. *P. dehradunicus* Pal and Sengupta is recorded only from foot hills of Uttar Pradesh (Map 4).

Oryzaephilus Ganglbauer with thirteen species has a world-wide distribution and reaches its maximum diversity in tropical Africa. This genus comprises species which occur commonly in stored products and of them, *O. surinamensis* (L.) and *O. mercator* (Fauvel) have achieved their cosmopolitan distribution through commercial transportation. These two species also possess a wide distribution within India. *O. genalis* Halstead possesses a wide distribution from Bihar, Orissa to South India and Sri Lanka, while *O. acuminatus* is recorded only from South India and Sri Lanka (Map 6).

Ahasverus Gozis is a small genus, fairly common in temperate climates than in tropics and shows its maximum diversity in both North and South America. Only *A. advena* (Waltl) has a cosmopolitan distribution and is recorded in India from Madhya Pradesh, Maharashtra, West Bengal, Bihar and Kerala.

Silvanopsis Grouvelle with three species, is Oriental in distribution. *S. simoni* Grouvelle is the most widely distributed species in Southeast Asian countries and in India this is recorded from Assam, Bihar, Uttar Pradesh, Gujarat and Karnataka. *S. nepalensis* Pal and Sengupta is recorded only from Nepal.

Silvanolomus Reitter is a small genus with a wide distribution in Africa, Australia and different Oriental countries. *S. denticollis* (Reitter), known from Borneo, Burma and Sri Lanka is recorded in India from West Bengal, Bihar, Karnataka and Kerala. *S. halsteadii* sp.

nov. (in present study) is recorded from Meghalaya only (Map 8).

Silvanoides Halstead is a small Oriental genus and is extending as far as some Pacific islands. *S. cribricollis* (Grouvelle), with a fairly wide distribution in Southeast Asia and Pacific islands, is recorded in India from the Northeastern part only (Map 5).

The subfamily Psammoecinae contains two large genera, viz., *Psammoecus* Latreille and *Telephanus* Erichson. The species of the former genus are highly developed in the Oriental region and extending as far as Australia and Samoa island, with a few species are found in Europe, Africa, Madeira and Hawaii islands; while the species of *Telephanus* clearly shows their Neotropical distribution. Sixteen species of *Psammoecus* are at present recorded from India. Within India, only *P. trimaculatus* Motschulsky is widely distributed. *P. lepidus* Grouvelle is recorded from eastern and western Himalayas and higher altitude in South India. *P. andrewesi* Grouvelle is also recorded from higher elevation in northern as well as southern India. *P. decoratus* Grouvelle, *P. delicatus* Grouvelle, *P. graciosus* Grouvelle, *P. nitidus* Grouvelle and *P. impressicollis* Grouvelle are representing South Indian forms, while *P. khasia* Pal (Mikir hills), *P. harmandi* Grouvelle (Darjeeling, Sikkim), *P. complexus* Pal (Darjeeling), *P. wittmeri* Pal and Sengupta (Darjeeling), *P. bambusae* Pal (Darjeeling), *P. bhutanicus* Pal (Bhutan) *P. trilochana* Pal (Himachal Pradesh, Nepal) are representing northern forms and occurring at higher altitude. *P. simoni* Grouvelle is recorded from Gangetic plain of West Bengal.

Cryptamorpha Wollaston, the only genus of the subfamily Cryptamorphinae shows its maximum diversity in Australia and New Zealand. Most of the Indian species are represented in Himalayas, especially in eastern part, and *C. infans* Grouvelle (Nilgiri hills) is representing the only southern form. *C. sculptifrons* Reitter possesses wider distribution, is recorded from Darjeeling (West Bengal), Sikkim, Bhutan and is known also from the adjacent Palaearctic countries, viz., China and Japan. The other species, viz., *abnormis* sp. nov. (in present study) (Darjeeling), *nepalensis* sp. nov. (in present study) (Nepal), *bhutanensis* Pal and Sengupta (Bhutan) and *kaszabi* Pal and Sengupta (Meghalaya, Dajeeling) possess more or less localised distributions (Map 11). *Indophanus* Pal, represented by *I. dakshinus* Pal only is endemic to South India.

The Uleiotaeninae is represented in all the zoogeographical regions and shows its maximum diversity in the Australian region. *Uleiota* Latreille is the largest and widely distributed genus of this subfamily. This genus is predominant in the Oriental region with more than one-third of the described species are known from India. Of the six Indian species, *U. indica* (Arrow) and *U. serricollis* (Candeze) are recorded only from South India and the latter species is extending as far as Sri Lanka. The other species, viz., *spinicollis* (Guérin-Méneville), *puberula* (Reitter), *fallax* (Grouvelle) and *alticola* Pal, Sengupta and Crowson are recorded mainly from the Northeastern part of the country (Map 12), of which *U. spinicollis* possesses wider distribution to Burma and Java.

The apparent differences in geographical distribution of the Indian Silvanidae may be due to differential surveys in various areas. Therefore, any conclusion regarding this must be regarded as highly speculative.

Table 2.

Relative species composition of World - Orient - India
(including Nepal and Bhutan) of the Indian genera.

Genus	World species (No.)	Oriental species (No.)	Indian speices (No.)
<i>Silvanus</i>	23	14	12
<i>Silvanoprus</i>	16	11	9
<i>Protosilvanus</i>	6	4	3
<i>Silvanoides</i>	2	1	1
<i>Ahasverus</i>	11	1	1
<i>Silvanolomus</i>	4	2	2
<i>Silvanopsis</i>	3	3	2
<i>Oryzaephilus</i>	13	4	4
<i>Monanus</i>	16	12	2
<i>Monanops</i>	7	6	1
<i>Airaphilus</i>	33	3	3
<i>Psammoecus</i>	75	38	16
<i>Indophanus</i>	1	1	1
<i>Cryptamorpha</i>	28	7	6
<i>Uleiota</i>	30	12	6

PHYLOGENETIC CONSIDERATION

As reviewed earlier, the constitution of 'Silvanidae' has undergone changes from time to time. The arrangements of the Hetschko's Catalogue (1930) has been followed until Crowson (1955) who attributed distinct family status to Hetschko's 'Silvaninae' in his "Natural classification of the families of Coleoptera". The constitution, classification and relationship between the subfamilies had remained to establish a satisfactory system. Recently, Pal, Sengupta and Crowson (1984), while dealing with the systematic position of *Uleiota*, considered the phylogeny of the family Silvanidae, and the result of this study is extracted here, though certain alterations are made in coding of characters subsequent to the recent findings by Crowson (in litt.).

In order to elucidate the natural (phylogenetic) affinities, one needs, first to distinguish the characters which are primitive and which are derived characters. Supposedly, primitive characters are represented here by white squares, and derived characters by black squares. When modifications take different forms, the derived characters are represented by half black squares, and cross-hatched squares indicate both primitive and derived condition within the same group (Chart 1).

CUCUJINAE	BOGANINAE	PSAMMOECINAE
PHLOESTICHINAE	HYMAEINAE	SILVANINAE
LAEMOPHLOEINAE	ULEIOTINAE	
PASSANDRINAE	CRYPTAMORPHINAE	

Chart 1. Depicting the larval and adult characters in Cucujidae, Silvanidae, Boganiidae, Phoestichinae and Passandrinae.

CHARACTERS USED IN CHART 1

1. Pygopod-like structure of larva absent (Figs. 28, 29, 30) present (Figs. 332, 405, 413, 420)	☐ ☒	8. Front coxal cavities of adult open (Figs. 309) closed (Figs. 4, 81, 255) open/closed	☐ ☒ ☒
2. 1st tarsal segment of adult not shortest (Figs. 5, 17) shortest (Fig. 16) shortest/not shortest	☐ ☒ ☒	9. Tarsi of adult simple (Figs. 16, 17, 49) lobed (Figs. 83, 195, 286) simple/lobed	☐ ☒ ☒
3. Tarsal formula of adult 5-5-5 in male and 5-5-5 in female 5-5-5 in both sexes (Fig. 2)	☐ ☒	10. Urogomphi of larva present, upturned present, posteriorly projected (Figs. 28, 29, 30, 419) absent (Figs. 332, 405)	☐ ☒ ☒
4. Mandibular cavity of adult present (Figs. 10, 27, 261) absent (Figs. 23, 24, 25) present/absent	☐ ☒ ☒	11. Antennal club of adult present (Figs. 1, 31) absent (Fig. 303) present/absent	☐ ☒ ☒
5. Trochantins of front coxal cavities of adult exposed hidden	☐ ☒	12. Antennal segment 3 of larva long (Figs. 398, 407, 414) short (Figs. 327, 334, 389)	☐ ☒
6. Spiracles of larva bicameral bicameral + annular annular (Figs. 333, 342)	☐ ☒ ☒	13. Radial cell of wing of adult present (Fig. 20) absent (Figs. 9, 18, 19, 22)	☐ ☒
7. Anal veins of wing of adult five (Figs. 21, 22, 289) four (Fig. 20) three (Fig. 19) one (Figs. 9, 52)	☐ ☒ ☒ ☒	14. Maxillary mala of larva falciform (Figs. 329, 338) blunt	☐ ☒

Fourteen selected characters are represented here by numbered columns and the different subfamilies correspond to the rows. In seeking the phylogenetic affinities of any taxon, it is necessary to establish which characters-states are primitive within it and which are its most primitive existing members. In Silvanidae, we consider that *Uleiota* (subfamily Uleiotinae) is on the whole the most primitive of the types so far described. Presumed primitive features in it include the well-developed dorsal mandibular cavities, opened front coxal cavities, simple tarsi; and in larva long antennal segment 3.

The transference of Uleiotinae from Cucujidae to Silvanidae, suggested by Crowson (1973), is supported by the results of the present study, and by the characters analysed in our matrix. Crytamorphinae and Psammoecinae provide transitional stages, in both adult and larval characters between Uleiotinae (Hyliotinae auctt, Crowson 1973) and Silvaninae proper, whereas the gap between Uleiotinae and Cucujinae is not bridged in this way. Uleiotinae would appear to in most respects the most primitive of Silvanidae, and it is through this subfamily that any remoter affinities of Silvanidae are likely to be traceable. Of all other groups of Clavicornia known to us, the one showing greatest similarities to Uleiotinae is Hymaeinae, placed by Crowson (1973) in Phloestichidae together with Phloestichinae, Priasilphinae and Agapythinae. *Hymaea* and its allies differ from Uleiotinae in having heteromerous male tarsi, in having a Cryptophagid-like apical 'gape' of the elytral suture, in having tarsal segment 1 not shorter than 2, and in the larval stage in having hooked upturned urogomphi of more normal Cucujoid-type and the 9th abdominal tergite about as long as the 8th. In nearly all these respects, *Hymaea* is probably more primitive than Uleiotinae, which it resembles in wing-venation, mandibular cavities, post-ocular head constriction, open front coxal cavities, tendency to denticulation of prothoracic margins, aedeagus, and larval mouthparts, etc. In most of the respects in which *Hymaea* differs from Uleiotinae it resembles *Phloestichus* or *Priasilpha*. We conclude that Silvanidae, including Uleiotinae are more closely related to at least some of the groups previously placed in Phloestichidae than they are to Cucujinae or Laemophloeinae. The implications are that in a strictly phylogenetic classification, either some or all of the Phloestichidae should be included in Silvanidae, or the Phloestichidae should be split into 3 subfamilies of equivalent status to Silvanidae. Only through phloestichid forms would it seem possible to establish remoter links with Cucujinae, Passandrinae and Laemophloeinae.

The affinities of Laemophloeinae are if anything even more problematic than those of Uleiotinae. We consider that the main groups to which Laemophloeinae might have direct relations are the Cucujinae, Passandrinae and Boganiinae. Within Laemophloeinae, the most aberrant and probably on the whole the most primitive type may be represented by *Carinophloeus* Lefkovitch, which its describer wished to exclude from the subfamily altogether. Some of characters of *Carinophloeus* are doubtless apomorphic in relation to normal Laemophloeinae, e.g., the outward closure of the middle coxal cavities by the sterna, but others notably the form of the metendostenite, the relatively narrowly separated and usually transverse front coxae, and the presence of well-developed structures in the mandibles which may represent reduced mandibular cavities like those seen in some of Silvanidae – unfortunately the *Carinophloeus* larva is still undescribed. *Carinophloeus* shares the extremely reduced wing venation of normal Laemophloeinae, and the pronotal elytral ridges which are usual in the group.

A number of Laemophloeine genera, notably *Passandrophloeus* and *Narthecius* approach Passandrinae in facies, and that group needs to be considered as possibly related to the Laemophloeines. Obvious differences include the more or less confluent gular sutures of Passandrinae (and concomitant modifications of the tentorium), the highly reduced mouthparts of known Passandrine larvae, the much more primitive-looking wing-venation and metendosternites of Passandrines, and their simple upturned larval urogomphi. Clearly, neither of these two subfamilies could be derived from any known type of the other. An interesting feature of some Passandrinae is the presence (e.g., in *Catogenus*) of dorsal tubercles on the mandibles fitting into lateral emarginations of the clypeal projection, though without the dorsal cavities which normally accompany such tubercle in Boganiinae etc. This suggests, as do the mandibles of *Carinophloeus*, derivation from an ancestral form with Boganiinae-like mandibles. Probably apomorphic features shared by Laemophloeinae and Passandrinae include the complete concealment of the trochantins of the front coxae, the inverted aedeagus (shared also with Cucujinae and Silvanidae), and possibly the reduction or loss of the maxillary cardines and the obtuse maxillary mala in the larvae.

The possibility of a relation of Laemophloeinae or Passandrinae or both to Boganiinae as well as Cucujinae is suggested by the parallel with Silvanidae - Laemophloeinae possibly standing in relation to Boganiinae much as Silvaninae do in relation to Hymaeinae. It is unfortunate that we know of no certainly identified larvae of Boganiinae - some larvae collected by R. A. Crowson under bark of dead trees in S. Queensland, Australia in 1966 much resemble those of Laemophloeinae but differ in the presence of an endocarina and different form of the frontal sutures, the strongly bicameral abdominal spiracles, in the different form of the mandibles and in many respects these larvae resemble those of some Phalacridae as much as they do Laemophloeinae. Apparent affinities to Phalacridae have also been noted in adult Boganiinae; like many Phalacridae, adult Boganiinae appear to be floricolous, specimens studied having pollen grains in their gut content. No other adult Coleoptera, other than typical Laemophloeinae, found in company with these larvae could possibly be associated with them; larvae were collected in spring, before the seasons at which floricolous adult Boganiinae might be expected to appear. A possible relation of Laemophloeinae to Phalacridae was already suggested by Böving and Craighead (1931) on the basis of larval structure. If these larvae really are of Boganiinae, they provide strong support for a derivation of Laemophloeinae from that group, but tend to leave open the question any particular affinity of Laemophloeinae to Passandrinae or Cucujinae. Larvae of Cucujinae show little indication of affinity to the supposed Boganiinae larvae, but would be more readily linked with Phloestichidae in their head structures.

CHARACTERS STUDIED

ADULT

A. *Size* : All the species dealt with here fall within the range of 1.36 - 11.56 mm. The majority lie between 2.00 - 3.00 mm. Consequently size is rarely a very useful character in identification of species. However, all the species of *Uleiota* so far seen are 5.20 mm. to 11.56 mm. long; *U. spinicollis* is the largest one, exceeding 9.37 mm.

B. *Colour* : The colour is of limited diagnostic value in the family, except when a number of samples are available for comparison, and it has been used to distinguish a few forms with obvious elytral markings. The prevalent colour of the species is reddish-brown and sometimes yellowish or blackish. Some species, viz., *Monanus concinnulus*, *Psammoecus* spp. and *Cryptamorphia* spp. have their characteristic black markings on elytra, which often provide useful characters for distinguishing these species.

C. *Shape* : General body shape is elongated and varies from somewhat ovoid (*Ahasverus*, *Silvanolomus*, *Psammoecus*, *Indophanus*) to nearly parallel-sided (*Silvanus*, *Silvanoprus*, *Oryzaephilus*, *Protosilvanus*, *Uleiota*). The dorsal surface is rather markedly flat in *Uleiota*, *Protosilvanus*, *Monanus* (*Monanops*) *rambicus*; more or less convex in *Ahasverus*, *Silvanolomus*, *Psammoecus* and *Cryptamorphia*. Most of the genera can be recognised by their general facies.

D. *Head* :

1. The antenna is 11-segmented and inserted under projection of frons in Silvaninae; this insertion is rather dorso-lateral in Psammoecinae, Cryptamorphinae and Uleiotinae, and is hence useful at the subfamily level. Antennal segments are somewhat moniliform in Silvaninae, rather elongated in Psammoecinae, Cryptamorphinae and Uleiotinae, in *Silvanopsis* and *Monanus concinnulus* the segments are short. Apical three segments usually form a distinct antennal club in Silvaninae but is not distinguishable in Psammoecinae, Cryptamorphinae and Uleiotinae. Within the Silvaninae, there are differences in the degree and development of antennal club. The apical segment of the club is usually transverse or as wide as long. In some species the apical segment is more robust and more strongly elongated, as found in *Airaphilus* spp. and *Monanus* (*Monanops*) *rambicus*. In some species, viz., *Ahasverus advena*, *Silvanopsis simoni*, *S. nepalensis* the basal segment of club (segment 9) is markedly narrower than the middle one (segment 10).

2. Eyes and Temples - The eyes are usually uniform throughout the family; large, round and coarsely faceted. In *Cryptamorphia infans* the eyes are somewhat conical.

The temples are usually little developed, extended slightly laterally and is subject to considerable variation even among related species. In the genera *Protosilvanus*, *Silvanoides*, *Uleiota*, these are prominent, extended laterally slightly beyond the margins of eyes and distinct platform-like. Usually the temples are about as long as one or two eye facets and are much shorter than the eyes. In some species, viz., *Oryzaephilus surinamensis*, *Silvanoprus longicollis*, *S. distinguendus* sp. nov. (present study) *S. palnicus* sp. nov. (present study) the temples are well-developed, long and more or less as long as eyes. The proportion of length of eye and temple is used in separating *Oryzaephilus surinamensis* and *O. genalis* from *O. mercator* and *O. acuminatus*. The length of temple in relation of length of eye facet is used in separating *Silvanus lewisi*, *S. imitatus* from *S. difficilis*, *S. bidentatus* and others. The comparison of temple with eye facets may often proved to be a useful character for separating a few closely related species in different genera.

3. Fronto-clypeal suture - This suture is well-marked in the subfamilies Psammoecinae and Cryptamorphinae but absent in Uleiotinae and Silvaninae. This is one of the prominent characters by which the former two subfamilies can easily be separated from the latter two.

4. Transverse impressed line on vertex - This line on the posterior side of vertex behind eyes is very conspicuous in the genera *Silvanus*, *Silvanoprus*, *Protosilvanus* etc. and indistinct in the genera *Oryzaephilus*, *Monanus* (*Monanops*) etc. This is a useful character at the generic level and is clearly visible when the specimen is studied by making slide preparation.

5. Neck - Usually the neck is more or less constricted and almost uniform throughout the family.

6. Gular sutures - The gular sutures are widely separated and uniform throughout the family.

7. Tentorium - The tentorium is composed of two longitudinal tentorial arms (pretentorina) which are usually connected by a transverse bridge near middle (corpotentorium) as in *Silvanus*, *Silvanoprus*, *Silvanopsis*, *Monanus* etc. Rarely, as in *Protosilvanus*, this transverse connection is absent. Lateral arms (Posttentorina) from the longitudinal arms are found only in *Oryzaephilus*.

8. Mouthparts :

Mandible - Each mandible is usually with three apical teeth and well-developed mola with dorsal fine transverse ridges. The dorsal side of basal half is hollowed out as dorsal mandibular cavity, protected by a dorsal tubercle in the genera *Airaphilus*, *Psammoecus*, *Cryptamorphus* and *Uleiota*. This mandibular cavity is usually vestigial in Silvaninae, whereas well-developed in Psammoecinae, Cryptamorphinae and Uleiotinae.

Maxilla - The lacinia is long, narrow and fringed with fine setae, apical spine is usually absent; rarely, in *Airaphilus*, has a distinct apical spine. First segment of the maxillary palpus is small, other three segments are variable length and shape. The apical segment is usually fusiform, rarely securiform, as in Psammoecinae. Unlike other Silvaninae, the apical segment is shorter than segment 2 in *Protosilvanus*. The palpi are often pubescent and rarely glabrous in *Silvanopsis*. Securiform apical segment separates Psammoecinae from the other three subfamilies.

Labium - The first segment of labial palpus is small, other two segments are variable length and shape. The apical segment is usually fusiform, and sometimes securiform as in Psammoecinae and Uleiotinae. Segment 2 is usually about as wide as apical one in Silvaninae and narrower in Psammoecinae, rounded and much wider than apical one in Cryptamorphinae. In all Silvaninae the apical segment is usually largest, except *Protosilvanus*, where the apical segment is shorter than segment 2. The palpi are often pubescent and rarely, glabrous in *Silvanopsis*. The shape and size of palpal segments are of taxonomic importance especially, in separating the subfamilies, and also used for separating *Protosilvanus* from other related genera.

Labrum - The labrum is transverse, front margin usually rounded and fringed with setae and of little variation within the family.

E. Prothorax : The shape of the prothorax as a whole is the most important single external character by which the majority of the genera and species may be recognised. The development of spines at the front angles, degree of curvature of lateral margins, the

presence or absence and shape of lateral teeth, convexity of pronotum, and shape and proportions of the prothorax are usually very useful character for separating the species.

1. Shape and proportions of prothorax - The shape of the prothorax ranges from elongated to rather transverse. The terms 'as broad as long', 'transverse' and 'elongated' prothorax have been widely used in descriptions, and key to the genera, which proved to be a useful character.

2. Structure of anterior spine - the prothoracic anterior spine formed by prolongation of front angle is characteristic of the genera *Silvanus*, *Silvanoprus*, *Protosilvanus* and *Silvanoides*. In *Ahasverus* it is broadly rounded. The shape, degree of development and the angle formed at the origin with lateral margin of prothorax provide useful characters in identification of species of these genera.

3. Lateral margins - The shape of the lateral margin has the greatest effect on the general appearance of prothorax. It may be slightly wavy in *Silvanus*, *Silvanoprus* and *Protosilvanus*; rather rounded in *Ahasverus* and *Cryptamorpha abnormis* sp. nov. (present study). The lateral margins in *Silvanus*, *Protosilvanus*, *Silvanoprus*, *Protosilvanus* etc. are finely denticulate or serrated, whereas in others with number of large teeth. The shape and number of teeth varies. The genera *Oryzaephilus*, *Silvanopsis* and *Silvanolomus* possess six large teeth, whereas *Airaphilus* bears eight to fifteen teeth and *Monanus* with eight to eleven teeth. The lateral teeth of *Oryzaephilus* and *Silvanolomus* are usually acute, but in *Silvanopsis* these are broadly pointed or the lateral margin appearing undulated. The lateral teeth of *Airaphilus* and *Monanus* are smaller. The subfamily Silvaninae has been divided into two major divisions based on the presence or absence of lateral teeth and further on the number of teeth, within the key to the genera. Lateral teeth of *Psammoecus* and *Uleiota* are variable number and form.

4. Depression on pronotal disc - There are shallow lateral depressions on either side of the middle line in the genera *Silvanus*, *Silvanoprus* and *Protosilvanus*, whereas in *Oryzaephilus* the pronotum is demarcated by a median and a pair of lateral longitudinal carinae and a well-marked longitudinal depression on either side of median carina. The presence of longitudinal grooves and carinae on pronotum separates *Oryzaephilus* from all other genera of Silvaninae. These depressions are less defined and variable in a few genera. This character has sometimes been used as additional character in the keys. The pronotum of *Cryptamorpha abnormis* sp. nov., with a well-marked median longitudinal depression separates this species from other species of *Cryptamorpha*.

5. Punctuation - Two features of pronotal punctuation have been used in descriptions and keys - strength and type. Punctuation on pronotum is usually coarse and dense. Strength is estimated subjectively as a comparison of the size of the punctures on the pronotal disc with similar punctures on another species, or more commonly, with punctures on head of the same specimen. The pronotal disc rarely varies in punctuation type and surface sculpture. The surface is usually granulate and dull or rarely with rugose, ocellate punctures (*Silvanoprus longicollis*, *S. distinguendus* and *S. palnicus*).

6. Sterno-pleural suture - The sterno-pleural suture is subject to considerable variation. It may be extended to anterior margin as in *Airaphilus*, or to front angle as in *Silvanus*,

Silvanoides, *Silvanolomus* etc., or to lateral margin as in *Protosilvanus*, *Psammoecus*, *Cryptamorphia* and *Uleiota*. This character is useful at the generic level and used in the key.

7. Coxal cavities - Except Uleiota the coxal cavities are closed externally in all silvanids and it is the most important distinguishing character for separating Uleiota from other three subfamilies. The coxae may be widely separated as in *Uleiota* and *Protosilvanus*; or narrowly separated as in *Silvanus*, *Silvanoprus*, *Silvanoides* and *Silvanopsis*; or internally contiguous as in *Silvanolomus*, *Psammoecus* and *Cryptamorphia*. These two characters are very useful at the generic level and hence used in the key.

F. Elytra :

1. Shape - The normal shape of elytra is elongated, somewhat parallel-sided and more or less convex. In some genera the elytra are less elongated and somewhat ovoid, as in *Ahasverus*, *Silvanolomus*, *Psammoecus* and *Indophanus*. While in others they are longer and more parallel-sided as in *Silvanus*, *Protosilvanus*, *Monanus* (*Monanops*) and *Uleiota*. In *Protosilvanus*, *Monanus* (*Monanops*) and *Uleiota* the dorsal surface is markedly flattened. The general shape of elytra is occasionally sufficiently distinct to distinguish a genus. The majority show only small difference that can not be defined by measurements only.

2. Puncturation - The punctures on the elytra are arranged in regular longitudinal rows. Normally, in Silvaninae the number of rows are nine and in *Psammoecus* and *Indophanus* ten and eight respectively. An incomplete row, the scutellary stria is present on either side of elytral suture in *Cryptamorphia* only. Width of each puncture is often compared with the width of interstices between the rows. In some cases, especially, in the genera *Psammoecus* and *Cryptamorphia* the width of punctures has often been used for separating a few related species, hence used in descriptions and keys.

3. Interstices - The interstices are usually costate and sometimes carinate, as in *Protosilvanus*, *Oryzaeophilus* and *Uleiota*.

4. Pubescence - The pubescence is usually said to be single, short and semierect, which is comparatively longer in *Airaphilus* and *Psammoecus*. A few species of *Psammoecus* possess double pubescence, short and long along lateral margins.

5. Epipleura - The recurved portion of the elytron beneath the body at lateral side is called 'epipleuron'. This is moderately wide near shoulder and decreases gradually in width till it disappears at apex or little before apex. The epipleura usually are less variable within the family, except in *Indophanus*, that possesses a markedly developed epipleura.

6. Scutellum - This is usually transverse; somewhat pentagonal in the genera of Silvaninae, Cryptamorphinae and Uleiota, and rather triangular in *Psammoecus* and *Indophanus*.

G. Wing :

The wing venation in Silvaninae and Psammocinae is uniform; venation is reduced, with single anal vein but devoid of radial cell and subcubital fleck. The number of anal veins

in *Cryptamorpha* and *Uleiota* are five and three respectively. These number of anal veins may be of considerable importance in tracing the relationships of different groups in consideration, but since it is a hidden character it is not used in the keys to subfamilies and genera.

H. *Meso-metathorax* :

1. Mesosternum The mesosternum is short and transverse; sternal fitting between mesocoxae is usually in a straight line in Silvaninae and Uleiotinae, which is more or less emarginated or sinuated in Psammoecinae and Cryptamorphinae. The lateral borders of mesosternal process are usually more or less notched in the posterior half, which are rarely straight or 'normal' in *Oryzaeophilus* and *Silvanopsis nepalensis*. The meso-metasternal junction and lateral border are useful at the generic level and hence used in the key.

2. Metasternum - The metasternum is more or less transverse and usually with a median longitudinal impressed line of variable length. Rarely, in *Indophanus* the metasternum is markedly short, that separates this genus from other silvanid genera. The mesocoxal lines are absent, except in *Ahasverus*. Rarely, glandular cavities are present behind mesocoxae in *Uleiota*.

3. Coxal cavities - The mesocoxal cavities are broadly opened outwardly and mesepimera always reach the coxal cavities. The hind coxal cavities are strongly transverse and oval. The degree of separation of meso- and hind-coxae are of importance at the generic level.

4. Metendosternite The metendosternite is Y-shaped, consisting of a broadly elongated furcal stalk, a pair of lateral arms of furca or appophyses which are forked at tip. The anterior tendons of metendosternite are usually obscured, which are well-developed in *Cryptamorpha* and *Uleiota*.

I. *Legs* :

The legs are generally moderately long. Three pairs of legs are usually similar to each other in their shape and structure.

1. Coxae - The front and middle coxae are nearly rounded, and hind-coxae are transverse and oval. Front and middle trochantins are hidden.

2. Trochanters - The trochanters are always short and simple. The shape of trochanter is usually subtapezoidal with a rounded proximal margin. In *Protosilvanus*, *Oryzaeophilus*, *Silvanus bidentatus*, *S. robustus* the hind trochanters, and in *Cryptamorpha abnormis* the middle trochanters are produced into a short spinous projection in male and thus indicating the sexual differences.

3. Femora - The femora are almost uniform throughout the family; usually elongate, more or less cylindrical and swollen towards middle. In *Silvanoprus cephalotes* both the front and middle femora are armed with a short spine in both sexes. In *Silvanoides* the ventral side of hind femora are ridged in male and thus, indicating the sexual differences.

4. Tibiae - The tibiae are slender, elongated and more or less thickened at apex. The apex

of tibia is usually with two normal minute spurs which are indistinct in *Oryzaephilus*. The apex of tibia in *Psammoecus* is with a circlet of apical spurs.

5. Tarsi - The tarsal formula of the Silvanidae is always 5 5 5 in both sexes. Segment 1 is elongated; segments 2 and 3 subequal, these segments may be simple or lobed; segment 4 is distinctly shorter than other segments; apical segment is elongated, cylindrical and bearing a pair of claws at its apex. The structure of tarsi is very variable, which may be of the following types : (a) simple in *Silvanus*, *Protosilvanus*, *Silvanoides* and *Uleiota*; (b) segment 3 slightly incrassate in *Oryzaephilus* and *Silvanopsis*; (c) segment 3 lobed in *Silvanoprus*, *Ahasverus* and *Silvanolomus*; (d) segments 2 and 3 lobed in *Monanus*; (e) segments 1 to 3 lobed in *Psammoecus* and *Indophanus*; (f) segments 1 and 2 lobed and segment 3 bilobed in *Cryptamorpha*. The shape of tarsi is thus of great importance and used in the key for several times to separate the major divisions of the family and subfamilies.

J. Abdomen :

1. Ventrites - The abdomen is composed of five visible sternites or ventrites. Each ventrite is freely articulated and movable; the first ventrite is longer than each one of the four succeeding ones; the fifth ventrite is generally semicircular or subconical in its outline, with peculiarly notched at its posterior border in *Cryptamorpha abnormis*.

2. Intercoxal process and femoral lines on ventrite 1 - The apical margin of intercoxal process may be almost straight in *Silvanolomus*, *Oryzaephilus* and *Airaphilus*; or broadly pointed in *Silvanus*, *Silvanoprus*, *Protosilvanus*, *Psammoecus*, *Indophanus* and *Uleiota*. This character is of considerable value at the generic level. The femoral line is represented on the first ventrite behind each hind coxal cavity. The femoral line may be narrowly or widely separated from the hind coxal cavity. It may be closed, as in *Silvanus*, *Silvanoprus*, *Oryzaephilus*, *Psammoecus*, *Cryptamorpha* etc.; or opened, as in *Ahasverus* and *Silvanoides*. This feature in a few instances is useful at the generic level, and it separated the related species of *Airaphilus* viz., *A. abnormis* from *A. serricollis* and *A. andrewesi*. Rarely, glandular cavities are present behind hind-coxae in *Uleiota*.

3. Spiracles - There are seven pairs of spiracles, first six pairs lying on pleural sclerites and seventh pair of edge on the tergite 7.

4. Male genitalia - The aedeagus is inverted Cucujoid-type and its general structure is rather similar throughout the family. Aedeagus is composed of the following parts : (a) median lobe proper is broadly elongated, dorso-ventrally compressed chitinous structure, median strut single and usually spatulate at apex, (b) tegmen consists of a basal piece and a pair of parameres; the parameres bear one to many setae at their apex or margins. The structure of aedeagus in Silvanidae especially, the tip of median lobe and parameres seem to be species-specific and are very useful character for the determination of species.

5. Female genitalia - The female genital tube or ovipositor is rather less variable. The general structure of this organ is composed of a pair of paraprocts, a pair of valvifers, a pair of coxites, a pair of long styli attached on outer margin of apex of coxites.

LARVA

A. *General form* :

The full grown larvae of Silvanidae are elongated, rather parallel-sided with slightly narrowed in front and behind, and sometimes with well-developed paired urogomphi on the posterior end of ninth abdominal tergite. The larvae are of little variation in their general outlines, but sometimes are with characteristic setal patterns and pigmentation. Comparable differences in setal patterns and pigmentation are often not dependable, but in several genera they are of sufficient magnitude to be readily recognized and are then used in the key.

B. *Head Capsule* :

The head capsule is subglobular and broader than long.

1. Shape of frontal suture - The frons is demarcated by the frontal suture. The frontal suture is Cucujoid-type and uniform throughout the family but sometimes indistinctly visible.

2. Antenna - The antenna is moderately long and 3-segmented; segment 1 is slightly elongated, segment 2 is markedly long, segment 3 may be minute (Silvaninae) or well-developed (Psammoecinae, Cryptamorphinae and Uleiotinae). The sensory appendage is usually present, minute and its position varies. The well-developed segment 3 separates 3 subfamilies viz., Psammoecinae, Cryptamorphinae and Uleiotinae from the Silvaninae. Within the Silvaninae the antenna may be longer than the length of head and segment 2 is more or less parallel-sided (*Silvanus*, *Silvanoprus*, *Protosilvanus*, *Ahasverus*), or shorter than the head and segment 2 broadened towards apex (*Monanus*, *Oryzaephilus*, *Airaphilus*). The length of antenna and shape of segment 2 are of use to separate two major divisions within Silvaninae and thus used in the key.

3. Ocelli - Five or six ocelli are present behind antenna; their arrangements are variable and specific for each type, which are illustrated with diagrams.

4. Arrangement of setae - The number, length and arrangement of setae of dorsal side are variable and specific for each type. Sometimes the density of setae are sufficiently distinct to be worthy for recognition of a few genera and species and thence only used in the key.

5. Mouthparts

Mandible - Each mandible is with three apical teeth and their inner margins sometimes bifid. The toothed apex of mandible is usually tapering from base to apex; but in *Oryzaephilus* the apical teeth are broader and the apical part is not tapering from base to apex, which separates this genus from other genera. The well-developed mola bears transverse dorsal ridges, ventral longitudinal rows of asperites and their numbers are variable. The prostheca is simple, somewhat triangular, apically pointed and almost uniform throughout the family.

Maxilla - The falciform maxillary mala bears one to three apical spines. The genera *Silvanus*, *Silvanoprus*, *Protosilvanus*, *Psammoecus* bear single; *Ahasverus*, *Monanus*,

Airaphilus bear two; and *Cryptamorpha* and *Uleiota* bear three apical spines. *Oryzaephilus mercator* and *O. surinamensis* are bearing one and two apical spines respectively. The number of setae on inner margin of mala, both on dorsal and ventral sides are variable and of considerable importance. The maxillary palpus is 3-segmented; segment 1 is transverse, segments 2 and 3 are distinctly elongated, segment 3 is slightly narrower at apex and with sensorial projections at the tip; ratio of length of palpal segments is an important character.

Labium - The labium is narrowed anteriorly with 2-segmented palpi. The relative lengths and widths of palpal segments provide useful characters.

Labrum - The labrum is attached at apex of clypeus, semicircular and almost similar throughout the family.

C. Thorax :

Thoracic tergites and arrangement of setae on pronotum - The thoracic segments are more or less transverse; each tergite bears simple and pointed setae - characteristic for each type and illustration with figure is provided. Rarely, each tergite is with transverse brownish pigmented area in *Airaphilus* and *Oryzaephilus*. These transverse spots are splitted longitudinally along median line in *Oryzaephilus*, whereas entire in *Airaphilus*.

D. Abdomen :

1. **Structure of abdominal segments** - The abdomen consists of ten segments, of which nine segments are easily visible from above. The width of first three or four abdominal segments are more or less equal to thoracic segments and then slightly narrowed; seventh to ninth segments are progressively narrower. Rarely, the tergites are with brownish pigmented area (*Airaphilus*, *Oryzaephilus*), correspondingly similar to that of thoracic tergites. The tergite of ninth segment is small and rarely with long, narrow, pointed unsclerotized urogomphi (*Cryptamorpha* and *Uleiota*). The presence of urogomphi separates the subfamilies Cryptamorphinae and Uleiotinae from Silvaninae and Psammoecinae. The sternite of ninth segment forms a conical pygopod-like structure and varies from elongated to slightly transverse. The tenth segment is represented by a sclerite attached to the apex of pygopod-like structure.

2. **Arrangement of setae** The type and arrangement of setae on abdominal segments are important features and characteristic for each type. The characteristic appearance of individual forms are illustrated with figures.

E. Spiracles :

All spiracles are annular, lying on body surface and uniform throughout the family.

F. Legs :

The legs are well-developed, moderately long and coxae are moderately widely separated. The claws bear tarsungular setae and its number and arrangement are of considerable importance. The claws often bear two tarsungular setae lying side by side (*Silvanus*, *Ahasverus*, *Oryzaephilus*, *Monanus*, *Uleiota*) or one beyond other (*Airaphilus*, *Psammoecus*, *Cryptamorpha*) or single tarsungular seta (*Silvanoprus*, *Protosilvanus*)

SYSTEMATIC ACCOUNT

CHARACTERS OF FAMILY SILVANIDAE

ADULT :

General appearance small to moderately large (1.36 - 11.56 mm.), usually parallel-sided and somewhat flattened or sometimes ovoid and subconvex, elytral puncturation arranged in rows.

Head : Usually slightly elongated, sometimes transverse, usually with a transverse line on vertex behind eyes, fronto-clypeal suture present or absent, often with a pair of lateral longitudinal grooves above eyes, antennal insertions hidden or exposed but never distinctly dorsal. Gular sutures widely separated; anterior part of gular region without longitudinal grooves, rarely with a transverse groove (*Cryptamorpha*); genal process normal. Tentorium simple, with two long tentorial arms often connected by a narrow transverse corpora-tentorium near middle, sometimes with lateral process from tentorial arms. Antenna 11-segmented, scape elongated, with or without club. Mandible with two or three apical teeth, mola well-developed, on dorsal side sometimes with a large cavity near base opening dorsally and protected by a dorsal tubercle, otherwise cavity reduced to a vestige and without dorsal tubercle. Maxilla with distinct lacinia and galea, lacinia narrow and usually without apical spine but fringed with fine hairs, galea broad and its apex densely hairy, palpi with apical segment rarely securiform. Labium with mentum transverse; palpi with apical segment rarely securiform or strongly transverse, or distinctly smaller than segment 2. Labium transverse, its apical margin more or less rounded.

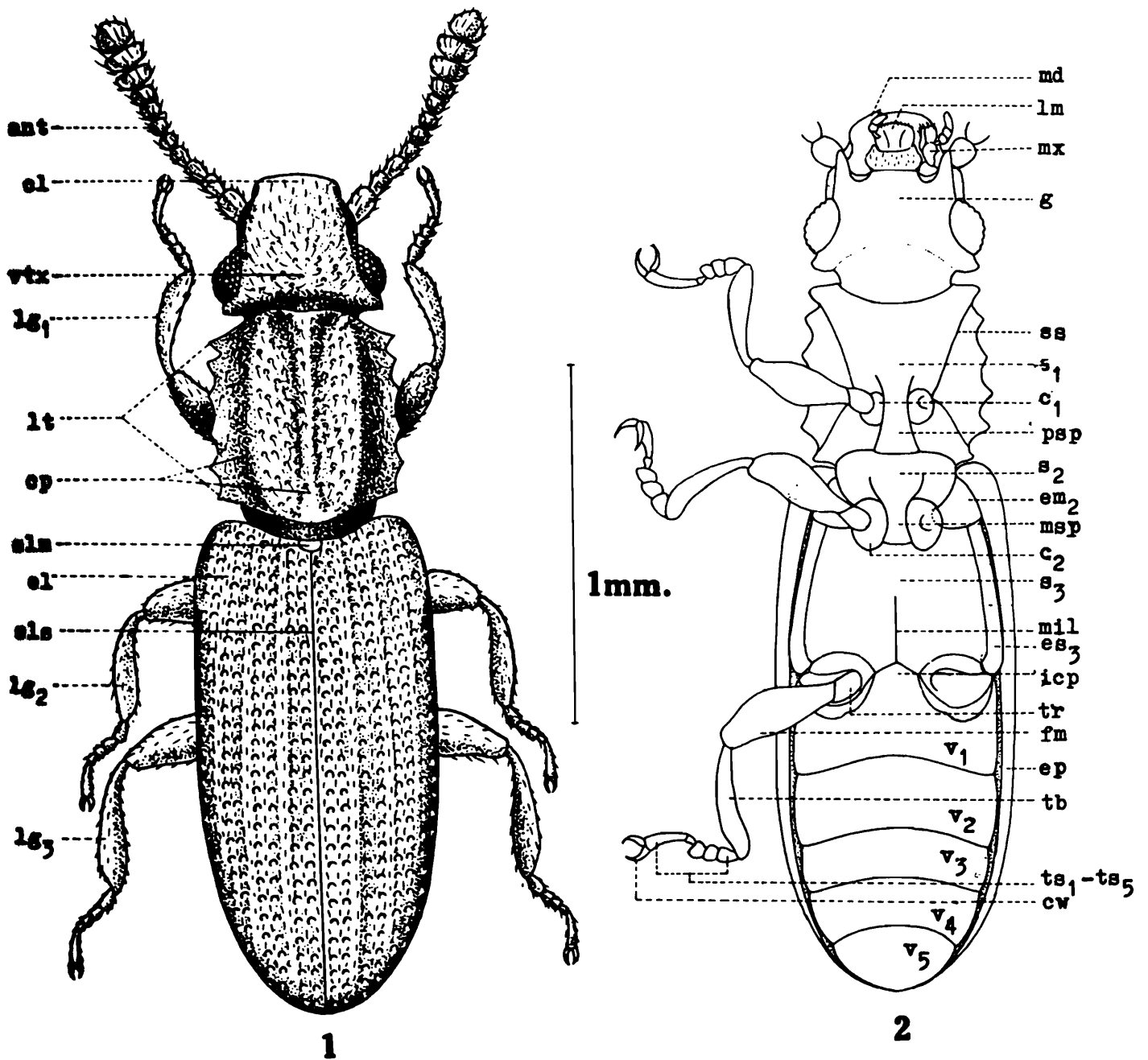
Prothorax : Usually elongated and rarely transverse, side margins often serrated and sometimes with distinct teeth, pronotum without distinct prebasal impressions, prosternum moderately broad with apical margin almost straight, front coxae usually closely and rarely widely situated, trochantins hidden; coxal cavities somewhat rounded, usually externally closed behind and rarely open, internally open or closed.

Meso-metathorax : Mesocoxae often closely situated, Sternal fitting between mesocoxae usually in a straight line or sometimes with a narrow projection from metasternum; mesocoxae broadly opened outwardly, mesepimera extending upto cavities; sometimes pit-like cavities present on anterior part of metasternum; hind-coxae transverse. Metasternum often reduced and without lateral plates, sometimes well-developed with anterior tendons.

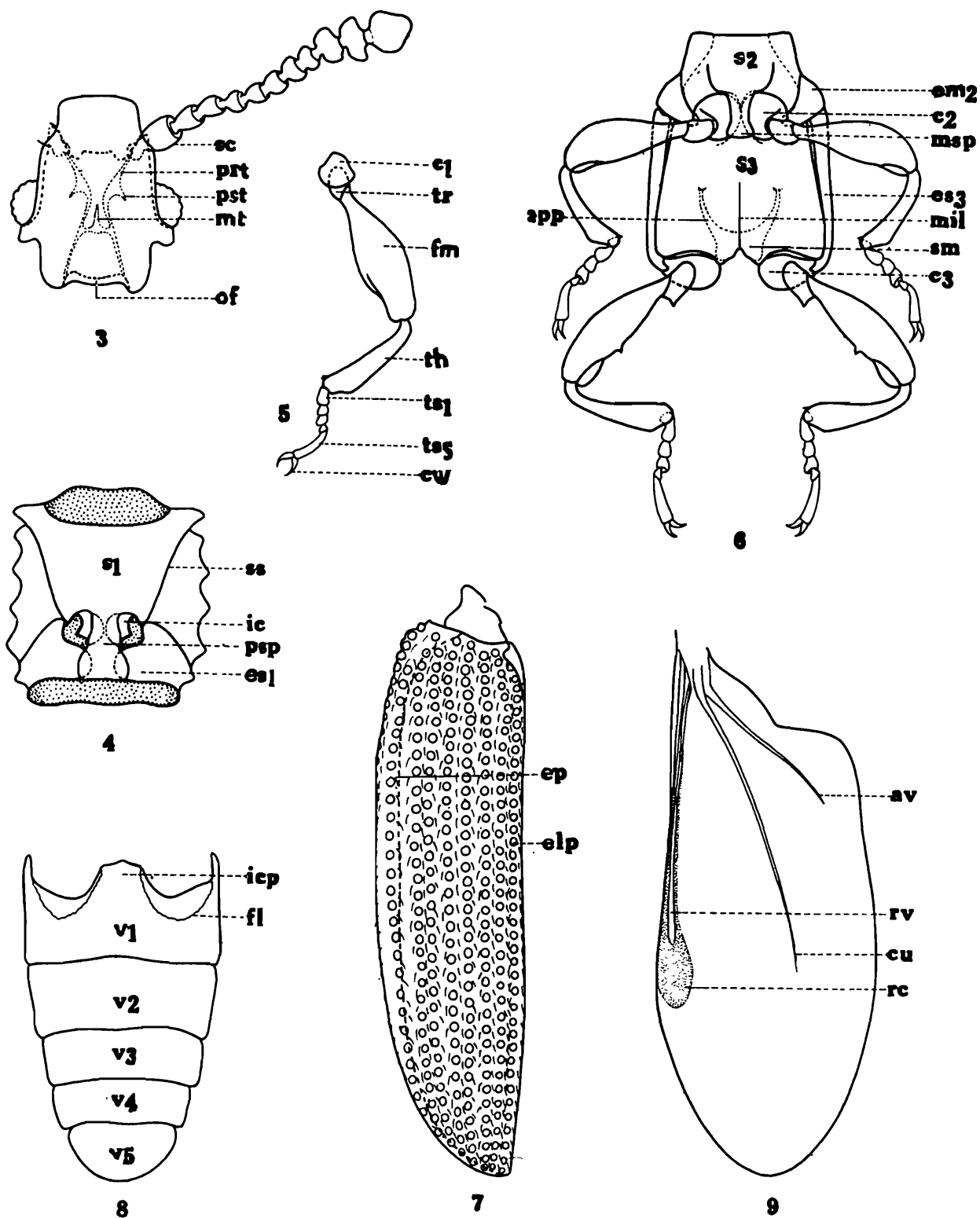
Elytra and Wing : Elytra punctured in regular rows and usually with 9 rows of punctures, rarely with scutellary striae (*Cryptamorpha*), epipleura usually complete upto apex. Wing usually with single anal vein, rarely with five (*Cryptamorpha*) or three (*Uleiota*); devoid of radial cell, R-m cross vein and subcubital fleck.

Legs : Trochanters short and simple, femora swollen towards middle, tibiae slightly broadened at apex and usually with two apical spurs; tarsal formula 5 - 5 - 5 in both sexes, segments 1 to 3 usually simple or slightly lobed and rarely strongly lobed below, length of segment 1 variable, segment 4 smallest, segment 5 elongated, claws simple.

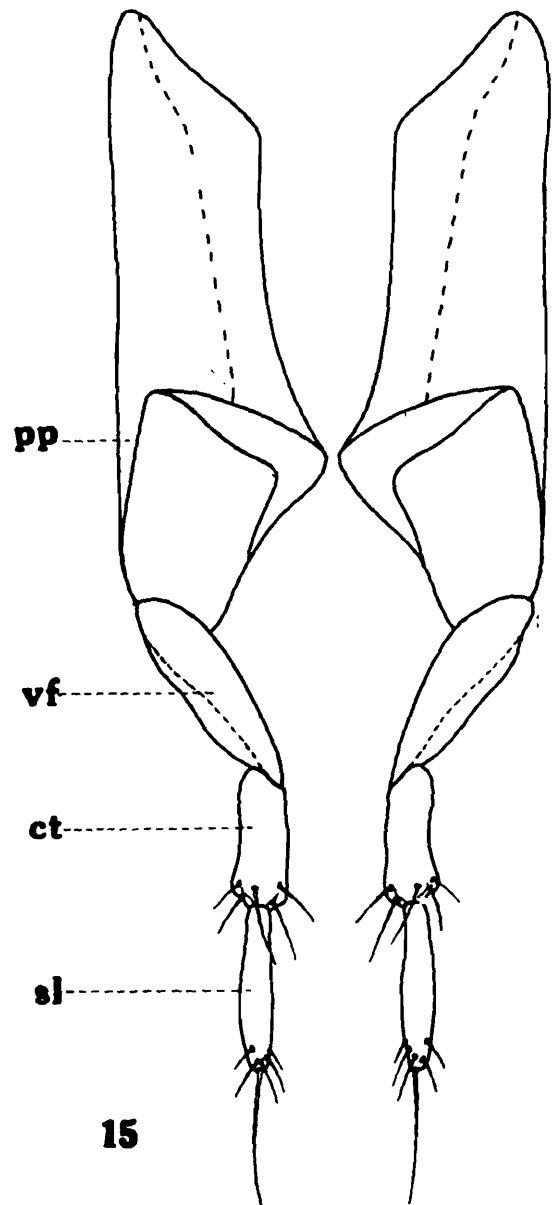
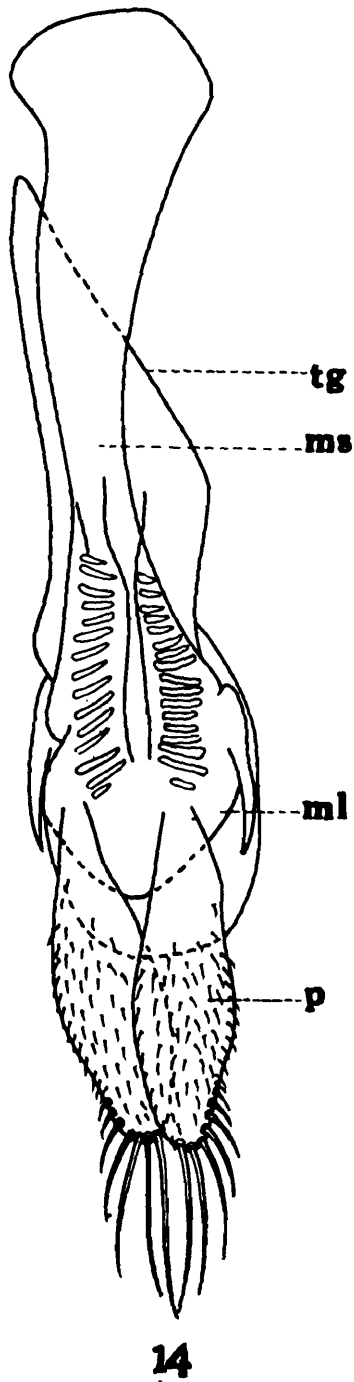
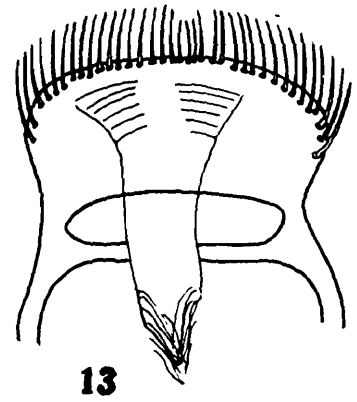
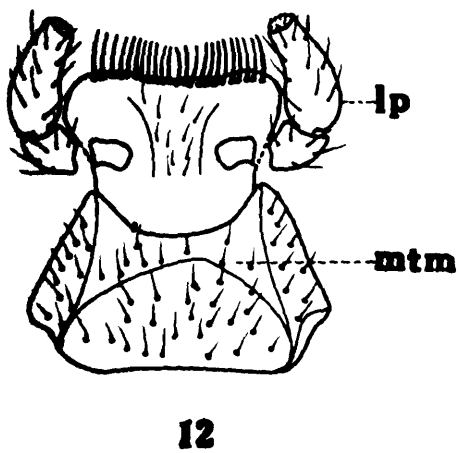
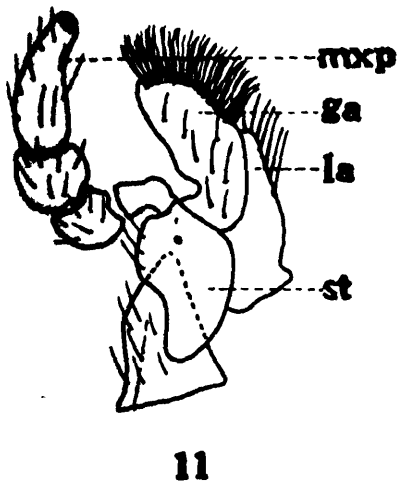
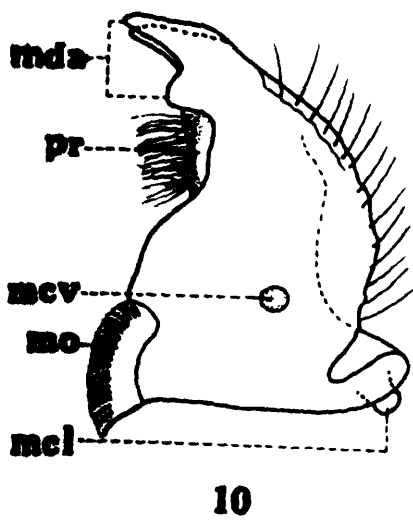
Abdomen : Completely covered by elytra, all ventrites freely articulated, ventrite 1 longest and ventrites 2 to 5 more or less equal in length; ventrite 1 usually with closed



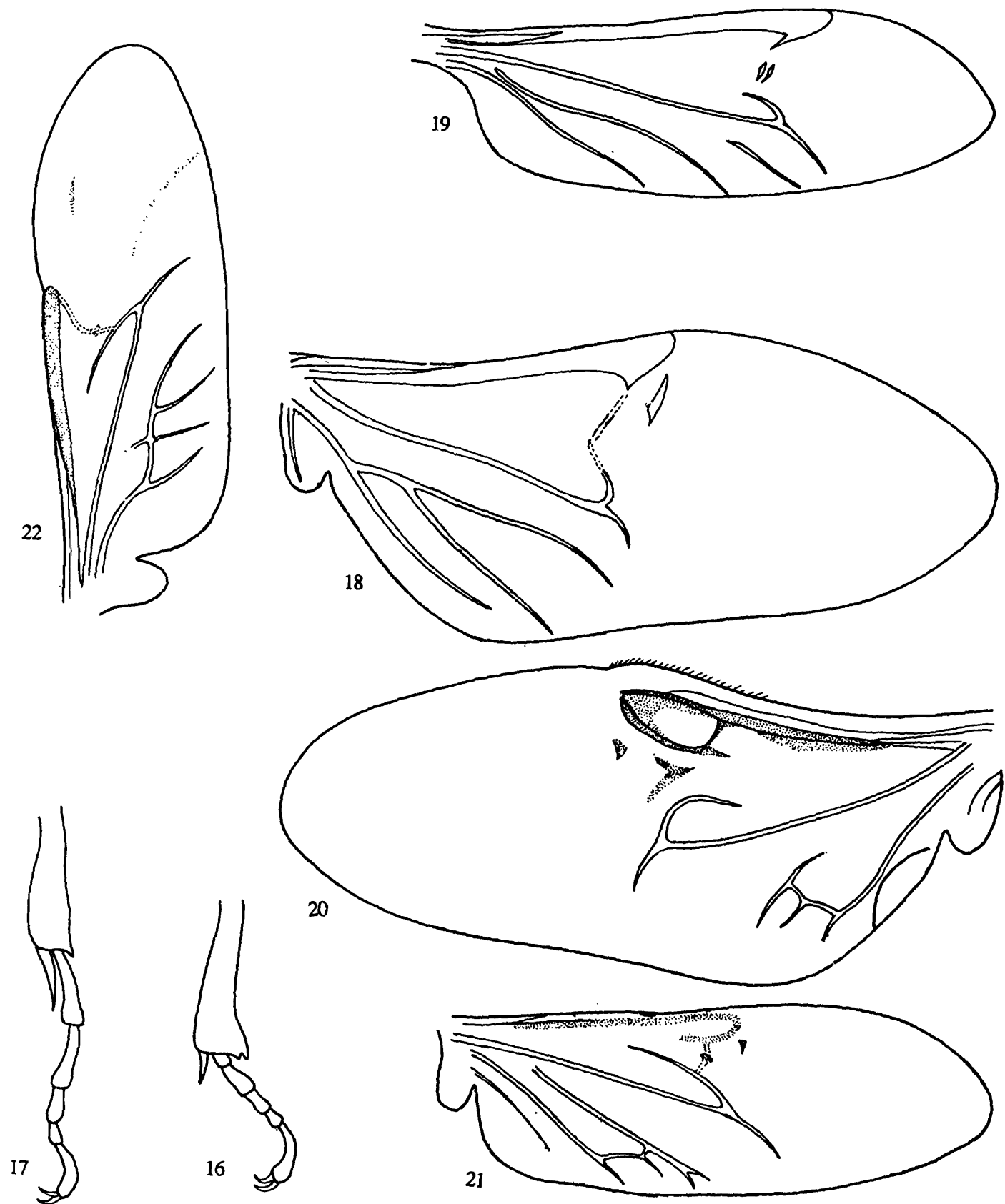
Figs. 1-2. *Oryzaephilus mercator* (Fauvel) : 1, Dorsal view; 2, Ventral view.



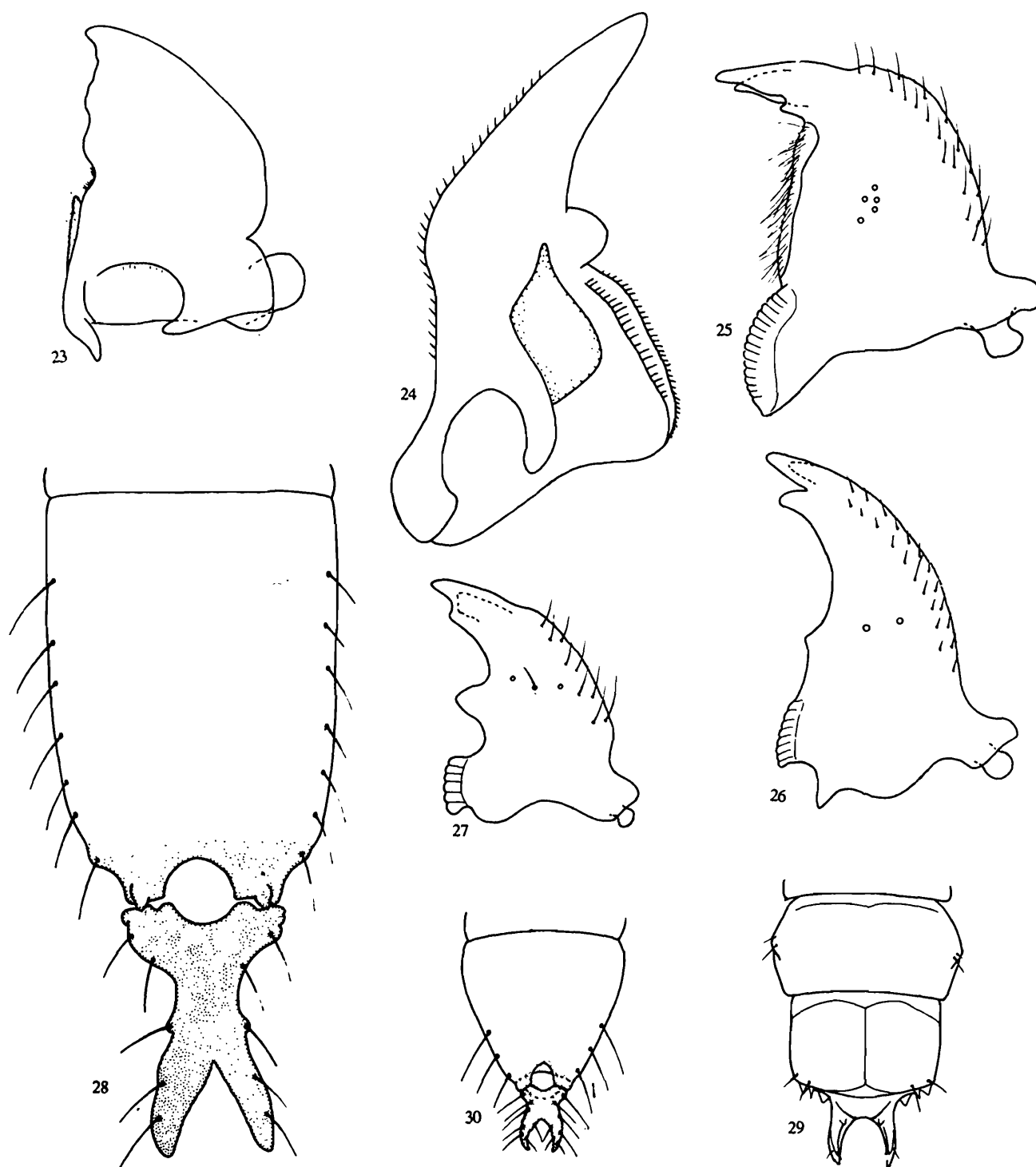
Figs. 3-9. *Oryzaephilus mercator* (Fauvel) : 3, Head, Dorsal view; 4, Prothorax, Ventral view; 5, Front leg; 6, Meso-metathorax, Ventral view; 7, Left elytron, Dorsal view; 8, Abdomen, Ventral view; 9, Wing.



Figs. 10-15. *Oryzaephilus mercator* (Fauvel): 10, Right mandible, Dorsal view; 11, Right maxilla, Ventral view; 12, Labium, Ventral view; 13, Labrum; 14, Aedeagus, Dorsal view; 15, Ovipositor.



Figs. 16-22. 16, Hind tarsus of *Laemotmetus insignis* (Passandrinae); 17, Hind tarsus of *Ancistria* sp. (Ancistriinae); 18, Wing of *Laemotmetus insignis*; 19, Wing of *Ancistria* sp; 20, Wing of *Boganium* sp. (Boganinae); 21, Wing of *Phloestichus* sp. (Phloestichidae); 22, Wing of *Hymaea* sp. (Hymaeinae).



Figs. 23-30. 23, Right mandible of *Laemotmetus insignis* (Passandrinae) Dorsal view; 24, Left mandible of *Ancistria* sp., (Ancistriinae) Dorsal view; 25, Right mandible of *Pediacus* sp., (Cucujinae), Dorsal view; 26, Right mandible of *Pseudolaemus* sp. (Laemophloeinae), Dorsal view; 27, Right mandible of *Cryptolestes pusillus* (Laemophloeinae), Dorsal view; 28, Dorsal view of terminal abdominal segments of larva of *Pediacus* sp. (Cucujinae); 29, Dorsal view of terminal abdominal segments of *Cucujus* sp. (Cucujinae); 30, Dorsal view of terminal abdominal segments of *Cryptolestes* sp. (Laemophlocinae).

femoral lines, rarely open, rarely with glandular pit (*Uleiota*), intercoxal process variable; 7 pairs of spiracles, first six pairs lying on pleural sclerites and 7th pair on the edge of tergite 7. Aedeagus inverted Cucujoid-type, median lobe usually broadly elongated and with a median strut, articulated parameres well-developed. Ovipositor well-developed with 2 - or 3-segmented gonapophyses.

LARVA

General appearance long, narrow, more or less parallel-sided with slightly narrowed posteriorly, often somewhat flattened, antennae and legs moderately long and coxae moderately widely separated.

Head : Moderately to strongly transverse, with more or less distinct Cucujoid-type of frontal suture, without endocarina and metopic suture. Antennal segment 1 elongated, segment 2 markedly long, segment 3 minute or well-developed and sensory appendage minute. Hypostomal rods often distinct and diverging posteriorly. Ocelli five or six on each side of head. Mandible with three apical teeth and their inner margin sometimes dentate, well-developed mola with distinct curved oblique rows of asperites, often with a row of hairs along basal margin; prosthema simple, narrow, pointed, chitinized apically with translucent in basal half and ventral crushing tubercle usually distinct. Maxillary mala falciform with one to three apical spines, a dorsal row of setae present along its inner margin, a rounded process often present on inner margin of stipes, groups of dorsal denticles usually present on palpiger, palpiger well-developed, palpi with segment 1 markedly transverse, segments 2 and 3 distinctly elongated and more or less equal; cardo forming a sharp angle with stipes, maxillary articulating area well-developed and oval. Hypopharynx well-developed and hypopharyngeal bracon distinct. Labial palpi 2-segmented, segment 1 usually transverse, apical segment narrower and slightly elongated.

Thorax and abdomen : Dorsal surface devoid of tubercles or granules; setae sparse, simple and usually pointed. Width of thoracic and first three to four abdominal segments more or less equal. First abdominal segment slightly shorter than segment 2, segments 7 - 9 progressively narrower, tergite 9 small and sometimes with well-developed unsclerotized urogomphi, sternite 9 forming a conical pygopod-like prolongation on which segment 10 forming a small apical part.

Spiracles and legs : All spiracles annular and lying on body surface. Legs sometimes long; coxae small; claws simple and often with two tarsungular setae lying side by side or one above other.

TAXONOMY OF ADULTS

Key to the Adults of Silvanid Subfamilies

1. Front coxal cavities externally widely opened behind (Fig. 309); tarsi simple; antennal scape markedly long, antenna long and filiform; facies parallel-sided with dorsal surface markedly flattened.... *Uleiotinae* p.211

Front coxal cavities externally closed behind (Figs. 4, 255, 284); tarsi usually lobed, rarely simple; antennal scape moderately long, if markedly long and distinctly filiform antenna, body ovoid; facies subconvex or ovoid, if markedly flattened and parallel-sided, antenna clubbed 2

- 2. Antenna short to moderately long, scape rather small and antennal club more or less distinct; head without fronto-clypeal suture; antennal insertions hidden under projections of frons; mandible usually with vestigial cavity and dorsal tubercle absent; dorsal side of head without longitudinal grooves or striae between eyes; tarsi simple or slightly lobed
..... Silvaninae p. 44

Antenna long and slender, scape large and antennal club not distinguishable; head with distinct fronto-clypeal suture; antennal insertions somewhat dorso-lateral and exposed; mandibles with well-developed cavities and dorsal tubercles; head with a pair of longitudinal grooves or striae between eyes; tarsi strongly lobed below 3

- 3. Apical segments of labial and maxillary palpi securiform or strongly transverse; head without curved transverse groove on anterior part of gular region; elytra without scutellary striae Psammoecinae p. 158
- Apical segments of labial and maxillary palpi elongated and more or less fusiform; head with a distinct curved transverse groove on anterior part of gular region; elytra with distinct scutellary striae
..... Cryptamorphinae p. 195

Key to the Adults of Silvanid Genera

- 1. Front coxal cavities externally widely open behind (Fig. 309); tarsi simple; antennal scape markedly long, antenna long and filiform; facies parallel-sided with dorsal surface markedly flattened (Fig. 301)
..... *Uleiota* Latreille p. 211
- Front coxal cavities externally closed behind; tarsi usually lobed, rarely simple; antennal scape moderately long, if markedly long and distinctly filiform antenna, body ovoid; facies subconvex or ovoid, if markedly flattened and parallel-sided, antenna clubbed 2
- 2. Head without fronto-clypeal suture and devoid of longitudinal grooves or striae; antennal insertions hidden under projections of frons, antennal club more or less distinct 3
- Head with distinct fronto-cylpeal suture and a pair of longitudinal grooves or striae present on vertex (Figs. 238, 274); antennal insertions somewhat exposed, antennal club not distinguishable 12

3. Lateral margin of prothorax finely serrated and without large teeth or denticles (Figs. 47, 121, 137) 4
 Lateral margin of prothorax with more or less large teeth or denticles (Figs. 4, 170, 193, 226) 8
4. Prothorax transverse; anterior spines of prothorax moderately large, broadly rounded apically and callosity-like; elytra somewhat ovoid and lateral margins evenly curved outwardly (Fig. 134); femoral lines present on metasternum (Fig. 135) *Ahasverus* Gozis p. 111
 Prothorax elongated; anterior spines of prothorax small to large and more or less pointed apially; elytra somewhat parallel-sided and lateral margins more or less wavy (Figs. 31, 69, 100, 115); metasternum devoid of femoral lines (Figs. 45, 79, 101, 116) 5
5. Species markedly flattened; sterno-pleural suture of prothorax extending to lateral margin; front coxae widely separated (Fig. 121); apical segments of maxillary and labial palpi shorter than segment 2 (Figs. 128, 129); antennal segments 9 and 10 usually with apical spines; 7th elytral interstice more or less carinate *Protosilvanus* Grouvelle p. 102
 Species moderately flattened; sterno-pleural suture of prothorax extending to anterior spine; front coxae less widely separated (Figs. 47, 81, 103); apical segments of maxillary and labial palpi longest (Figs. 54, 55); antennal segments 9 and 10 devoid of apical spines; elytral interstices not carinate 6
6. Apex of anterior spines lying beneath front margin of prothorax; antennal segments 4 to 8 about as broad as long (Fig. 100); femoral lines on abdominal ventrite 1 opened (Figs. 106); dorsal surface of head and prothorax rather sparsely punctured and somewhat shiny; apex of each paramere with more than one long seta (Fig. 113)
 *Silvanoides* Halstead p. 96
 Apex of anterior spines lying in a same level or beyond front margin of prothorax; antennal segments 4 to 8 elongated (Figs. 31, 69); femoral lines on ventrite 1 closed (Figs. 50, 84); dorsal surface of head and prothorax with dense, coarse punctures and rather dull; apex of each paramere with one long seta (Figs. 58, 92) 7
7. Tarsal segment 3 strongly lobed below (Fig. 79)
 *Silvanoprus* Reitter p. 75
 Tarsi simple (Fig. 45) *Silvanus* Latreille p. 44
8. Lateral margin of prothorax with 6 distinct teeth or denticles (Figs. 1, 149, 165) 9

- Lateral margin of prothorax with at least 8 teeth or denticles (Figs. 189, 220) 11
9. Pronotum with three distinct longitudinal carinae (Fig. 1); lateral margins of mesosternal process simple and not notched (Figs. 6)
 *Oryzaephilus* Ganglbauer p. 128
- Pronotum uniformly convex and devoid of longitudinal carinae (Figs. 149, 165); lateral margins of mesosternal process usually notched (Figs. 154, 172) 10
10. Antenna short; antennal segment 9 slightly wider than segment 8, distinctly narrower than segment 10 and club somewhat 2-segmented (Figs. 165, 167); tarsal segment 3 slightly incrassate (Fig. 172)
 *Silvanopsis* Grouvelle p. 122
- Antenna moderately long; antennal segment 9 distinctly wider than segment 8, slightly narrower than segment 10 and club clearly 3-segmented (Fig. 149); tarsal segment 3 strongly lobed below (Fig. 154)
 *Silvanolomus* Reitter p. 116
11. Pubescence on dorsal surface long and distinct; lateral margin of prothorax with 8 to 15 denticles and each denticle with a posteriorly directed long seta; apical margin of clypeus more or less rounded (Figs. 220, 221); only tarsal segment 3 strongly lobed below (Fig. 228); mandible with 2 apical teeth and a well-developed dorsal cavity (Fig. 232); species usually dark brown
 *Airaphilus* Redtenbacher p. 150
- Pubescence on dorsal surface short and fine; lateral margin of prothorax with 8 to 11 denticles and each denticle with an anteriorly directed short seta; apical margin of clypeus almost straight (Figs. 189, 206); tarsal segments 2 and 3 strongly lobed below (Fig. 195); mandible with 3 apical teeth and vestige of dorsal cavity (Fig. 199); species yellowish-brown to reddish-brown
 *Monanus* Sharp p. 139
12. Apical segments of labial and maxillary palpi elongated and more or less fusiform (Figs. 292, 293); elytra more or less parallel-sided with distinct scutellary striae; head with a distinct curved transverse groove on anterior part of gular region (Fig. 282); sternal fitting between mesocoxae in a slightly curved line (Fig. 286); tarsal segment 3 bilobed (Fig. 285)..
 *Cryptamorpha* Wollaston p. 195
- Apical segments of labial and maxillary palpi securiform or strongly transverse (Figs. 262, 263); elytra ovoid and without scutellary striae; head devoid of curved transverse groove on anterior part of gular region; sternal fitting between mesocoxae with a narrow short projection from metasternum (Fig. 257); tarsal segment 3 lobed below (Fig. 253) 13

13. Facies broadly elongated; antenna somewhat moniliform, scape moderately long and widest near apex, segment 4 normally long; lateral margin of prothorax usually finely denticulate and rarely with a few moderately long spines; sides of elytra rarely explanate, epipleura moderately developed, lateral margins usually smooth; longitudinal striae on vertex between eyes distinct; metasternum normal; wing with single anal vein
 *Psammoecus* Latreille p. 158

Facies elongate-ovoid; antenna distinctly filiform, scape markedly long and narrowed at apex, segment 4 markedly long; lateral margin of prothorax armed with long spines (Fig. 271); sides of elytra markedly explanate, epipleura markedly developed, lateral margin spinose (Figs. 273, 273); metasternum markedly short; species apterous ... *Indophanus* Pal p. 191

Subfamily I SILVANINAE

Genus 1. *Silvanus* Latreille

1804. *Silvanus* Latreille, *Histoire Naturelle, générale et particulière, des crustacés et des insectes*, **11** : 158.
 1807. *Silvanus* : Latreille, *Genera Crustaceorum et Insectorum* **3** : 19.
 1823. *Leptus* Duftschmidt, *Fauna Austriae*, **3** : 156.
 1899. *Leptus* : Ganglbauer, *Die Käfer von Mitteleuropa*, **3** : 581.
 1912. *Silvanus* : Grouvelle, *Annls Soc. ent. Fr.* **81** : 332 340.
 1930. *Silvanus* : Hetschko, *Coleopt. Cat.*, **109** : 59.
 1973. *Silvanus* : Halstead, *Bull. Br. Mus. nat. Hist (Ent.)* **29** (2) : 41, 47.
 1977. *Silvanus* : Pal and Sengupta, *Oriental Ins.*, **11** (2) : 270 - 271.

Type species : *Ips unidentata* Olivier.

Historical review : *Silvanus* is one of the large genus of the subfamily Silvaninae. The genus was proposed by Latreille (1804) for the species, *Ips unidentata* Olivier, and later in 1807 he described the genus. Subsequently several unrelated species were described under this genus by various workers. Ganglbauer (1899) first revised the genus *Silvanus*. Grouvelle (1912) erected 4 subgenera, viz., *Microsilvanus*, *Parasilvanus*, *Protosilvanus* and *Cathartosilvanus* under this genus. Hetschko (1930) in Junk's 'Coleopterorum Catalogus' listed 55 species under *Silvanus* including 3 species, viz., *S. bidentatus* (Fabricius), *S. lateritius* Reitter and *S. lewisi* Reitter from India. Halstead (1973) while revising *Silvanus* pointed out that in "Coleopterorum Catalogus" Hetschko has erroneously included 21 species. He also established 3 more new genera, viz., *Calpus*, *Pensus* and *Silvanoides*, and given generic status to Grouvelle's subgenera *Cathartosilvanus*, *Parasilvanus* and *Protosilvanus*, and merged the subgenus *Microsilvanus* with *Silvanus*. Halstead recognised 17 valid species under *Silvanus* of which 5 species are recorded from India, viz., *S. lewisi*, *S. bidentatus*, *S. recticollis* Reitter, *S. difficilis* Halstead and *S. rossi* Halstead, and transferred the Indian species *S. lateritius* Reitter to the genus *Protosilvanus* Grouvelle. Pal and Sengupta (1977) added 5 more new species to this genus from India. In the present study 3 new species are described, *S. gibbus* Pal and Sengupta and *S. ruficarpus* Pal and Sengupta

are synonymised with *S. difficilis* Halstead, *S. curvispinus* Pal and Sengupta is synonymised with *S. robustus* Halstead, and larva of *S. difficilis* is described for the first time.

Habit - habitat : *Silvanus* Latreille is comprised of minute and flat beetles (2-3.5 mm.), live primarily under bark of fallen or dead standing trees, found also in mouldy stored food products and rarely in haystack. Halstead (1973) reported 12 species those are associated with stored food products in Britain.

Geographical distribution : The genus *Silvanus* is widely distributed to all the Zoogeographical regions, but predominantly in the Oriental countries, tropical Africa and Australia. This genus also occurs abundantly all over India. The majority of the Indian *Silvanus* have northern distribution patterns. These widespread northern species may further be divided into those primarily northern (*S. rossi*, *S. imitatus*, *S. robustus* and *S. bhutanicus*) and those fairly common in northern and southern parts (*S. lewisi*, *S. difficilis* and *S. familiaris*). *S. lewisi* and *S. difficilis* are the most widely distributed forms, extending from the higher elevations of northern India towards southern into Tamil Nadu, occurring in both lowland and montane situations. These two species reveal a wider distribution in far eastern countries extending into Australia, of which *S. lewisi* bears its distribution also in Africa. *S. rossi* and *S. robustus* are montane species, occurring only at higher elevations in the Northwestern and Northeastern parts of the country respectively. *S. recticollis*, with a fairly wide distribution in South-East Asia and Africa is hitherto recorded in India only from the Gangetic West Bengal. The remainder of the Indian species are so far having restricted distributional records. Of the 12 species dealt with here, the majority probably have Oriental affinities and most of them have closely related counter-parts in South-East Asia. *S. bidentatus* appears to be an isolated Palaearctic form, represented in South India.

Description : General form (Fig. 31) elongated, moderately depressed, usually reddish-brown to blackish-brown.

Head (Fig. 46) elongated, front margin of clypeus almost straight, eyes moderately large and coarsely faceted, temple often flattened beneath eye, transverse impressed line on vertex behind eyes present, tentorium with two long tentorial arms and a transverse bridge (corpo-tentorium) near middle. Antenna moderately long and slender, antennal insertions hidden under projection of frons, 11-segmented, scape broadly elongated, segments 2 (pedicel) - 8 subequal and narrower than scape, club loose and 3-segmented. Mandible (Fig. 53) elongated with 3 apical teeth, mola well-developed and a trace of dorsal mandibular cavity present near base. Maxilla (Fig. 54) with lacinia narrow, elongated and without apical spine; galea short, broad and its apex densely hairy; palpi fringed with few setae, palpi with segment 2 slightly longer than segment 3, apical segment longest and fusiform. Labium (Fig. 55) with mentum triangular, palpi with apical segment longest and fusiform. Labrum (Fig. 56) with apical margin slightly rounded.

Prothorax (Fig. 47) usually longer than broad; front angle with a prominent spine, side margins finely serrated; pronotum with a median disc usually demarcated by shallow lateral depressions; prosternal process broad at apex and its apical margin straight; front-coxae moderately widely separated, coxal cavities rounded, cavities closed behind externally and internally, sterno-pleural sutures extending to front angles.

Meso-metathorax (Fig. 49) : Mesocoxae narrowly separated, cavities broadly opened outwardly, lateral margins of mesosternal process notched at middle, sternal fitting between mesocoxae almost in a straight line. Metasternum about as broad as long, median impressed line extends anteriorly almost upto apex, hind coxae more widely separated, metendosternite simple and represented by two appophyses.

Wing and Elytra : Wing (Fig. 52) with single anal vein; without radial cell, anal cell and subcubital fleck. Elytra somewhat parallel-sided, usually slightly sinuate across anterior one-third, each elytron (Fig. 51) with 9 rows of stria punctures, without scutellary striole, single and double rows of pubescence on alternate interstices, epipleura narrow and complete upto apex.

Legs (Fig. 48) moderately long, trochanters short and simple, femora usually swollen towards middle, tibiae not broadened at apex and with two apical spurs, tarsal formula 5-5-5 in both sexes, tarsi simple, tarsal segment 1 long, segments 2 and 3 shorter and subequal, segment 4 shortest, claws simple.

Abodmen (Fig. 50) elongated, ventrite 1 longest, intercoxal process broad and its apical margin broadly pointed, femoral lines closed; ventrites 2-5 subequal. Aedeagus (Fig. 58) with median lobe broad; median strut single, elongated and its apex spatulate; parameres non-articulated, well-developed, slender, elongated and its apex bilobed. Ovipositor (Fig. 57) with well-developed paraprocts, valvifers, coxites, and long styli attached on outer margin of apex of coxites.

Larva known : *Silvanus difficilis* Halstead, by present description.

Sexual dimorphism : The most prominent dimorphism among Indian species is seen in *robustus* and *bidentatus* where the hind-trochanter in male with a short denticle; in male of some other species hind femur with a more or less distinct ridge(detail under the description of species).

Key to the Species of *Silvanus* Latreille

- 1. Temple not distinctly flattened beneath eye to form a platform, eyes small with fewer facets; anterior spine of prothorax directed towards front and its tip distinctly blunt (Fig. 34)*recticollis* Reitter p. 53

Temple distinctly flattened beneath eye to form a platform, eyes moderately or markedly large and with many facets; anterior spine of prothorax directed slightly outwards and its tip more or less pointed (Figs. 31, 39) 2
- 2. Temple markedly short and represented by a thin platform, length of temple shorter than width of one eye facet and its outer apical angle pointed (Figs. 31-33) 3

Temple distinct and thick, length of temple longer than width of one eye facet and its outer apical angle somewhat broad (Figs. 35-44) 5

3. Prothorax short and broad, hardly longer than broad excluding anterior spines (1.00 : 0.98), anterior one-third of lateral margin not sinuate before formation of anterior spine (Fig. 32) *imitatus* Pal and Sengupta p. 50
 Prothorax distinctly elongated, distinctly longer than broad excluding anterior spines (1.00 : 0.84 - 0.88), anterior one-third of lateral margin sinuate before formation of anterior spine (Figs. 31, 33) 4
4. Anterior spine of prothorax long and about as long as half of length of eye (Fig. 31); aedeagus with outer apical lobe of each paramere bearing two setae and of which outer one shorter (Fig. 58) *lewisi* Reitter p. 48
 Anterior spine of prothorax short and as long as one-third of length of eye (Fig. 33); aedeagus with outer apical lobe of each paramere bearing two setae and of which outer one longer (Figs. 59)
 *familiaris* sp. nov. p. 52
5. Inner margin of anterior spine of prothorax distinctly curved outwardly (Fig. 35); aedeagus with median lobe expanded before apex (Fig. 61)
 *rossi* Halstead p. 55
 Inner margin of anterior spine of prothorax usually almost straight; aedeagus with median lobe not expanded before apex 6
6. Eyes about half as long as head (Figs. 36, 40, 41), distance between two eyes on ventral side less than 1.5 times wider than length of each eye
 7
 Eyes hardly one-third as long as head (Figs. 39, 43, 44), distance between two eyes on ventral side at least twice wider than length of each eye
 10
7. Outer margin of anterior spine of prothorax curved inwardly and its tip projected somewhat inwardly and towards front, prothorax somewhat elliptical excluding anterior spines; antennal segment 9 elongated (Fig. 41); aedeagus with apical projection of median lobe elongated and pointed (Fig. 67); hind trochanter of male with a short spine
 *robustus* Halstead p. 63
 Outer margin of anterior spine of prothorax straight and directed more outwardly, prothorax not elliptical excluding anterior spines and distinctly narrowed posteriorly; antennal segment 9 transverse (Figs. 36, 40, 42); aedeagus with apical projection of median lobe short and blunt (Figs. 62, 68); hind trochanter of male devoid of spines 8
8. Anterior spine of prothorax short and about one-third as long as eye (Fig. 42) *andamanicus* sp. nov. p. 64
 Anterior spine of prothorax distinctly longer and at least half as long as eye (Figs. 36, 40) 9

9. Anterior spine of prothorax long, distinctly longer than half as long as eye, slightly narrow and its tip somewhat pointed; lateral margin of prothorax sinuate before posterior angle to form a short spinous projection; antennal segment 7 not longer than segment 6; colour blackish-brown (Fig. 40) ..
.....*nigrans* Pal and Sengupta p. 61
- Anterior spine of prothorax moderately long and about half as long as eye, comparatively broader and its tip blunt; lateral margin of prothorax not or little sinuate before posterior angle and without spinous proejction; antennal segment 7 slightly longer and broader than segment 6; colour yellowish to reddish-brwon (Figs. 36)*difficilis* Halstead p. 57
10. Anterior spine of prothorax, short, narrow, its tip pointed and projected towards lateral sides; posterior one-third of elytra distinctly narrowed towards apex (Fig. 39)*bidentatus* (Fabricius) p. 59
- Anterior spine of prothorax distinctly broader, its tip projecting anteriorly or antero-laterally; posterior one-third of elytra slightly narrowed towards apex (Fig. 43, 44) 11
11. Prothorax as broad as long, anterior spine projecting anteriorly, puncturation on median part of pronotum distinctly finer than on lateral sides, lateral longitudinal depressions on pronotum absent (Fig. 43)
.....*silvanus* sp. p. 66
- Prothorax elongated, anterior spine projecting antero-laterally puncturation on pronotum coarse and unifrom throughout, lateral longitudinal depressions on pronotum distinct. (Fig. 44)*bhutanicus* sp. nov. p. 67

1. *Silvanus lewisi* Reitter

1876. *Silvanus lewisi* Reitter, *Col. Hefte*, **15** : 76 (Type-loc. : Japan; Type deposition British Museum Nat. Hist., London).
1908. *Silvanus lewisi* : Grouvelle, *Annls Soc. ent. Fr.*, **77** : 491.
1912. *Silvanus (Silvanus) lewisi* : Grouvelle, *Annls Soc. ent. Fr.*, **81** : 338.
1973. *Silvanus lewisi* : Halstead, *Bull. Br. Mus. nat. Hist. (Ent.)*, **29** (2) : 53.
1977. *Silvanus lewisi* : Pal and Sengupta, *Oriental Ins.*, **11**(2) : 272-273.

S. lewisi can be easily distinguished from other Indian species of *Silvanus* in having large eyes, temple shorter than one eye facet and with pointed outer apical angle; prothorax elongated and slightly convergent posteriorly, anterior spine about half as long as eye and its tip pointed; aedeagus (Fig. 58) with apex of each paramere bilobed, outer apical lobe with two setae of which the outer one is comparatively shorter.

Description : General form (Fig. 31) elongaed, moderately depressed, uniformly yellowish to reddish-brown; covered with short, semierect, golden pubescence.

Head : Exposed part of head wider than long, eyes large and about half as long as head, length of temple shorter than width of one eye facet, temple extended laterally beneath eye

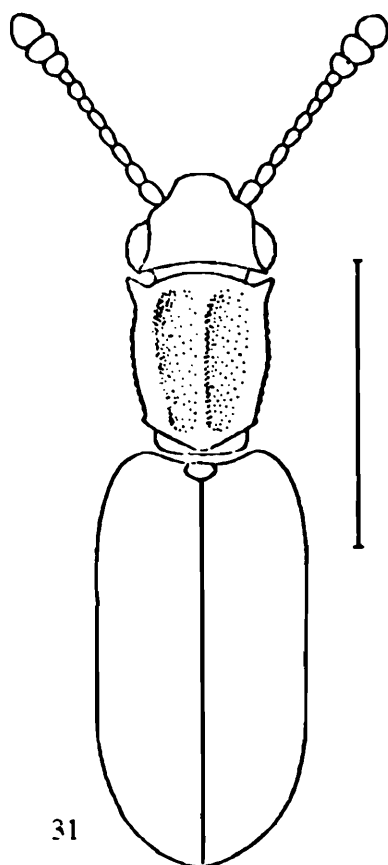


Fig. 31. *Silvanus lewisi* Reitter, Dorsal view (Scale = 1.0 mm)

and its outer apical angle pointed, puncturation on vertex coarse and dense and that of near anterior margin of clypeus finer, setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel about as long as scape and slightly narrower, segment 3 slightly shorter and narrower than pedicel, segments 4 and 5 equal and slightly shorter than segment 3, segment 6 shorter than segment 5, segment 7 longer than segment 6, segment 8 slightly shorter than segment 7, segments 9 and 10 transverse and segment 11 about as broad as long. *Prothorax* convex, elongated, width across anterior spines greater than across middle (1.13 - 1.20 : 1.00); anterior spines originate rather gradually from sides, moderately large and about half as long as each eye and its tip pointed; lateral margin of prothorax curved and with few small denticles, lateral depressions on pronotal disc slightly marked, puncturation on pronotum coarse and dense and similar to that of vertex of head, setae projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* two times as long as broad, widest near middle, lateral margins wavy and explanate, rows of punctures on elytra deep and large and setae projected posteriorly. Puncturation on ventral side finer than on dorsal side. Aedeagus (Fig. 58) with apical projection of median lobe short; apex of each paramere bilobed, inner lobe long with a long seta, and outer lobe short with two short setae of which the inner one comparatively longer. In male hind-femur with a short ridge on posterior margin and posterior margin of hind-tibia with a row of spinules.

Measurements : Total length 2.08-2.47 mm., width of head across eyes 0.44-0.48 mm., length of antenna 0.67-0.87 mm., width of prothorax across middle 0.44-0.48 mm., length of elytra 1.25-1.44 mm. and width across middle 0.63-0.70 mm.

Materials examined : 34 ex. INDIA : ASSAM, Phulbari, 4 ex., 24.xi.1974, T. Sengupta, under bark of *Shorea robusta*; 1 ex., 24.xi.1974, T. Sengupta, under bark of *Bombax* sp.; MEGHALAYA, Dainadubi Reserve Forest, Garo hills, 3 ex., 18.xi.1974, T. Sengupta, under bark of fallen *Shorea robusta* tree; WEST BENGAL, Darjeeling district, Sukna, 1 ex., 5.v.1976, T. K. Pal, under bark; Calcutta (Ultandanga and Chetla), 2 ex., 16.iii.1975, T. K. Pal, under bark; 3 ex., 12 & 20.iv.1975, T. K. Pal, under bark of *Bombax* sp.; HIMACHAL PRADESH, Ramdhada, 12 km. O Mandi, 5 ex., 22.x.1981, T. K. Pal, under bark; UTTAR PRADESH, Dehra Dun, Lakshibag, 2 ex., 10.vi.1975, T. Sengupta, under bark; Dehra Dun, Jhajra, 1 ex., 18.viii.1926, F. Ent., ex. *Shorea robusta*; KERALA, Walayar Forest, 1 ex., 1.xii.1971, T. Sengupta, under bark; ANDAMAN Is., S. Andaman, Chatham, 8 ex., 5.xii.1928, under bark of *Sterculia campanulata* (3 ex.), ex. *Terminalia bialata* (4 ex.), ex. *Shorea robusta* (1 ex.).

Distribution : INDIA : Assam, Meghalaya, West Bengal, Himachal Pradesh, Uttar Pradesh, Tamil Nadu, Karnataka, Kerala, Andaman Is.; SRILANKA; VIETNAM; TAIWAN; JAPAN; MALAYSIA; SINGAPORE; INDONESIA; PHILIPPINES; NEW GUINEA; SOLOMON Is.; AUSTRALIA; CONGO; GHANA.

Remarks : Grouvelle (1908) first recorded this species in India from Nilgiri Hills (Tamil Nadu). Halstead (1973) recorded it from Sendhara (Madhya Pradesh); Cinchona, Annamalai Hills, Coimbatore (Tamil Nadu); Dohnavar, Kanara, Mysore (Karnataka). Pal and Sengupta (1977) recorded *lewisii* from Assam, Meghalaya, West Bengal, Uttar Pradesh, Kerala and Andaman Islands.

2. *Silvanus imitatus* Pal and Sengupta

1977. *Silvanus imitatus* Pal and Sengupta, *Oriental Ins.*, 11(2) : 273 (Type-loc. : Phulbari, Assam, India; Type-deposition-Zoological Survey of India, Calcutta).

This species is closely related to *S. lewisii* but can be easily separated by its prothorax comparatively broader, excluding anterior spines the prothorax hardly longer than broad (1.00 : 0.98), anterior one-third of lateral margin of prothorax not sinuate before formation of anterior spine, puncturation on head and pronotum slightly coarser and lateral margins of elytra more distinctly wavy at middle.

Description : General form (Fig. 32) elongated, moderately depressed, uniformly reddish-brown and covered with short, semierect, golden pubescence.

Head : Exposed part of head wider than long, eyes large and length of eye about half as long as head, length of temple shorter than width of one eye facet, temple extended laterally beneath eye and its outer apical angle pointed, puncturation on vertex coarse and dense and that of near anterior margin of clypeus finer, setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel about as long as scape but slightly narrower, segment 3 slightly shorter and narrower than pedicel, segments 4 and 5 equal and slightly shorter than segment 3, segment 6 shorter than segment

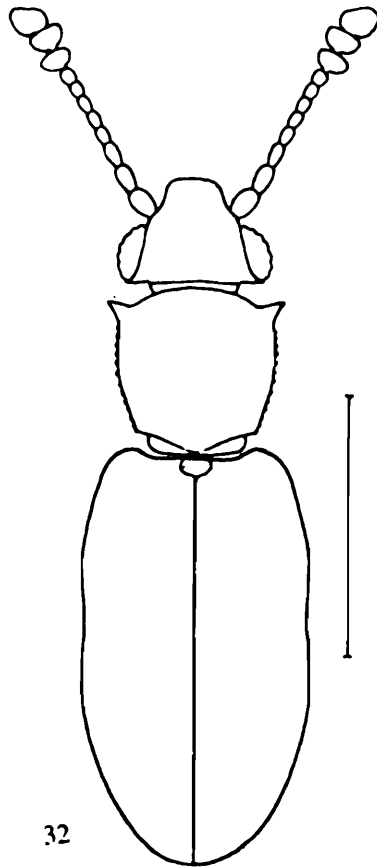


Fig. 32. *Silvanus imitatus* Pal and Sengupta, Dorsal view (Scale = 1.00 mm)

5, segments 7 and 8 equal and slightly shorter than segment 6, segments 9 and 10 transverse and segment 11 elongated. *Prothorax* convex, almost equal in length and breadth, width across anterior spines greater than across middle (1.10 : 1.00); anterior spines originate rather gradually from sides, moderately large and its length slightly less than half of length of each eye and its tip pointed; lateral margin of prothorax curved and with few small denticles, lateral depressions on pronotal disc slightly marked. Punctuation on pronotum coarse and dense and similar to that of vertex of head, setae projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* about two times as long as broad, widest near middle, lateral margins wavy and explanate, rows of punctures on elytra deep and large and setae projected posteriorly. Punctuation on ventral side finer than on dorsal side.

Measurements of holotype : Total length 2.41 mm., width of head across eyes 0.52 mm., length of antenna 0.80 mm., width of prothorax across middle 0.54 mm., length of elytra 1.50 mm. and width across middle 0.75 mm.

Material examined : *Holotype*, INDIA : ASSAM, Phulbari, 24.x.1974, T. Sengupta, under bark of log (Zoological Survey of India, Calcutta; Reg. No. 7963/H4A).

Distribution : INDIA : Assam.

Remarks : So far this species is known only from its type-locality.

3. *Silvanus familiaris* sp. nov.

The facies of this species closely resembles *Silvanus lewisi* Reitter and *S. difficilis* Halstead, but can be easily differentiated from the former species by its anterior spine of prothorax shorter and about one-third of length of eye; aedeagus with outer lobe of paramere bears two setae and unlike *lewisi* the outer seta is longer than inner one, apical projection of median lobe slightly less tapered. It may be distinguished from the latter species by its temple shorter than width of one eye facet and its outer apical angle pointed, anterior spine of prothorax slightly shorter, lateral margin of prothorax not sinuate before formation of anterior spine; aedeagus of this species with apical third of median lobe gradually narrowed posteriorly, outer lobe of paramere distinctly shorter than inner one and bears two setae of which the outer one longer.

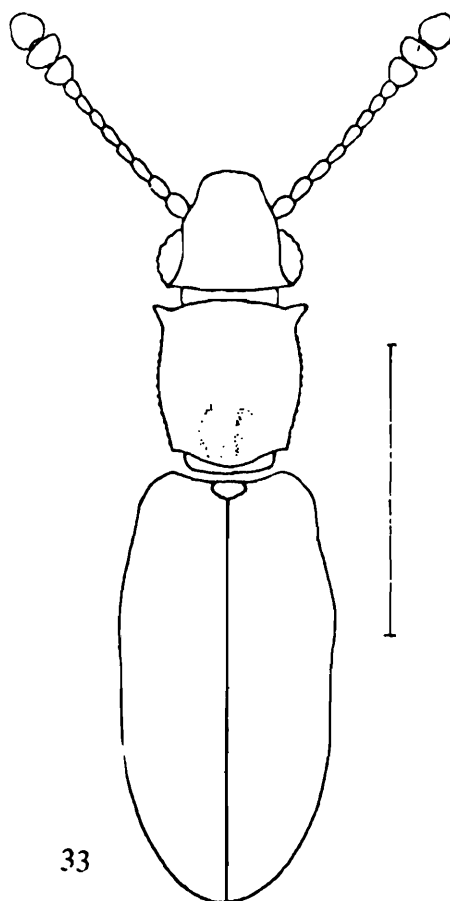


Fig. 33. *Silvanus familiaris*, sp. nov., Dorsal view (Scale = 1.0 mm).

Description : General form (Fig. 33) elongated, moderately depressed, uniformly reddish-brown and covered with short, semierect, golden pubescence.

Head : Exposed part of head wider than long, eyes large, length of eye slightly less than half of length of head, length of temple shorter than width of one eye facet, temple extended laterally beneath eye and its outer apical angle pointed, punctuation on vertex coarse and dense and that of near anterior margin of clypeus finer, setae short and projected towards

middle line. Antenna moderately long and slender, scape moderately large, pedicel about as long as scape but slightly narrower, segment 3 about as long as pedicel and slightly narrower, segments 4 and 5 almost equal and slightly shorter than segment 3, segment 6 slightly shorter than segment 5, segment 7 about as long as segment 6 and slightly wider, segment 8 shorter than segment 7, segments 9 and 11 about as long as broad and segment 10 transverse. *Prothorax* slightly elongated, width across anterior spines greater than width across middle (1.12 : 1.00); anterior spines originate rather gradually from sides, short and its length about one-third of length of eye and its tip somewhat pointed; lateral margin curved and with few small denticles, lateral depressions on pronotal disc slightly marked. Punctuation on pronotum coarse and dense and similar to that of vertex to head, setae projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* about two times as long as broad, widest near middle, lateral margins wavy and explanate, rows of punctures on elytra deep and large, setae projected posteriorly. Punctuation on ventral side finer than on dorsal side. Aedeagus (Fig. 59) with median lobe slightly broader behind middle and its apical projection short; apex of each paramere bilobed, inner lobe longer and with a long setae and outer lobe with two shorter setae. In male hind femur with short ridge on posterior margin and posterior margin of hind tibia with a row of spinules.

Measurements of holotype : Total length 2.26 mm., width of head across eyes 0.45 mm., length of antenna 0.86 mm., width of prothorax across middle 0.47 mm., length of elytra 1.33 mm., and width across middle 0.66 mm.

Holotype ♂, INDIA : BIHAR, Hazaribagh, 26.iii.1931, F. Economist, ex. *Boswellia serrata* (under bark). Aedeagus dissected and mounted on cover slip and pinned with the holotype (Forest Research Institute, Dehra Dun); *Paratypes* 2 ex., KERALA, Calicut ('Madras' in label), Perry's Timber Depot, 31.v.1941, B. M. Bhatia, crawling about between planks (1 Paratype in Zoological Survey of India, Calcutta, Reg. No. 11116/H₄A and 1 Paratype in Forest Research Institute, Dehra Dun); *Paratypes* 3 ex., Kerala, Trivandrum, 21.xi.1957, C.N.O., on stored wood (Zoological Survey of India, Calcutta; Reg No. 11088/H₄-11089/H₄).

Distribution : INDIA : Bihar, Kerala.

4. *Silvanus recticollis* Reitter

1876. *Silvanus recticollis* Reitter, *Col. Hefte*, **15** : 61 (Type-loc. : Japan; Type deposition - British Museum Nat. Hist., London).

1879. *Silvanus reflexus* Reitter, *Verh. zool. bot. Ges. Wien*, **29** : 85.

1882. *Silvanus vitulus* Grouvelle, *Annali Mus. civ. Stor. nat. Giacomo Doria*, **32** : 294.

1912. *Silvanus* (*Microsilvanus*) *vitulus* : Grouvelle, *Annls Soc. ent. Fr.*, **81** : 332.

1912. *Silvanus* (*Microsilvanus*) *pumilus* Grouvelle, *Annls Soc. ent. Fr.*, **81** : 332.

1912. *Silvanus* (*Microsilvanus*) *minimus* Grouvelle, *Annls Soc. ent. Fr.*, **81** : 334.

1973. *Silvanus recticollis* : Halstead, *Bull. Br. Mus. nat. Hist. (Ent.)*, **29** (2) : 55.

1977. *Silvanus recticollis* : Pal and Sengupta, *Oriental Ins.*, **11**(2) : 274-275.

This species is shorter (1.61-1.82 mm.) than *S. lewisi* (2.08-2.50 mm.) and can be easily

distinguished from other species in having characteristic shape of head and prothorax (Fig. 34), eyes small, temple long and distinctly flattened beneath eye to form a platform; prothorax almost quadrate, anterior spine broad and projected forward with its tip distinctly blunt.

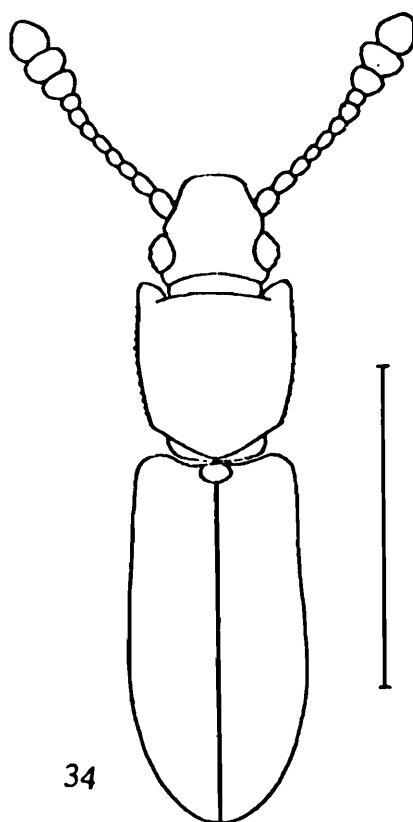


Fig. 34. *Silvanus recticollis* Reitter, Dorsal view (Scale = 1.00 mm).

Description : General form (Fig. 34) elongated, moderately depressed, uniformly yellowish-brown and covered with short, semierect, golden pubescence.

Head : Exposed part of head wider than long, eyes small and length of eye shorter than one-third of length of head, temple about half as long as eye or shorter and its outer margin rounded, puncturation on vertex coarse and dense and that of near anterior margin of clypeus finer, setae projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel shorter and narrower than scape, segment 3 slightly shorter than pedicel, segments 4 and 5 shorter than segment 3, segments 6-8 shorter than segment 5, segment 7 slightly wider than segments 6 and 8, segments 9 and 10 transverse and segment 11 about as long as broad. **Prothorax** convex, slightly elongated and apparently quadrate, width across anterior spines almost equal or slightly greater than across middle; anterior spines moderately large, about as long as eye or shorter, projected more forward and its tip exclusively blunt; lateral margins rather parallel-sided and slightly narrowed posteriorly, margins slightly explanate with few small denticles, lateral depressions on pronotal disc indistinct. Puncturation on pronotum coarse and dense and similar to that of vertex of head,

setae projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* shorter than twice as long as broad, widest near middle, lateral margins wavy and explanate, rows of punctures on elytra deep and large. Puncturation on ventral side finer than on dorsal side and rather shiny. Aedeagus (Fig. 60) with median lobe distinctly broader behind middle and lateral margins wavy, apical projection short and blunt; apex of each paramere bilobed with inner lobe longer, each lobe with single setae, inner seta longer.

Measurements : Total length 1.61-1.82 mm., width of head across eyes 0.25-0.36 mm., length of antenna 0.61-0.66 mm., width of prothorax across middle 0.39-0.44 mm., length of elytra 0.95-1.07 mm. and width across middle 0.52-0.55 mm.

Material examined : 6 ex. INDIA : WEST BENGAL, Calcutta, 5 ex., May-June 1914, F.H.G., at light; Howrah district, Sankrail, 1 ex., 12.i.1976, T. K. Pal, haystack.

Distribution : INDIA : West Bengal; THAILAND; VIETNAM; LAOS; SULAWESI; JAPAN; TAIWAN (Ryuku Is.); MAURITANIA; CONGO; ZAIRE; ZIMBABWE.

Remarks : Halstead (1973) and Pal and Sengupta (1977) recorded this species in India from Calcutta (West Bengal).

5. *Silvanus rossi* Halstead

1973. *Silvanus rossi* Halstead, *Bull. Br. Mus. nat. Hist. (Ent.)* **29** (2) : 54 (Type-loc. : Kumaon : Uttar Pradesh, India; Type deposition British Museum Nat. Hist., London)

1977. *Silvanus rossi* : Pal and Sengupta, *Oriental Ins.*, **11**(2) : 274-275.

The facies of this species is apparently similar to *S. lewisi* and can be separated from the latter species in having temple of head about as long as one eye facet and its outer apical angle blunt, eyes slightly smaller, pedicel slightly longer than antennal scape, inner margin of anterior spine of prothorax slightly curved, scutellum about as broad as long, lateral margin of elytra more wavy, median lobe of aedeagus broader behind middle and sides distinctly wavy.

Description : General form (Fig. 35) elongated, moderately depressed, uniformly reddish-brown and covered with short, semierect, golden pubescence.

Head : Exposed part of head wider than long, eyes large and length of eye slightly shorter than half of length of head, temple slightly longer than one eye facet, temple extended laterally beneath eye and its outer apical angle broad, puncturation on vertex coarse and dense and that of near anterior margin of clypeus finer, setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel slightly longer and narrower than scape, segment 3 shorter than pedicel, segment 4 shorter than segment 3, segment 5 longer than segment 4, segment 6 shorter than segment 5, segment 7 longer than segment 6, segment 8 shorter than segment 7, segments 9 and 10 transverse and segment 11 about as broad as long. *Prothorax* convex, elongated and slightly narrowed posteriorly, width across anterior spines greater than across middle (1.00 : 0.92); anterior spines moderately large, originate gradually from lateral sides, its length about half as long as each eye, inner margin of anterior spine curved outwardly; lateral margin curved and with few small denticles, lateral depressions on pronotum slightly marked near base, puncturation on pronotum coarse and dense and similar to that of vertex of head, setae

projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* about twice as long as broad, widest near middle, lateral margins wavy and explanate, rows of punctures on elytra deep and large. Puncturation on ventral side finer than on dorsal side. Aedeagus (Fig. 61) with median lobe broader behind middle and then gradually narrowed apically, apical projection moderately long; apex of each paramere bilobed, shorter lobe with two short setae and longer lobe with single long seta. In male hind femur with a short and slightly prominent ridge on posterior side, and posterior margin of hind tibia with a row of spinules.

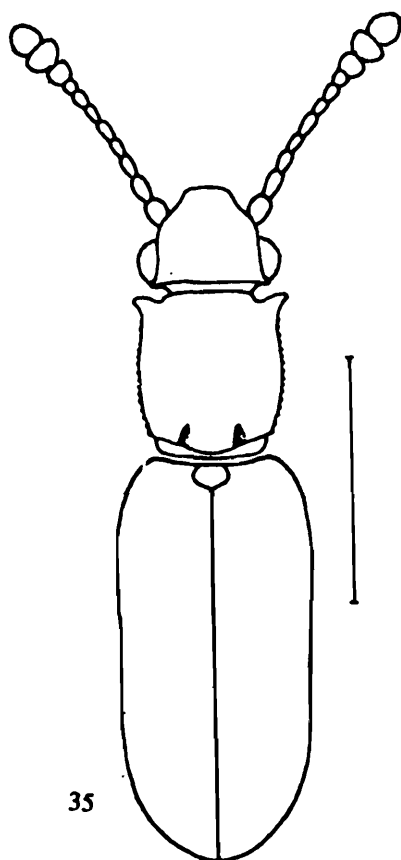


Fig. 35. *Silvanus rossi* Halstead, Dorsal view (Scale = 1.0 mm).

Measurements : Total length 2.52-2.55 mm., width of head across eyes 0.51-0.53 mm., length of antenna 0.87-0.89 mm., width of prothorax across middle 0.54-0.55 mm., length of elytra 1.54-1.56 mm. and width across middle 0.73-0.75 mm.

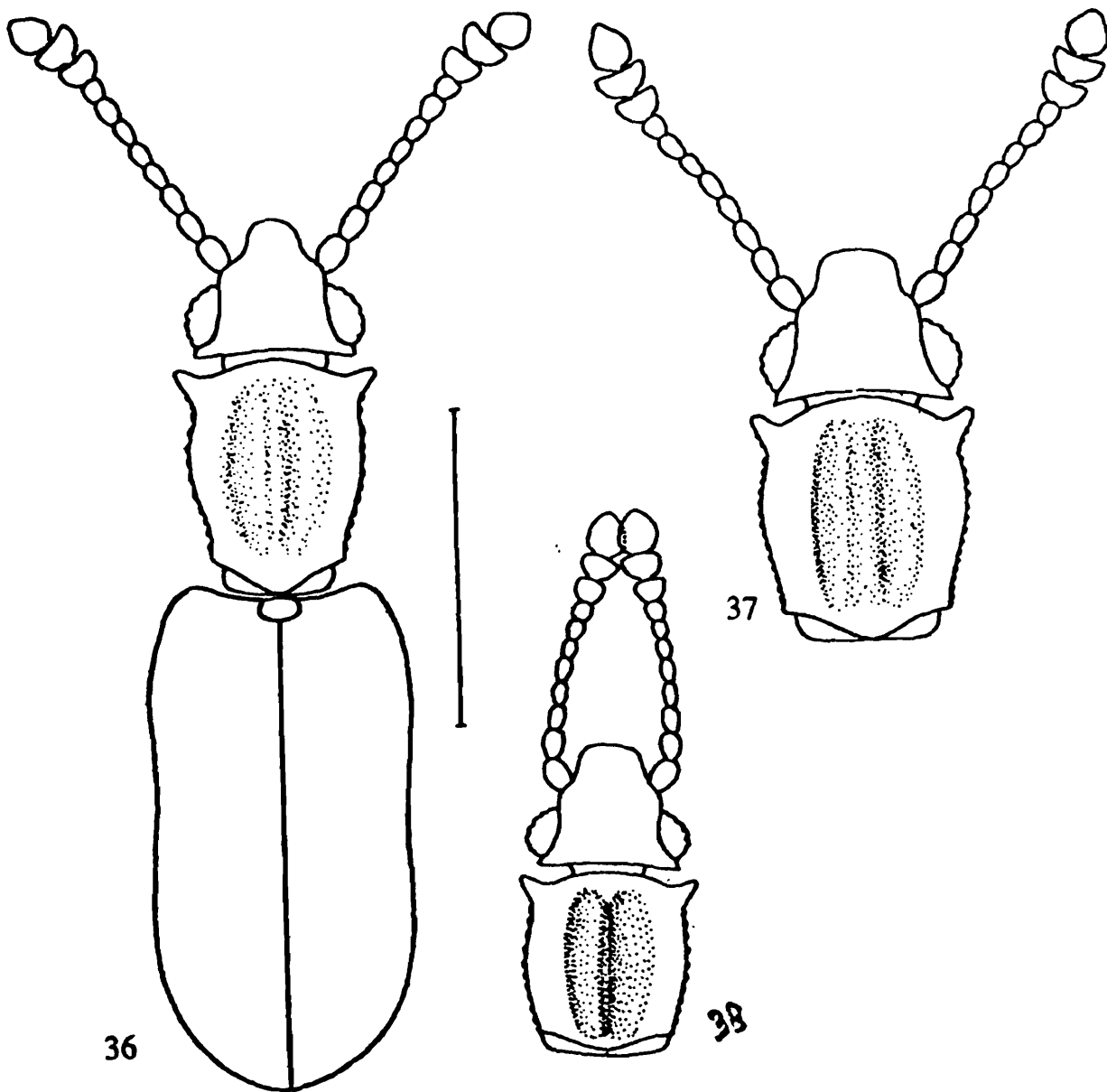
Materials examined : 4 ex. INDIA : HIMACHAL PRADESH, Solan, Happy Valley, 1 ex., 17.vi.1975, T. Sengupta, under bark of *Pinus* sp.; Solan, 3 ex., 19.x.1981, T. K. Pal, under bark.

Distribution : INDIA: Uttar Pradesh, Himachal Pradesh; THAILAND; NEW GUINEA.

Remarks : Halstead (1973) recorded this species in India from Kumaon : Uttar Pradesh; Pal and Sengupta (1977) recorded it from Himachal Pradesh.

6. *Silvanus difficilis* Halstead

1973. *Silvanus difficilis* Halstead, *Bull. Br. Mus. nat. Hist. (Ent.)*, **29** (2) : 73 (Type-loc. : Keruing : Malay; Type deposition British Museum Nat. Hist., London).
1977. *Silvanus difficilis* : Pal and Sengupta, *Oriental Ins.*, **11**(2) : 279-280.
1977. *Silvanus gibbus* Pal and Sengupta, *Oriental Ins.*, **11**(2) : 275-276; Syn. nov.
1977. *Silvanus ruficarpus* Pal and Sengupta, *Oriental Ins.* **11**(2) : 276-277; Syn. nov.



Figs. 36-38. *Silvanus difficilis* Halstead : 36, Dorsal view; 37-38, Head and prothorax, Dorsal view of variants (Scale = 1.0 mm).

This is a variable species, can be recognised by its temple about as long as 1.5-2.0 eye facets with broad outer apical angle, anterior spine of prothorax about half as long as head

with slightly blunt tip and well-developed lateral depressions on pronotal disc. This species shows some resemblance to other Indian species, viz., *familiaris*, *nigrans*, *robustus* and *bhutanicus*, and the comparisons are discussed under respective species.

Description : General form (Fig. 36) elongated, moderately depressed, yellowish or reddish-brown and covered with short, semierect, golden pubescence.

Head : Exposed part of head wider than long, eyes large and length of eye slightly shorter than half of length of head, temple about as long as 1.5 - 2 eye facets, temple extended laterally beneath eye and its outer apical angle broad, puncturation on vertex coarse and dense and that of near anterior margin of clypeus finer, setae projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel and segment 3 about as long as scape but narrower, segments 4 and 5 equal and slightly shorter than segment 3, segment 6 slightly shorter than segment 5, segment 7 slightly longer than segment 6, segment 8 slightly shorter than segment 7, segments 9 and 10 transverse and segment 11 slightly elongated. *Prothorax* convex, elongated and narrowed posteriorly, width across anterior spines greater than across middle (1.02-1.06 : 1.00); anterior spines moderately large, about half as long as eye or slightly shorter and its tip slightly blunt, anterior spines originate gradually or sometimes a bit abruptly from lateral sides; lateral margin curved and with few small denticles, lateral depressions on pronotal disc usually rather well-marked. Puncturation on pronotum coarse and dense and similar to that of vertex of head, setae projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* more than two times as long as broad, widest near middle, lateral margins wavy and explanate, rows of punctures on elytra deep and large, interstices alternately wider and narrower, setae projected posteriorly. Puncturation on ventral side finer than on dorsal side. Aedeagus (Figs. 62-65) with median lobe broad posteriorly; apex of each paramere bilobed, inner lobe with a long seta and outer lobe with two short setae. In male hind-femur with a short ridge in basal half of anterior margin and posterior margin of hind-tibia with a row of spinules.

Measurements : Total length 2.20-2.82 mm., width of head across eyes 0.47-0.58 mm., length of antenna 0.85-1.00 mm., width of prothorax across middle 0.48-0.54 mm., length of elytra 1.38-1.66 mm. and width across middle 0.70-0.80 mm.

Materials examined : 100 ex. *Holotype* and *Paratypes* 4 ex. of *Silvanus gibbus*, INDIA : WEST BENGAL, Calcutta, 20.v.1975, T. K. Pal, under bark of *Bombax* sp.; *Paratype* of *S. gibbus*, 1 ex., ASSAM, Kaziranga, Panbari, 15.xi.1974, T. Sengupta, under bark of *Shorea robusta*; *Paratype* of *S. gibbus*, 1 ex. MEGHALAYA, Dainadubi Reserve Forest, 18.xi.1974, under bark of *Shorea robusta* (Zoological Survey of India, Reg. No. 7964-7970/H4A) *Holotype* of *Silvanus ruficarpus*, INDIA : ASSAM, Kaziranga, Panbari, 15.xi.1974, T. Sengupta, under bark of *Bombax* sp., (Zoological Survey of India, Reg. No. 7961/H4A); ARUNACHAL PRADESH, Namdapha Survey 1981, Horn bill Camp, 35 Km. from Miao, 3 ex., 14.iv.1981, S. Biswas, under bark; WEST BENGAL, Darjeeling district, Sukna, 5 ex., 5.v.1976, T. K. Pal, under bark of *Shorea robusta*; UTTAR PRADESH, Dehra Dun, Jhajra, 6 ex., 29-30.x.1925, B. M. Bhatia, ex. *Shorea robusta*; 1 ex., 10.xi.1925, B. M. Bhatia, ex. *Terminalia tomentosa*; Almorah, 1600 m., 5 ex. 17.x.1976, T. Sengupta, under bark of *Pinus* sp. log; HIMACHAL PRADESH, Solan, 3 ex., 19.x.1981, T. K. Pal, under bark;

Rajgarh, 30 km. O-Solan, 12 ex., 18.x.1981, T. K. Pal, under bark; Salogra, 2 ex., 20.x.1981, T. K. Pal, under bark; MADHYA PRADESH, Birguri, Raipur, 8 ex., 3.iii.1923, 5.iii.1923, 26.iii.1923, 13.iv.1923, 15.iv.1923, 24.iv.1923, 7.v.1923, ex. *Shorea robusta*; Birsinghpur, Umaria, Rewa, 1 ex., 15.xi.1927, C.F.C. Beeson, under bark of *Boswellia serrata*; MAHARASTRA, Belgaum, Nagar galli, 1 ex., 18.xi.1929, B. M. Bhatia, *Odina woodifera*; KARNATAKA, S. Kanara, Sunksal, 2. ex., 14.xii.1929 & 30.i.1930, B. M. Bhatia, ex. *Diospyros paniculata*; W. D. Kanara, Ramanguli, 1 ex., 26.ii.1940, F.R.I. Project, *Terminalia tomentosa*; KERALA, Cochin, Timber Depot, 7 ex., ex. *Mangosa creosoted timber*; TAMIL NADU, Madumalai Reserve Forest, 1 ex., 7.xii.1971, T. Sengupta, under bark of log; ANDAMAN Is., N. Andaman, Bonington, 8 ex., 2-27.xii.1928, B. M. Bhatia, ex. *Canarium euphyllum* (4 ex.), *Pterocarpus dalbergioides* (3.ex.), *Artocarpus chaplasi* (1 ex.); Middle Andaman, 5 ex., 7-11. xii.1928, B. M. Bhatia, ex. *Planchonia andamanica* (1 ex.), *Dipterocarpus turbinatus* (1 ex.), *Canarium euphyllum* (1 ex.), *Terminalia manii* (1 ex.), *Sterculia campanulata* (1 ex.); S. Andaman, Chatham, 24 ex., 5-23.xii. 1928, B. M. Bhatia, ex. *Canarium euphyllum* (17 ex.), *Terminalia bialata* (7 ex.); BURMA: Rangoon, Steel Brothers & Co., 2 ex., vii.1924, ex. *Hopea odorata*; Magayi, Insein, 4 ex., 1.xii.1921, C.F.C. Beeson, ex. unknown timber; Palauk Chaung, Mergui, 1 ex., 1.1930, R. N. Parker.

Distribution : 'Normal form' INDIA : Arunachal Pradesh, Assam, Meghalaya, West Bengal, Himachal Pradesh, Madhya Pradesh, Maharashtra, Karnataka, Kerala, Tamil nadu, Andaman Is.; SRI LANKA; BURMA (New record); VIETNAM; TAIWAN; MALAYSIA; SINGAPORE; INDONESIA; PHILIPPINES; MOLUCCAS; I. DELCAS (Off N. Coast of New Britain); SOLOMON Is.; SAMOA Is., AUSTRALIA; WEST AFRICA. 'New Guinea form' NEW GUINEA; NEW IRELAND; AUSTRALIA.

Remarks : Halstead (1973) while describing this species mentioned that there are two distinct forms, viz., 'Normal form' and 'New Guinea form' The 'Normal form' differs from the 'New Guinea form' by its short temple, and wider and shorter prothorax. Halstead recorded this species ('Normal form') in India from the following localities : Cinchona, Annamalai Hills : Tamil Nadu; Malabar coast, Mahe : Kerala; Kanara : Karnataka; W. Almorah Divn., Kumaon, Kheri Forest : Uttar Pradesh. Pal and Sengupta (1977) described *S. gibbus* and *S. ruficarpus* from West Bengal, Assam, Meghalaya, and Assam respectively. Subsequent to the description of *gibbus* and *ruficarpus*, the authors have examined a number of examples, apparently similar either to *difficilis*, *gibbus* or *ruficarpus* and with intermediate types. A series of male genitalia of each of the representative types were dissected out, examined and found no significant distinction among them. Moreover, externally the intermediate types are clearly indicating a range of prothoracic shapes. The specimens studied here belong to the 'Normal form' of *difficilis*.

7. *Silvanus bidentatus* (Fabricius)

1792. *Dermestes 2 dentatus* Fabricius, *Entomologiae Systemeticae Emendate et Auctae*, 1(1) : 223 (Type-loc. : Germany; Type deposition-Zoological Museum, Copenhagen).
1792. *Colydium sulcatum* Fabricius, *Entomologiae Systemeticae Emendate et Auctae*, 1(1) : 555.
1826. *Silvanus bidentatus* : Sturm, *Katalog meiner Insekten Sammlung* 1. Käfer : 196.
1876. *Silvanus affinis* Reitter, *Col. Hefte*, 15 : 58.

1880. *Silvanus bidentatus* var. *affinis* Reitter, *Verh. zool. bot. Ges Wien.*, **29** : 509.

1908. *Silvanus bidentatus* : Grouvelle, *Annls Soc. ent. Fr.*, **77** : 490.

1912. *Silvanus (Silvanus) bidentatus* : Grouvelle, *Annls Soc. ent. Fr.*, **81** : 338.

1973. *Silvanus bidentatus* : Halstead, *Bull. Br. Mus. nat. Hist. (Ent.)*, **29** (2) : 68.

1977. *Silvanus bidentatus* : Pal and Sengupta, *Oriental Ins.*, **11** (2) : 275.

This species is closely related to Nearctic and Neotropical species, *S. muticus* Sharp, and can be distinguished by its antenna comparatively thicker with segments 3-8 less elongate, temples longer; anterior spine of prothorax originating less gradually from lateral margin, projecting more towards lateral side, and narrower; lateral depressions on pronotal disc well-marked; hind trochanter in male with short, prominent spine.

Description : General form (Fig. 39) elongated, moderately depressed, uniformly reddish-brown and covered with short, semierect, golden pubescence.

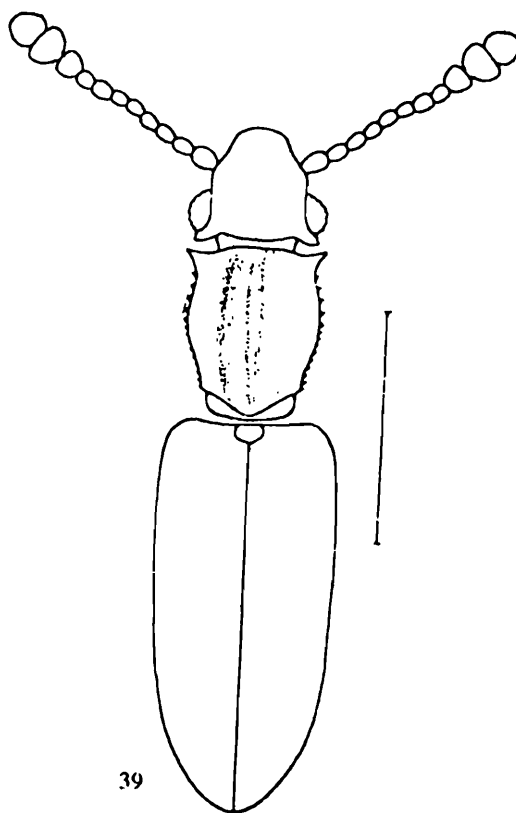


Fig. 39. *Silvanus bidentatus* (Fabricius), Dorsal view (Scale = 1.0 mm).

Head : Exposed part of head wider than long, eyes moderately large and about one-third as long as head, length of temple about as long as 2.5 eye facets, temple extended laterally beneath eye and its outer apical angle broad, puncturation on vertex coarse and dense and that of near anterior margin of clypeus finer, setae short and projected towards middle line. Antenna moderately long and slightly less slender, scape moderately large, pedicel and segment 3 slightly shorter and narrower than scape, segments 4 and 5 equal and shorter than

segment 3, segment 6 shorter than segment 5, segment 7 wider than segment 6, segment 8 slightly shorter than segment 7, segments 9 - 11 more or less transverse. *Prothorax* convex, elongated and narrowed posteriorly, width across anterior spines greater than width across middle (1.02-1.06 : 1.00); anterior spines originate less gradually from sides, moderately large, about half as long as eye or slightly shorter, projecting more outwardly and its tip rather pointed; lateral margin curved with few small denticles, lateral depressions on pronotal disc rather well-marked. Puncturation on pronotum coarse and dense and similar to that of vertex of head, setae projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* more than two times as long as broad, widest in anterior half, lateral margins less wavy and explanate, rows of punctures on elytra deep and large, setae projected posteriorly. Puncturation on ventral side finer than on dorsal side. Aedeagus (Fig. 66) with median lobe slightly broader behind middle and then gradually narrowed towards apex, apex of each paramere with two unequal lobes, longer lobe with single long apical seta and shorter lobe with two short setae. In male hind trochanter with a small spine, hind-femur with a short ridge on posterior margin of basal half.

Measurements : Total length 2.55 - 2.85mm., width of head across eyes 0.52-0.57 mm., length of antenna 0.95-1.05 mm., width of prothorax across middle 0.52-0.58 mm., length of elytra 1.54-1.70 mm. width across middle 0.69-0.77 mm.

Material examined : 10 ex. EUROPE, 1 ex., (Z.S.I. Reg. No. 747/11); ITALY : PIEMONTE, Novara, Passo, Colma, 900 m., 9 ex., iv.71, Rossa.

Distribution : Primarily a Palaearctic species and introduced elsewhere (Halstead, 1973). Hitherto recorded from INDIA : Tamil Nadu; THAILAND, JAPAN; EUROPE (Germany, Russia, Italy, Britain); U.S.A.; CANADA; HAWAIIAN Is.

Remarks : Grouvelle (1908) recorded this species in India from Nilgiri Hills : Tamil Nadu.

8. *Silvanus nigrans* Pal and Sengupta

1977. *Silvanus nigrans* Pal and Sengupta, *Oriental Ins.*, 11(2) : 277 (Type-loc. : Tistabazar : West Bengal, India; Type deposition Zoological Survey of India, Calcutta).

The general appearance of this species is somewhat similar to *S. bidentatus* (Fabricius) but can be separated by its longer anterior spine of prothorax, its apex not sharply pointed and less outwardly projected; eyes large and distance between two eyes on ventral side distinctly shorter than that in *bidentatus*. This species also shows some resemblance to *difficilis* but can be separated by its longer anterior spine of prothorax, narrower and more acute at apex; unlike *difficilis* lateral margin of prothorax sinuate before posterior angle to form a small spinous projection, hind-femora widest before middle, species uniformly blackish.

Description : General form (Fig. 40) elongated moderately depressed, uniformly blackish-brown and covered with short, semierect golden pubescence.

Head : Exposed part of head wider than long, eyes large and length of eye slightly less than half of length of head, temple about as long as two eye facets, temple extended laterally beneath eye and its outer apical angle broad, puncturation on vertex coarse and dense and

that of near anterior margin of clypeus slightly finer, setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel about as long as scape and narrower, segment 3 shorter than pedicel, segments 4 and 5 equal and shorter than segment 3, segments 6 and 7 equal and shorter than segment 5, segment 7 slightly wider than segment 6, segment 8 shorter than segment 7, segments 9 and 10 transverse and segment 11 elongated. *Prothorax* convex, elongated and narrowed posteriorly, width across anterior spines greater than width across middle (1.00 : 0.90); anterior spines large, originate gradually from lateral sides, longer than half of length of eye and its tip slightly pointed; lateral margin curved with few small denticles, lateral depressions on pronotal disc rather well-marked, puncturation on pronotum coarse and dense and similar to that of vertex of head, setae projected posteriorly. *Scutellum* moderately large, transverse and pubescent. *Elytra* about two times as long as broad, widest near middle, lateral margins wavy and explanate, rows of punctures on elytra deep and large, setae projected posteriorly. Puncturation on ventral side finer than on dorsal side and rather shiny.

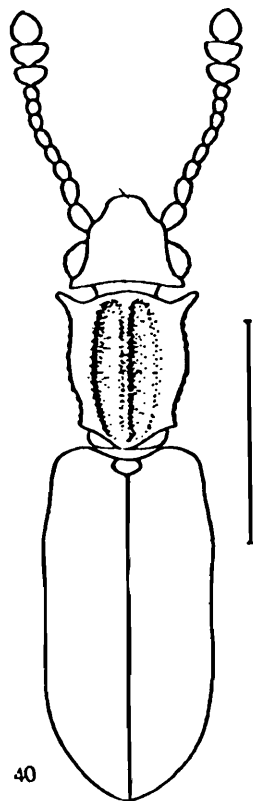


Fig. 40. *Silvanus nigrans* Pal and Sengupta, Dorsal view (Scale = 1.0 mm).

Measurements of holotype : Total length 2.57 mm., width of head across eyes 0.51 mm., length of antenna 0.94 mm., width of prothorax across middle 0.43 mm., length of elytra 1.50 mm. and width across middle 0.73 mm.

Material examined : *Holotype*, INDIA : West Bengal, Darjeeling district, Tistabazar,

18.iv.1971, T. Sengupta, under bark of log (Zoological Survey of India, Calcutta; Reg. No. 7962/H₄A).

Distribution : INDIA : West Bengal (Darjeeling district).

Remarks : So far this species is recorded only from its type-locality.

9. *Silvanus robustus* Halstead

1973. *Silvanus robustus* Halstead, *Bull. Br. Mus. nat. Hist (Ent.)*, **29** (2) : 71 (Type-loc. : Johore, Layang : Malaya; Type deposition British Museum Nat. Hist., London).

1977. *Silvanus curvispinus* Pal and Sengupta, *Oriental Ins.*, **11** (2) : 278-279; Syn. nov.

This is a distinct species, nearest to *S. difficilis* Halstead but can be easily separated by its prothorax excluding anterior spines somewhat elliptical, outer margin of anterior spine of prothorax curved inwardly, lateral depressions on pronotal disc indistinct, puncturation on pronotum coarse, antennal segment 9 elongated, hind-trochanter in male with a spine, aedeagus with apical projection of median lobe distinctly elongated and pointed at apex.

Description : General form (Fig. 41) elongated, moderately depressed, uniformly reddish-brown and covered with short, semierect, golden pubescence.

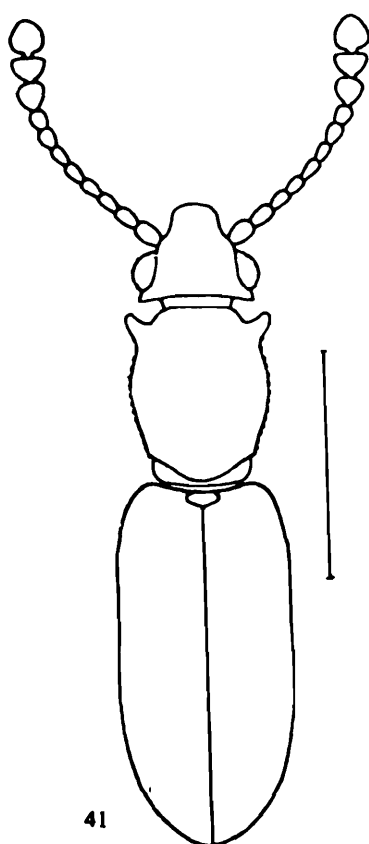


Fig. 41. *Silvanus robustus* Halstead, Dorsal view (Scale = 1.0 mm).

Head : Exposed part of head wider than long, eyes large and length of eye less than half

of length of head, temple about as long as two eye facets, temple extended laterally beneath eye and its outer apical angle broad, puncturation on vertex coarse and dense and that of near anterior margin of clypeus finer, setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel as long as scape and narrower, segments 3-5 equal and slightly shorter than pedicel, segment 6 shorter than segment 5, segment 7 about as long as segment 6 and slightly wider, segment 8 shorter than segment 7, segments 9 and 11 slightly elongated and segment 10 slightly transverse. *Prothorax* convex, elongated, excluding anterior spines somewhat elliptical, width across anterior spines almost equal to width across middle (1.00 : 0.99); anterior spines moderately large and originate gradually from lateral sides, about half as long as eye, outer margin of anterior spine slightly curved inward, projected in front and its tip blunt; lateral margin evenly curved and with few small denticles; depressions on pronotal disc indistinct, a little prominent near base; puncturation on pronotum coarse and dense and slightly coarser than that of vertex of head, setae projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* slightly more than two times as long as broad, widest near middle, lateral margins wavy and explanate, rows of punctures on elytra deep and large, setae projected posteriorly. Puncturation on ventral side finer than on dorsal side and shiny. Aedeagus (Fig. 67) with median lobe elongated, apical projection long and pointed at apex; apex of each paramere with two equal lobes, outer lobe with two short setae and inner lobe with single long seta. In male hind-trochanter with a short spine, upper margin of posterior side of hind-femur with a prominent ridge, and posterior margin of hind tibia with spinules.

Measurements : Total length 3.01 - 3.15 mm., width of head across eyes 0.43-0.58 mm., length of antenna 1.08-1.18 mm., width of prothorax across middle 0.58-0.66 mm., length of elytra 1.53-1.78 mm. and width across middle 0.73-0.84 mm.

Material examined : *Holotype* of *Silvanus curvispinus* ♂, INDIA : ASSAM, Kaziranga, Panbari, 15.xi.1974, T. Sengupta, under bark of *Bombax* sp. (Zoological Survey of India, Calcutta; Reg. No. 7960/H4A); ARUNACHAL PRADESH, Namdapha, 1 ex., 21.iv.1981, S. Biswas, under bark; West Bengal, Darjeeling district, Lopchu, 2 ex., 24.xi.1929, J.C.M. Gardner, ex. *Casearia glomerata*.

Distribution : INDIA : Assam, Arunachal Pradesh, West Bengal; MALAYSIA; SINGAPORE; INDONESIA; PHILIPPINES.

Remarks : Subsequent to the description of *S. curvispinus* Pal and Sengupta, the authors have examined additional materials with dissection of male genitalia, compared with those of *robustus* and found no characteristic difference among them. *S. curvispinus* is, therefore, synonymised with *S. robustus*.

10. *Silvanus andamanicus* sp. nov.

This species is closely related to *S. difficilis* but can be differentiated by the anterior spine of prothorax shorter and about one-third as long as eye, excluding anterior spines prothorax slightly more broader (1.27 : 1.00) than that of *difficilis* (1.32-1.35 : 1.00), unlike *difficilis* median lobe of aedeagus truncated near apex, apices of parameres more closer, inner shorter lobe of paramere with single seta.

Description : General appearance (Fig. 42) elongated, moderately depressed, uniformly reddish-brown and covered with short, semierect, golden pubescence.

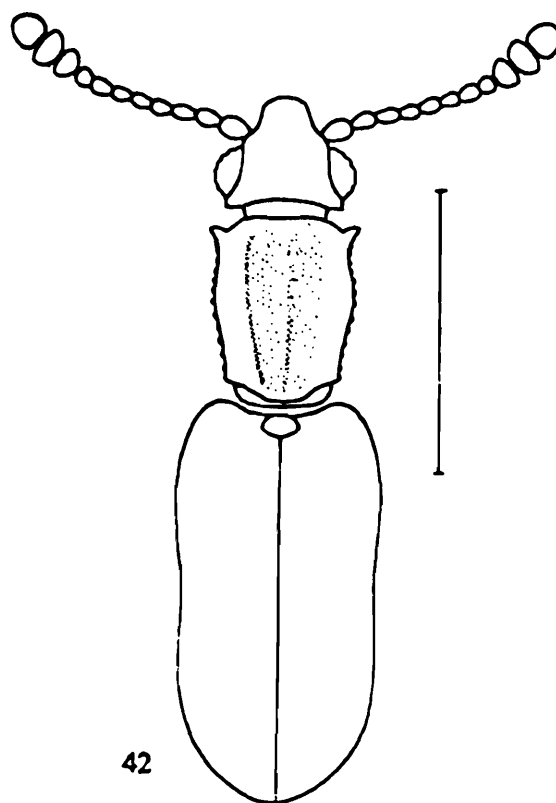


Fig. 42. *Silvanus andamanicus*, sp. nov., Dorsal view (Scale = 1.0 mm).

Head : Exposed part of head wider than long, eyes large, eye about half as long as head, length of temple about as long as two eye facets, temple extended laterally beneath eye and its outer apical angle broad, puncturation on vertex coarse and dense and that of near anterior margin of clypeus slightly finer, setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel about as long as scape and narrower, segment 3 slightly shorter and narrower than pedicel, segments 4 and 5 almost equal and shorter than segment 3, segment 6 shorter than segment 5, segment 7 slightly longer and wider than segment 6, segment 8 shorter than segment 7, segments 9 and 10 transverse and segment 11 about as broad as long. **Prothorax** convex, elongated and narrowed posteriorly, width across anterior spines greater than width across middle (1.12 : 1.00); anterior spines short, originate gradually from lateral sides, about one-third as long as eye; lateral margin curved with few small denticles, lateral depressions on pronotal disc rather well-marked, puncturation on pronotum coarse and dense and similar to that of vertex of head, setae short and projected towards middle line. **Scutellum** moderately large, transverse and pubescent. **Elytra** about two times as long as broad, widest near middle, lateral margin wavy and explanate, rows of punctures on elytra deep and large, setae projected posteriorly. Puncturation on ventral side finer than on dorsal side. Aedeagus

(Fig. 68) with median lobe broad posteriorly and somewhat truncated near apex; apices of parameres very close, apex of each paramere bilobed, inner lobe short with single short seta. In male upper margin of posterior side of hind-femur with prominent ridge.

Measurements of holotype : Total length 2.38 mm., width of head across eyes 0.33 mm., length of antenna 0.88 mm., width of prothorax across middle 0.51 mm., length of elytra 1.32 mm. and width across middle 0.63 mm.

Holotype ♂ INDIA : Middle Andaman, 8.xii.1928, B. M. Bhatia, ex. *Dipterocarpus turbinatus*. Aedeagus dissected and mounted on cover slip and pinned with the holotype (Forest Research Institute, Dehra Dun).

Distribution : INDIA : Andaman Island.

11. *Silvanus* sp.

This species shows close similarity with *S. unidentatus* (Olivier) but can be differentiated by its prothorax being as broad as long, inner margin of anterior spine of prothorax projecting anteriorly, puncturation on median part of pronotum distinctly finer than on lateral sides, and basal margin of pronotum well-defined.

Description : General form (Fig. 43) elongated, moderately depressed, uniformly reddish-brown, a little shiny; covered with short, semierect, golden pubescence.

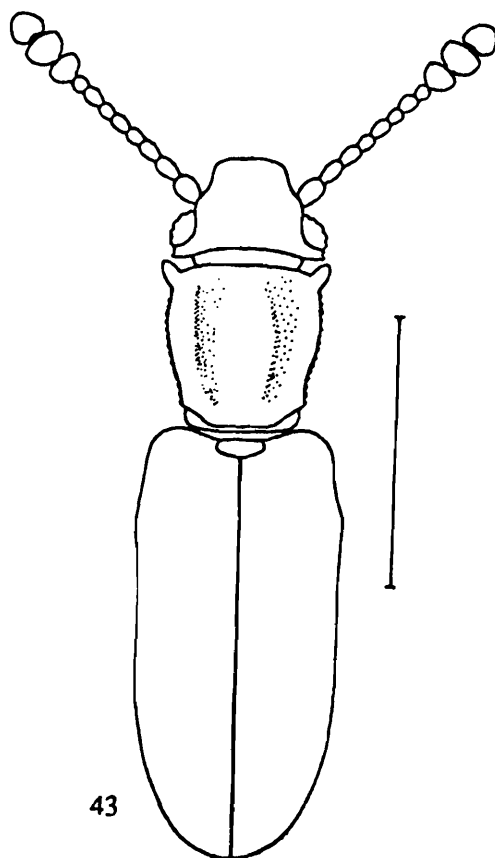


Fig. 43. *Silvanus* sp. Dorsal view (Scale = 1.0 mm).

Head : Exposed part of head wider than long, eyes small, about one-third as long as head, length of temple about as long as 2.5 eye facets, temple extended laterally beneath eye and its outer apical angle broad, puncturation on vertex moderately coarse and dense and that of near anterior margin of clypeus finer, setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel about as long as scape but narrower, segment 3 slightly shorter than pedicel, segments 4 and 6 about equal and slightly shorter than segments 3 and 5, segment 7 longer than segment 6, segment 8 shorter than segment 7, segments 9 and 11 about as broad as long and segment 10 transverse. **Prothorax** as broad as long, slightly narrowed posteriorly, width across anterior spines slightly greater than width across middle (1.07 : 1.00), anterior spines originate gradually from lateral sides, moderately long and slightly shorter than length of eye, projected more anteriorly and its tip less pointed, lateral margin curved and with few small denticles, lateral depressions on pronotal disc indistinct. Puncturation on median part of pronotum moderately coarse and dense and similar to that of vertex of head, on sides and near basal margin puncturation distinctly coarser. **Scutellum** moderately large, transverse and pubescent. **Elytra** more than two times as long as broad, widest near middle, lateral margins slightly wavy and a little explanate, rows of punctures on elytra deep and large. Puncturation on ventral side finer than on dorsal side.

Measurements : Total length 2.66 mm., width of head across eyes 0.54 mm., length of antenna 0.90 mm., width of prothorax across middle 0.56 mm., length of elytra 1.60 mm. and width across middle 0.74 mm.

Material : 1 ♀, INDIA : KASHMIR, Pahalgam, Lidar Valley, 2099 m. (7000 ft.), 7.vi.28, B. M. Bhatia, ex. *Pinus excelsa*.

Remarks : For detection of more affirmative characters from more material this species not named in the present study.

12. *Silvanus bhutanicus* sp. nov.

1979. *Silvanus* sp. Pal and Sengupta, *Entomologica Basiliensia*, 4 : 69 (Bhutan).

This species shows resemblance to *S. difficilis* and *S. sp.* It can be distinguished from *difficilis* by its distinctly shorter eyes, ratio of temple and eye 1 : 3 in contrast to at least 1 : 5 in *difficilis*, and anterior spine of prothorax originating more gradually from lateral side. The elongated prothorax with antero-laterally projecting anterior spine, coarse and uniform pronotal punctures, distinct lateral longitudinal depressions on pronotal disc distinguish this species from *Silvanus* sp. (in present study).

Description : General form (Fig. 44) moderately depressed, uniformly reddish-brown and covered with short, semierect, golden pubescence.

Head : Exposed part of head wider than long, eyes small, about one-third as long as head, length of temple about as long as three eye facets and its outer apical angle broad, genal margin above antennal insertion a little raised, puncturation on vertex coarse and dense and that of near anterior margin of clypeus finer, setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel and segment 3 about as long as scape but narrower, segments 4-6 shorter and subequal, segment 7 longer and slightly wider than segment 6, segment 8 short, segments 9 and 10 more or less transverse,

apical segment damaged. *Prothorax* convex a little elongated and narrowed posteriorly, width across anterior spines greater than width across middle (1.10 : 1.00); anterior spines moderately long, originate gradually from lateral sides, about as long as eye; lateral margin curved with few small denticles, lateral depressions on pronotal disc rather well-marked, puncturation on pronotum coarse and dense and similar to that of vertex of head, setae short and projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* more than two times as long as broad, widest near middle, lateral margins wavy and explanate, rows of punctures on elytra deep and large, setae projected posteriorly. Puncturation on ventral side finer than on dorsal side.

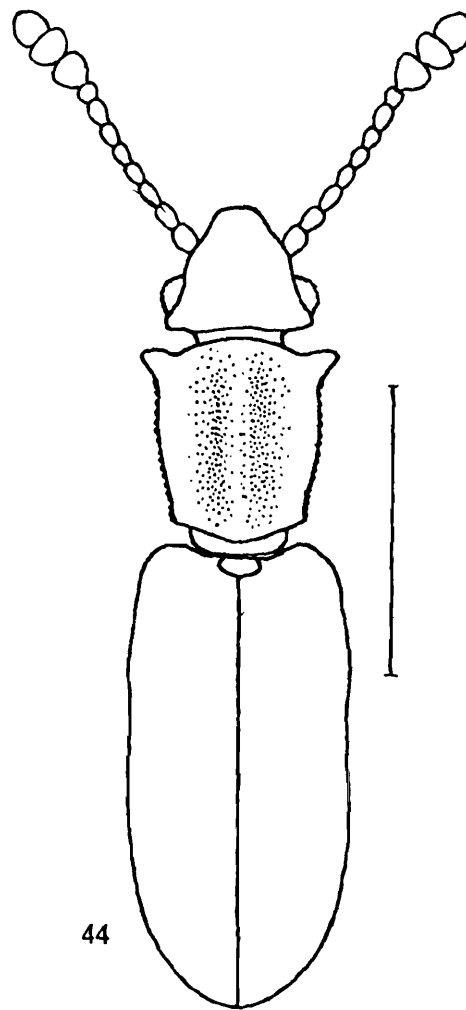
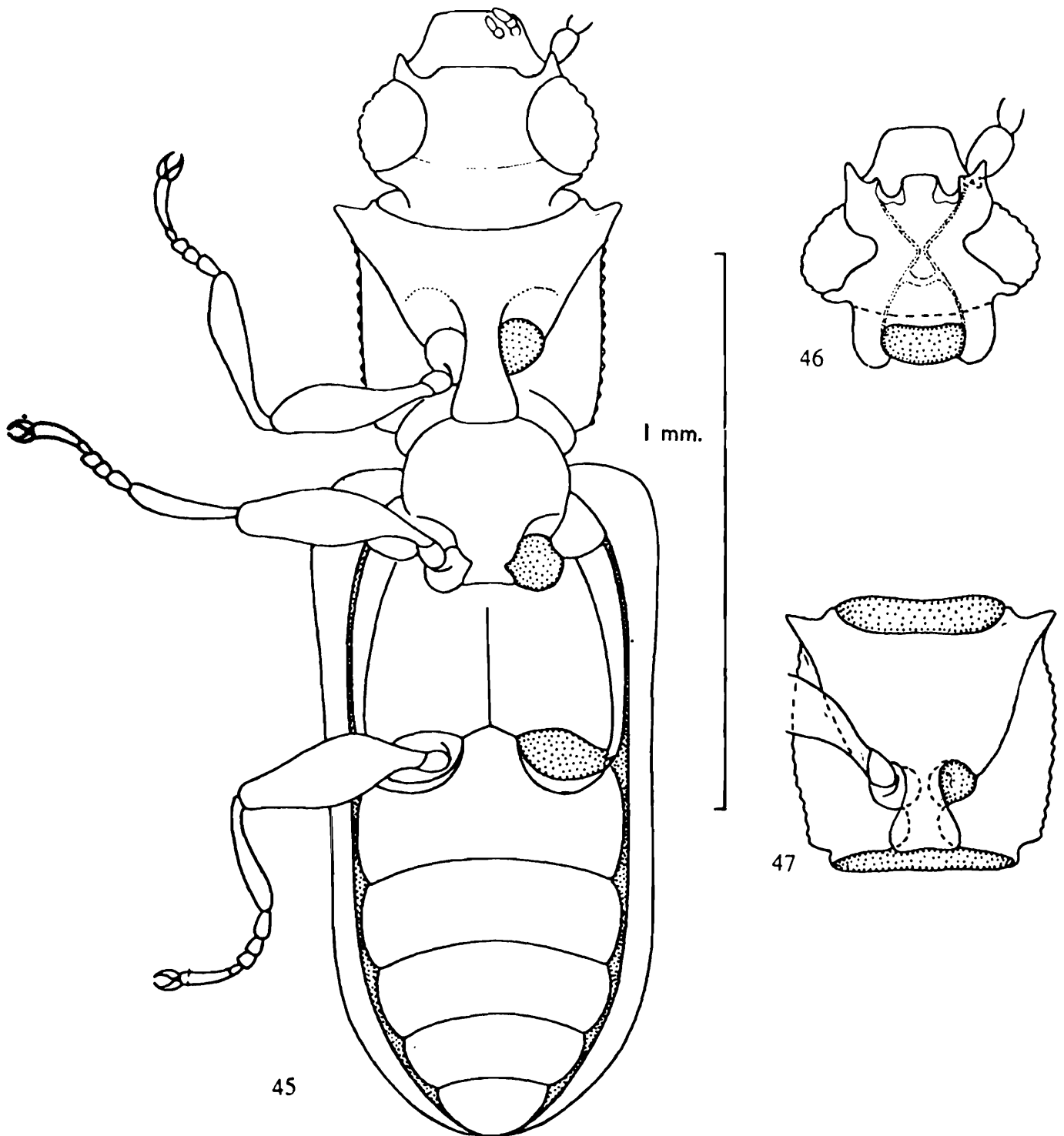


Fig. 44. *Silvanus bhutanicus*, sp. nov., Dorsal view (Scale = 1.0 mm).

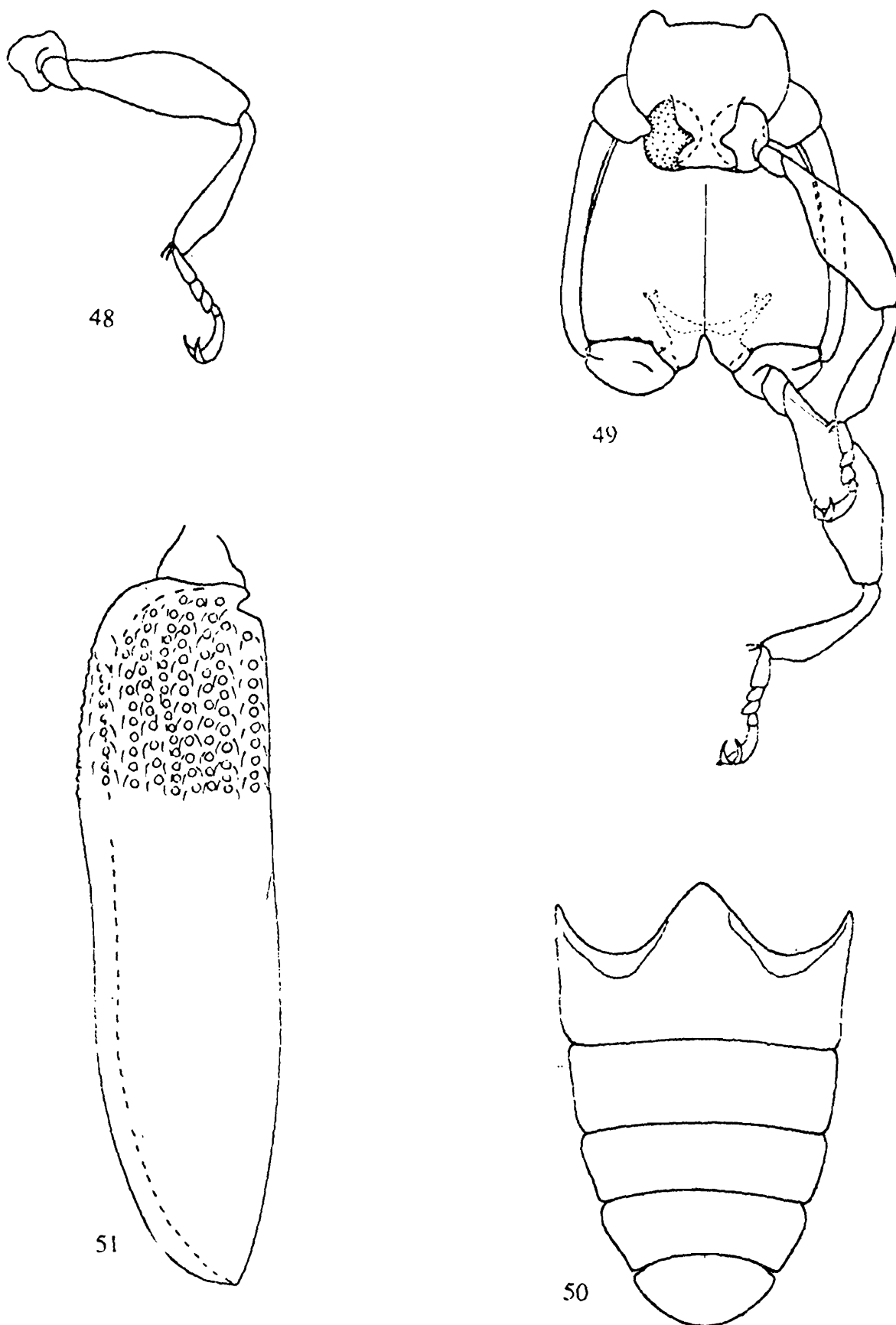
Measurements of holotype : Total length 2.84 mm., width of head across eyes 0.58 mm., length of antenna (except apical segment) 0.90 mm. width of prothorax across middle 0.61 mm., length of elytra 1.66 mm. and width across middle 0.80 mm.

Holotype ♀, BHUTAN, 21 km. O-Wangdi Phodrang, 1700-2000 m., Nat. Hist Museum Basel-Bhutan Expedition 1972 (Naturhistorischen Museum, Basel).

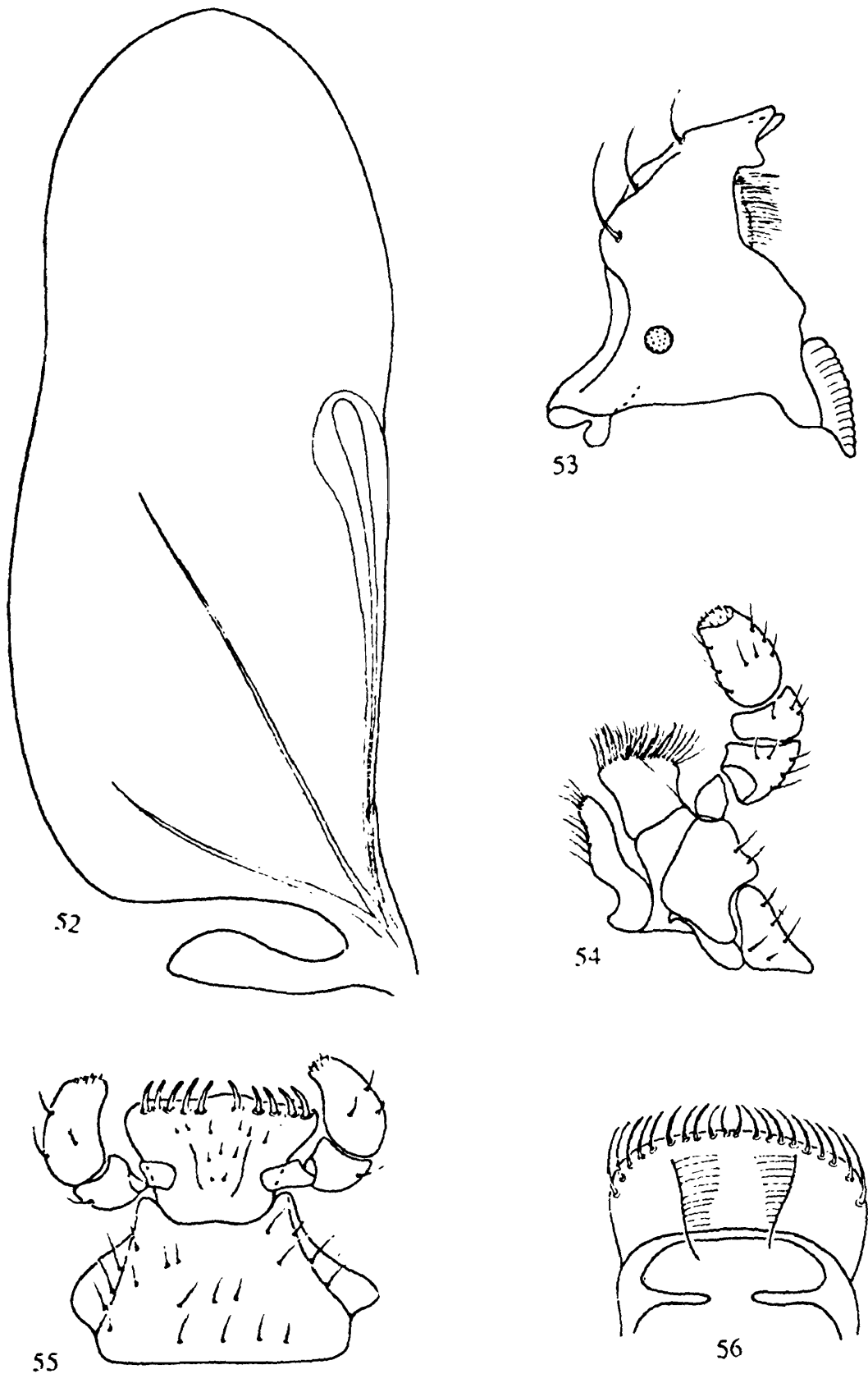
Distribution : BHUTAN.



Figs. 45-47. *Silvanus lewisi* Reitter; 45, Ventral view; 46, Head, Ventral view; 47, Prothorax, Ventral view.



Figs. 48-51. *Silvanus lewisi* Reitter; 48, Front leg; 49, Meso-metathorax, Ventral view; 50, Abdomen, Ventral view; 51, Left elytron, Dorsal view.



Figs. 52-56. *Silvanus lewisi* Reitter; 52, Wing; 53, Left mandible, Dorsal view; 54, Left maxilla, Ventral view; 55, Labium Ventral view; 56, Labrum.

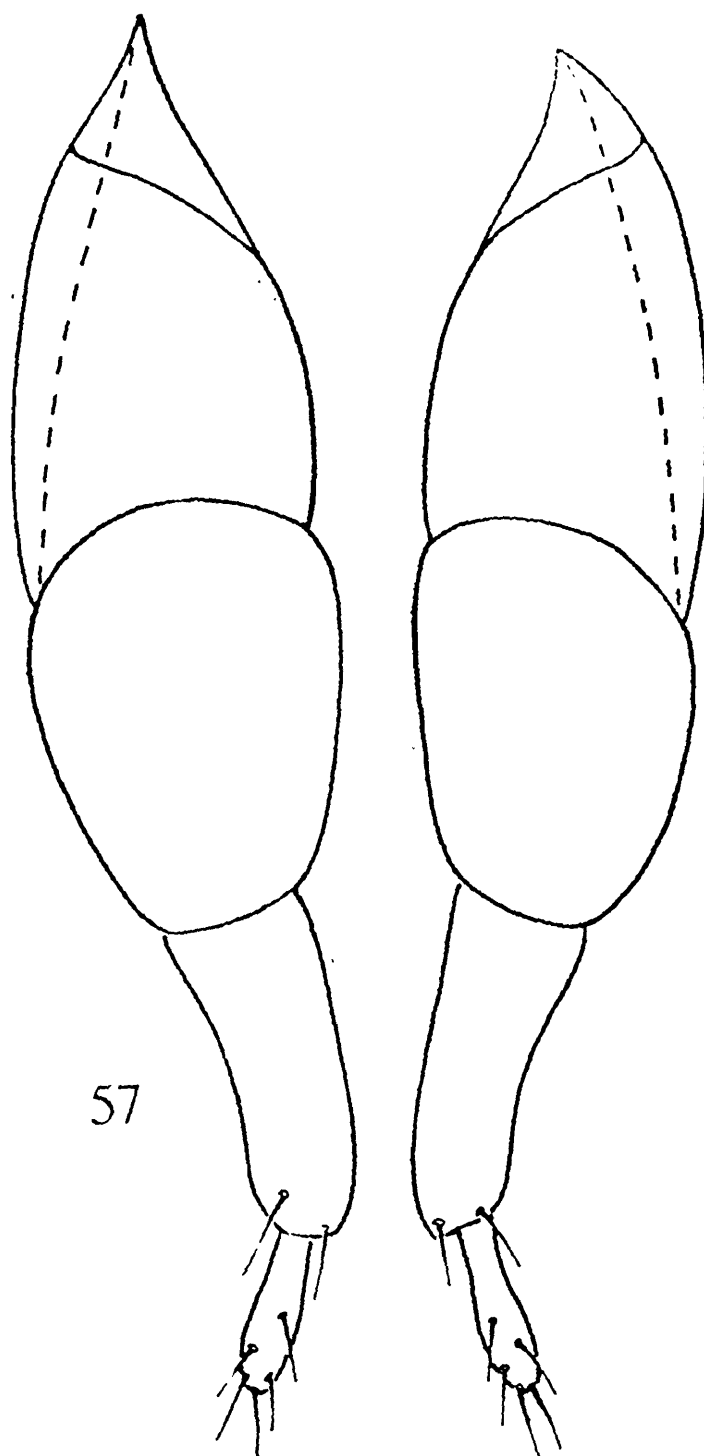
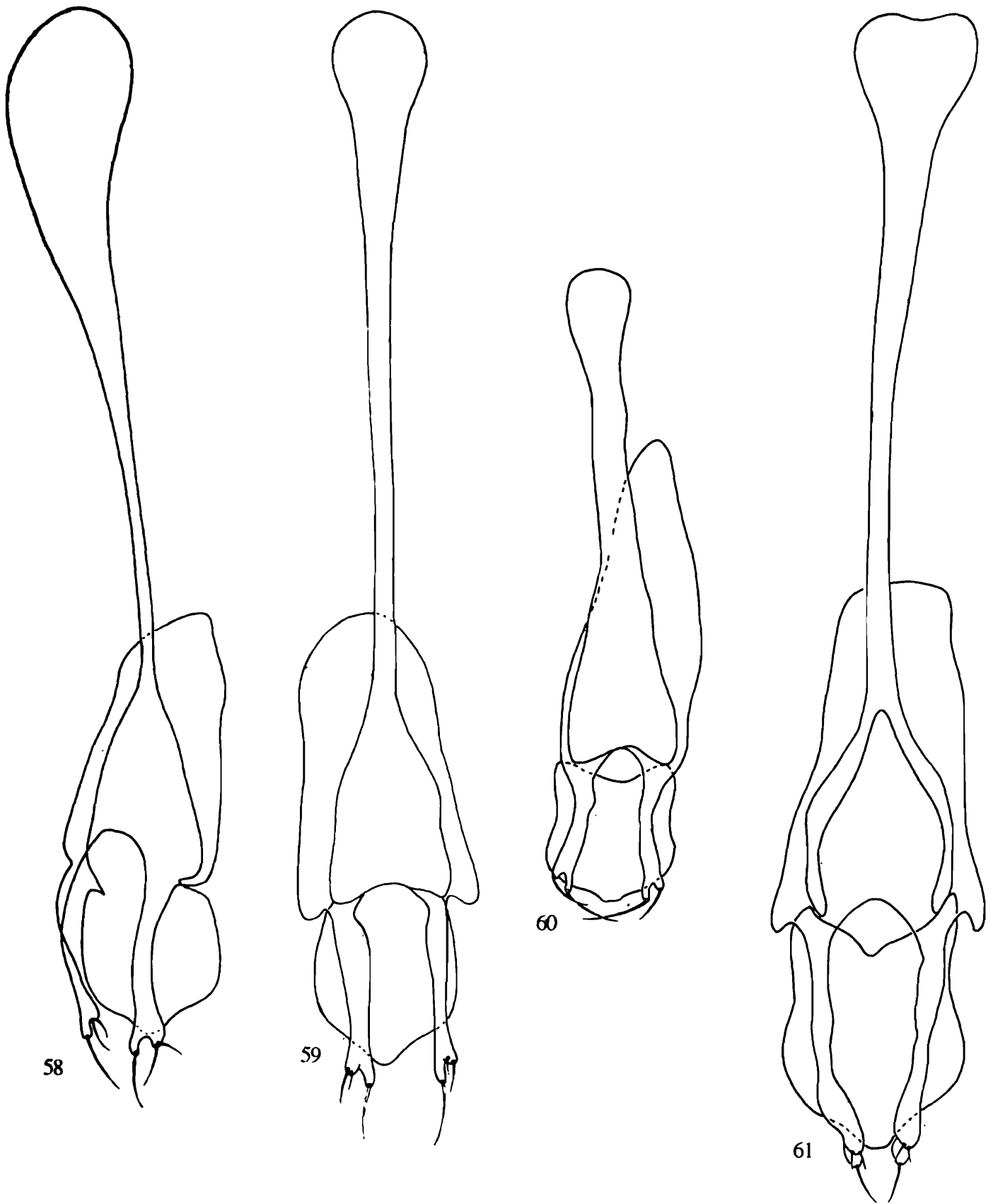
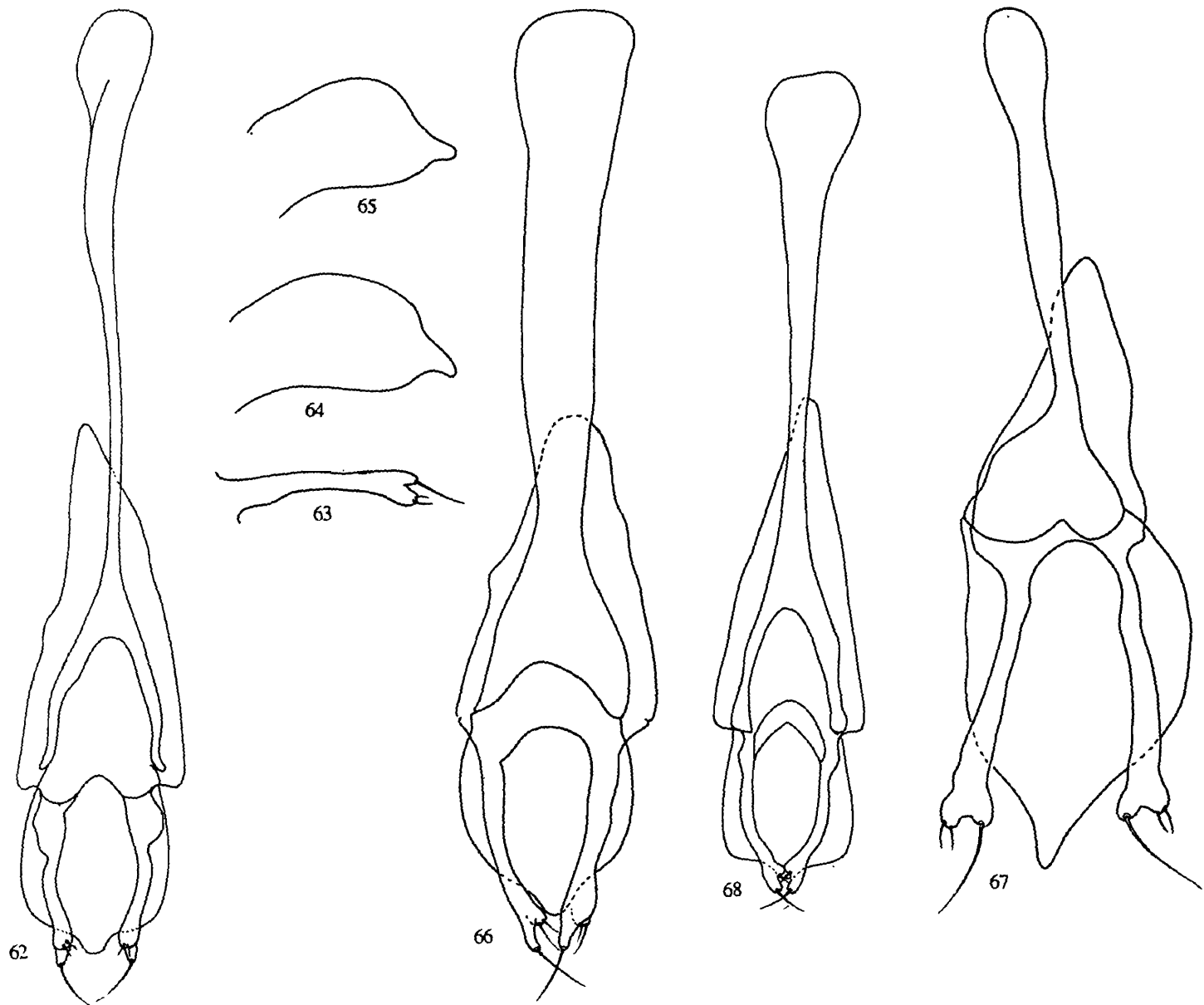


Fig. 57. Ovipositor of *Silvanus lewisi* Reitter.



Figs. 58-61. Aedeagi, Dorsal view; 58, *Silvanus lewisi* Reitter; 59, *S. familiaris* sp. nov.; 60, *S. reticollis* Reitter; 61, *S. rossi* Halstead.



Figs. 62-68. Aedeagi, Dorsal view; 62, *S. difficilis* Halstead; 63, Left paramere of *S. difficilis*; 64-65, Shapes of median lobes of *S. difficilis*, Dorso-lateral view; 66, *S. bidentatus* (Fabricius); 67, *S. robustus* Halstead; 68, *S. andamanicus* sp. nov.

Genus 2. *Silvanoprus* Reitter

1911. *Silvanoprus* Reitter, *Fauna Germanica*, 3 : 45, 46.

1912. *Silvanoprus* : Grouvelle, *Annls Soc. ent. Fr.* 81 : 341.

1930. *Silvanoprus* : Hetschko, *Coleopt. Cat.* 109 : 63.

Type-species : *Silvanus fagi* Guérin-Méneville.

Historical review : *Silvanoprus* is a fairly large genus, erected by Reitter (1911) for the species *Silvanus fagi* Guérin Méneville. Subsequently, he and Grouvelle added several species to this genus. Grouvelle (1912) recognised 13 species, viz., *fagi*, *grouvellei* (Reitter), *angusticollis* (Reitter), *parallellocollis* (Reitter), *feai* (Grouvelle), *javanicus* (Grouvelle), *insidiosus* (Grouvelle), *scuticollis* (Walker), *orientalis* (Grouvelle), *longicollis* Reitter, *tenuicollis* (Grouvelle), *cephalotes* (Reitter) and *inermis* (Reitter) under *Silvanoprus*. Hetschko (1930) in Junk's 'Coleopterorum Catalogus' listed 12 species and synonymised *S. grouvellei* (Reitter) with *S. fagi* (Guérin-Méneville). Halstead (1973) transferred 3 species of *Silvanus* Latreille to *Silvanoprus*, which are *Silvanus birmanicus* Grouvelle, *S. frater* Grouvelle and *S. porrectus* Walker. So far, 4 species, viz., *scuticollis* (Walker), *cephalotes* (Reitter), *longicollis* (Reitter) and *indicus* Pal and Sengupta are known from India. Hitherto the larva of *Silvanoprus* is unknown. In the present study 4 species are described as new to science and the larva of *S. angusticollis* is added.

Habit-habitat : The representatives of this genus are commonly found in haystack and vegetable garbage; recorded also from the under side of bark, stored rice, lac and sometimes attracted to light.

Geographical distribution : This genus is found predominantly in the Oriental region, tropical Africa, Madagascar, and also recorded from Europe and North America. In India its range extends from the North-western Himalaya through the South in to Tamil Nadu. It is also common at low and intermediate elevations. The species are recorded mainly from Assam, foot-hills of Himalayas, Chotanagpur plateau, Nilgiri and Palni hills etc. The majority of the Indian species have southern distribution patterns. Some of these are equally common in southern as well as as northern parts, viz., *S. scuticollis*, *S. cephalotes*, *S. longicollis*, *S. angusticollis*. The above 4 species are the most common and widespread forms in various biotic areas, extending from the subalpine coniferous forests and temperate arable lands south into the southern coasts upto Sri Lanka (except *S. angusticollis*). Of these 4 species, *S. angusticollis* represents a high altitude form. All the above species are having wide distribution in the far East Oriental countries and adjacent Palaearctic zones. *S. scuticollis* appears to be nearly a cosmopolitan species occurring in almost all major faunal regions of the World. *S. indicus*, *S. prolixicornis*, *S. nepalensis*, *S. distinguendus* and *S. palnicus* are representing montane forms, occurring at higher elevations. Of these five species, the first three are restricted to the northern and northeastern parts while the remainder two are southern forms. Of the 9 species dealt with here a majority are having affinities and closely related allies within the African fauna, with a few representing nearly similar forms of some European species.

Description : General form (Fig. 69) elongated, rather narrowed and parallel-sided, moderately depressed, usually yellowish-brown or reddish-brown and rarely blackish-brown.

Head (Fig. 80) elongated, front margin of clypeus almost straight, eyes moderately large and coarsely faceted, temple often flattened beneath eye, vertex with a transverse impressed line behind eyes, tentorium simple with two longitudinal arms connected by a transverse corpo-tentorium near middle. Antenna moderately long and slender, antennal insertions hidden under projection of frons, 11-segmented, scape broadly elongated, pedicel and segment 3 about as long as scape and narrower, segments 4-8 usually slightly shorter than preceding segments, club loose and 3-segmented. Mandible (Fig. 87) with 3 apical teeth, mola well-developed and a vestige of dorsal mandibular cavity present near base. Maxilla (Fig. 88) with lacinia and galea rather short; lacinia narrow, elongated and without apical spine; galea broad and its apex densely hairy; palpi with segment 2 longer than segment 3, apical segment longest and fusiform. Labium (Fig. 89) with mentum transversely triangular, palpi with apical segment longest and fusiform. Labrum (Fig. 90) transverse and its apical margin rounded.

Prothorax (Fig. 81) usually elongated and rarely transverse, front angle with more or less prominent spine and projected forward, lateral margins finely denticulate, prosternal process broad and its apical margin almost straight, front coxae moderately widely separated. Coxal cavities round, cavities broadly closed behind externally and internally.

Meso-metathorax (Fig. 83) : Mesocoxae closely situated, cavities broadly opened outwardly, mesosternal process broad at base and notched at middle, sternal fitting between mesocoxae almost in a straight line. Metasternum transverse, median impressed line extends anteriorly near apex of mesosternal process, hind-coxae more widely separated than mesocoxae, metendosternite simple and represented by two apophyses.

Wing and elytra : Wing (Fig. 86) with single anal vein; without radial cell, anal cell and subcubital fleck. Elytra somewhat parallel-sided, usually slightly sinuate near middle, each elytron (Fig. 85) with 9 rows of stria punctures, without scutellary stria, single and double rows of pubescence on alternate interstices, epipleura narrow and complete upto apex.

Legs (Fig. 82) moderately long, trochanters short and simple, femora swollen towards middle, tibiae slightly broadened at apex and with two apical spurs; tarsal formula 5-5-5 in both sexes, segments 1 and 2 simple, segment 3 strongly lobed below, segment 4 shortest and claws simple.

Abdomen (Fig. 84) elongated, ventrite 1 longer than other ventrites, ventrites 2-5 subequal, intercoxal process of ventrite 1 broad at base and narrowed and slightly pointed at apex; femoral lines closed and usually narrowly separated from posterior margin of hind-coxal cavity, and rarely widely separated as in *S. longicollis*. Aedeagus (Fig. 92) with median lobe rather short and broad and slightly tapered posteriorly, median strut elongated and spatulate at apex; tegmen with a pair of well-developed, slender, elongated parameres usually bifid at apex and apex fringed with a few setae. Ovipositor (Fig. 91) with well-developed paraprocts, valvifers, coxites, and long styli attached on outer margin of apex of coxities.

Larva known : *Silvanoprus angusticollis* (Reitter), by present description.

Sexual dimorphism : Usually indistinct, but in *S. distinguendus* the hind-trochanter in male with a short spinous projection.

Remarks : Grouvelle (1912) divided *Silvanoprus* into two groups on the basis of extension of sterno-pleural suture of prothorax. In the first group he included *S. fagi*, *S. grouvellei*, *S. angusticollis*, *S. parallelocollis*, *S. feai*, *S. javanicus* and *S. insidiosus*, where the sterno-pleural suture extends to lateral margin near anterior spine. In the second group he included *S. scuticollis*, *S. orientalis*, *S. longicollis*, *S. tenuicollis*, *S. cephalotes* and *S. inermis*, where the sterno-pleural suture reaches the anterior margin of prothorax. Among the Indian species, *S. scuticollis* and *S. cephalotes* fall in the second group, other Indian species fall into first group. Unlike other species, first tarsal segment of *S. scuticollis* is markedly long and longer than segments 2 and 3 together, prothorax broader than long and its shape different.

Key to the Species of *Silvanoprus* Reitter

- 1. Prothorax broader than long, width of prothorax across anterior spines more than 1.5 times broader than width across posterior angles, prothorax distinctly narrowed posteriorly, lateral margins almost straight, shape of prothorax somewhat triangular (Fig. 69)
..... *scuticollis* (Walker) p. 79

Prothorax longer than broad, width of prothorax across anterior spines less than 1.25 times broader than width across posterior angles, prothorax slightly narrowed posteriorly behind middle, lateral margins distinctly curved, shapes of prothorax different 2
- 2. Temple of head moderately long and not flattened beneath eye, about as long as two to three eye facets and inwardly notched (Fig. 70)
..... *indicus* Pal and Sengupta p. 81

Temple of head very short or long and distinctly flattened beneath eye, either short, thin and outer apical angle pointed or long and outer apical margin rounded 3
- 3. Temple of head short, length of temple about as long as one or two eye facets and its outer apical angle somewhat pointed; puncturation of head and prothorax reticulate-type, coarse and dense 4

Temple of head long, length of temple about as long as eye or longer than eye and its outer apical margin rounded; puncturation of head and prothorax ocellate-type, coarse and somewhat globular 7
- 4. Front and middle femora with a distinct spine near middle; lateral margins of prothorax more or less uniformly curved outwardly; anterior spine of prothorax small, projected in front and about as long as one-fourth or shorter than length of eye (Fig. 71)
..... *cephalotes* (Reitter) p. 82

- Front and middle femora devoid of any spine; lateral margins of prothorax distinctly wavy and sinuate across anterior one-third; anterior spine of prothorax larger, about half as long as eye and projected somewhat outwardly 5
5. Anterior spine of prothorax markedly long and extending distinctly beyond front margin of prothorax, lateral margin of prothorax slightly sinuate at origin of anterior spine (Fig. 74) *prolixicornis* sp. nov. p. 86
- Anterior spine of prothorax comparatively shorter and not extending beyond front margin of prothorax, lateral margin of prothorax distinctly sinuate at origin of anterior spine (Figs. 72, 73, 75) 6
6. Anterior spine of prothorax narrow and slender and about twice as long as broad, outer margin of anterior spine straight and spine projected more towards lateral side, posterior margin of pronotum distinct (Fig. 72)
..... *angusticollis* (Reitter) p. 84
- Anterior spine of prothorax broad and about as broad as long, outer margin of anterior spine slightly curved and spine projected more towards front, posterior margin of pronotum indistinct near middle (Fig. 75)
..... *nepalensis* sp. nov. p. 88
7. Antennal scape markedly large and about twice as long as broad, antennal segments 9 and 10 distinctly elongated, temple slightly longer than length of eye; prothorax across anterior spine about as wide as across middle, anterior spine situated distinctly beneath level of anterior margin, outer margin of anterior spine slightly curved inwardly and lateral margin of prothorax markedly sinuate across anterior one-fourth (Fig. 77); aedeagus (Fig. 99) with apex of median lobe broad, apex of each paramere abruptly broadened *distinguendus* sp. nov. p. 90
- Antennal scape more or less large and maximum 1.5 times as long as broad, antennal segment 9 about as broad as long or slightly elongated and segment 10 about as broad as long, temple slightly shorter or about as long as eye; prothorax widest across anterior spine, anterior spine situated at level of anterior margin, outer margin of anterior spine either straight or slightly curved outwardly and lateral margin of prothorax slightly sinuate across anterior one-fourth (Figs. 76, 78); aedeagus (Figs. 97, 98) with apex of median lobe broadly pointed, apex of each paramere gradually narrowed 8
8. Antennal scape large, robust and segments 2-8 markedly narrower than scape; puncturation of pronotum coarse and uniform throughout, anterior spine projected forward and its tip somewhat pointed (Fig. 76); each paramere with only single long apical seta (Fig. 97)
..... *longicollis* (Reitter) p. 89

Antennal scape moderately large and segments 2-8 slightly narrower than scape; puncturation on pronotum slightly coarser towards posterior half than towards anterior half, anterior spine projected somewhat outwardly and its tip less pointed (Fig. 78); each paramere with a short pre-apical seta in addition to one long apical seta (Fig. 98)
 *palnicus* sp. nov. p. 92

13. *Silvanoprus scuticollis* (Walker)

1859. *Silvanus scuticollis* Walker, *Ann. Mag. nat. Hist.*, (B) 3 : 53 (Type-loc. : Sri Lanka; Type deposition British Museum Nat. Hist., London).
 1876. *Sivanus triangulus* Reitter, *Col. Hefte*, 15 : 60.
 1908. *Silvanus scuticollis* : Grouvelle, *Annls Soc. ent. Fr.*, 77 : 491.
 1912. *Silvanoprus scuticollis* : Grouvelle, *Annls Soc. ent. Fr.*, 81 : 342.
 1979. *Silvanoprus scuticollis* : Pal and Sengupta, *Entomologica Basiliensia*, 4 : 70.

This is a distinct species, distinguished from other species of *Silvanoprus* by its characteristic transverse, triangular shape of prothorax, gradually narrowed posteriorly.

Description : General form (Fig. 69) elongated, moderately depressed, yellowish or reddish-brown; covered with short, semierect, golden pubescence.

Head : Exposed part of head broader than long, eyes large and slightly shorter than half of length of head; temple short, equal or slightly longer than width of one eye facet, its outer apical angle slightly pointed; puncturation on vertex coarse and dense and that of towards anterior margin of clypeus slightly finer. Antenna moderately long and slender, scape moderately large, pedicel and segment 3 slightly shorter and narrower than scape, segments 4-8 subequal and shorter than segment 3, segments 9 and 10 transverse and segment 11 about as broad as long. *Prothorax* broader than long, distinctly narrowed posteriorly, widest across anterior spines and distinctly broader than head across eyes; anterior spine large, about two-thirds of length of eye and projected forward; lateral margins almost straight and diverging in front, finely denticulate; lateral depressions on pronotum slightly developed; puncturation on pronotum coarse, dense and similar to that of vertex of head; setae projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* less than two times as long as broad, widest near middle, lateral margins wavy and slightly explanate, rows of punctures deep and large, interstices narrower than width of each puncture, setae projected posteriorly. Puncturation on ventral side finer than on vertex of head and pronotum. Aedeagus (Fig. 92) with median lobe slightly tapered at apex, each paramere with a pair of apical setae : one long and other short.

Measurements : Total length 2.17-2.55 mm., width of head across eyes 0.50-0.58 mm., length of antenna 0.89-1.00 mm., width of prothorax across middle 0.48-0.55 mm., length of elytra 1.26-1.35 mm. and width across middle 0.67-0.85 mm.

Materials examined : 146 ex., INDIA : ASSAM, Mikir hills, 2 ex., 14.xi.1974, T. Sengupta, from bunch of dead leaves of forest; Phulbari, 3 ex., 24.xi.1974, T. Sengupta, leaf

garbage; Kaziranga, 75 m., 1 ex., 1976, Wittmer and Baroni; SIKKIM, Rangpo, 450 m., 10 ex., 10.iv.1976, T. K. Pal, haystack; WEST BENGAL, Jalpaiguri district, Dhupguri, 3 ex., 14.iv.1971, T. Sengupta, garbage with hays; same locality, 1 ex., 15.iv.1971, T. Sengupta, sweeping bush; Darjeeling district, Sukna, 1 ex., 5.v.1976, T. K. Pal, haystack; Nadia district, Suravisthan, 2 ex., 28.vii.1974, D. N. Biswas, new haystack; 24 Parganas district, Sagar Island, 10 ex., 24.iii.1975, T. K. Pal, haystack; Kakdwip, 30 ex., 25.iii.1975, T. K. Pal, haystack; Diamond Harbour, 15 ex., 25.iii.1975, T. K. Pal, haystack; Howrah district, Sankrail, 35 ex., 30.iii.1975 10.iii.1976, T. K. Pal, haystack; BIHAR, Chaibasa, 2 ex., 8.iii.1971, T. Sengupta, haystack; same locality, 1 ex., 11.xi.1970, T. Sengupta, Chaibasa, Kaswargaria, 1 ex., 8.iii.1971, T. Sengupta; Namkum, 2 ex., 6.xi.1971, T. Sengupta, lac; UTTAR PRADESH, Pantnagar, 2 ex., 24.iii.1972, T. Sengupta, haystack; Gorakhpur, 2 ex., 24.ix.1974, T. Sengupta, haystack; same locality, 16 ex., 25.x.1973, T. Sengupta, haystack; Nainital district, Dhikala, 5 ex., 24.x.1976, at light; Dehra Dun, New Forest, 1 ex., 18.x.1944, F. Ent., on dry grass; TAMIL NADU, Coimbatore, 1 ex., 29.iii.1977, T. Sengupta, haystack.

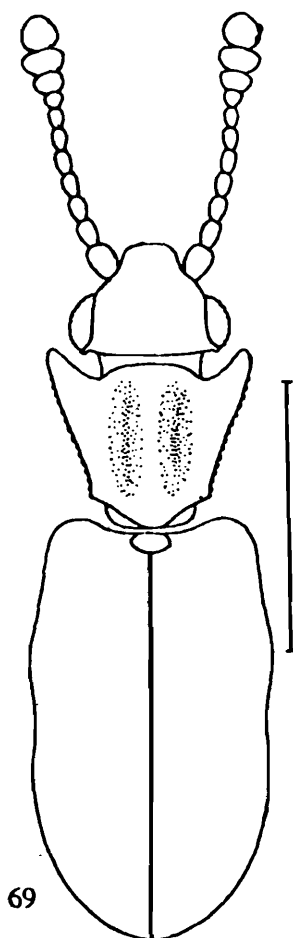


Fig. 69. *Silvanoprus scuticollis* (Reitter), Dorsal view (Scale = 1.0 mm).

Distribution : INDIA : Assam, Sikkim, West Bengal, Bihar, Uttar Pradesh, Tamil Nadu; SRI LANKA; MALAYSIA; INDONESIA (Sumatra); JAPAN; EAST AFRICA; MADAGASCAR; FRANCE; GUYANA; WEST INDIES.

Remarks : Grouvelle (1908) first recorded this species from India (Calcutta) and synonymised *Silvanus triangulus* Reitter with this species. This is a common and widespread species in India.

14. *Silvanoprus indicus* Pal and Sengupta

1979. *Silvanoprus indicus* Pal and Sengupta, *Entomologica Basiliensia*, 4 : 71-72 (Type-loc. : Mikir hills : Assam; Type deposition Zoological Survey of India, Calcutta).

This species resembles *S. angusticollis* (Reitter) but can be differentiated by its temple of head longer, not flattened beneath eye and its outer apical margin broad; anterior spine of prothorax usually smaller and less pointed at apex; aedeagus with its median lobe distinctly elongated, narrowed posteriorly and rather blunt at apex.

Description : General form (Fig. 70) elongated, moderately depressed, yellowish to reddish-brown; covered with short, semierect, golden pubescence.

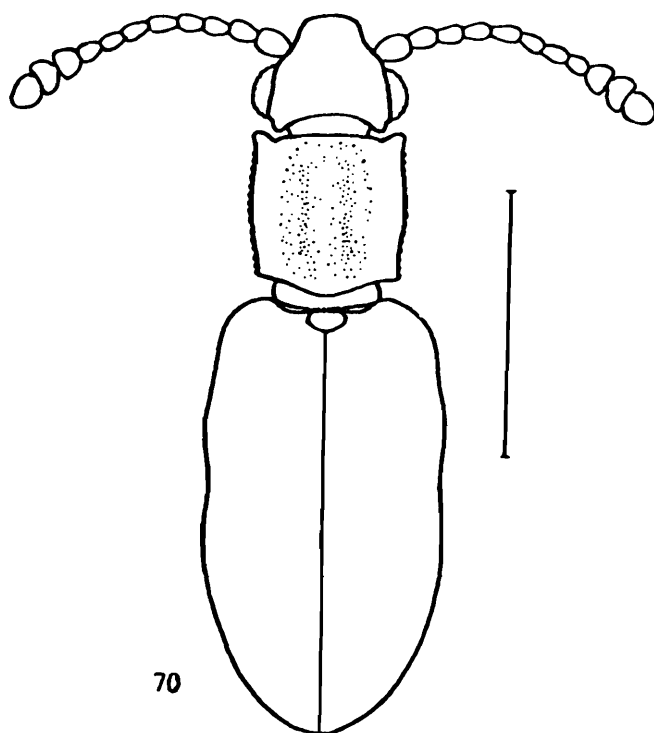


Fig. 70. *Silvanoprus indicus* Pal and Sengupta, Dorsal view (Scale = 1.0 mm)

Head : Exposed part of head broader than long, eyes large and length of eye slightly less than half of length of head, temple moderately long and about as long as 2.5 eye facets;

punctuation on vertex coarse, dense and that of towards anterior margin of clypeus slightly finer; setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel slightly shorter and narrower than scape, segments 3-7 subequal, segment 8 shorter than segment 7, segment 9 slightly elongated, segment 10 slightly transverse and segment 11 about as long as broad. *Prothorax* elongated, moderately convex, slightly narrowed posteriorly, anterior margin slightly rounded; anterior spine short, originates gradually from lateral side and its apex somewhat broadly pointed; lateral margins curved and sinuate at extremities, lateral depressions on pronotal disc slightly marked; punctuation on pronotum coarse, dense and similar to that of vertex of head; setae short and projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* about twice as long as broad, widest behind middle, lateral margins wavy and explanate, rows of punctures deep and large, interstices narrower than width of each puncture. On ventral side punctuation slightly finer than on dorsal side. Aedeagus (Fig. 93) with median lobe broadly elongated, parameres bilobed at apex, outer lobe of each paramere with one long seta and inner lobe with two short setae.

Measurements : Total length 2.29–2.33 mm., width of head across eyes 0.50–0.52 mm., length of antenna 1.08–1.10 mm., width prothorax across middle 0.37–0.38 mm., length of elytra 1.41–1.44 mm. and width across middle 0.70–0.72 mm.

Materials examined : 44 ex. *Holotype* ♂, INDIA : ASSAM, Mikir hills, 14.xi.1975, T. Sengupta, bunch of dead leaves of forest. Aedeagus dissected and mounted on cover slip and pinned with the holotype; *Paratypes* 10 ex., data same as holotype; *Paratypes* 3 ex., MEGHALAYA, Tura, 23.xi.1974, T. Sengupta, under dry cut grass; *Paratypes* 25 ex., SIKKIM, Rangpo, 450 m., 19.iv.1976, A. R. Bhaumik, haystack (Zoological Survey of India, Calcutta; Reg. No. 8377–8406/H4A and 8846–8855/H4A); *Paratypes* 5 ex., BHUTAN, Samchi, 3000 m., 7–11.iv.1972, Nat. Hist. Museum Basel - Bhutan Expedition 1972 (3 *Paratypes* in Nat. Hist. Museum, Basel and 2 *Paratypes* in Zoological Survey of India, Calcutta; Reg. No. 8407/H4A to 8408/H4A).

Distribution : INDIA : Assam, Meghalaya, Sikkim; BHUTAN.

15. *Silvanoprus cephalotes* (Reitter)

1876. *Silvanus cephalotes* Reitter, *Col. Hefte*, **15** : 62 (Type-loc. : Japan; Type deposition - British Museum Nat. Hist., London).

1908. *Sivanus longicollis* : *Sensu* Grouvelle (nec. Reitter), *Annls Soc. ent. Fr.* **77** : 492.

1912. *Silvanoprus longicollis* : *Sensu* Grouvelle (nec. Reitter), *Annls Soc. ent. Fr.*, **81** : 342.

1912. *Silvanoprus cephalotes* : Grouvelle, *Annls Soc. ent. Fr.*, **81** : 342.

1979. *Silvanoprus cephalotes* : Pal and Sengupta, *Entomologica Basiliensia*, **4** : 70.

This species can be recognised by its short temple with pointed outer apical angle, lateral margins of prothorax slightly rounded with very short anterior spines, front and middle femora with a distinct spine near middle of posterior margin in both sexes.

Description : General form (Fig. 71) elongated, moderately depressed, yellowish or reddish-brown; covered with short, semierect, golden pubescence.

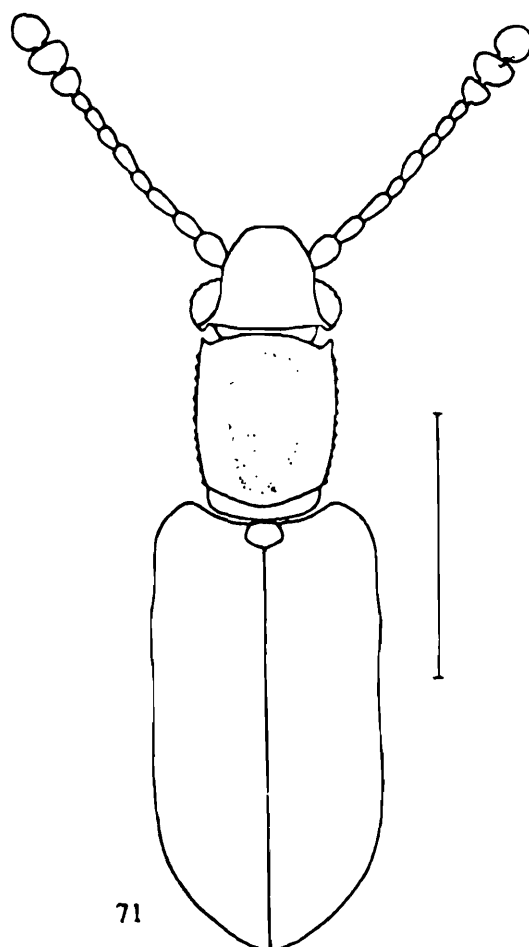


Fig. 71. *Silvanoprus cephalotes* (Reitter), Dorsal view (Scale = 1.0 mm).

Head : Exposed part of head broader than long, eyes large and length of eye slightly less than half of length of head, temple about as long as width of an eye facet and its outer apical angle slightly pointed; puncturation on vertex coarse, dense and that of towards anterior margin of clypeus slightly finer, setae short and projected towards middle line. **Antenna** moderately long, scape moderately large, pedicel and segment 3 about as long as scape, segments 4-8 subequal and shorter than segment 3, segment 9 about as broad long, segments 10 and 11 slightly transverse. **Prothorax** convex, elongated, widest near middle; anterior spine small, about one-fourth or shorter than length of an eye and projected forward; lateral margins curved outwardly and slightly sinuate near anterior one-fourth, finely denticulate; lateral depressions on pronotum slightly developed; puncturation on pronotum coarse, dense and similar to that of vertex of head; setae short and projected towards middle line. **Scutellum** moderately large, transverse and pubescent. **Elytra** more than two times as long as broad, widest near middle, lateral margins wavy and explanate, rows of punctures deep and large, interstices narrower than width of each puncture, setae projected posteriorly. Puncturation on ventral side of head and prothorax almost similar to that of dorsal side, that of meso-metathorax and abdomen slightly finer. Aedeagus (Fig. 94) with median lobe slightly tapered at apex, each paramere with a pair of setae : one long and other short.

Measurements : Total length 2.20 - 2.42 mm., width of head across eyes 0.30 - 0.51 mm., length of antenna 0.81-1.05 mm., width of prothorax across middle 0.41-0.48 mm.,

length of elytra 1.29 – 1.55 mm. and width across middle 0.63-0.70 mm.

Materials examined : 238 ex. INDIA : MEGHALAYA, Shillong, 5 ex., 27.iv.1976, T. Sengupta, haystack; Tura, 3 ex., 25.xi.1974, T. Sengupta, under dry cut grass, ASSAM, Mikir hills, 11 ex., 14.xi.1974, T. Sengupta, from bunch of dead leaves of forest; Kaziranga, 4 ex., 14.xi.1974, T. Sengupta, garbage with hays; Phulbari, 1 ex., 24.xi.1974, T. Sengupta, leaf garbage; SIKKIM, Rangpo, 450 m., 11 ex., 10.iv.1976, T. K. Pal, haystack; WEST BENGAL, Jalpaiguri district, Birpara, 1 ex., viii.1974, A. K. Dutta, at light; Burdwan district, Burdwan, 5 ex., 10.vii.1976, T. K. Pal, haystack; 24 Parganas district, Sagar Island, 30 ex., 24.iii.1975, T. K. Pal, haystack; Kakdwip, 22 ex., 25.iii.1975, T. K. Pal, haystack; Diamond Harbour, 30 ex., 25.iii.1975, T. K. Pal, haystack; Howrah district, Sankrail, 50 ex., 30.iii.1975 – 10.iii.1976, T. K. Pal, haystack; BIHAR, Ranchi, 3 ex., 5.iv.1975, T. K. Pal, haystack; Chaibasa, 1 ex., 28.xii.1970, T. Sengupta, haystack; same locality, 3 ex., 19.x.1975, T. Sengupta, haystack; DELHI, 15 ex., 12.v.1972, T. Sengupta, haystack of Jower; UTTAR PRADESH, Pantnagar, 2 ex., 24.iii.1972, T. Sengupta, haystack; Gorakhpur, 1 ex., 25.x.1973, T. Sengupta, haystack; Anandnagar, 25 km. from Lachmipur, 2 ex., 9. x. 1976, T. Sengupta, haystack; Nainital district. Dhikala, 12 ex., 24.x.1976, T. Sengupta, at light; KARNATAKA, Bangalore, 15 ex., 10.xii.1971, T. Sengupta, haystack; TAMIL NADU, Coimbatore, 420 m., 1 ex., ii.1970, T. R. S. Nathan; NEPAL : Katmandu, 5 ex., 28.iii.1972, T. Sengupta, haystack; Daman, 3 ex., 30.iii.1972, T. Sengupta, under heaps of dead grass; BHUTAN : Samchi, 300 m., 2 ex., 7-11. v. 1972, Nat. Hist. Museum Basel-Bhutan Expedition, 1972.

Distribution : INDIA : Meghalaya, Assam, Sikkim, West Bengal, Bihar, Delhi, Uttar Pradesh, Karnataka, Tamil Nadu; BHUTAN; NEPAL; SRILANKA; INDONESIA (Java); JAPAN; CHINA.

Remarks : Grouvelle (1908) first recorded this species from India (Nilgiri Hills : Tamil Nadu as *longicollis*) and subsequently, he in 1912 transferred it to *Silvanoprus*. The present redescription is based on 2 examples determined by Dr. D. G. H. Halstead. Grouvelle recorded *longicollis* from India and the characters given by him are very similar to the specimens determined as *cephalotes* by Halstead. Therefore, *S. longicollis* (Reitter) from India determined by Grouvelle well might be a member of *cephalotes*. This is also a common and widespread species of Indian *Silvanoprus* and has been recorded from North to South India almost throughout where the surveys were undertaken.

16. *Silvanoprus angusticollis* (Reitter)

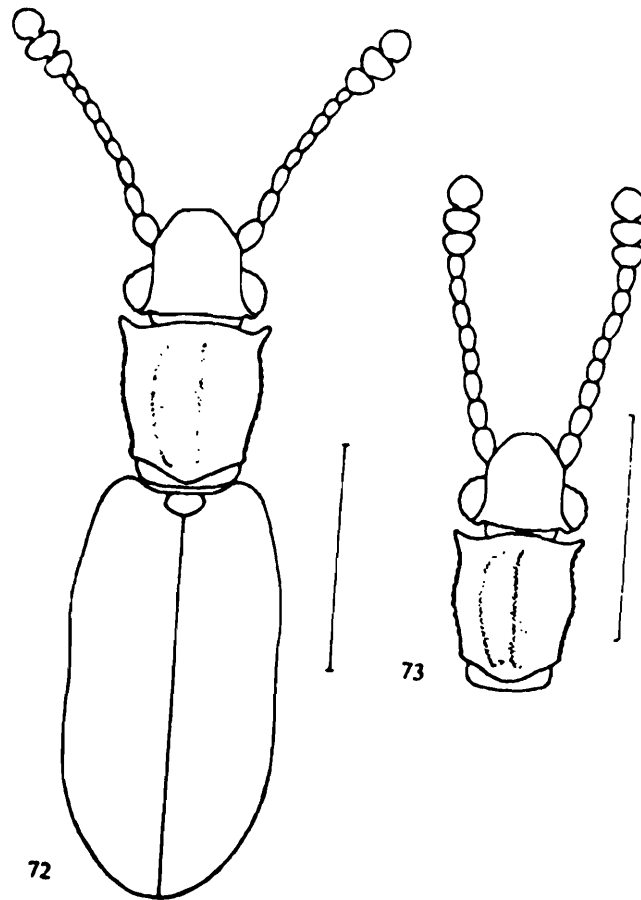
1876. *Silvanus angusticollis* Reitter, *Col. Hefte*, 15 : 59 (Type-loc. : Japan; Type deposition - British Museum Nat. Hist., London).

1912. *Silvanoprus angusticollis* : Grouvelle, *Annls Soc. ent. Fr.*, 81 : 341.

1979. *Silvanoprus angusticollis* : Pal and Sengupta, *Entomologica Basiliensia*, 4 : 71.

This species can be differentiated from the former species (*cephalotes*) by its prothoracic anterior spines distinctly larger and lateral margins of prothorax distinctly sinuate near anterior one-third. This species shows resemblance to other Indian species, viz., *prolixicornis* and *nepalensis*, and the comparisons are discussed under the respective species.

Description : General form (Fig. 72) elongated, moderately depressed, reddish-brown to blackish-brown; covered with short, semierect, golden pubescence.



Figs. 72-73. *Silvanoprus angusticollis* (Reitter): 72, Dorsal view; 73, Head and prothorax, Dorsal view of variants (Scale = 1.0 mm).

Head : Exposed part of head broader than long, eyes large and length of eye slightly less than half of length of head, length of temple shorter than one eye facet and its outer apical angle pointed; puncturation on vertex coarse, dense and that of towards anterior margin of clypeus slightly finer; setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel about as long as scape and narrower, segment 3 slightly shorter than pedicel, segments 4-8 subequal and shorter than segment 3, segments 9 and 11 about as broad as long and segment 10 slightly transverse. **Prothorax** convex, elongated, widest across anterior spines and slightly narrowed posteriorly behind middle; anterior spine originates gradually from side, moderately large, slightly shorter than half of length of eye, projected anteriorly and slightly outwardly, its tip somewhat pointed; lateral margins curved, indistinctly sinuate near anterior one-third and slightly sinuate near posterior angles, finely denticulate; lateral depressions on pronotum slightly developed; puncturation on pronotum coarse, dense and similar to that of vertex of head; setae short and projected towards middle line. **Scutellum** moderately large, transverse and pubescent. **Elytra** about two times as long as broad, widest near middle, lateral margins wavy and explanate, rows of punctures deep and large, interstices narrower than width of each puncture, setae projected posteriorly. Puncturation on ventral side slightly finer than

on vertex of head and pronotum. Aedeagus (Fig. 96) with median lobe distinctly acuminate at apex; apex of each paramere bilobed and lobes are almost equally long, inner lobe with a long seta and outer lobe with two shorter setae.

Measurements : Total length 2.55 - 3.01 mm., width of head across eyes 0.50 - 0.55 mm., length of antenna 1.08 - 1.17 mm., width of prothorax across middle 0.48 - 0.58 mm., length of elytra 1.52 - 1.85 mm. and width across middle 0.73 - 0.91 mm.

Materials examined : 68 ex., INDIA : MEGHALAYA, Shillong, 3 ex., 29.xi.1974, T. Sengupta, leaf garbage; SIKKIM, Gangtok, 1704 m., 2 ex., 24.iv.1976, T. K. Pal, under bark of *Schima wallichii*; same locality, 14 ex., 24.iv.1976, T. K. Pal, garbage of *Cryptomaria* leaf; Pakyang, 29 ex., 27.iv.1976, T. K. Pal, under bark; WEST BENGAL, Darjeeling district, Kalimpong, 1219 m., 2 ex., 17.iv.1971, T. Sengupta, haystack; UTTAR PRADESH, Kosi, 1 ex., 18.x.1976, T. Sengupta, haystack; KASHMIR; Dachigam Sanctuary, 14 ex., 1. iv. 1972, T. Sengupta, haystack; TAMIL NADU, Oote, 1 ex., 3.xii.1971, T. Sengupta, under bark of fallen log; BHUTAN, 21 km. O-Wangdi Phodr., 1700-2000 m., 1 ex., Nat. Hist. Mus. Basel-Bhutan Expedition 1972; NEPAL Dandapakhar, 1700 m., 1 ex., 7.vi.1976, Wittmer and Baroni.

Distribution : INDIA : Meghalaya, Sikkim, West Bengal (Darjeeling dist.), Uttar Pradesh, Kashmir, Tamil Nadu; BHUTAN; NEPAL; JAPAN.

Remarks : Pal and Sengupta (1979) recorded this species from Nepal and Bhutan, and in the present study it is being recorded from the Indian territory. 3 examples from Shillong, Meghalaya have been examined which have the lateral margins of prothorax more sinuate near origin of anterior spines and apex of anterior spines more distinctly pointed (Fig. 73).

17. *Silvanoprus prolixicornis* sp. nov.

This species is closely related to *S. angusticollis*, but can be differentiated by its anterior spines of prothorax being more broadly elongated and lateral margins of prothorax less sinuate near anterior one-third, segments of antennal club less transverse and puncturation on head and pronotum slightly coarser, aedeagus with its median lobe less tapered at apex and each paramere with its inner lobe distinctly elongated.

Description : General form (Fig. 74) elongated, moderately depressed, yellowish-brown; covered with short, semierect, golden pubescence.

Head : Exposed part of head broader than long, eyes large and length of eye shorter than half of length of head, temple about as long as one eye facet and its outer apical angle somewhat pointed, lateral margins of head rather elevated above antennal insertions; puncturation on vertex coarse, dense and that of towards anterior margin of clypeus slightly finer; setae scanty and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel about as long as scape and slightly narrower, segment 3 slightly shorter and narrower than pedicel, segments 4-8 subequal and slightly shorter than segment 3, segment 9 about as broad as long and segment 10 and 11 slightly transverse. *Prothorax* slightly elongated, convex and slightly narrowed posteriorly, widest across anterior spines, anterior margin slightly curved outwardly and slightly posterior to tips of anterior spines, anterior spine moderately large and its tip somewhat pointed; lateral margins almost straight and slightly sinuate on either side of middle, finely denticulate;

lateral depressions on pronotoal disc slightly developed; puncturation on pronotum coarse, **dense** and similar to that of vertex of head; setae projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* about two times as long as broad, lateral margins slightly wavy, rows of punctures deep and large, interstices narrower than width of each puncture, setae short and projected posteriorly. Puncturation on ventral side finer than on vertex and pronotum. Aedeagus (Fig. 95) with median lobe broadly elongated and slightly acuminate at apex; apex of each paramere bilobed, inner lobe elongated with a long seta, outer shorter lobe with a short seta and an additional seta above outer lobe.

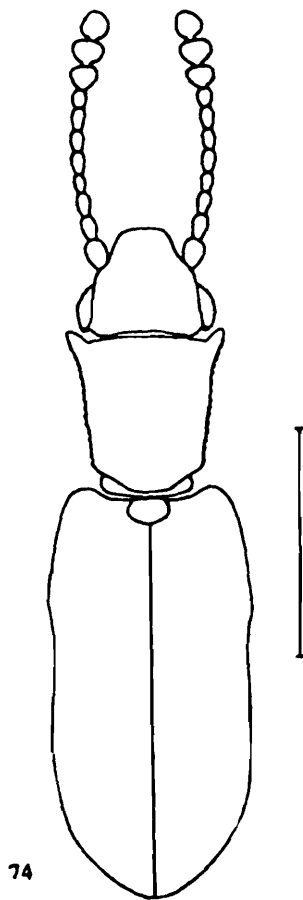


Fig 74. *Silvanoprus prolixicornis* sp. nov., Dorsal view (Scale = 1.0 mm).

Measurements of holotype : Total length 2.70 mm., width of head across eyes 0.52 mm., length of antenna 1.15 mm., width of prothorax across middle 0.55 mm., length of elytra 1.65 mm. and width across middle 0.82 mm.

Holotype ♂ INDIA : UTTAR PRADESH, Almorah, Airadeo, 11.vii.1937, J.C.M. Gardner, ex. *Alnus nitidus*. Aedeagus dissected and mounted on cover slip and pinned with the holotype (Forest Research Institute, Dehra Dun); **Paratype** 2 ex., data same as holotype (1 Paratype in Zoological Survey of India, Calcutta; Reg. No. 11117/H4A and other in Forest Research Institute, Dehra Dun).

Distribution : INDIA : Uttar Pradesh.

18. *Silvanoprus nepalensis* sp. nov.

The facies of this species is somewhat similar to *S. angusticollis* but can be readily separated by its prothorax being more elongated, meeting point of outer margin of anterior spine with lateral margin of prothorax distinctly sinuate, outer margin of anterior spine curved and its tip more distinctly pointed, posterior margin of pronotum not distinct near middle.

Description : General form (Fig. 75) elongated, moderately depressed, blackish-brown and covered with short, semierect, golden pubescence.

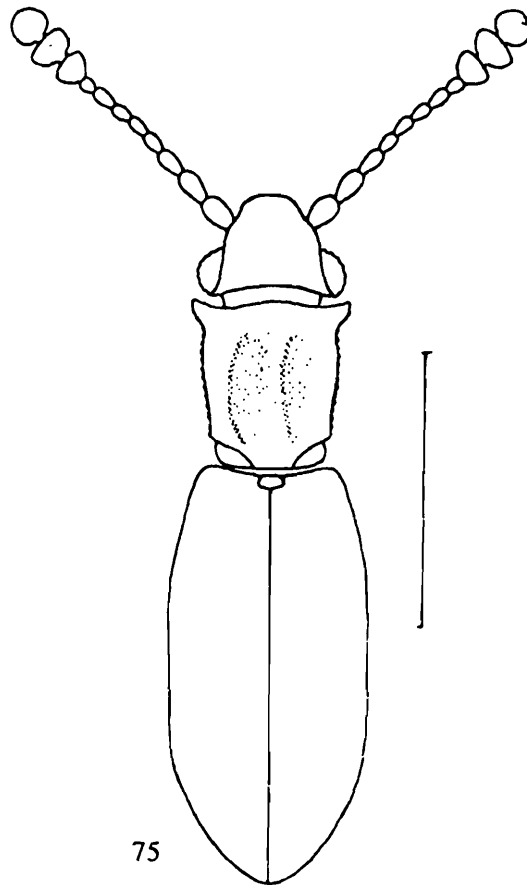


Fig. 75. *Silvanoprus nepalensis* sp. nov., Dorsal view (Scale = 1.0 mm).

Head : Exposed part of head broader than long, eyes large and length of eye slightly less than half of length of head, length of temple shorter than one eye facet and its outer apical angle pointed; puncturation on vertex coarse, dense and that of towards anterior margin of clypeus slightly finer; setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel about as long as scape and narrower, segment 3 slightly shorter and narrower than pedicel, segments 4-8 subequal and shorter than segment 3, segments 9 and 11 about as broad as long and segment 10 transverse. *Prothorax* convex, elongated, widest across anterior spines and slightly narrowed posteriorly; anterior spines originate less abruptly from sides, moderately large and half as long as eye, broad at base, projected outwardly and its tip pointed, outer margin of anterior spine slightly curved inward; lateral margins curved, distinctly sinuate near anterior one-third, finely denticulate; posterior margin of pronotum inconspicuous near middle, lateral depressions

on pronotum slightly marked, puncturation on pronotum coarse and dense and similar to that of vertex of head, setae short and projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* about two times as long as broad, widest near middle, lateral margins wavy and explanate, rows of punctures deep and large, interstices narrower than width of each puncture, setae projected posteriorly. Puncturation on ventral side finer than on vertex and pronotum.

Measurements of holotype : Total length 2.39 mm., width of head across eyes 0.47 mm., length of antenna 1.02 mm., width of prothorax across middle 0.44 mm., length of elytra 1.47 mm. and width across middle 0.75 mm.

Holotype 1 ex., NEPAL : Katmandu, 28.iii.1972, T. Sengupta, haystack (Zoological Survey of India, Calcutta; Reg. No. 11118/H4A).

Distribution : NEPAL.

19. *Silvanoprus longicollis* (Reitter)

1876. *Silvanus longicollis* Reitter, *Col. Hefte*, **15** : 60. (Type-loc. : Sri Lanka; Type deposition - Institute of Zoology, Polish Academy of Sciences, Warszawa).

1879. *Silvanus javanicus* Grouvelle, *Notes Leyd. Mus.*, **8** : 48, **syn. nov.**

1908. *Silvanus longicollis* Grouvelle (auct. nec. Reitter), *Annls Soc. ent. Fr.*, **77** : 491, 492.

1912. *Silvanoprus longicollis* : Grouvelle (auct. nec. Reitter), *Annls Soc. ent. Fr.*, **81** : 341.

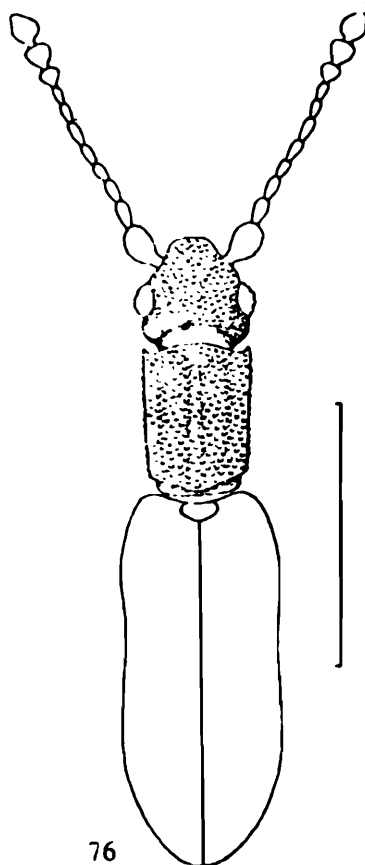


Fig. 76. *Silvanoprus longicollis* (Reitter), Dorsal view (Scale = 1.0 mm).

This species is characterized by its long temple, large antennal scape and ocellate punctures on head and prothorax. This species shows similarity with other Indian species, viz., *distinguendus* and *palnicus*, and the comparisons are discussed under respective species.

Description : General form (Fig. 76) elongated, moderately depressed, yellowish to blackish-brown; covered with short, semierect, golden pubescence.

Head : Exposed part of head broader than long, eyes rather short; temple long, slightly shorter than length of eye and its outer margin rounded; puncturation on vertex coarse, ocellate, dense and that of towards anterior margin of clypeus slightly finer. Antenna moderately long and slender, scape large; segments 2-8 subequal, shorter and markedly narrower than scape; segments 9-11 about as broad as long. *Prothorax* convex, elongated, widest across anterior spines, almost parallel-sided; anterior spine small, shorter than half of length of eye and projected forward; lateral margins almost straight to slightly wavy and finely denticulate, posterior margin of pronotum usually confluent with rim of foramen, lateral depressions on pronotum slightly developed; puncturation on pronotum coarse, ocellate and similarly dense as on vertex of head. *Scutellum* moderately large and transverse. *Elytra* more than two times as long as broad, widest near middle, lateral margins wavy and slightly explanate, rows of punctures deep and large, interstices slightly narrower than width of each puncture. On ventral side puncturation finer than on vertex and pronotum. Aedeagus (Fig. 97) with median lobe slightly tapered at apex, each paramere with a long apical seta.

Measurements : Total length 2.17 - 2.38 mm., width of head across eyes 0.39 - 0.44 mm., length of antenna 0.92 - 0.94 mm., width of prothorax across middle 0.39 - 0.45 mm., length of elytra 1.29 - 1.41 mm., and width across middle 0.57 - 0.68 mm.

Materials examined : 35 ex. *Type*, 1 ex., SRI LANKA (stated in the label as Ceylon), Nietner (Institute of Zoology, Polish Academy of Sciences, Warszawa); INDIA: MEGHALAYA, Garo hills, Dainadubi Reserve Forest, 9 ex., 18.xi.1974, T. Sengupta, leaf garbage; Sarengina, Dainadubi, 3 ex., 19.xi.1974, T. Sengupta, dead cut grass, garbage with hays; Tura, 2 ex., 23.xi.1974, T. Sengupta, under dry cut grass; WEST BENGAL, Jalpaiguri district, Dhupguri, 2 ex., 14.iv.1971, T. Sengupta, leaf litter; Howrah district, Sankrail, 10 ex., 30.iii.1975 - 10.iii.1976, T. K. Pal, haystack; UTTAR PRADESH, Gorakhpur, 2 ex., 15.viii.1975, T. Sengupta, fodder garbage; Nainital district, Dhikala, 5 ex., 25.x.1976, under bark of *Shorea robusta* and *Mallotus philippinensis*; TAMIL NADU, Coimbatore, 420 m., 1 ex., ii. 1970, T.R.S. Nathan.

Distribution : INDIA : Meghalaya, Assam, West Bengal, Uttar Pradesh, Tamil Nadu; SRI LANKA; MALAYSIA; INDONESIA (Java); CHINA; JAPAN; MADAGASCAR; EAST AFRICA.

Remarks : The present synonym is based on one example determined by Dr. D. G. H. Halstead and valuable comments received from him. Grouvelle (1912) recorded *Silvanoprus javanicus* from India (Assam) and the characters of *javanicus* are similar to the 'type' of *Silvanoprus longicollis*.

20. *Silvanoprus distinguendus* sp. nov.

This species is closely related to *S. longicollis* but can be easily separated by its antennal

scape about twice as long as broad, antennal segments 9 and 10 distinctly elongated, temple slightly longer than length of eye, anterior spines of prothorax situated beneath the level of anterior margin and lateral margins distinctly sinuate across anterior one-fourth; aedeagus with apical projection of median lobe broad and blunt, apex of each paramere abruptly broadened with one long and two shorter apical setae.

Description : General form (Fig. 77) elongated, moderately depressed, yellowish-brown; covered with short, semierect, golden pubescence.

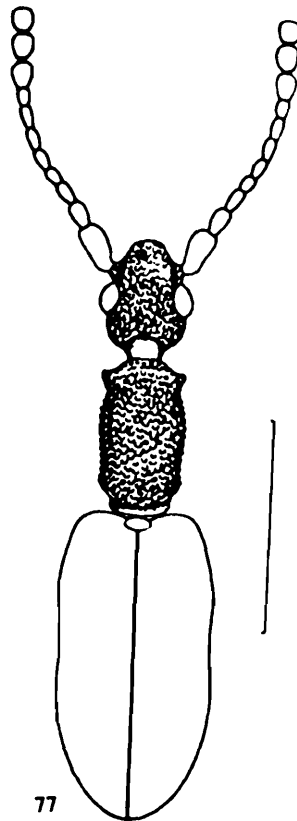


Fig. 77. *Silvanoprus distinguendus* sp. nov., Dorsal view (Scale = 1.0 mm).

Head : Exposed part of head broader than long, eyes rather short, temple long, slightly longer than length of eye and its outer margin slightly rounded; puncturation on vertex coarse, ocellate, moderately dense and that of towards anterior margin of clypeus slightly finer. Antenna moderately long and slender, scape large and about twice as long as broad; segments 2-8 narrower, subequal and shorter than scape; segments 9 and 10 distinctly and segment 11 slightly elongated. **Prothorax** convex, elongated and almost parallel-sided, width across anterior spines almost equal to width across middle; anterior spine small, about half as long as eye and projected forward; anterior spine situated beneath level of anterior margin and its outer margin curved inwardly; lateral margins slightly wavy, distinctly sinuate across anterior one-fourth, finely denticulate; posterior margin of pronotum slightly separated from rim of foramen, lateral depressions on pronotum indistinct; puncturation near front margin of pronotum finer than on vertex of head and on remaining part coarse,

ocellate and similar to that of vertex of head. *Scutellum* moderately large and transverse. *Elytra* about two times as long as broad, widest near middle, lateral margins wavy and slightly explanate, rows of punctures deep and large, interstices narrower than width of each puncture. On ventral side puncturation finer than on vertex of head and pronotum, hind-trochanter with a short, spinous projection in male. Aedeagus (Fig. 99) with apical projection of median lobe broad and blunt, paramere abruptly broadened at apex, each paramere with one long and two shorter apical setae.

Measurements of holotype : Total length 2.63 mm., width of head across eyes 0.44 mm., length of antenna 1.36 mm., width of prothorax across middle 0.42 mm., length of elytra 1.41 mm., and width across middle. 0.73 mm.

Holotype ♂, SRI LANKA : North Central, Medawachchiya, 6.ii.1970, Mussard Besuchet Löbl. Aedeagus dissected and mounted on plastic board and pinned with holotype; *Partatype* 1 ex., data same as holotype; *Paratype* 1 ex., SRI LANKA, Dhubulla, 2000 m., 12.i.1965, R. Mussard; *Paratype* 5 ex., INDIA : TAMIL NADU, Palni H., 39 km. E. Kodaikanal, 650 m., 11.xi.72, Besuchet Löbl Mussard (Holotype and Paratypes in Museum d' Histoire Naturelle, Geneve; 2 Paratypes in Zoological Survey of India, Calcutta, Reg. No. 11119/H4A, and 2 Paratypes in D.G.H. Halstead Coll., Slough).

Distribution : INDIA : Tamil Nadu; SRI LANKA.

21. *Silvanoprus palnicus* sp. nov.

This species is closely related to *S. longicollis* but can be separated by its antennal scape narrower and other segments comparatively broader; prothorax with lateral margins distinctly wavy, anterior spine projected somewhat outwardly and its apex less pointed, puncturation towards posterior side slightly coarser than towards anterior side, aedeagus with each paramere bears a short pre-apical seta in addition to one long apical seta.

Description : General form (Fig. 78) elongated, moderately depressed and yellowish-brown; covered with short, semierect, golden pubescence.

Head : Exposed part of head broader than long, eyes rather short; temple long, slightly shorter than length of eye and its outer margin rounded; puncturation on vertex coarse, ocellate, dense and that of towards anterior margin of clypeus slightly finer. Antenna moderately long and slender, scape moderately large; segments 2-8 narrower, subequal and shorter than scape; segment 9 elongated, segment 10 slightly transverse and segment 11 about as broad as long. *Prothorax* convex, elongated, widest across anterior spines; anterior spine small, about half as long as eye, projected somewhat outwardly and its tip less pointed; lateral margins slightly wavy, sinuate near origin of anterior spines, finely denticulate; posterior margin of pronotum confluent with rim of foramen, lateral depressions on pronotum slightly marked; puncturation on pronotum coarse, ocellate and similar to that of anterior margin of head, and puncturation towards posterior side slightly coarser. *Scutellum* moderately large and transverse. *Elytra* more than two times as long as broad, widest near middle, side margins wavy and explanate, rows of punctures deep and large, interstices slightly narrower than width of each puncture. Puncturation on ventral side of head and prothorax almost similar as on dorsal side and on remaining parts finer. Aedeagus (Fig. 98)

with apex of median lobe slightly tapered at apex; parameres long and slender, each paramere with a short pre-apical seta in addition to one long apical seta.

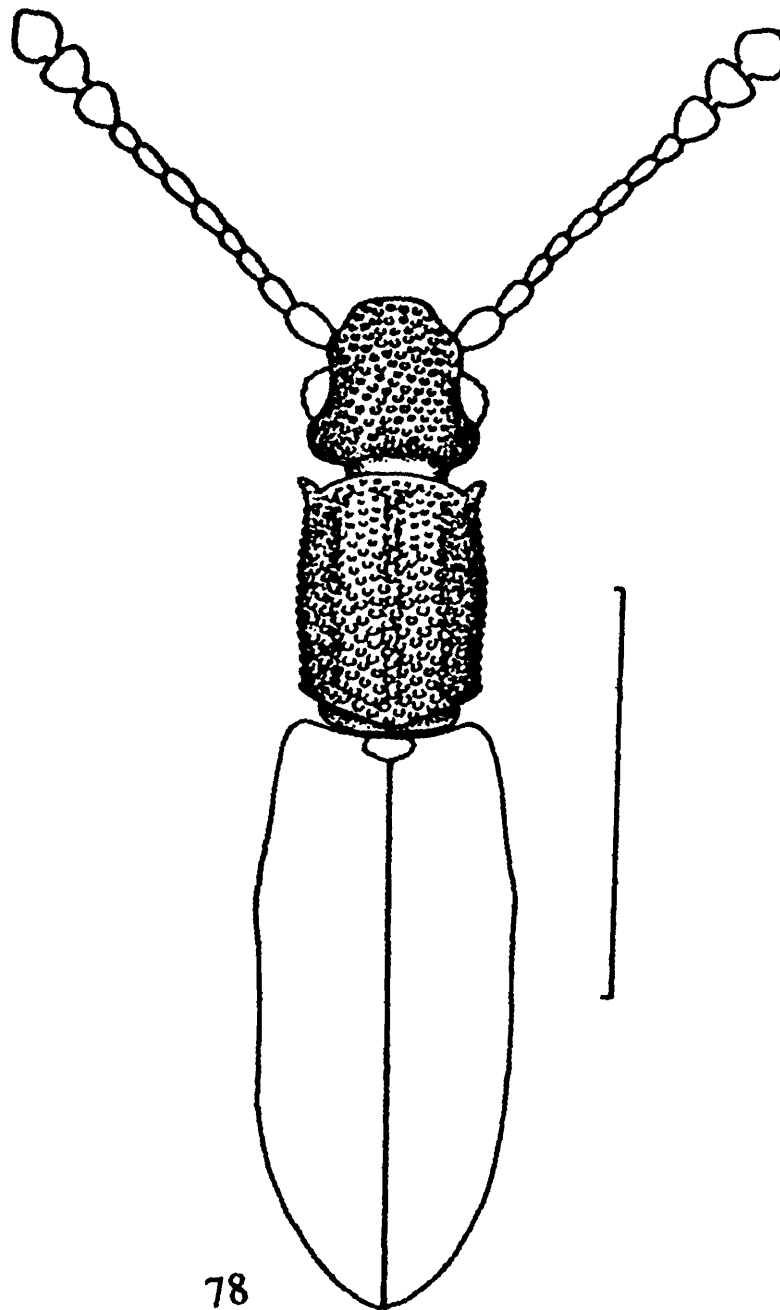
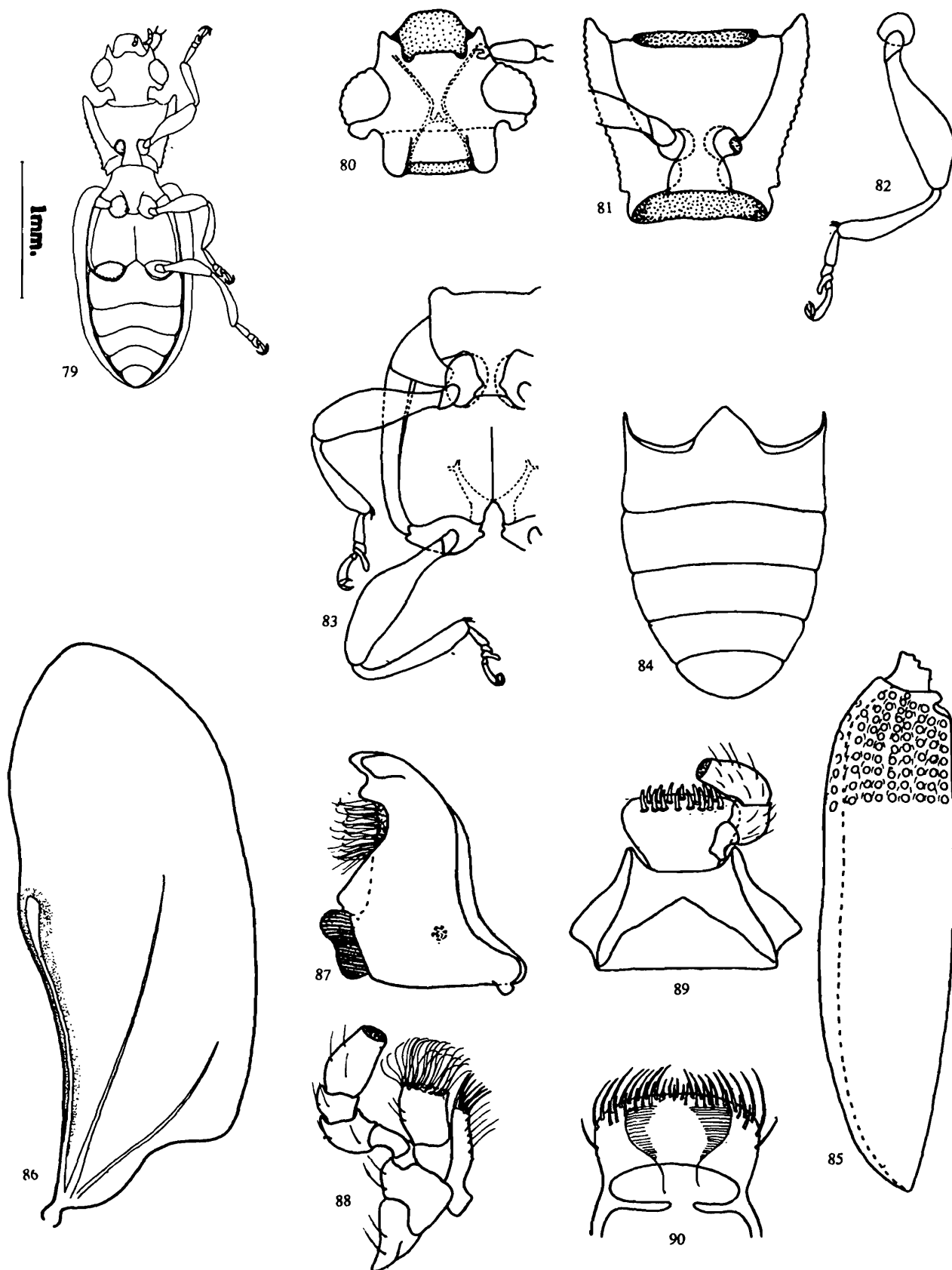
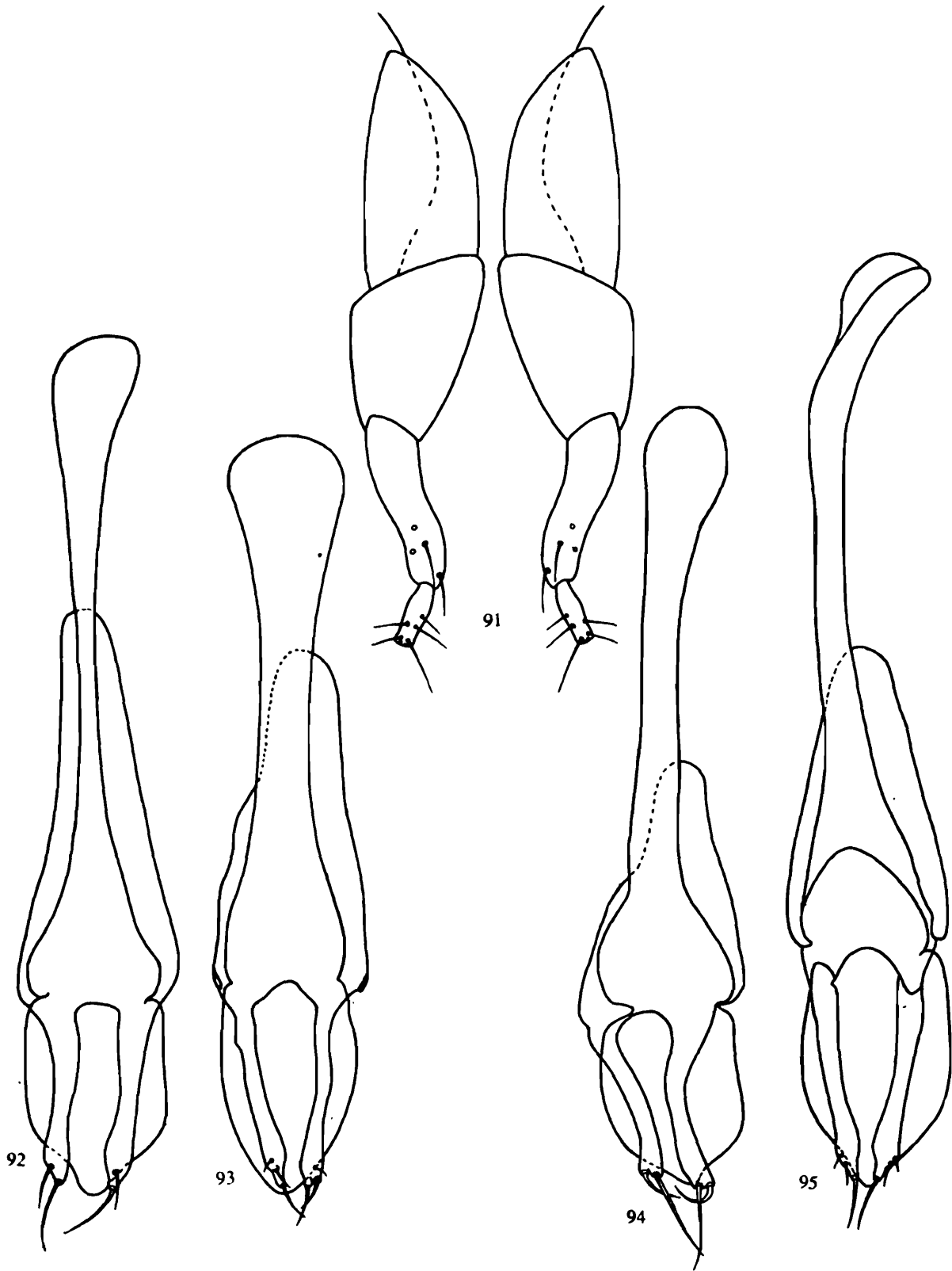


Fig. 78. *Silvanoprus palnicus* sp. nov., Dorsal view (Scale = 1.0 mm).



Figs. 79-90. *Silvanoprus scuticollis* (Reitter) : 79, Ventral view; 80, Head, Ventral view; 81, Prothorax, Ventral view; 82, Front leg; 83, Meso-metathorax, Ventral view; 84, Abdomen, Ventral view; 85, Left elytron, Dorsal view; 86, Wing; 87, Left mandible, Ventral view; 88, Right maxilla, Ventral view; 89, Labium, Ventral view; 90, Labrum.

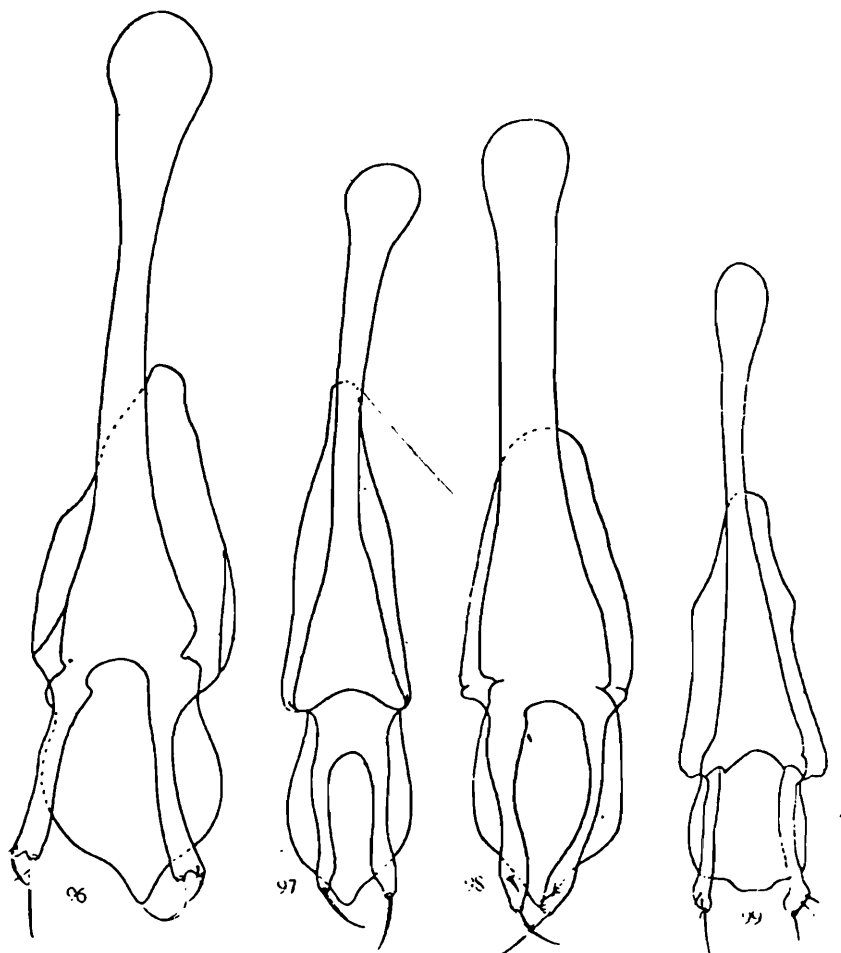


Figs. 91-95. 91, Ovipositor of *Silvanoprus scuticollis* (Reitter). 92-95, Aedeagi, Dorsal view; 92, *S. scuticollis*, (Reitter); 93, *S. indicus* Pal and Sengupta; 94, *S. cephalotes* (Reitter); 95, *S. prolixicornis* sp. nov.

Measurements of holotype : Total length 2.54 mm., width of head across eyes 0.41 mm., length of antenna 1.02 mm., width of prothorax across middle 0.39 mm., length of elytra 1.32 mm. and width across middle 0.57 mm.

Holotype ♂, INDIA : TAMIL NADU, Palni hills, 13-15.ix.22, Kemp. Aedeagus dissected and mounted on cover slip and pinned with the holotype; *Paratype* 1 ex., data same as holotype (Zoological Survey of India, Calcutta; Reg. No. 11120-11121/H4A).

Distribution : INDIA : Tamil Nadu.



Figs. 96-99. Aedeagi, Dorsal view: 96, *Silvanoprus angusticollis* (Reitter); 97, *S. longicollis* (Reitter); 98, *S. palnicus* sp. nov.; 99, *S. distinguendus* sp. nov.

Genus 3. *Silvanoides* Halstead

1973. *Silvanoides* Halstead, *Bull. Br. Mus. nat. Hist. (Ent.)* 29(2) : 87.

Type-species : *Silvanoides cheesmanae* Halstead.

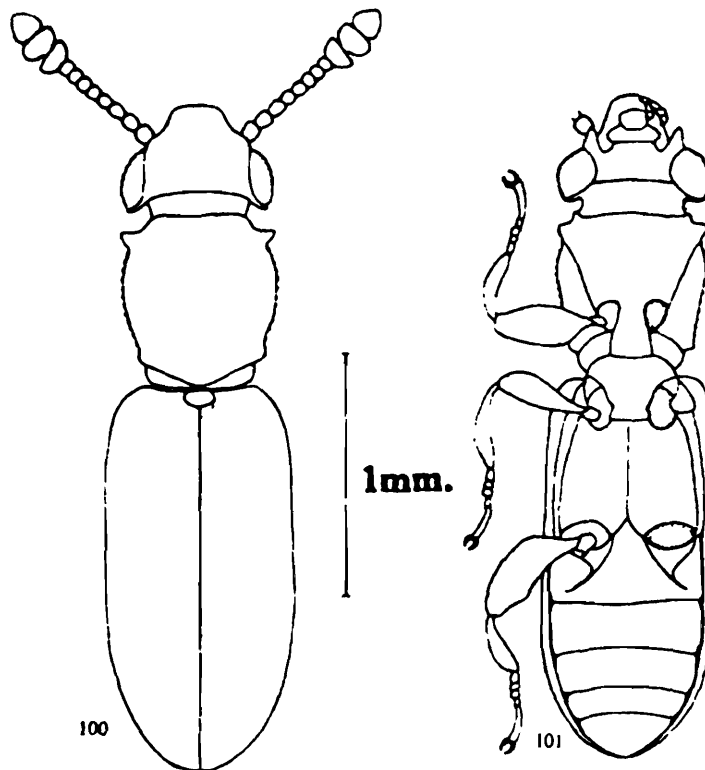
[= *cribricollis* (Grouvelle)].

Historical review : Halstead (1973) established the genus *Silvanoides* based on two species, viz., *cheesmanae* Halstead and *foveicollis* Halstead from Philippine Is., New Guinea and Solomon Is. and designated *cheesmanae* as the type-species. Later, Pal (1985) placed *Neosilvanus cribricollis* (Grouvelle) in this genus.

Habit-habitat : *Silvanoides* inhabits subcorticolous habitat.

Geographical distribution : This genus is mainly Oriental in distribution, found in the North-east India and various South-east Asian countries. The only Indian species viz., *cribricollis* (Grouvelle), with a fairly wide distribution in South-east Asia extending as far as some Pacific islands, is recorded from Meghalaya and Arunachal Pradesh.

Description : General form (Fig. 100) elongated, moderately flattened, slightly shiny and usually reddish-brown.



Figs. 100-101. *Silvanoides cribricollis* (Grouvelle): 100, Dorsal view; 101, Ventral view.

Head (Fig. 102) broader than long, front margin of clypeus straight, eyes large and coarsely faceted, temple flattened beneath eye and shelf-like, transverse impressed line on vertex behind eyes indistinctly visible, tentorium with two long tentorial arms connected by transverse corpo-tentorium. Antenna short and slender, antennal insertions hidden under projection of frons, 11-segmented, scape broadly elongated, pedicel and segment 3 almost as long as scape and narrower; segments 4-8 shorter, subequal, transverse or about as broad as long, club loose and 3-segmented. Mandible (Fig. 109) with 3 apical teeth, mola well-developed, vestige of dorsal mandibular cavity present near base. Maxilla (Fig. 110) with lacinia narrow, elongated and without apical spine; galea short, broad and its apex densely hairy, palpi with segment 2 slightly longer than segment 3, apical segment longest and fusiform. Labium (Fig. 111) with mentum somewhat triangular and transverse, palpi with apical segment longest and fusiform. Labrum (Fig. 112) transverse with apical margin rounded.

Prothorax (Fig. 103) elongated, front angle with a prominent spine beneath anterior margin, lateral margins finely denticulate, pronotum with a median disc demarcated by shallow lateral depressions, front coxae moderately widely separated, coxal cavities almost round, cavities broadly closed behind externally and opened internally, prosternal suture extending to front angle.

Meso-metathorax (Fig. 105): Mesocoxae moderately widely separated, cavities broadly opened outwardly, mesosternal process notched behind middle, sternal fitting between mesocoxae in a straight line. Metasternum transverse, median impressed line extends anteriorly almost upto apex of mesosternal process; hind-coxae more widely separated than mesocoxae, metendosternite simple and represented by two appophyses.

Wing and Elytra : Wing (Fig. 108) with single anal vein; without anal cell, radial cell and subcubital fleck. Elytra somewhat parallel-sided, each elytron (Fig. 107) with 9 rows of stria punctures, without scutellary striole, alternate interstices with single and double rows of pubescence, epipleura narrow and complete upto apex.

Legs (Fig. 104) moderately long, trochanters short and simple, femora swollen towards middle, tibiae not broadened at apex and with two apical spurs; tarsal formula 5-5-5 in both sexes, tarsi simple, segment 1 elongated, segments 2 and 3 short and subequal, segment 4 shortest, claws simple.

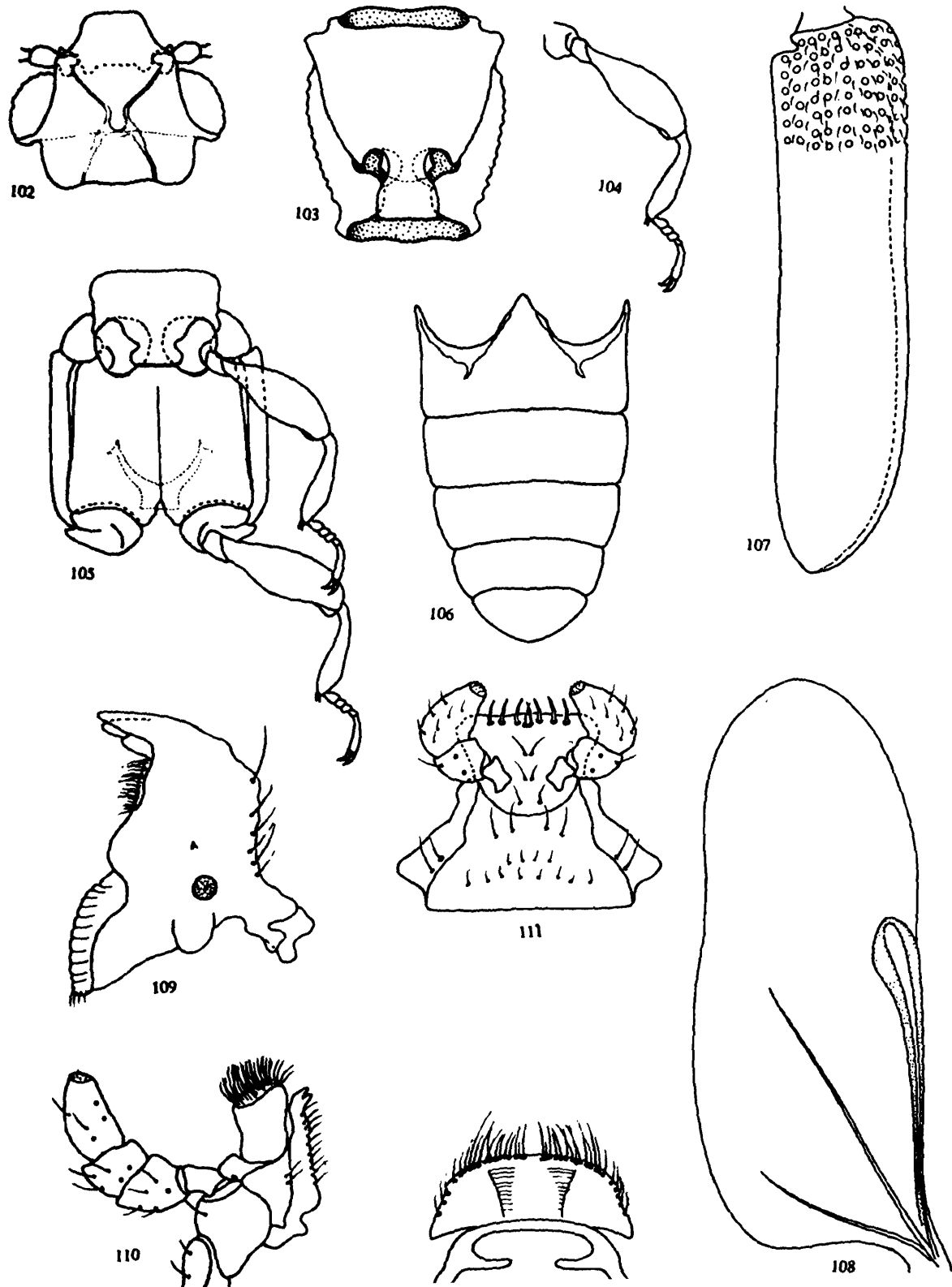
Abdomen (Fig. 106) elongated, ventrite 1 longest, intercoxal process broad and broadly pointed at apex, femoral lines opened; ventrites 2-5 shorter and subequal. Aedeagus (Fig. 113) with median lobe broad and slightly tapered at apex, median strut elongated and its apex spatulate; parameres well-developed, slender, elongated, apex usually broad and bilobed and with two long setae on one lobe and few short setae on other lobe. Ovipositor (Fig. 114) with well-developed paraprocts, valvifers, coxites and styli attached on outer margin of apex of coxites.

Larva known : No larva has yet been described.

Sexual dimorphism : In male hind-trochanter with a short spinous projection and hind-femur with a ridge on ventral side.

Remarks : Grouvelle (1912) erected the genus *Neosilvanus* for *Silvanus atratulus* Grouvelle, *S. levicollis* Grouvelle and *S. cribricollis* Grouvelle. Halstead (1973) has established *Silvanoides* for *S. cheesmanae* Halstead and *S. foveicollis* Halstead (Type : *cheesmanae*). According to subsequent examination *cheesmanae* has become a junior synonym of *cribricollis*. As regards the status of *Silvanoides*, Dr. D.G.H. Halstead (*in litt.*) opined that it remains a good genus distinct from *Neosilvanus* with *atratulus*. While describing *Neosilvanus*, Grouvelle (1912) placed *levicollis* and *cribricollis* with *atratulus*, the latter species is entirely different.

Silvanoides is closely related to *Silvanus* Latreille but can be separated by the following characters : Antennal segments 4-8 about as broad as long to slightly transverse, anterior spines situated beneath the level of anterior margin of prothorax, femoral lines on abdominal ventrite 1 opened, aedeagus with apex of paramere bilobed and with two long setae on one lobe and a few short setae on other lobe.



Figs. 102-112. *Silvanoides cribricollis* (Grouvelle): 102, Head, Dorsal view; 103, Prothorax, Ventral view; 104, Front leg; 105, Meso-metathorax, Ventral view; 106, Abdomen, Ventral view; 107, Right elytron, Dorsal view; 108, Wing; 109, Right mandible, Dorsal view; 110, Right Maxilla, Ventral view; 111, Labium, Ventral view; 112, Labrum.

22. *Silvanoides cribricollis* (Grouvelle)

1897. *Silvanus cribricollis* Grouvelle, *Annali Mus. civ. Stor. nat. Giacomo Doria*, **38** (series 2 **18**) : 397 (Type-loc. : Engano, Sumatra; Type deposition - Museum National d' Histoire Naturelle, Paris).
1912. *Neosilvanus cribricollis* : Grouvelle, *Annls Soc. ent. Fr.*, **81** : 324.
1973. *Silvanoides cheesmanae* Halstead, *Bull. Br. Mus. nat. Hist. (Ent.)*, **29**(2) : 87; **syn. nov.**
1985. *Silvanoides cribricollis* : Pal, *Rec. zool. Surv. India*, **82**(1-4) : 196.

This species can be recognised by its dorsally flattened, parallel-sided shiny body, short antenna with segments 4-8 somewhat moniliform, anterior spines of prothorax prominent and situated beneath the level of anterior margin, lateral depressions on pronotal disc slightly developed. This species is closely related to *S. foveicollis* Halstead but can be differentiated by lateral depressions on pronotal disc well-developed and prothorax comparatively elongated in *foveicollis*.

Description : General form (Fig. 100) elongated, moderately flattened, rather shiny, reddish-brown and covered with short, semierect, golden pubescence.

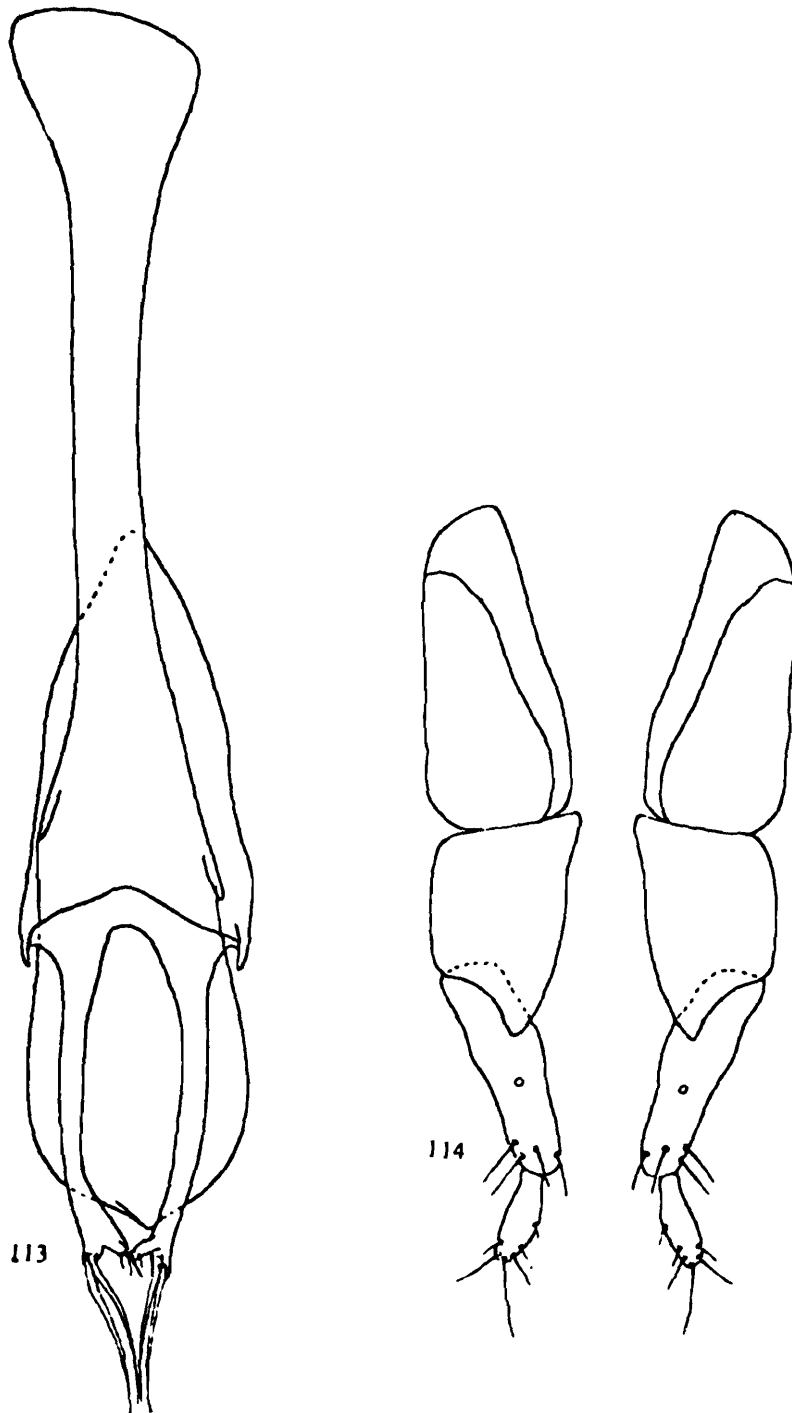
Head : Exposed part of head broader than long, eyes large and about half as long as head, temple slightly shorter than width of one eye facet and sloped downward, puncturation on vertex fine and sparse and that of towards anterior margin of clypeus slightly finer, setae short and projected towards middle line. Antenna short and slender, scape moderately large, pedicel slightly shorter and narrower than scape, segment 3 slightly narrower than pedicel, segments 4 and 5 shorter than segment 3; segments 6-8 slightly shorter than segment 5, about as broad as long and of which segment 8 slightly transverse; segments 9 and 10 distinctly transverse and segment 11 slightly less so. *Prothorax* elongated, convex and narrowed posteriorly, width across anterior spines slightly greater than width across eyes (1.03 : 1.00), anterior spine situated beneath level of anterior margin and its tip somewhat pointed, posterior margin of anterior spine curved upward; lateral margins curved and slightly sinuate near posterior angle, with a few small denticles; lateral depressions on pronotal disc moderately developed, puncturation on sides of pronotum coarser and denser than near middle, setae short and projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* more than two times as long as broad, almost parallel-sided and lateral margins feebly wavy, rows of puncture deep and large, interstices narrower than width of puncture, setae short and projected posteriorly, puncturation on ventral side fine and almost similar as on vertex of head. *Aedeagus* (Fig. 113) with apex of median lobe slightly projected and its lateral margin uniformly curved, outer apical lobe of each paramere with two long setae and inner lobe with two short setae.

Measurements : Total length 2.64 mm., width of head across eyes 0.58 mm., length of antenna 1.14 mm., width of prothorax across middle 0.58 mm., length of elytra 1.58 mm. and width across middle 0.78 mm. (n = 1).

Materials examined : 3 ex. INDIA : MEGHALAYA, Songsak, 2 ex., 20.xi.1974, T. Sengupta, under bark of fallen tree; ARUNACHAL PRADESH, Namdapha Survey, Miao, 1 ex., 5.v.1981, S. Biswas, under bark.

Distribution : INDIA : Meghalaya, Arunachal Pradesh; INDONESIA (Sumatra); PHILIPPINES; NEW GUINEA; SOLOMON Is. Pal (1985) first time recorded this species from India.

Remarks : The present re-description is based on 2 examples from Meghalaya, determined by Dr. D. G. H. Halstead. In a personal communication he commented that there is considerable variation in the form of the apex of median lobe and development of the process of parameres. He also mentioned that our specimens are absolutely identical with a *cribricollis* paratype and proposed the present synonymies.



Figs. 113-114. *Silvanoides cribricollis* (Grouvelle): 113, Aedeagus, Dorsal view; 114, Ovipositor.

Genus 4. *Protosilvanus* Grouvelle

1912. *Silvanus* (*Protosilvanus*) Grouvelle, *Annls Soc. ent. Fr.*, **81** : 336.
 1973. *Protosilvanus* Grouvelle : Halstead, *Bull. Br. Mus. nat. Hist. (Ent.)*, **29**(2) : 89.
 1984. *Protosilvanus* : Pal and Sengupta, *Oriental Ins.*, **18** : 235.

Type-species : *Silvanus lateritius* Reitter.

Historical review : Grouvelle (1912) established the subgenus *Protosilvanus* under the genus *Silvanus* Latreille for the species, *S. lateritius* Reitter, *S. inaequalis* Grouvelle, *S. granosus* Grouvelle and *S. carinatus* Grouvelle. Halstead (1973) attributed generic status to Grouvelle's subgenus *Protosilvanus*, designated *S. lateritius* Reitter as the type-species and added one species, *P. fasciatus* Halstead from Fiji Islands. Pal and Sengupta (1984) described *P. dehradunicus*, recorded *P. granosus* (Grouvelle) from India, and described the larva of *P. lateritius*.

Habit-habitat : Halstead (1973) noted that *Protosilvanus* occurs principally under bark of trees and also recorded *P. lateritius* in stored products. Pal and Sengupta (*loc. cit.*) gave a brief habitat records of this genus from India, where the representatives occur primarily beneath bark of number of tree species in wet forests and woodlands, found also in bushy vegetation, grass and leaf litter.

Geographical distribution : This genus is restricted to warm climatic zones with a few species extend to warm temperate zones, mainly Oriental in distribution and extending upto Pacific Islands. *Protosilvanus* is recorded almost throughout in India, of which *lateritius* is the most common species. Outside India this species has a wide distribution. Another common species, *granosus* is recorded outside India from Sri Lanka as far as Solomon Islands. Rest of the species are known to be more or less restricted in distribution.

Description : General form (Fig. 115) elongated, flattened, almost parallel-sided, usually yellowish-brown to reddish-brown.

Head (Fig. 120) broader than long, front margin of clypeus straight, eyes large and coarsely faceted, temple flattened beneath eye and shelf-like, transverse impressed line on vertex behind eyes distinct, tentorium simple with two long tentorial arms. Antenna moderately long and slender, antennal insertions hidden under projection of frons, 11-segmented, scape broadly elongated, segments 2-8 subequal, club loose and 3-segmented. Mandible (Fig. 127) elongated with 3 apical teeth, mola well-developed, vestige of dorsal mandibular cavity present near base. Maxilla (Fig. 128) with lacinia narrow, elongated and without apical spines; galea short, broad and its apex densely hairy; palpi with segment 2 longest, segment 3 short, apical segment longer than segment 3 and narrowed at apex. Labium (Fig. 129) with mentum somewhat triangular and transverse, palpi with segment 2 longest and apical segment short. Labrum (Fig. 130) transverse with apical margin slightly rounded.

Prothorax (Fig. 121) elongated, lateral margins finely denticulate, front angle with a spine usually beneath anterior margin, pronotum flat, front coxae widely separated, coxal cavities almost round, cavities broadly closed behind externally and internally, prosternal process broad at apex and its apical margin almost straight, sterno-pleural suture extending to lateral margin.

Meso-metathorax (Fig. 123) : Mesocoxae widely separated and slightly closer than front coxae, cavities broadly opened outwardly, lateral margins of mesosternal process notched near middle, sternal fitting between mesocoxae almost in a straight line. Metasternum about as broad as long, median line extending anteriorly near middle, hind-coxae separated slightly wider than mesocoxae, metendosternite simple and represented by two appophyses.

Wing and Elytra : Wing (Fig. 126) with single anal vein; without radial cell, anal cell and subcubital fleck. Elytra parallel-sided, each elytron (Fig. 125) with 9 rows of striae punctures, without scutellary striae, alternate instices with single and double rows of pubescence, epipleura narrow and almost complete upto apex.

Legs (Fig. 122) moderately long, trochanters short and simple, femora swollen towards middle, tibiae not broadened at apex and with two apical spurs; tarsal formula 5-5-5 in both sexes, tarsi simple, tarsal segment 1 long, segments 2 and 3 shorter than segment 1, segment 4 shortest, claws simple,

Abdomen (Fig. 124) elongated, ventrite 1 longest, intercoxal process broad and its apex broadly pointed, femoral lines closed; ventrites 2-5 subequal. Aedeagus (Fig. 132) with median lobe broad, median strut elongated and somewhat broader at apex; parameres well-developed, slender and with a few long setae at apex. Ovipositor (Fig. 131) with elongated paraprocts, valvifers, coxites, and styli attached on outer margin of apex of coxites.

Larva known : *Protosilvanus lateritius* (Reitter).

Sexual dimorphism : Hind-trochanter in male with spinous projection.

Key to the Species of *Protosilvanus* Grouvelle

1. Antennal segments 9 and 10 without apical spines (Fig. 118), median impressed line on metasternum extends anteriorly upto apex of metasternum, species small (2.33-2.40 mm.) *granosus* Grouvelle p. 108

Antennal segments 9 and 10 with apical spines (Fig. 115), median impressed line on metasternum extends anteriorly slightly beyond middle, species larger (2.94-4.64 mm.) 2

2. Prothorax widest across anterior spines, anterior spine prominent (Fig. 115) *lateritius* (Reitter) p. 103

Prothorax widest near middle, anterior spine less prominent (Fig. 117) ..
..... *dehradunicus* Pal and Sengupta p. 106

23. *Protosilvanus lateritius* (Reitter)

1878. *Silvanus lateritius* Reitter, *Verh. zool-bot. Ges. Wien*, 28 : 194 (Type-loc. : Sri Lanka, Type-deposition ?).
1908. *Silvanus lateritius* : Grouvelle, *Annls Soc. ent. Fr.*, 77 : 490.

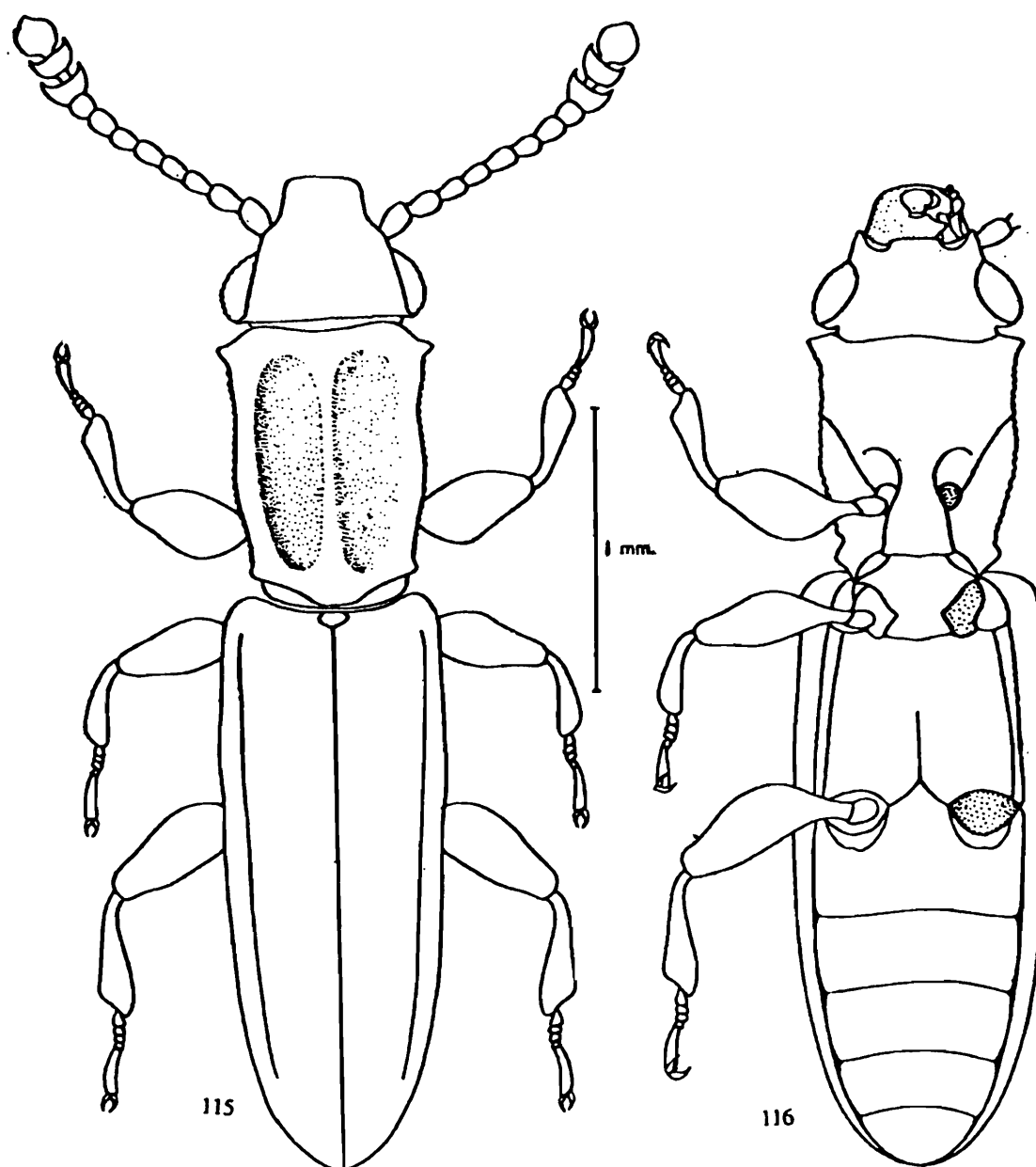
1912. *Silvanus (Protosilvanus) lateritius* : Grouvelle, *Annls Soc. ent. Fr.*, **81** : 336.

1973. *Protosilvanus lateritius* : Halstead, *Bull. Br. Mus. nat. Hist. (Ent.)*, **29** (2) : 96.

1984. *Protosilvanus lateritius* : Pal and Sengupta, *Oriental Ins.*, **18** : 237.

This species can easily be recognised by its antennal segments 9 and 10 with apical spines, front angles of prothorax with prominent anterior spines situated beneath the level of anterior margin, prothorax widest across anterior spines and elytral interstice 7 strongly carinate.

Description : General form (Fig. 115) elongated, flat, yellowish-brown to blackish-brown; covered with short, semierect, golden pubescence.



Figs. 115-116. *Protosilvanus lateritius* (Reitter): 115, Dorsal view; 116, Ventral view.

Head : Exposed part of the head broader than long, eyes large, length of eye about half of length of head, temple shorter than width of one eye facet and its outer apical angle pointed; puncturation on vertex coarse, dense and that of towards anterior margin of clypeus slightly finer; setae projected towards middle line. Antenna moderately long and slender, scape moderately large, segments 2-7 subequal and slightly narrower than scape, segment 8 smallest, segments 9 and 11 about as broad as long and segment 10 transverse, apical spines present on lateral margins of segments 9 and 10. *Prothorax* flat, elongated and slightly narrowed posteriorly, anterior margin slightly sinuate near middle; anterior spines distinct, situated beneath anterior margin and usually well-developed; lateral margins finely serrated, curved and usually slightly sinuate near posterior angles; lateral depressions on pronotal disc more or less well-marked; puncturation on pronotum coarse, dense and almost similar to that of vertex of head; setae projected towards middle line. *Scuellum* moderately large and transverse. *Elytra* more than two times as long as broad, almost parallel-sided, lateral margins slightly wavy, rows of punctures deep and large, interstice 7 strongly carinate and extending slightly more than anterior three-fourths. On ventral side puncturation finer than on dorsal side. Aedeagus (Fig. 132) with median lobe tapered at apex; each paramere with a few apical setae, of which posterior three setae longer than others, median strut long and slightly broader at apex.

Measurements : Total length 2.94 - 4.64 mm., width of head across eyes 0.62 - 0.83 mm., length of antenna 1.00 - 1.44 mm., width of prothorax near middle 0.61 - 0.88 mm., length of elytra 1.80 - 2.50 mm. and width across middle 0.74 - 0.94 mm.

Materials examined : 603 ex. INDIA : ARUNACHAL PRADESH, Daporijo, 4 ex., 26.x.1966; Nalero Lohi, 518 m., 4 ex., 4.xii.69, J. M. Julka & party; Kalek, 1158 m., Abor Exped., 2 ex., 29.xii.71, Kemp, under bark; Rotung, 426 m., Abor Exped., 6 ex., 28.xii.77 and 2.i.12, Kemp, under bark; Above Panji, 1219 m., Abor Exped., 2 ex., 16.i.12, Kemp, under bark; Deban North, 14 ex., 28.iv.1981, S. Biswas; Deban, 10 ex., 28.v.1981, S. Biswas, under bark; Gibbonland, 360 m., 12 ex., 3.v.1981, S. Biswas, under bark; MEGHALAYA, Dainadubi Reserve Forest, Garo Hills, 8 ex., 18.xi.1974, T. Sengupta, under bark of *Shorea robusta*; Songsak Reserve Forest, 8 ex., 21.xi.1974, T. Sengupta, under bark of *Shorea robusta* and *Cinnamo mura*; ASSAM, Sadiya, Abor Exped., 4 ex., 26.xi.11, under bark; Kaziranga, Panbari, 3 ex., 14.xi.1974, T. Sengupta, under bark of *Shorea robusta*; WEST BENGAL, Jalpaiguri dist., Rajabhatkhawa Forest, 3 ex., 11.xi.1974, T. Sengupta, under bark of *Gamelina arborea*, *Amoora wallichii*, *Artocarpus chaplasi*; Hasimara, 20 ex., 2.xii.1974, under bark of cut logs of *Lagerstroemia perviflora*; Dhupguri, 4 ex., 14-15.iv.1971, T. Sengupta, sweeping bush and leaf litter; Gayerkata, 8 ex., 15.ii.1974, A. Datta, under bark of *Terminalia belerica*; Darjeeling dist., Sukna, 4 ex., 22.iv.1971, T. Sengupta, under bark; 5 ex., 5.v.1976, T. K. Pal, under bark; Calcutta (Ultadanga & Chetla), 350 ex., iii.1975 to viii.1975, T. K. Pal, under bark of *Bombax* sp., *Tamrindus indica*, *Mangosa* sp., Sirish, Harul and several unknown logs; Howrah dist., Rajganj, 2 ex., 13.x.1974, T. K. Pal, under bark; Burdwan dist., Burdwan, 5 ex., 10.vii.1976, T. K. Pal, under bark; BIHAR, Chaibasa, 35 ex., 19.x.1964, 15.x.1971, 29 & 31.xii.1971, 25.x.1974, T. Sengupta, under bark of *Mangosa* sp., dead standing and fallen tree and old logs, on living grass etc.; UTTAR PRADESH, Gorakhpur, 2 ex., 15.iv.1973, R. Lyall; 8 ex., 24.ix.1974, T. Sengupta, under bark of *Bombax* sp.; Dehra Dun, Lakshibag,

10 + 20 ex., 10.vi.1975, T. Sengupta, under bark of Jhingan tree and under bark of unknown log respectively; Dehra Dun, Natwarabag, 2 + 9 ex., 1. vii. 1975, T. Sengupta, under fungusy bark of *Shorea robusta* and under bark of Raani log; HIMACHAL PRADESH, Nahan Renuka, 932 m., 10 ex., 17.vi.1975, 10 ex., under bark of dead branch of fig tree; KERALA, Walayar forest, 5 ex., 1.xii.1971, T. Sengupta, under bark; TAMIL NADU, Madumalai Reserve Forest, 10 ex., 7.xii.1971, T. Sengupta, under bark; ANDAMAN Is., Port Blair, 4 ex., 15.ii 15.iii.15, Kemp.

Distribution : Grouvelle (1908) recorded this species in India from Western Dekhan, Nilgiri Hills and Andaman Islands; Halstead (1973) recorded from Nepal and Bangladesh. So far this species is recorded from the following areas : INDIA : Arunachal Pradesh, Meghalaya, Assam, West Bengal, Bihar, Uttar Pradesh, Himachal Pradesh, Kerala, Tamil Nadu, Andaman Is.; NEPAL; BANGLADESH; BURMA; SRI LANKA; THAILAND; VIETNAM; MALAYSIA; SINGAPORE; INDONESIA (Sumatra); PHILIPPINES; TAIWAN; CHINA (Hainan); JAPAN.

Biology : This is one of the most common and widely distributed species of Indian Silvanidae and found under bark of number of tree species. Except for the dispersal flights, about which little is known, *lateritius* spends its entire life beneath or around bark of fallen or felled trees. Sometimes individuals have been found in twigs or stored produce, but it is likely that they too were associated with subcorticolous habitat. Both adults and larvae are presumed to feed upon fungal spores, which comprise the subcorticolous habitat, as suggested by the presence of these spores in dissected mouth parts and gut. This species is normally gregarious, and in post-monsoon period it may congregate in large numbers on newly formed fungal mass. Copulation appears to take place beneath bark. This has been observed only in a few instances, and the couples are disturbed with the exposition of bark. The egg laying period is long and there is an overlap of generations. The larvae are lightly pigmented and cylindrical. Upon hatching they move on with moderate speed. At least four larval instars were observed. Some pupae are found parasitized in the field, but the parasitoids could not be detected out. The teneral adults usually come over the bark with sun rise and by two weeks they become fully pigmented. In the laboratory the life history was observed by applying the live specimens within two pieces of bark of *Bombax malabaricum*, with some frass material from where the specimens were collected. The eclosion of larvae from eggs take place from 7-9 days, larvae pupate within 16-22 days, adults hatch out between 12 and 16 days, and consequently, the total life cycle took place from 35-47 days during July-September, 1975, in Calcutta.

24. *Protosilvanus dehradunicus* Pal and Sengupta

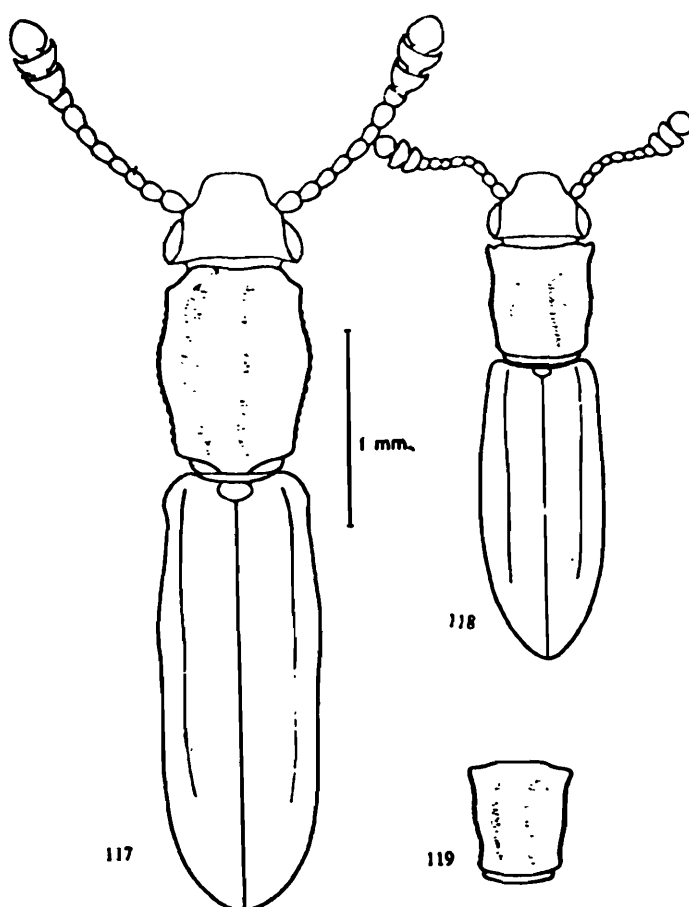
1984. *Protosilvanus dehradunicus* Pal and Sengupta, *Oriental Ins.*, **18** : 240 (Type-loc. : Lakshibag, Dehra Dun : Uttar Pradesh, India; Type deposition Zoological Survey of India, Calcutta).

This species is closely related to *P. lateritius* but can be differentiated by its prothorax being widest across middle and anterior spines not prominent.

Description : General form (Fig. 117) elongated, flat, reddish-brown; covered with short, semierect, golden pubescence.

Head : Exposed part of head broader than long, eyes large, length of eye slightly less

than half of length of head, temple shorter than width of one eye facet and its outer apical angle pointed; puncturation on vertex coarse, dense and that of towards anterior margin of clypeus slightly finer; setae projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel and segment 3 about as long as scape and slightly narrower, segment 4 slightly shorter than segment 3, segment 5 slightly longer and wider than segment 4, segment 6 slightly shorter than segment 5 and more or less equal to segment 4, segment 7 longer and broader than segment 6, segment 8 shorter and narrower than segment 7, segments 9 and 11 about as broad as long and segment 10 transverse, apical spines present on lateral margins of segments 9 and 10. *Prothorax* flat, elongated and narrowed posteriorly, anterior margin slightly sinuate near middle, anterior spine small and not prominent; lateral margins finely serrated, curved and slightly sinuate before posterior angles; lateral depressions on pronotal disc rather well-marked; puncturation on pronotum coarse, dense and slightly coarser than on vertex of head; setae projected towards middle line. *Scutellum* moderately large and transverse. *Elytra* more than two times as long as broad, almost parallel-sided, lateral margins slightly wavy near middle, punctures deep and large, interstices 3 and 5 slightly raised, interstice 7 strongly carinate and extending almost upto anterior three-fourths. On ventral side puncturation finer than on dorsal side.



Figs. 117-119. *Protosilvanus dehradunicus* Pal and Sengupta, Dorsal view; 118, *P. granosus* (Grouvelle), Dorsal view; 119, Pronotum of a variant of *P. granosus*.

Measurements of holotype : Total length 3.76 mm., width of head across eyes 0.73 mm., length of antenna 1.27 mm., width of prothorax near middle 0.80 mm., length of elytra 2.14 mm. and width across middle 0.88 mm.

Material examined : *Holotype* ♀, INDIA : UTTAR PRADESH, Dehra Dun, Lakshibag, 10.vi.1975, T. Sengupta, under bark of Jhingan tree (Zoological Survey of India, Calcutta; Reg. No. 10120/H4A).

Distribution : INDIA : Uttar Pradesh.

Remarks : So far this species is known only from its type-locality.

25. *Protosilvanus granosus* (Grouvelle)

1897. *Silvanus granosus* Grouvelle, *Ann. Mus. civ. Stor. nat. Giacomo Doria*, **32** (series 2 **12**) : 396 (Type-loc. : Engano, Sumatra : Indonesia; Type deposition - Museum National d' Histoire Naturelle, Paris).

1912. *Silvanus (Protosilvanus) granosus* : Grouvelle, *Annls Soc. ent. Fr.*, **81** : 336.

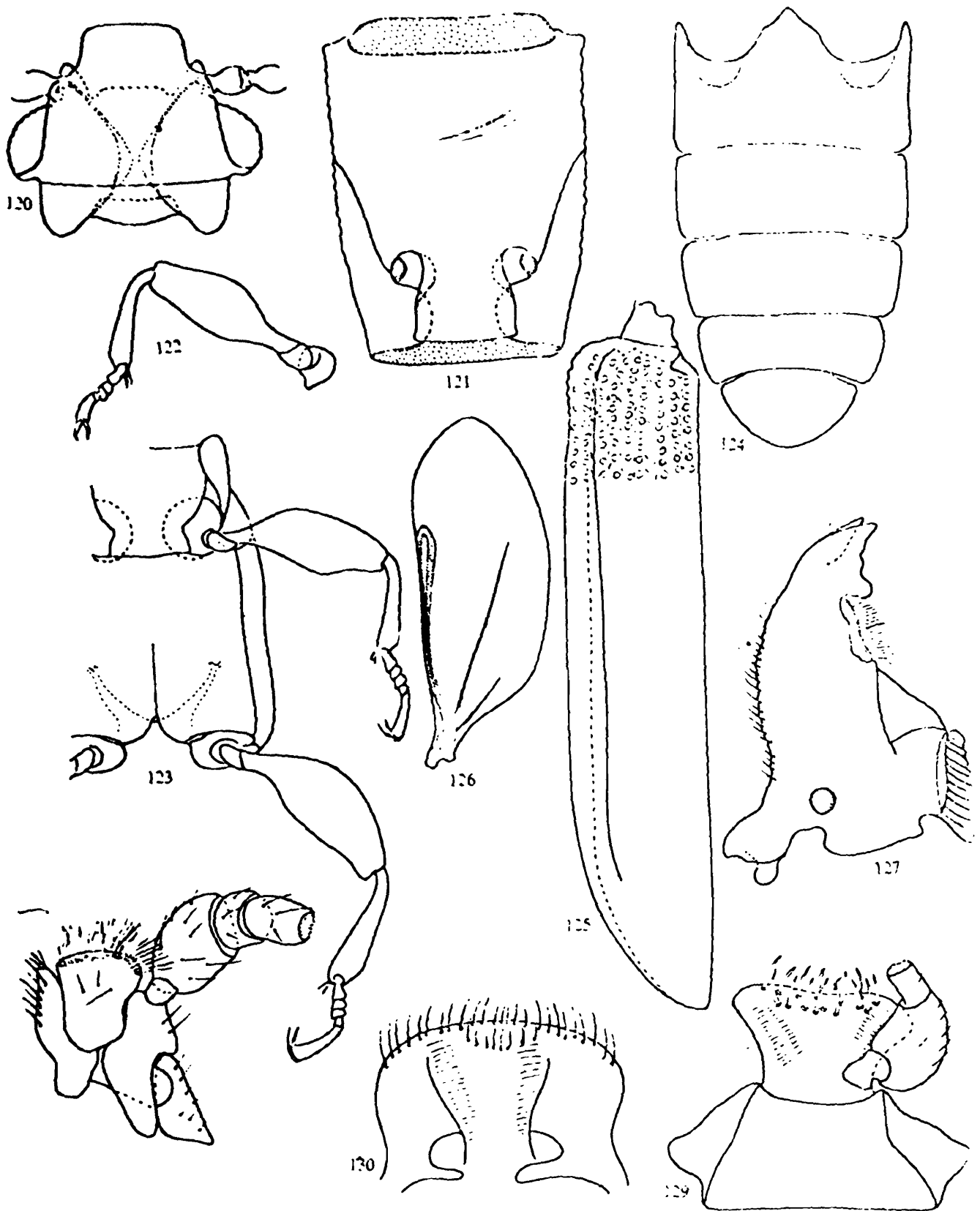
1973. *Protosilvanus granosus* : Halstead, *Bull. Br. Mus. nat. Hist. (Ent.)*, **29** (2) : 93.

1984. *Protosilvanus granosus* : Pal and Sengupta, *Oriental Ins.* **18** : 241.

This species can easily be distinguished from other Indian species, viz., *P. lateritius* and *P. dehradunicus* by its smaller size (2.33-2.38 mm.), antennal segments 9 and 10 devoid of apical spines, median impressed line of metasternum extending upto apex of mesosternal process, 7th elytral interstice less carinate and shorter in length. The aedeagus of this species differs from that of *lateritius* by its median lobe more acuminate at apex, apex of paramere broader and with two short and six long apical setae.

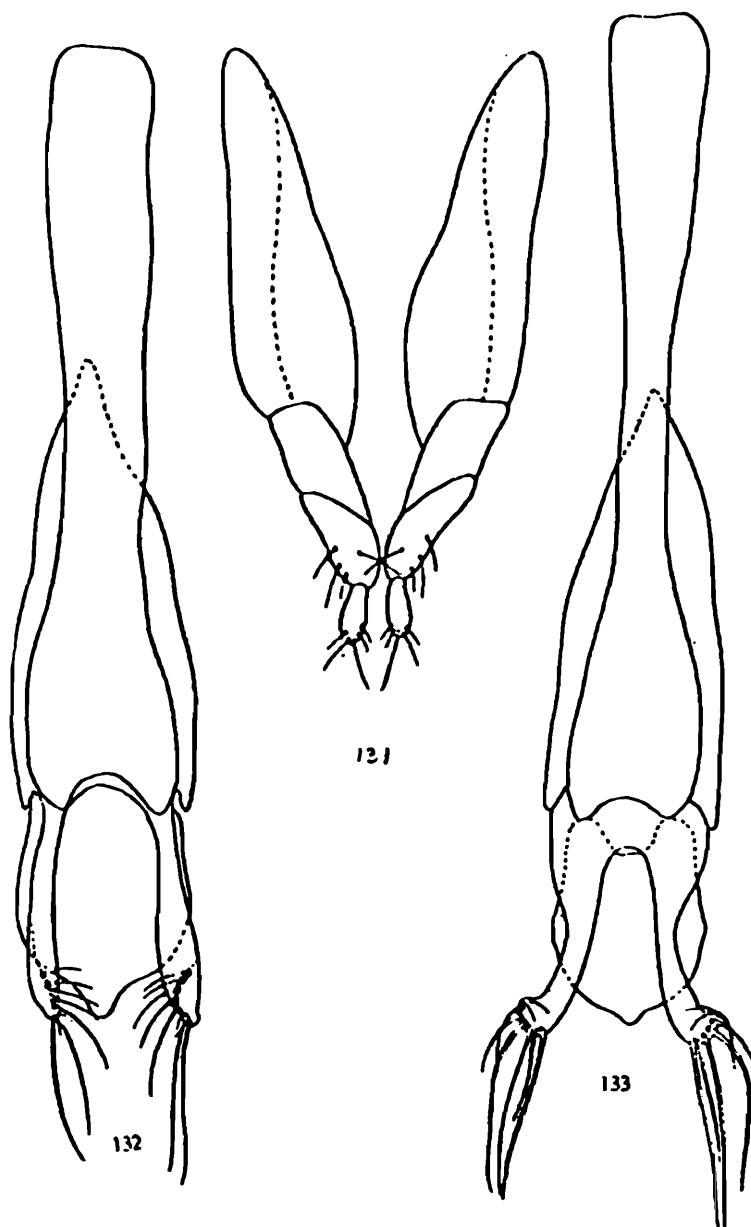
Description : General form (Fig. 118) elongated, flat, reddish-brown; covered with short, semierect, golden pubescence.

Head : Exposed part of head broader than long, eyes large, length of eye about half of length of head, temple shorter than width of one eye facet and its outer apical angle pointed; puncturation on vertex coarse, dense and that of towards anterior margin of clypeus slightly finer, setae projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel about as long as scape and slightly narrower, segment 3 slightly shorter and narrower than pedicel, segment 4 shorter than segment 3, segment 5 slightly longer than segment 4, segment 6 shorter than segment 5 and equal to segment 4, segment 7 slightly longer and wider than segment 6, segment 8 slightly shorter and narrower than segment 7, segments 9 and 10 clearly transverse and devoid of any spine, segment 11 about as broad as long. *Prothorax* flat, elongated, slightly narrowed posteriorly and almost similar to *P. lateritius*; anterior margin sinuate near middle, rarely continues to form anterior spines and meeting point of anterior margin and anterior spines not sharply demarcated (Fig. 119); anterior spine small and its tip slightly pointed; lateral margins finely serrated, curved and slightly sinuate near posterior angles; lateral depressions on pronotal disc slightly marked; puncturation on pronotum coarse, dense and similar to that of vertex of head; setae projected towards middle line. *Scutellum* moderately large and transverse. *Elytra* more than two times as long as broad, almost parallel-sided and lateral margins slightly wavy near middle, rows of punctures deep and large, interstices alternately wider and narrower, 7th interstice slightly raised than other interstices and prominent upto anterior three-fourths. On ventral



Figs. 120-130. *Protosilvanus lateritius* (Reitter) : 120, head, Dorsal view; 121, prothorax, Ventral view; 122, Front leg; 123, Meso-metathorax, Ventral view; 124, Abdomen, Ventral view; 125, Left elytron, Dorsal view; 126, Wing; 127, Left mandible, Dorsal view; 128, Left maxilla, Ventral view; 129, Labium, Ventral view; 130, Labrum.

side puncturation finer than on dorsal side. Aedeagus (Fig. 133) with median lobe broadly elongated and tapered at apex, apex of each paramere slightly broader and with two short and six long setae.



Figs. 131-133. Ovipositor of *Protosilvanus lateritius* (Reitter); 132-133. Aedeagi, Dorsal view: 132, *P. lateritius*; 133, *P. granosus* (Grouvelle).

Measurements : Total length 2.33 - 2.38 mm., width of head across eyes 0.50 - 0.52 mm., length of antenna 0.75 - 0.77 mm., width of prothorax near middle 0.50 mm., length of elytra 1.40 - 1.42 mm. and width across middle 0.57 - 0.58 mm.

Materials examined : 5 ex., INDIA : WEST BENGAL, Darjeeling district, Rangpo, 450 m., 4 ex., 21.iv.1976, T. K. Pal, under bark of *Ailanthus grandis*; Calcutta, 1 ex., 17.viii.1975, T. K. Pal, under bark of Sirish log.

Distribution : INDIA : West Bengal; SRI LANKA; MALAYSIA; SINGAPORE; INDONESIA (Sumatra, Java); PHILIPPINES; SOLOMON Is.

Remarks : Subsequent to the original description, Grouvelle (1912) recorded this species from Singapore and Malay archipelago; Halstead (1973) recorded from Sri Lanka, Philippines and Solomon Islands; Pal and Sengupta (1984) recorded from India (West Bengal).

Genus 5. *Ahasverus* Gozis

1881. *Ahasveris* Gozis, *Annls Soc. ent. Fr.*, (6) 1 : Bull. p. CXXVII.

1882. *Cathartus* (*Ahasverus*) Gozis : Reitter, *Dt. ent. Z.*, 26 : 296.

1899. *Cathartus* (*Ahasverus*) : Ganglbauer, *Die Käfer von Mitteleuropa*, 3 : 587.

1908. *Cathartus* (*Ahasverus*) : Grouvelle, *Annls Soc. ent. Fr.*, 77 : 492.

1911. *Ahasverus* : Reitter, *Fauna Germanica*, 3 : 45.

1912. *Ahasverus* : Grouvelle, *Annls Soc. ent. Fr.*, 81 : 383.

1930. *Ahasverus* : Hetschko, *Coleopt. Cat.*, 109 : 66.

Type-species : *Cathartus advena* (Waltl).

Historical review : The genus *Ahasverus* was erected by Gozis (1881) for the species, *Cathartus advena* (Waltl). Reitter (1882), Ganglbauer (1899) and Grouvelle (1908) considered it as a subgenus of *Cathartus* Reiche. Reitter (1911) re-established its generic status and subsequently, Grouvelle (1912) followed Reitter's treatment. Stebbing (1914), and Imms and Chatterjee (1915) recorded *Ahasverus advena* from different parts of India. Hetschko (1930) in Junk's 'Coleopterorum Catalogus' listed 11 species under this genus of which *A. excisus* (Reitter) is recorded from India and *A. advena* is cosmopolitan in distribution. But Dr. D. G. H. Halstead has informed the authors that "As far as *Ahasverus excisus* is concerned this is a South American (West Indies) species, not East Indies as suggested in some publication. It was of course described from Havana cigars in Munich" (in litt.). In the present study only *A. advena* is dealt with.

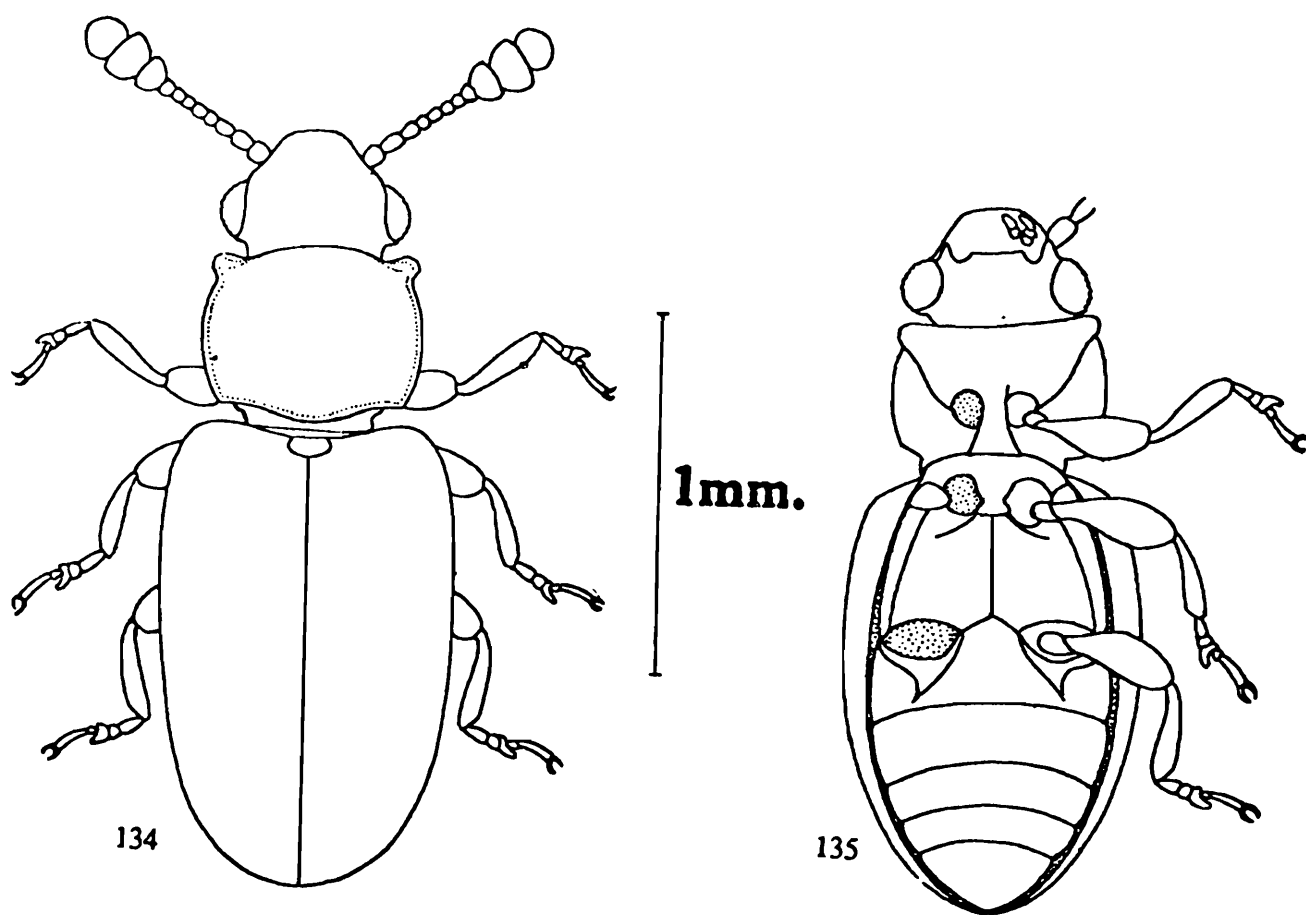
Habit-habitat : Of the species of *Ahasverus*, the detailed habitat record of *A. advena* is available. It has been recorded from stored grains and cereal products, copra, spices, cocoa, ground nuts, other oil seeds and their products, tobacco, herbs, roots and haystacks. In India this species has been recorded in lac, *Tectona grandis* leaf, *Shorea robusta* seeds, ship biscuit, stored rice, plum. As noted earlier, *A. excisus* was known to be described from cigars.

Geographical distribution : This genus seems to be more diversely represented in the temperate climate. So far the present distributional record is concerned, *Ahasverus* occurs most abundantly in the Nearctic region followed by the Neotropical, with extension of one species to Europe. Due to its association with stored products, *A. advena* has attained a world-wide distribution. In India this species hitherto possesses a wide but scattered distributional records from north to southern parts.

Description : General form (Fig. 134) elongated, moderately convex, laterally serrated transverse prothorax, usually yellowish-brown.

Head (Fig. 136) slightly transverse, front margin of clypeus almost straight, eyes moderately large and coarsely faceted, temple short and flattened beneath eye, transverse

impressed line on vertex behind eyes absent, tentorium with two long tentorial arms connected by transverse corpo-tentorium. Antenna rather short and slender, antennal insertions hidden under projection of frons, 11-segmented, scape broadly elongated, segments 2-8 subequal and narrower than scape, club 3 segmented. Mandible (Fig. 143) elongated with 3 apical teeth, mola well-developed, a trace of dorsal mandibular cavity present near base. Maxilla (Fig. 144) with lacinia narrow, elongated and without apical spine; galea short, broad and its apex densely hairy; palpi with segments 2 and 3 nearly equal, apical segment longest and fusiform. Labium (Fig. 145) with mentum somewhat triangular and transverse, palpi with apical segment longest and slightly narrowed towards apex. Labrum (Fig. 146) with apical margin rounded.



Figs. 134-135. *Ahasverus advena* (Waltl): 134, Dorsal view. 135, Ventral view.

Prothorax (Fig. 137) transverse, lateral margins finely serrated, front angle projected and forming a callosity-like structure, pronotum slightly convex, front coxae narrowly separated, coxal cavities almost rounded, cavities broadly closed behind externally and internally, prosternal process broad at apex and its apical margin almost straight, sternopleural suture extending to front angle.

Meso-metathorax (Fig. 139) : Mesocoxae narrowly separated, cavities broadly opened outwardly, lateral margins of mesosternal process notched near apex, sternal fitting between mesocoxae almost in a straight line. Metasternum transverse, with femoral lines, median impressed line extends anteriorly upto apex of mesosternal process, hind-coxae

widely separated, metendosternite simple and represented by two appophyses.

Wing and Elytra : Wing (Fig. 142) with single anal vein; without radial cell, anal cell and subcubital fleck. Elytra somewhat ovoid, each elytron (Fig. 141) with 9 rows of stria punctures, without scutellary striae, alternate interstices with 2 and 3 rows of setae.

Legs (Fig. 138) moderately long and slender, trochanters short and simple, femora swollen towards middle, tibiae not broadened at apex and with two apical spurs; tarsal formula 5-5-5 in both sexes, tarsal segments 1-3 short and subequal, segment 3 lobed below, segment 4 shortest, claws simple.

Abdomen (Fig. 140) elongated, ventrite 1 longest, intercoxal process broad and broadly pointed at apex, femoral lines opened; ventrites 2-5 shorter and subequal. Aedeagus (Fig. 147) with median lobe elongated and broadly pointed apically; parameres well-developed, slender, broadened near apical one-third and narrowed apically, with a long apical seta. Ovipositor (Fig. 148) with well-developed paraprocts, valvifers, coxites, and styli attached on outer margin of apex of coxites.

Larva known : *Ahasverus advena* (Waltl).

Sexual dimorphism : No secondary sexual characters are observed.

Remarks : *Ahasverus* is closely related to the genus *Cathartus* Reiche but can be easily separated by the following characters :

AHASVERUS

1. Prothorax transverse, lateral margins curved outwardly, anterior angles produced and callosity-like sterno-pleural suture extending to anterior angle.
2. Antennal segment 9 distinctly narrower than segment 10.
3. Elytra ovoid.
4. Femoral lines on metasternum present.

CATHARTUS

1. Prothorax elongated, almost parallel-sided, anterior angles slightly produced laterally, sterno-pleural suture extending to lateral margin and far below anterior angle.
2. Antennal segment 9 slightly narrower than segment 10.
3. Elytra parallel-sided.
4. Femoral lines on metasternum absent.

26. *Ahasverus advena* (Waltl)

1832. *Cryptophagus advena* Waltl, *Faunas*, 1: 169 (Type-loc. : 'America Australi'; Type-deposition - ?).
1834. *Cathartus advena* : Waltl, *Revue Entomologique*, 2 : 256.
1846. *Silvanus advena* : Erichson, *Naturgeschichte der Insekten Deutschlands*, 3 : 339.
1846. *Cryptophagus angustatus* Lucas, *Explor. Alger*, : 221.
1847. *Cryptophagus guerinii* Allibert, *Revue Zool.*, 10 : 12.
1854. *Silvanus advena* : Wollaston, *Insecta Maderensia* : 169.
1876. *Cryptophagus ? striatus* Rouget, *Annls Soc. ent. Fr.*, (5) 6 : Bull. p. CCVII.
1881. *Ahasverus advena* : Gozis, *Annls Soc. ent. Fr.*, (6) 1 : Bull. p. CXXVII.
1884. *Silvanus advena* : Casey, *Trans. Am. ent. Soc.*, 11 : 72.

1899. *Cathatus (Ahasverus) advena* : Ganglbauer, *Die Käfer von Mitteleuropa*, 3 : 588.

1908. *Cathartus (Ahasverus) advena* : Grouvelle, *Annls Soc. ent. Fr.*, 77 : 492.

1911. *Ahasverus advena* : Reitter, *Fauna Germanica*, 3 : 47.

1912. *Ahasverus advena* : Grouvelle, *Annls Soc. ent. Fr.*, 81 : 381.

Common name : Foreign grain beetle.

This species is characterised by its transverse prothorax with outwardly curved side margins and callosity-like anterior angles, ovoid elytra, antennal segment 9 distinctly narrower than segment 10.

Description : General form (Fig. 134) elongated, moderately convex, finely serrated transverse prothorax narrower than elytra; covered with short, semierect, golden pubescence.

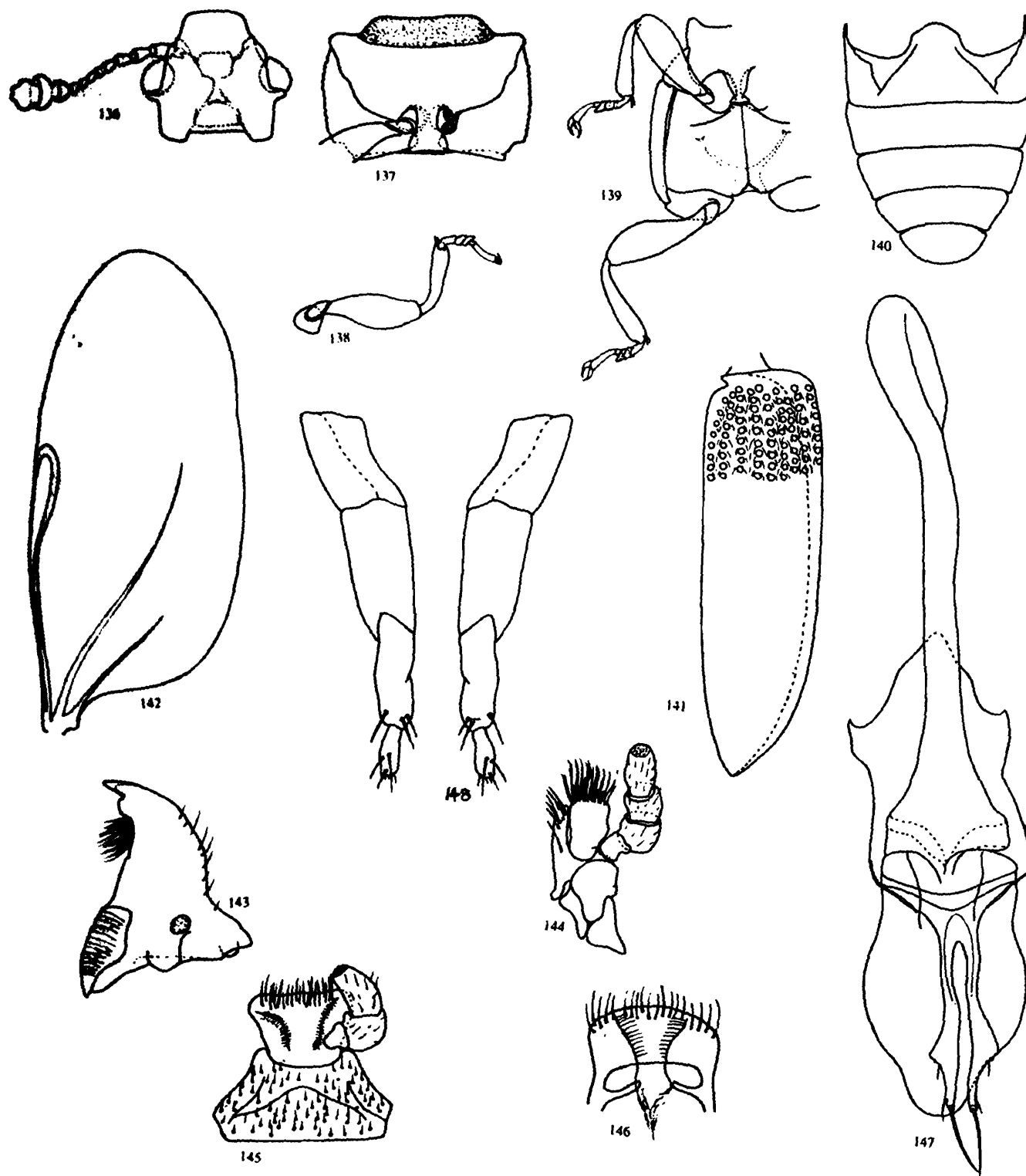
Head : Exposed part of head broader than long, eyes moderately large, length of eye about one-third of length of head, temple shorter than width of one eye facet and its outer apical angle pointed, puncturation on vertex fine and dense and that of towards anterior margin of clypeus slightly finer, setae projected towards middle line. Antenna short and slender, considerably shorter than lengths of head and prothorax together (1.00 : 1.25), scape moderately large, pedicel about as long as scape and slightly narrower, segment 3 slightly shorter and narrower than pedicel, segments 4-8 shorter and subequal, segment 9 slightly transverse and distinctly narrower than segment 10, segment 11 slightly transverse and slightly narrower than segment 10. *Prothorax* transverse and convex; anterior angle prominent, produced slightly towards lateral side and its tip broadly rounded; lateral margin uniformly curved outwardly and finely serrated, pronotum narrowly bordered, puncturation on pronotum fine and dense and similar to that of vertex of head, setae projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* less than two times as long as broad, elongated and somewhat ovoid, lateral margins slightly explanate and not wavy, rows of punctures slightly deep and moderately large, pubescence denser than on head and pronotum and projected posteriorly. Puncturation on ventral side similar to that of dorsal side. Aedeagus (Fig. 147) with parameres broadened across apical one-third and narrowed posteriorly, each paramere with a long and a short apical setae.

Measurements : Total length 1.36-2.23 mm., width of head across eyes 0.47-0.52 mm., length of antenna 0.58-0.72 mm., width of prothorax across middle 0.55-0.67 mm., length of elytra 1.11 - 1.41 mm. and width across middle 0.66-0.83 mm.

Materials examined : 76 ex. INDIA : WEST BENGAL, Calcutta, 11 ex., 31.vii.1965, P. K. Ghosh, from copra consignment; 1 ex., 24.vii.1977, Mazumdar, *Shorea robusta* seed brought from Bankura; BIHAR, Chaibasa, 50 ex., 15.i.1978, T. Sengupta, *Zizyphus jujuba* (plum); KERALA, Vellyani, 3 ex., 18.ix.1959, C.N.O., stored rice; 2 ex., 3.ix.1960, C. N. Oomen, stored rice; EUROPE, 9 ex.

Distribution : Cosmopolitan. So far in India this species is recored from Madhya Pradesh, Maharastra, West Bengal, Bihar and Kerala.

Biology : This species occurs on a wide variety of products such as grains, cereal products, oil seeds, dried fruits, herbs, spices etc. Usually it infests in large number when the produce is mouldy and it is capable of feeding and breeding on mould alone. Corbett, Yusope and Hassan (1937) therefore, regarded it as a mould feeder rather than a direct



Figs. 136-148. *Ahasverus advena* (Waltl): 136, Head, Dorsal view; 137, Prothorax, Ventral view; 138, Front leg; 139, Meso-metathorax, Ventral view; 140, Abdomen, Ventral view; 141, Right elytron, Dorsal view; 142, Wing; 143, Right mandible, Dorsal view; 144, Left maxilla, Ventral view; 145, Labium, Ventral view; 146, Labrum; 147, Aedeagus, Dorsal view; 148, Ovipositor.

destroyer of stored food stuffs. Its status as a pest of stored food products was assessed after some investigation of its feeding habit on different food stuffs by Woodroffe (1962). Both the adults and larvae actually eat ground nuts, was observed under binocular microscope and the feeding was recorded photographically. Stebbing (1914) noted that this species made gall in teak leaf and caused defoliation in Madhya Pradesh, Maharashtra and Tamil Nadu. Imms and Chatterjee (1915) mentioned *A. advena* as a common enemy of lac insect in India, though Glover (1937) regarded it as a harmless scavenger.

Remarks: It originally is an American species, but has been distributed by commerce to most of the tropical and warm-temperate regions of the world (Woodroffe, 1962).

Genus 6. *Silvanolomus* Reitter

1911. *Silvanopsis* Reitter (*sensu* nec. Grouvelle), 1911, *Fauna Germanica*, **3** : 44.

1912. *Silvanolomus* Reitter, *Wien. ent. Ztg.*, **31** : 286.

1912. *Silvanolomus* : Grouvelle, *Annls Soc.ent.Fr.*, **81** : 331.

1930. *Silvanolomus* : Hetschko, *Coleopt. Cat.*, **109** : 64.

Type-species : *Silvanus denticollis* Reitter.

Historical review : Reitter (1911) erected this genus based on 2 species, viz., *Silvanus denticollis* Reitter and *Silvanus pullus* Reitter, and named it as '*Silvanopsis*'. Since this name was preoccupied by a genus established by Grouvelle, Reitter (1912) proposed the new name '*Silvanolomus*' for this genus. Grouvelle (1912) added *Silvanus crenicollis* Grouvelle to this genus. Hetschko (1930) in Junk's 'Coleopterorum Catalogus' listed 3 species under *Silvanolomus*, viz., *crenicollis* (Grouvelle) (Australia), *denticollis* (Reitter) (Sri Lanka, Sumatra, Borneo), and *pullus* (Reitter) (West Africa, Morocco, Kilimanjaro). In the present study this genus is recorded from India with 2 species, of which one is new.

Habit-habitat : The habitat record of this genus was not available in the earlier works. In the present study the species are collected from different flowers and bajra crop.

Geographical distribution : This genus seems to be more diversely represented in the tropical climate and so far remains recorded from some parts of Oriental region, Africa and Australia. *S. denticollis* possesses a wide distribution in India and various far eastern countries.

Description : General form (Fig. 149) elongated, moderately convex, convex pronotum with six lateral teeth, yellowish to reddish-brown.

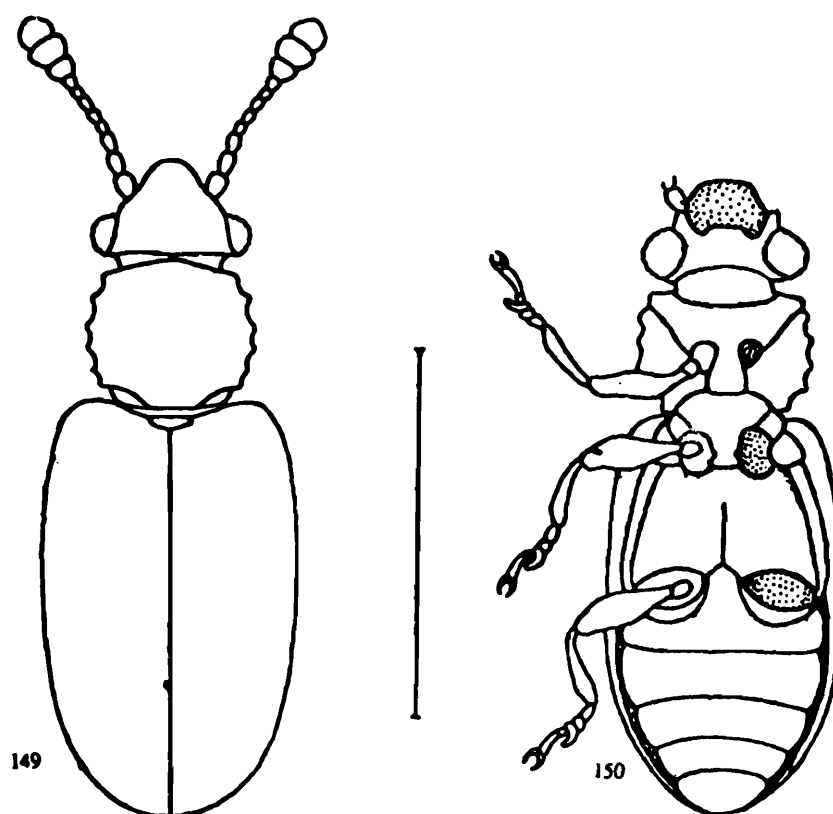
Head (Fig. 151) transverse, front margin of clypeus almost straight, eyes moderately large and coarsely faceted, temple flattened beneath eye and short shelf-like, transverse impressed line on vertex behind eyes absent, tentorium with two long tentorial arms and transverse corpo-tentorium near middle. Antenna moderately long and slender, antennal insertions hidden under projection of frons, 11-segmented, scape broadly elongated, pedicel and segment 3 about as long as scape and narrower, segments 4-8 subequal and shorter, club loose and 3-segmented. Mandible (Fig. 158) with 3 apical teeth, mola well-developed, a trace of dorsal mandibular cavity present near base. Maxilla (Fig. 159) with lacinia narrow, elongated and without apical spine; galea short, broad and its apex densely hairy; palpi with

segments 2 and 3 almost equal, apical segment longest and fusiform. Labium (Fig. 160) with mentum triangular and transverse, palpi with apical segment longest and fusiform. Labrum (Fig. 161) with apical margin slightly concave.

Prothorax (Fig. 152) slightly transverse, side margin with six large teeth, front coxae contiguous, coxal cavities almost round, cavities broadly closed behind externally as well as internally, prosternal process broad at apex and its apical margin straight, sterno-pleural suture extending to anterior tooth.

Meso-metathorax (Fig. 154) : Mesocoxae contiguous, cavities broadly opened outwardly, mesosternal process notched near apex, sternal fitting between mesocoxae in a straight line. Metasternum transverse, median impressed line extends anteriorly near middle, hind-coxae widely separated, metendosternite simple and represented by two appophyses.

Wing and Elytra : Wing (Fig. 157) with single anal vein; without radial cell, anal cell and subcubital fleck. Elytra somewhat ovoid, each elytron (Fig. 156) with 9 rows of striae punctures, without scutellary striae, alternate interstices with single and double rows of pubescence, epipleura narrow and complete upto apex.



Figs. 149-150. *Silvanolomus denticollis* (Reitter): 149, Dorsal view; 150, Ventral view (Scale = 1.0 mm).

Legs (Fig. 153) moderately long, trochanters short and simple, femora swollen towards

middle, tibiae not broadened at apex and with two apical spurs; tarsal formula 5-5-5 in both sexes, tarsal segment 1 elongated, segments 2 and 3 shorter and subequal, segment 3 strongly lobed below, segment 4 shortest, claws simple.

Abdomen (Fig. 155) elongated, ventrite 1 longest, intercoxal process broad and its apical margin almost straight, femoral lines closed, ventrites 2-5 subequal. Aedeagus (Fig. 163) with median lobe broadly elongated, median strut elongated and its apex spatulate; parameres well-developed, slender, elongated and with a few short apical setae; near base of median strut with a group of about 13-17 transverse chitinous bars on each side. Ovipositor (Fig. 162) with well-developed paraprocts, valvifers, coxites, and styli attached on outer margin of apex of coxites.

Larva known : No larva is described.

Sexual dimorphism : No distinct secondary sexual characters are observed, only except the examined males are comparatively slightly shorter than the females.

Key to the Species of *Silvanolomus* Reitter

1. Aedeagus with parameres widest near middle, each paramere with two long apical setae and a group of short setae near middle (Fig. 163).....
..... *denticollis* (Reitter) p. 118
- Aedeagus with paramers widest near apex, each paramere with only four apical setae (Fig. 164)..... *halsteadi* sp. nov. p. 120

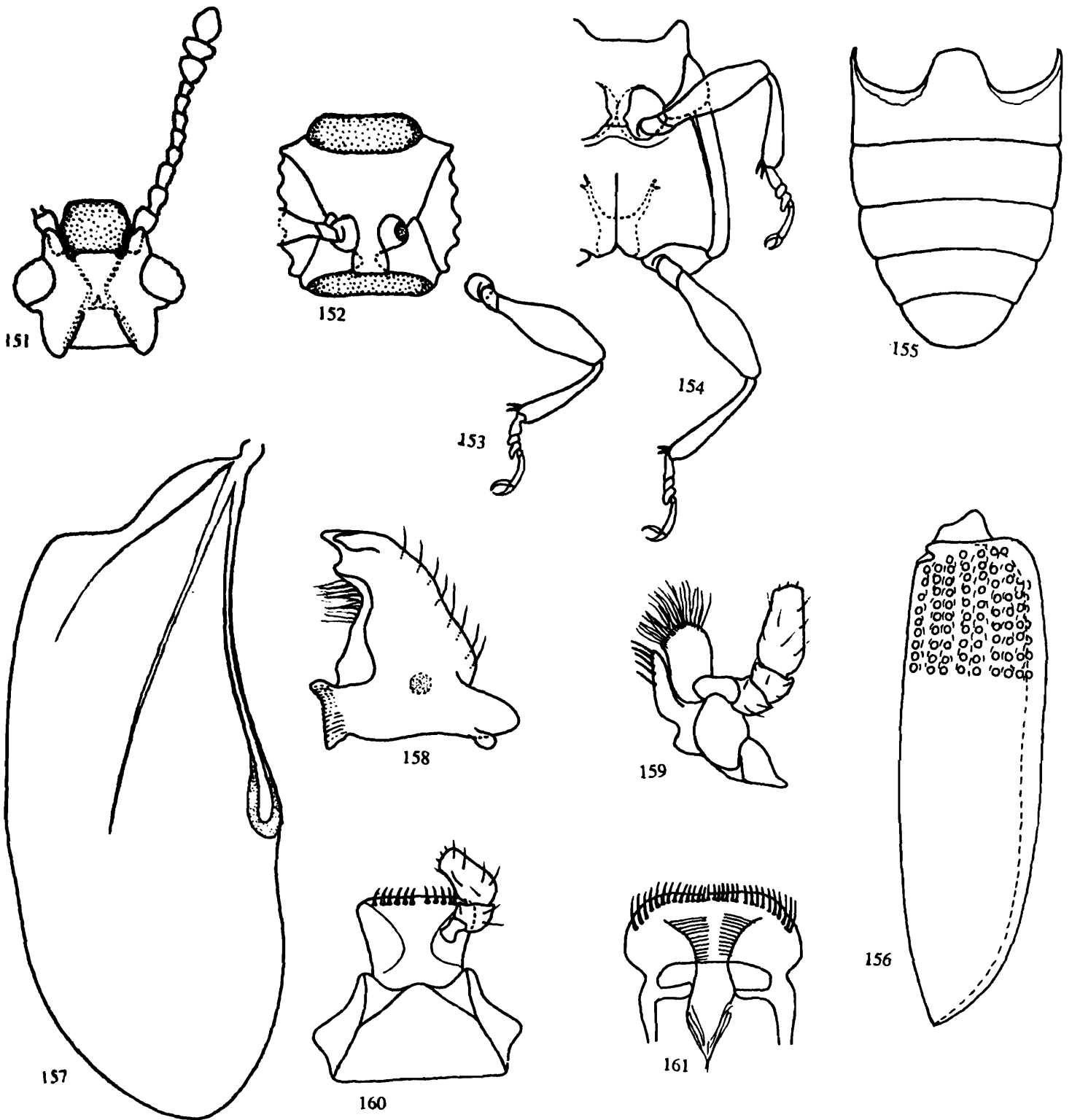
27. *Silvanolomus denticollis* (Reitter)

1876. *Silvanus denticollis* Reitter, *Col. Hefte.*, **15** : 56 (Type-loc. : Sri Lanka; Type deposition - British Museum Nat. Hist., London).
1908. *Silvanus denticollis* : Grouvelle, *Annls Soc. ent. Fr.*, **77** : 490.
1911. *Silvanopsis denticollis* : Reitter, *Fauna Germanica*, **3** : 44, nota.
1912. *Silvanolomus denticollis* : Reitter, *Wien.ent.Ztg.*, **31** : 286.
1912. *Silvanolomus denticollis* : Grouvelle, *Annls Soc.ent.Fr.*, **81** : 331.

This species is characterised by the lateral margin of prothorax with six acute teeth, coarsely punctate and convex pronotum, and ovoid elytra.

Description : General form (Fig. 149) elongated, moderately convex, prothorax with six large teeth on lateral side, blackish or yellowish brown and covered with short, semierect, golden pubescence.

Head : Exposed part of head broader than long, eyes large and length of eye about half as long as head, temple shorter than length of one eye facet and its outer apical angle slightly pointed, puncturation on vertex coarse and dense and that of towards anterior margin of clypeus slightly finer, setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel slightly shorter and narrower than scape, segment 3 about as long as pedicel and slightly narrower; segments 4-8 shorter than segment 3, subequal and elongated; segments 9-11 more or less transverse. *Prothorax* slightly broader than long, convex, slightly broader than head across eyes (1.12 ; 1.00), anterior



Figs. 151-161. *Silvanolomus denticollis* (Reitter): 151, Head, Dorsal view; 152, Prothorax, Ventral view; 153, Front leg; 154, Meso-metathorax, Ventral view; 155, Abdomen, Ventral view; 156, Right elytron, Dorsal view; 157, Wing; 158, Left mandible, Ventral view; 159, Left maxilla, Ventral view; 160, Labium, Ventral view; 161, Labrum.

margin feebly rounded; lateral margin with six short, broad and slightly pointed teeth; puncturation on pronotum coarse, dense and similar to that of vertex of head, setae short and projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* less than two times as long as broad, lateral margins slightly wavy, rows of punctures moderately large and deep, interstices strongly pubescent and setae projected posteriorly. On ventral side puncturation finer than on dorsal side, median impressed line on metasternum extending anteriorly slightly beyond middle. Aedeagus (Fig. 163) with parameres elongated and widest near middle, each paramere with two long apical setae and a group of shorter setae near middle; median strut broad at apex and its apical margin slightly curved inwardly, near base of median strut a group of about 13 chitinous bars on each side.

Measurements : Total length 1.61-1.94 mm., width of head across eyes 0.39-0.45 mm., length of antenna 0.60-0.64 mm., width of prothorax across middle 0.41-0.50 mm., length of elytra 1.02-1.26 mm. and width across middle 0.58-0.72 mm.

Materials examined : 45 ex., INDIA : WEST BENGAL, Nadia district, Badkulla, 6.iii.1977, T. K. Pal, dried flower of *Dahlia*; BIHAR, Chaibasa, 17 ex., 29.xii.1970, T. Sengupta, bajra (crop); KARNATAKA, Coorg, Fraserpet, F.R.I. Sandal Insect Survey, 1 ex., 7.iv.31, plot 3 (material received from Identified collection of British Museum Nat. Hist.); TAMIL NADU, Mahaballipuram, 6 ex., 25.iii.1977, T. Sengupta, Cashew flower.

Distribution : INDIA : West Bengal, Bihar, Karnataka, Tamil Nadu; SRI LANKA; INDONESIA (Sumatra, Borneo).

Remarks : Reitter (1876) described this species from Sri Lanka and subsequently, Grouvelle (1908) recorded it from Sumatra and Borneo. This species is being first time recorded from India.

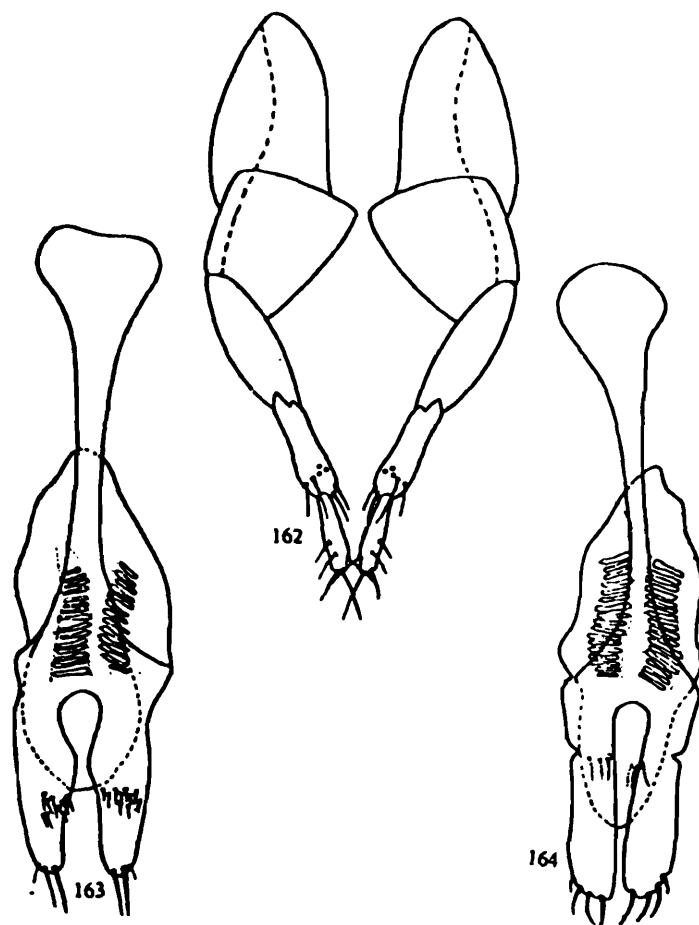
28. *Silvanolomus halsteadi* sp. nov.

This species is very similar in facies to *S. denticollis* but can be separated by structure of its aedeagus. The parameres widest near apex and each paramere with four apical setae (Fig. 164), puncturation on metasternum and ventrites slightly finer, median impressed line on metasternum shorter and extending upto middle.

Description : General form similar to *S. denticollis*; elongated, moderately convex, prothorax with six large teeth on lateral side, uniformly blackish-brown and covered with short, semierect, golden pubescence.

Head : Exposed part of head broader than long, eyes large and length of eye about half as long as head, temple shorter than length of one eye facet and its outer apical angle slightly pointed, puncturation on vertex coarse and dense and that of towards anterior margin of clypeus slightly finer, setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel slightly shorter and narrower than scape, segment 3 about as long as pedicel and slightly narrower; segments 4-8 shorter than segment 3, subequal and slightly elongated; segments 9-11 more or less transverse. *Prothorax* slightly broader than long, convex, slightly broader than head across eyes (1.05 : 1.00), anterior margin feebly rounded; lateral margin with six short, broad and slightly pointed teeth, puncturation on pronotum coarse, dense and similar to that of vertex of head; setae

short and projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* less than two times as long as broad, lateral margins slightly wavy, rows of punctures moderately large and deep, interstices strongly pubescent and setae projected posteriorly. On ventral side puncturation finer than on dorsal side, median impressed line on metasternum extends anteriorly upto middle. Aedeagus (Fig. 164) with parameres elongated, widest near apex; median strut broad at apex and its apical margin curved outwardly, near base on median strut a group of 16-17 chitinous bars on each side.



Figs. 162-164. 162, Ovipositor of *Silvanolomus denticollis* (Reitter); 163-164: Aedeagi, Dorsal view; 163, *S. denticollis* (Reitter); 164, *S. halsteadii* sp. nov.

Measurements of holotype : Total length 1.62 mm. width of head across eyes 0.39 mm., length of antenna 0.60 mm., width of prothorax across middle 0.41 mm., length of elytra 1.02 mm. and width across middle 0.58 mm.

Holotype ♂, INDIA : MEGHALAYA, Sarengina, Dainadubi, 19.xi.1974, T. Sengupta, flower of *Boga medulla*. Aedeagus dissected and mounted on cover slip and pinned with the holotype; **Paratype** 9 ex., data same as holotype (Zoological Survey of India, Calcutta; Reg. No. 11122/H₄A-11131/H₄A).

Distribution : INDIA : Meghalaya.

Remarks : This species is named after Dr. D.G.H. Halstead, in recognition of his notable contributions to the systematics of Silvanidae.

Genus 7. *Silvanopsis* Grouvelle

1892. *Silvanopsis* Grouvelle, *Annls Soc. ent. Fr.*, **61** : 285.

1911. nec. *Silvanopsis* Reitter, *Fauna Germanica*, **3** : 44 (= *Silvanolomus* Reitter, 1912)

1912. *Silvanopsis* : Grouvelle, *Annls Soc. ent. Fr.*, **81** : 318.

1930. *Silvanopsis* : Hetschko, *Coleopt. Cat.*, **109** : 74.

1980. *Silvanopsis* : Halstead, *Zool. J. Linn. Soc.*, **69** : 350-351.

Type-species : *Silvanopsis simoni* Grouvelle.

Historical review : *Silvanopsis* is a small genus, erected by Grouvelle (1892) based on 2 species, viz., *S. simonis* Grouvelle and *S. raffrayi* Grouvelle from Philippines and Singapore respectively. Imms and Chatterjee (1915) reported that the larvae of *Silvanus iyeri* Grouvelle, is a common enemy of lac insect (*Kerrea lacca*) in India though Grouvelle did not describe this species. Hetschko (1930) listed the above 2 of Grouvelle's species under this genus. Pal and Sengupta (1979) described *S. nepalensis* from Nepal. Halstead (1980) synonymised *Silvanus iyeri* Imms and Chatterjee with *S. simoni* Grouvelle and dealt with two species while revising this genus.

Habit-habitat : *Silvanopsis* comprises minute beetles (2.61-3.08 mm.) and previously noted to be found in lac. In the present study *Silvanopsis simoni* is found in brood lac, bajra (*Pennisetum typhoides*), cotton ('toola'), bush etc.

Geographical distribution : This is an Oriental genus, hitherto recorded from Nepal, India, Bangladesh, Sri Lanka and several South East Asian countries, extending upto Philippines. *S. simoni* has a wide distribution in India and several far eastern countries, while *S. nepalensis* is recorded only from Nepal.

Description : General form (Fig. 165) elongated, moderately flattened, laterally undulated prothorax, usually reddish-brown to blackish-brown.

Head (Fig. 169) transverse, front margin of clypeus usually almost straight, eyes moderately large and coarsely faceted, temple flattened beneath eye and shelf-like, transverse impressed line on vertex behind eyes present, tentorium with two long tentorial arms and a transverse corpo-tentorium near middle. Antenna short and slender, antennal insertion hidden under projection of frons, 11-segmented, scape broadly elongated, segments 2-8 subequal and narrower than scape; club a little compact, indistinctly 3-segmented or 2-segmented. Mandible (Fig. 177) elongated, with 3 apical teeth, mola well-developed, a trace of dorsal mandibular cavity present near base. Maxilla (Fig. 178) with lacinia narrow, elongated and without apical spines; galea short and broad and its apex densely hairy; palpi with segments 2 and 3 almost equal, apical segment longest and fusiform. Labium (Fig. 179) with mentum somewhat triangular and transverse, palpi with apical segment longest and fusiform. Labrum (Fig. 180) with apical margin slightly concave.

Prothorax (Fig. 170) almost quadrate or slightly elongated, lateral margin undulated and forming six broad teeth, pronotum slightly convex, front coxae moderately widely separated, coxal cavities slightly elongated, cavities broadly closed behind externally and opened internally, prosternal process broad at apex and its apical margin almost straight, sterno-pleural suture extending to anterior tooth.

Meso-metathorax (Fig. 172) : Mesocoxae almost contiguous, cavities broadly opened outwardly, lateral margins of mesosternal process usually notched at middle (simple in

nepalensis), sternal fitting between meso-coxae almost in a straight line. Metasternum transverse, median impressed line extends anteriorly near apex of meso-sternal process, hind-coxae widely separated; metendosternite simple and represented by two apophyses.

Wing and Elytra : Wing (Fig. 176) with single anal vein; without anal cell, radial cell and subcubital fleck. Elytra somewhat parallel-sided, each elytron (Fig. 175) with 9 rows of stria punctures, without scutellary striole, alternate interstices with single and double rows of pubescence, epipleura narrow and complete upto apex.

Legs (Fig. 171) moderately long and slender, trochanters short and simple, femora swollen towards middle, tibiae not broadened at apex and with two apical spurs; tarsal formula 5-5-5 in both sexes, tarsal segments 1-3 subequal and segment 3 slightly incrassate, segment 4 shortest, claws simple.

Abdomen (Fig. 174) elongated, ventrite 1 longest, intercoxal process broad and broadly pointed at apex, femoral lines closed, ventrites 2-5 subequal, Aedeagus (Fig. 181) with median lobe broad and narrowed towards apex, median strut elongated and bifid at apex; parameres well-developed, slender and with a few setae; near base of median strut with a group of transverse, chitinous bars on each side. Ovipositor (Fig. 182) with well-developed paraprocts, valvifers, coxites, and styli attached on outer margin of apex of coxites.

Larva known : Larva of *S. iyeri* var. *mysorensis* (= *S. simoni*) is illustrated by Mahadihassan (1955).

Sexual dimorphism : In male hind-trochanter with a short spinous projection, hind femur with a short spinous projection medially on upper margin of posterior side, apical half of posterior margin of hind tibia distinctly serrated.

Key to the Species of *Silvanopsis* Grouvelle

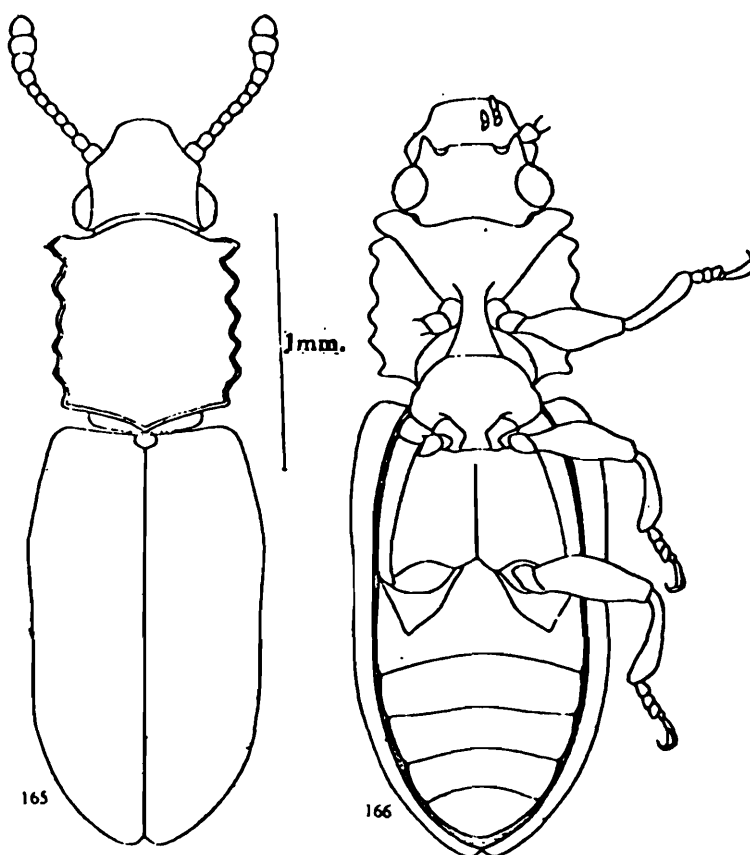
1. Antennal club 3-segmented and segment 9 slightly narrower than segment 10; pronotum distinctly bordered (Fig. 165); lateral margins of mesosternal process notched; femoral lines on ventrite 1 wide and angular posteriorly (Fig. 166) *simoni* Grouvelle p. 123

Antennal club distinctly 2-segmented; pronotum not bordered (Fig. 167); lateral margins of mesosternal process devoid of notch; femoral lines on ventrite 1 almost marginal striae of hind-coxae and rounded (Fig. 168) ..
..... *nepalensis* Pal and Sengupta p. 125

29. *Silvanopsis simoni* Grouvelle

1892. *Silvanopsis simonis* Grouvelle, *Annls Soc. ent. Fr.*, **61** : 286 (Type-loc. : Luzon, Philippines; Type deposition-Museum National d' Histoire Naturelle, Paris).
1908. *Silvanopsis simoni* : Grouvelle, *Annls Soc. ent. Fr.*, **77** : 490.
1915. *Silvanus iyeri* Imms and Chatterjee, *Indian Forest Mem.*, **1** : 37.
1955. *Silvanus iyeri* var. *mysorensis* Mahadihassan, *Curr. Sci.*, **24** : 418.
1980. *Silvanopsis simoni* : Halstead, *Zool. J. Linn. Soc.*, **69** : 352.

Parallel-sided prothorax with side margins undulated appearing six broad and blunt teeth, margins bordered; short antenna with segment 9 narrower than segment 10 characterise this species. This species shows some similarity with *S. raffrayi* Grouvelle, but can be readily separated by short and projecting eyes, apically emarginate clypeus, 2-segmented antennal club and broad declivous anterior prothoracic tooth of *raffrayi*.



Figs. 165-166. *Silvanopsis simoni* (Grouvelle): 165, Dorsal view; 166, Ventral view.

Description : General form (Fig. 165) elongated, moderately depressed, reddish-brown to blackish-brown; covered with short, semierect, golden pubescence.

Head : Exposed part of head broader than long, eyes moderately large and slightly shorter than one-third of length of head, temple about as long as one eye facet and its outer apical angle slightly pointed, puncturation on vertex coarse and dense and that of towards anterior margin of clypeus slightly finer, setae short and projected towards middle line. Antenna short and slender, scape moderately large, pedicel and segment 3 slightly shorter and narrower than scape, segments 4-7 shorter than segment 3 and about as long as broad, segment 8 elongated and slightly longer than segment 7, segment 9 wider than segment 8 and about as broad as long, segments 10 and 11 transverse. **Prothorax** convex, slightly elongated or quadrate and almost parallel-sided, anterior margin rounded; anterior tooth moderately large, broad and projected outwardly; lateral margin with six broad and blunt teeth including anterior tooth, margin of pronotum finely bordered; puncturation on pronotum coarse, dense and similar to that of vertex of head, setae projected towards middle

line. *Scutellum* moderately large, transverse and pubescent. *Elytra* less than two times as long as broad, widest near middle, lateral margins wavy and slightly explanate, apex of elytra slightly notched, 3rd and alternate intertices slightly raised; setae on sutural, 2nd, 3rd and then alternate interstices projected posteriorly; rows of setae on 4th, and then on alternate interstices diverge posterolaterally and projected towards nearest raised interstice. On ventral side puncturation finer than on dorsal side. Aedeagus (Fig. 181) with apical projection of median lobe elongated and pointed at apex; each paramere with a long apical seta and four shorter setae on inner margin near apex; near base of median strut a group of about 20-23 chitinous bars on each side.

Measurements : Total length 2.61-2.70 mm., width of head across eyes 0.52-0.55 mm., length of antenna 0.63-0.66 mm., width of prothorax across middle 0.64-0.69 mm., length of elytra 1.58-1.64 mm. and width across middle 0.85-0.92 mm.

Materials examined : 12 ex. INDIA : BIHAR, Namkum, 7 ex., 6.i.1971, T. Sengupta, lac; 1 ex., Locality and date same as above, bush of grass; Chaibasa, Putida Hills, 1 ex., 29. xii. 1970, T. Sengupta, 'bajra' (crop); ASSAM, Silchar, Cachar, 1 ex., 1911, from 'Toola' (cotton); Locality ?, 2 ex., 10.xi.10, brood out of lac.

Distribution : INDIA : Assam, Bihar, Uttar Pradesh, Gujarat, Karnataka; SRI LANKA; BANGLADESH; BURMA; MALAYSIA; INDONESIA (Sumatra); SINGAPORE; VIETNAM; CHINA; JAPAN; PHILIPPINES.

Remarks : Imms and Chatterjee (1915) mentioned that *Silvanus iyeri* Grouvelle is an enemy of lac insect. Mahadihassan (1955) recorded *Silvanus iyeri* var. *mysorensis* from Mysore (Karnataka). Grouvelle did not describe this species. The authors have examined several examples of this species including 2 examples (from Assam) determined by A. Grouvelle as "*Silvanopsis iyeri* Grouvelle", present in the Zoological Survey of India. Dr. D. G. H. Halstead informed that there are 'types' in the Paris Museum (Museum National d' Histoire Naturelle). In this context of nomenclatural controversy, Dr. Halstead commented that "In Imms and Chatterjee (1915) there is a brief description and a good figure of *Silvanopsis iyeri* which they attribute to Grouvelle. However, as he (Grouvelle) did not describe it and as, in nomenclature their brief description and figure represent a specific description, *Silvanopsis iyeri* must stand as a specific name attributed to them (i.e., *Silvanopsis iyeri* Imms and Chatterjee)" [Personal communication]. Later, Halstead (1980) synonymised *S. iyeri* Imms and Chatterjee with *S. simoni* Grouvelle.

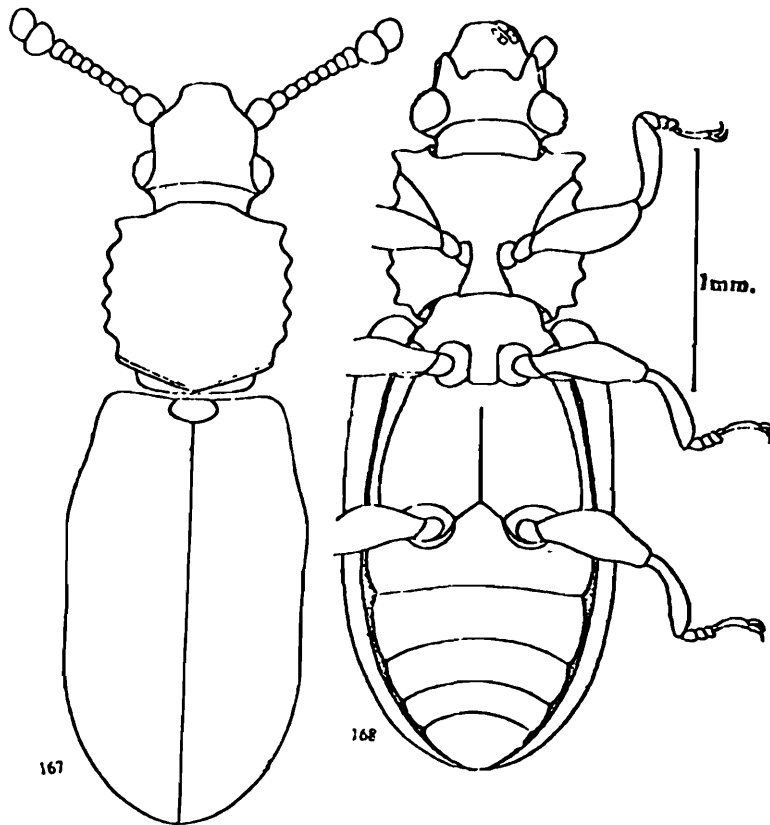
Subsequent to the description of this species, Grouvelle (1908) recorded it from Burma; and Halstead (1980) recorded from Sri Lanka Bangladesh, West Malaysia, Sumatra, Singapore, Vietnam, China and Japan.

30. *Silvanopsis nepalensis* Pal and Sengupta

1979. *Silvanopsis nepalensis* Pal and Sengupta, *Entomologica Basiliensia*, 4: 72-74 (Type-loc. : Pokhara, Nepal; Type deposition Naturhistorischen Museum, Basel).

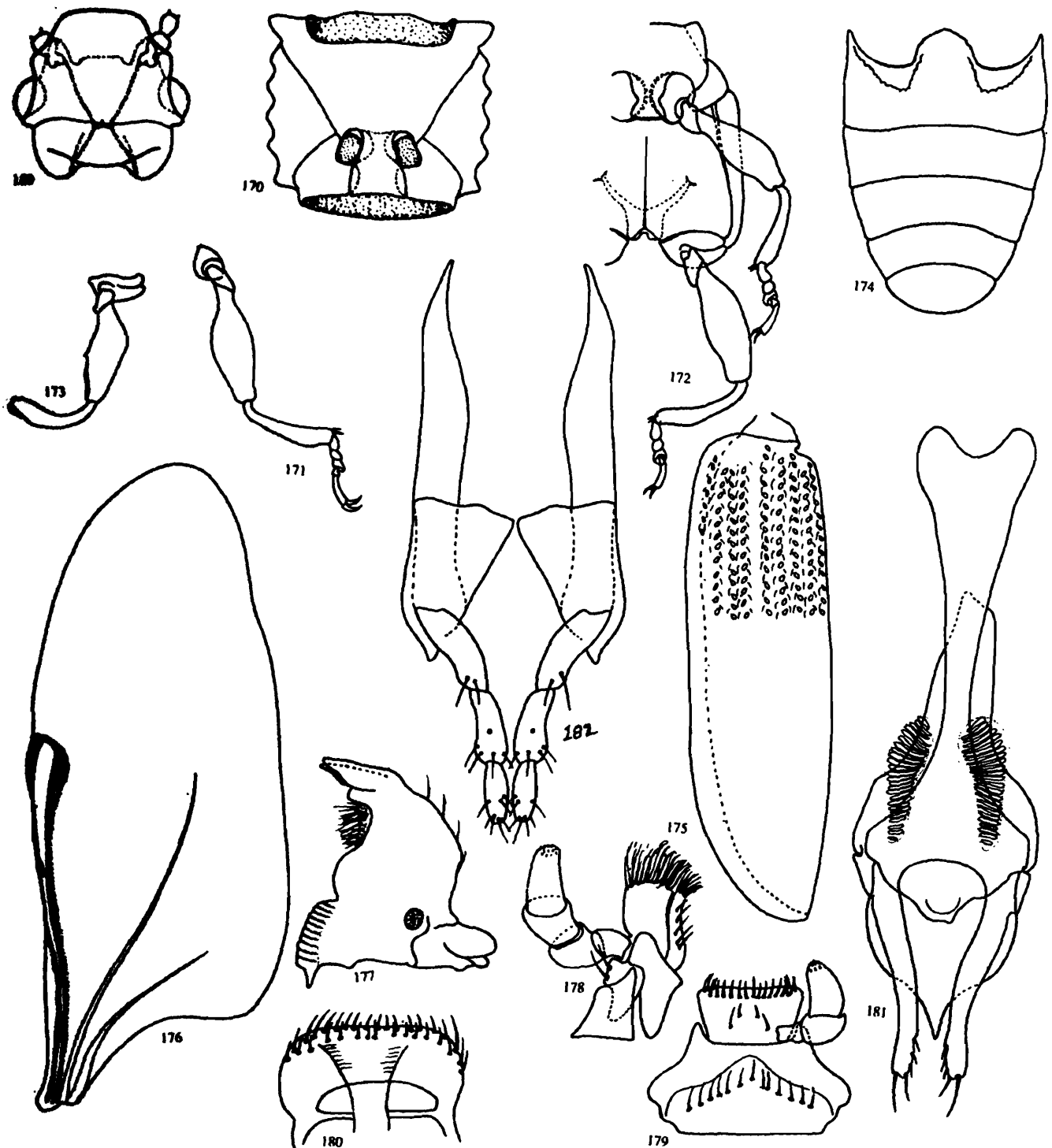
This is a distinct species and can be readily separated from *S. simoni* by its distinct 2-segmented antennal club, unbordered pronotum, simple mesosternal process, and femoral lines on ventrite 1 almost marginal striae of hind-coxae.

Description : General form (Fig. 167) elongated, moderately depressed, blackish-brwn and covered with short, semierect, golden pubescence.



Figs. 167-168. *Silvanopsis nepalensis* Pal and Sengupta: 167, Dorsal view; 168, Ventral view.

Head : Exposed part of head broader than long, eyes moderately large and about one-third of length of head, temple about as long as one eye facet and its outer apical angle pointed; puncturation on vertex coarse and dense and that of towards anterior margin of clypeus slightly finer, setae short and projected towards middle line. Antenna short and slender, scape moderately large, pedicel and segment 3 shorter and narrower than scape; segments 4-8 short, subequal and about as broad as long; segment 9 slightly wider than segment 8 and transverse, segments 10 and 11 distinctly transverse of which segment 10 slightly wider than segment 11. *Prothorax* convex, about as broad as long and almost parallel-sided, anterior margin rounded; anterior tooth moderately large, broad and outwardly projected; lateral margin with six broad and blunt teeth including anterior tooth, margin of pronotum not bordered; puncturation on pronotum coarse, dense and similar to that of vertex of head, setae projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* less than two times as long as broad, rather parallel-sided, widest near middle, lateral margins wavy and slightly explanate, apex of elytra slightly notched, alternate interstices slightly raised, setae projected posteriorly. On ventral side puncturation finer than on dorsal side.



Figs. 169-182. *Silvanopsis simoni* (Grouvelle): 169, Head, Dorsal view; 170, Prothorax, Ventral view; 171, Front leg; 172, Meso-metathorax, Ventral view; 173, Hind leg of male; 174, Abdomen, Ventral view; 175, Left elytron, Dorsal view; 176, Wing; 177, Right mandible, Dorsal view; 178, Right maxilla, Ventral view; 179, Labium, Ventral view; 180, Labrum; 181, Aedeagus, Dorsal view; 182, Ovipositor.

Measurements of holotype : Total length 3.08 mm., width of head across eyes 0.61 mm., length of antenna 0.78 mm., width of prothorax across anterior teeth 0.76 mm., length of elytra 1.77 mm. and width across middle 1.02 mm.

Material examined : *Holotype* ♀, Nepal : Pokhara, 820 m., 15-18: vi. 1976, W. Wittmer and C. Baroni Urbani (Naturhistorischen Museum, Basel).

Distribution : NEPAL.

Remarks : Unlike other *Silvanopsis*, *S. nepalensis* has distinct 2-segmented antennal club, unbordered lateral margin of pronotum, lateral margin of mesosternal process not notched (Fig. 168). It well might be necessary to erect a new genus for this species, but no attempt has been made, as the species is represented by only single female specimen (Pal and Sengupta, 1979).

Genus 8. *Oryzaephilus* Ganglbauer

1899. *Silvanus* (*Oryzaephilus*) Ganglbauer, *Die Käfer von Mitteleuropa*, 3 : 584.

1911. *Oryzaephilus* : Reitter, *Fauna Germanica*, 3 : 45.

1912. *Oryzaephilus* : Grouvelle, *Annls Soc. ent. Fr.*, 81 : 318.

1930. *Oryzaephilus* : Hetschko, *Coleopt. Cat.*, 109 : 67.

1980. *Oryzaephilus* : Halstead, *Zool. J. Linn. Soc.*, 69 : 277-279.

Type-species : *Silvanus surinamensis* (Linnaeus).

Historical review : The people probably were familiar with the species of *Oryzaephilus*, especially *surinamensis* (saw-toothed grain beetle) and *mercator* (merchant grain beetle), long before their description by Linnaeus (1758) and Fauvel (1889) as well known insects those attack stored food products. Ganglbauer (1899) erected the subgenus *Oryzaephilus* under the genus *Silvanus* Latreille to accommodate *S. surinamensis* (Linnaeus) and *S. mercator* Fauvel. Reitter (1911) attributed generic status to Ganglbauer's subgenus, *Oryzaephilus*. Grouvelle (1912) regarded *mercator* as a variety of *surinamensis*. Hetschko (1930) in Junk's "Coleopterorum Catalogus" listed 8 species under this genus, of which only *gossypii* (Chittenden) is recorded from India. Howe (1953) and Slow (1958) confirmed the distinct specific status of *mercator* from that of *surinamensis*. Spilman (1961) synonymized *O. gossypii* with *O. mercator*. Aitken (1965) described *O. gibbosus* from East Africa, and Halstead (1973) transferred *Silvanus fauveli* Reitter to this genus. Halstead (1980) while revising *Oryzaephilus*, designated *surinamensis* (Linnaeus) as the type-species, transferred *aridulus* (Blackburn), *congener* (Olf) to the genus *Australonausibius* Halstead, and *maximus* (Grouvelle) to the genus *Pseudonausibius* Halstead; synonymised *peculiaris* (Grouvelle) with *Australonausibius congener* (Olf) and *denticulatus* Macleay with *Nausibius clavicornis* (Kugelann). He (*loc. cit.*) recognised 13 species under *Oryzaephilus* of which, *O. genalis* Halstead and *O. acuminatus* Halstead are recorded from India, and *O. surinamensis* and *O. mercator* with a World-wide distribution. Hitherto the larvae of *O. surinamensis* and *O. mercator* are known.

Habit and habitat : *Oryzaephilus* is comprised of minute beetles (2.5 - 3.5 mm.), live primarily in stored food products, dried seeds. Sometimes they are attracted to light or found

in the subcorticolous habitat.

Geographical distribution : As the representatives are mostly associated with a vast range of commodities in commercial farm and domestic food stores, this genus has attained a world-wide distribution through international trade of these articles. Correspondingly in India *O. surinamensis* and *O. mercator* due to their association with various stored articles, are distributed in various parts. *O. acuminatus* represents the southern distribution pattern, while *O. genalis* is common in southern as well as some of the northern parts.

Description : General form (Fig. 1) elongated, moderately depressed, pronotum with three longitudinal carinae and six lateral teeth, usually reddish-brown to blackish-brown.

Head (Fig. 3) elongated, front margin of clypeus almost straight, eyes small to large and coarsely faceted, temple flattened beneath eye and shelf-like, transverse impressed line on vertex behind eyes absent; tentorium with two longitudinal arms connected by corporotentorium, with median tentorial process and post-tentorina. Antenna moderately long and slender, antennal insertions hidden under projection of frons, 11-segmented, scape broadly elongated, pedicel and segment 3 usually about as long as scape and slightly narrower, segments 4-8 shorter and subequal, club loose and 3-segmented. Mandible (Fig. 10) elongated with three apical teeth, mola well-developed, a trace of dorsal mandibular cavity present near base. Maxilla (Fig. 11) with lacinia narrow, elongated, and without apical spines; galea short, broad and its apex densely hairy; palpi with segments 2 and 3 almost equal, apical segment longest and fusiform. Labium (Fig. 12) with mentum somewhat triangular and transverse, palpi with apical segment longest and fusiform. Labrum (Fig. 13), transverse and its apical margin rounded.

Prothorax (Fig. 4) elongated, lateral margin with six distinct teeth, pronotum with a discal area demarcated by a median and lateral longitudinal carinae, and lateral longitudinal grooves on either side of median carina. Front coxae almost contiguous, coxal cavities almost round, cavities broadly closed behind externally and internally, prosternal process broad at apex and its apical margin straight, sterno-pleural suture extending to anterior tooth.

Meso-metathorax (Fig. 6) : Mesocoxae almost contiguous, cavities broadly opened outwardly, lateral margins of mesosternal process simple, sternal fitting between mesocoxae almost in a straight line. Metasternum slightly transverse, median impressed line extends anteriorly near middle, hind-coxae widely separated, metendosternite simple and represented by two appophyses.

Wing and Elytra : Wing (Fig. 9) with single anal vein; without radial cell, anal cell and subcubital fleck. Elytra somewhat parallel-sided, side margins usually slightly wavy, each elytron (Fig. 7) with 9 rows of striae punctures, without scutellary striae, alternate interstices with two and three rows of pubescence, epipleura narrow and complete upto apex.

Legs (Fig. 5) moderately long and slender, trochanters short and simple, femora swollen towards middle, tibiae not broadened at apex and devoid of distinguishable apical spurs; tarsal formula 5-5-5 in both sexes, tarsi simple but segment 3 slightly incrassate, segment 1 elongated, segments 2 and 3 equal and slightly shorter than segment 1, segment 4 shortest, claws simple.

Abdomen (Fig. 8) elongated, ventrite 1 longest, intercoxal process broad, its apical margin truncated and nearly straight, femoral lines closed; ventrites 2-5 subequal. Aedeagus (Fig. 14) with median lobe broad, median strut elongated and its apex spatulate; parameres well-developed, articulated, slender and elongated, fringed with a few long setae and many short setae, long setae with simple or forked tips; near base of median strut with a group of 8-20 transverse, chitinous bars on each side. Ovipositor (Fig. 15) with well-developed paraprocts, valvifers, coxites, and long styli attached on outer margin of apex of coxites.

Larva known : *O. surinamensis* (Linnaeus) and *O. mercator* (Fauvel).

Sexual dimorphism : In male hind-trochanter with a spinous projection, hind-femur with a distinct spine on posterior side at middle, front-tibia with two and middle and hind tibiae with single apical tooth. Males are usually more elongated than females.

Key to the Species of *Oryzaephilus* Ganglbauer

1. Length of temple of head about as long as 2 to 2.5 eye facets, length of eye about 3 to 4 times the length of temple. Aedeagus with each paramere distinctly broadened near middle and about 2.5 to 3 times as long as broad 2

Length of temple of head about 3.5 to 4 eye facets, length of eye usually shorter than twice the length of temple. Aedeagus with each paramere nearly parallel-sided and at least 5 times as long as broad 3

2. Antennal segments 6 and 7 about as long as broad, prothorax a little elongated (1.10-1.14 : 1.00), lateral margins of frons and longitudinal carinae on pronotum normally elevated. Aedeagus with apex of each paramere with three long setae and their tips simple (Fig. 14) *mercator* (Fauvel) p. 133

Antennal segments 6 and 7 distinctly elongated, prothorax distinctly elongated (1.21 : 1.00), lateral margins of frons and longitudinal carinae on pronotum strongly and more markedly elevated. Aedeagus with apex of each paramere with 6 long setae and their tips forked (Fig. 188) *acuminatus* Halstead p. 135

3. Antennal segments 6-8 about as long as broad; aedeagus with parameres fringed with apical and outer marginal setae (Fig. 186) *surinamensis* (Linnaeus) p. 131

Antennal segments 6-8 elongated; aedeagus with parameres fringed with a few long setae only at apex (Fig. 187) *genalis* Halstead p. 136

31. *Oryzaephilus surinamensis* (Linnaeus)

1758. *Dermestes surinamensis* Linnaeus, *Systema Naturae*, ed. 10, 1 : 357 (Type-loc. : Surinam : South America; Type deposition ?, not in Linnaean Collection, London).

1758. *Tenebrio cursor* Linnaeus, *Systema Naturae*, ed. 10, 1 : 418.
1775. *Tenebrio surinamensis* : Degeer, *Memoires pour Servir a l'Histoire des Insectes*, 5 : 54.
1775. *Anobium frumentarium* Fabricius, *Systema Entomologica* : 62.
1783. *Ips sexdentata* Herbst, *Archiv der Insectengeschichte*, 4 : 31.
1790. *Silpha sexdentata* : Gmelin, *Systema Naturae*, 1(4) : 1619.
1790. *Silpha surinamensis* : Gmelin, *Systema Naturae*, 1(4) : 1620.
1790. *Ips frumentaria* : Olivier, *Entomologie, ou Histoire Naturelle des Insectes*. 2(18) *Ips* : 10.
1792. *Scarites cursor* : Fabricius, *Entomologia Systematica*, 1 : 96.
1792. *Colydium frumentarium* : Fabricius, *Entomologia Systematica*, 1 : 496.
1792. *Dermestes sexdentatus* : Fabricius, *Entomologia Systematica*, 1 : 232.
1776. nec. *Dermestes sexdentatus* Boerner, *Oekonomische Nachrichten der Patriotischen Gessellschaft in Schlesien*, 4 : 78 (now *Ips sexdentatus* (Boerner) : Scolylitidae).
1794. *Lyctus sexdentatus* : Kugelann, *Schneider's Magazine*, 1 : 566.
1800. *Colydium sexdentatum* : Paykull, *Fauna Suecica, Insecta*, 3 : 313.
1802. *Corticaria frumentaria* : Marsham, *Coleoptera Britannica*: 107.
1813. *Silvanus sexdentatus* : Gyllenhal, *Insecta Suecica Classis, I, Coleoptera sive Eleuterata* 1 (3) : 406.
1829. *Silvanus surinamensis* : Stephens, *A Systematic Catalogue of British Insects* : 92.
1846. *Silvanus bicornis* Erichson, *Naturgeschichte der Insecten Deutschlands*. 1, *Coleoptera*, 3 : 337.
1890. *Silvanus surinamensis* var. *bicornis* : Reitter, *Wien. ent. Ztg.*, 9 : 255.
1899. *Silvanus* (*Oryzaephilus*) *surinamensis* : Ganglbauer, *Die Käfer von Mitteleuropa*, 3 : 584.
1911. *Oryzaephilus surinamensis* : Reitter, *Fauna Germanica*, 3 : 46.
1912. *Orzaephilus surinamensis* : Grouvelle, *Annls Soc. ent. Fr.*, 81 : 318.
1980. *Oryzaephilus surinamensis* : Halstead, *Zool. J. Linn. Soc.*, 69 : 286-290.

Common name : Saw-toothed grain beetle.

This is the most common species of *Oryzaephilus*, found in a wide variety of stored products and can be easily distinguished by its relative lengths of eye and temple.

Description : General form (Fig. 183) elongated, moderately depressed, moderately elevated carinae of pronotum, long temple of head, reddish-brown to blackish-brown and covered with short, semierect, golden pubescence.

Head : Exposed part of head about as wide as long, eyes small to moderately large, length of eye about one-fourth of length of head, length of temple about as long as 3.5 to 4 eye facets and about as long as eye or slightly shorter than it, lateral margin of frons slightly elevated, puncturation on vertex coarse and dense and that of towards anterior margin of clypeus slightly finer, setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel and segment 3 slightly shorter and narrower than scape, segments 4-8 subequal and about as broad as long, segments 9 and 10 transverse and segment 11 about as broad as long or slightly transverse. *Prothorax* elongated (1.1-1.3 : 1 excluding teeth), convex, anterior margin outwardly curved with

slight indentation at middle, lateral margin with anterior tooth more acute than other teeth, pronotal disc with lateral longitudinal carinae convergent towards extremities than in middle, longitudinal grooves on either side of median carina rather well-marked; puncturation on pronotum coarse and dense and similar to that of vertex of head. *Scutellum* moderately large, transverse and pubescent. *Elytra* slightly more than two times as long as broad, lateral margins wavy and explanate, rows of punctures on elytra moderately large; interstices 3, 5 and 7 slightly carinate; setae projected posteriorly. On ventral side puncturation of head and prothorax almost similar to that of dorsal side, of meso-metathorax and abdomen slightly finer. Aedeagus (Fig. 186) with parameres long and slender, each paramere fringed with numerous short setae and a few long setae on outer margin and apex, apical long setae forked at tip; near base of median strut a group of 11-13 chitinous bars on each side.

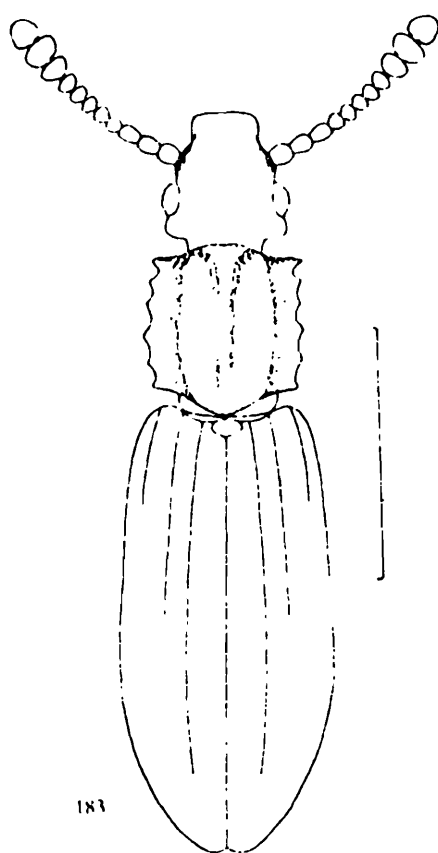


Fig. 183. *Oryzaephilus surinamensis* (L.), Dorsal view (Scale = 1.0 mm).

Measurements : Total length 2.75-3.50 mm., width of head across eyes 0.55-0.68 mm., length of antenna 0.81-1.06 mm., width of prothorax across middle 0.61-0.75 mm., length of elytra 1.60-1.95 mm. and width across middle 0.79-0.96 mm.

Materials examined : 70 ex. INDIA: WEST BENGAL, Calcutta, 2 ex., 19.ix.09, C.A.P., dried walnut; 8 ex., June, 1888, W. M. Duncan, Ship biscuits; 1 ex., 5.ii.1892, E. C. Cotes, date fruit; 36 ex., 7.iv.1971, T. Sengupta, Rice; 2 ex., 6.vii.1972, T. Sengupta, Rice; 5 ex., vii.1974; 4 ex., 30.v.1953, T. G. Vazirani; 5 ex., 24.viii.1977, Mazumdar, *Shorea robusta* seed brought from Bankura; BIHAR, Chaibasa, 2 ex., 11.xi.1970, T.

Sengupta, Rice; Ranchi, 1 ex., W. H. Irvine; UTTAR PRADESH, Dehra Dun, 10. vi. 1971, A. Sing; Dehra Dun, New Forest, 2 ex., 27.ii.1928, N. C. Chatterjee; TAMIL NADU, Madras, 1 ex., Sorghum seed; Coimbatore, 440 m., 1 ex., ii.1970, T.R.S. Nathan.

Distribution : Cosmopolitan. In India this species is so far recorded from West Bengal, Bihar, Uttar Pradesh and Tamil Nadu.

Biology : Losses caused by the saw-toothed grain beetle are often considerable. Its attack often followed by that of other species viz., *Sitophilus oryzae*, *Tribolium castaneum*. Due to enormous economic importance as stored grain pest, works on various aspects of its bionomics were carried out (Wheeler, 1921; Hamilin and Benton, 1925; Back and Cotton, 1926; Hinton and Corbet, 1943; Howe, 1953; Verner, 1971; Korunic, 1971 etc.). But nothing practically is available on the biology of this insect in the Indian environment. The observations of the life history studies on unboiled rice conducted in the laboratory (June-September, 1974) are summarised. The adults are very active and gregarious. Individuals begin depositing eggs from 6th-7th day after emergence. 1-3 eggs are laid in some crevices or loosely ground food stuff. The eggs are white, smooth, elongate-oval (0.85 : 0.25 mm.). The maximum number of eggs laid by a single female recorded is 94 in 120 days. The eggs are hatched in 4-7 days. The larvae are voracious eater. Three larval instars were observed and full grown larva measures about 3 mm. in length and 0.55 mm. in width across head capsule. Larval period varied from 6-16 days. Larvae usually pupate in pupal cells, constructed by powered food stuffs with sticky secretion. The pupal period varied from 10-20 days. The total life cycle, from laying of eggs to emergence of adults, ranged from 3-6 weeks time.

32. *Oryzaephilus mercator* (Fauvel)

1889. *Silvanus mercator* Fauvel, *Revue Ent.*, **8** : 132 (Type-loc. : France; Type deposition Institut Royal des Sciences Naturelles de Belgique, Brussels).
 1890. *Silvanus mercator* : Reitter, *Wien. ent. Ztg.*, **9** : 255.
 1897. *Silvanus gossypii* Chittenden, *Bull. Bur. Ent. U. S. Dep. Agric.*, **8** : 13.
 1899. *Silvanus (Oryzaephilus) mercator* : Ganglbauer, *Die Käfer von Mitteleuropa*, **3** : 585.
 1911. *Oryzaephilus mercator* : Reitter, *Fauna Germanica*, **3** : 46.
 1912. *Oryzaephilus surinamensis* var. *mercator* : Grouvelle, *Annls Soc. ent. Fr.*, **81** : 318, 319.
 1958. *Oryzaephilus mercator* : Slow, *Bull. ent. Res.*, **49** : 27.
 1980. *Oryzaephilus mercator* : Halstead, *Zool. J. Linn. Soc.*, **69** : 306-309.

Common name : Merchant grain beetle.

This species resembles *O. gibbosus* Aitken but distinguishable by more elongated form, more parallel lateral carinae of pronotum, and abruptly broadened paramere near middle of *gibbosus*.

Description : General form (Fig. 1) elongated, moderately depressed, moderately elevated carinae of pronotum, short temple of head, blackish-brown and covered with short, semierect, golden pubescence.

Head : Exposed part of head wider than long, eyes large and length of eye about one-third of length of head, length of temple about as long as 2 to 2.5 eye facets or about one-

third as long as eye, lateral margin of frons slightly elevated, puncturation on vertex coarse and dense and that of towards anterior margin of clypeus slightly finer, setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel and segment 3 about as long as scape and slightly narrower, segments 4-7 about as broad as long and shorter than segment 3, segment 8 slightly transverse, segments 9 and 10 distinctly transverse and segment 11 about as broad as long or slightly transverse. *Prothorax* elongated (1.30-1.35 : 1 excluding teeth), convex, anterior margin outwardly curved and sometimes with slight indentation at middle, anterior tooth more acute than other lateral teeth which more or less pointed, pronotal disc with lateral longitudinal carinae slightly convergent at extremities, longitudinal groove on either side of median carina well-marked, puncturation on pronotum coarse and dense and similar to that of vertex of head. *Scutellum* moderately large, transverse and pubescent. *Elytra* more than two times as long as broad, lateral margins wavy and explanate, rows of punctures on elytra moderately large; interstices 3, 5 and 7 slightly carinate; setae projected posteriorly. On ventral side puncturation of head and prothorax almost similar to that of dorsal side, and of meso-metathorax and abdomen slightly finer. Aedeagus (Fig. 14) with parameres elongated, slightly broader across posterior half, each paramere fringed with numerous small setae and a few long setae only at apex, tips of apical long setae simple; near base of median strut a group of 15-17 chitinous bars on each side.

Measurements : Total length 3.00-3.50 mm., width of head across eyes 0.41 - 0.54 mm., length of antenna 0.82-1.01 mm., width of prothorax across middle 0.68-0.80 mm., length of elytra 1.70-2.50 mm. and width across middle 0.84-1.02 mm.

Materials examined : 162 ex. INDIA : WEST BENGAL, Calcutta, 2 ex., 16.xi.1971, T. Sengupta, wheat; 1 ex., 6. xi. 1974, T. Sengupta, corn flake; 49 ex., 10.iv.1974, T. Sengupta, cashew nut; BIHAR, Chaibasa, 1 ex., 30.x.1964, T. Sengupta, wheat; 2 ex., 11.xi.1970, T. Sengupta, rice; RAJASTHAN, Ajmer, 2 ex., 1969, S. M. Dutta, ground nut; MAHARASTRA, Bombay, 5 ex., 1974; TAMIL NADU, Coimbatore, 440 m., 1 ex., ii. 1970, T. R. S. Nathan; and 100 ex. from culture on cashew nut maintained by T. K. Pal.

Distribution : Cosmopolitan. This species is particularly wide spread in Africa, Asia, North and South America, Australia and in some European countries. In India this species is recorded from West Bengal, Bihar, Rajasthan, Maharastra and Tamil Nadu.

Biology : It is commonly a pest of oil seeds and their products. In India this species was found to infest cashew nut, ground nut, corn flake, wheat and rice. Howe (1956) gave a brief account of the biology of *mercator* along with *surinamensis*. The observations on the life history studies on cashew nuts conducted in the laboratory are summarised. The adults begin to copulate after 3-5 days of emergence. During copulation the male mounts the back of the female at rest. The male touches his antennae repeatedly over the head of female with intermittent intervals. After these primary activities for about 20-25 minutes, the male introduces his aedeagus into the genital opening of the female and both remain in coition for about 5-10 seconds. The female begins laying eggs from 3rd day of copulation and preferably in dark. The eggs are elongate-oval (0.80 : 0.25 mm.) and hatched in 3-6 days. The larvae feed rapidly after initial slow movement. Three larval instars were observed and the full grown larvae are usually a little shorter than that of *surinamensis* (2.8 mm.). Larval

period varied from 11-18 days and the pupal period ranged from 5-9 days. The total development was completed by 19-33 days during April-August, 1978.

Remarks : Grouvelle (1912) mentioned that *surinamensis* and *mercator* are two extremes of the same species. Subsequently, Slow (1958) established that these two are distinct species. The male genitalia, and ratio of eye and temple lengths are significantly different. Slow also noted that the cross breeding of these two species produced no offspring.

33. *Oryzaephilus acuminatus* Halstead

1980. *Oryzaephilus acuminatus* Halstead, *Zool. J. Linn. Soc.* **69**: 309-312 (Type-loc.: Coimbatore : Tamil Nadu, India; Type deposition Museum d' Histoire Naturelle, Geneve).

This species is near to *O. mercator* in having similar type of general appearance and temple of head but can be separated by its antennal segments 5-7 distinctly elongated and segments 9 and 10 strongly transverse, prothorax narrower and more elongated (1.21 : 1.00 including teeth) than *O. mercator* (1.10 - 1.4 : 1.00 including teeth), head with lateral margins of frons and pronotal carinae more strongly developed; aedeagus with each paramere bearing more long apical setae and their tips forked.

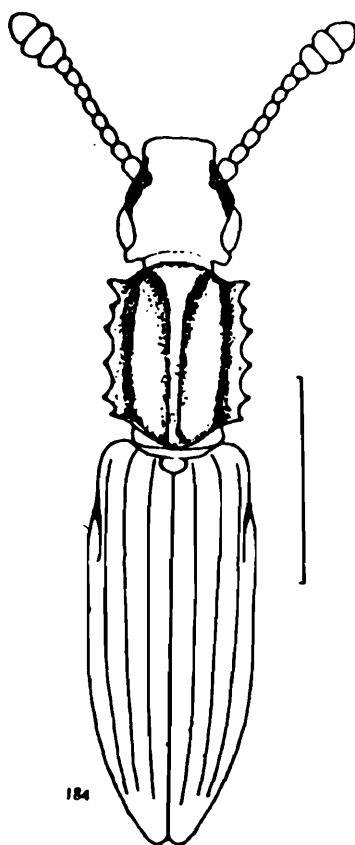


Fig. 184. *Oryzaephilus acuminatus* Halstead, Dorsal view (Scale = 1.0 mm).

Description : General form (Fig. 184) elongated, moderately depressed, strongly

elevated carinae of pronotum, short temple of head, blackish-brown and covered with short, semierect, golden pubescence.

Head : Exposed part of head about as broad as long, eyes large and length of eye slightly longer than one-third length of head, length of temple about as long as 2.5 eye facets or one-fourth as long as eye, lateral margin of frons strongly elevated, puncturation on vertex coarse and dense and that of towards anterior margin of clypeus slightly finer, setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel slightly shorter and narrower than scape, segment 3 about as long as pedicel and slightly narrower; segments 4-7 elongated, subequal and shorter than segment 3; segment 8 slightly transverse and slightly shorter than segment 7, segment 10 slightly more transverse than segments 9 and 11. *Prothorax* elongated (1.45 : 1 excluding teeth) and rather parallel-sided, convex, anterior margin outwardly curved, lateral margin with anterior tooth largest and pointed at apex, other teeth subequal and less pointed; longitudinal carinae on pronotal disc strongly elevated and longitudinal groove on either side of median carina more well-marked, carinae convergent towards extremities, puncturation on pronotum coarse and dense and similar to that of vertex of head. *Scutellum* moderately large and transverse. *Elytra* more than two times as long as broad, lateral margins wavy and not explanate, rows of punctures moderately large; interstices 3, 5 and 7 raised and extending almost upto apex; apex of elytra forked, setae projected posteriorly. On ventral side puncturation finer than on dorsal side. Aedeagus (Fig. 188) with parameres elongated, broadened near middle, each paramere fringed with numerous short marginal setae and about 5 long apical setae, tips of apical setae forked; near base of median strut a group about 21 chitinous bars on each side.

Measurements : Total length 2.89 - 3.94 mm., width of head across eyes 0.55 - 0.60 mm., length of antenna 0.95 - 1.10 mm., width of prothorax across middle 0.61 - 0.72 mm., length of elytra 1.95 - 2.24 mm. and width across middle 0.85-0.90 mm.

Materials examined : 11 ex. INDIA : TAMIL NADU, Tope, 1524 m., foot of Palni Hills, 1 ex., 22-23.x.1922, S. Kemp, at light; 10 ex., sent by Dr. D. G. H. Halstead, from culture of specimens imported to Britain from Sri Lanka (Paratypes of *acuminatus* were chosen by Dr. Halstead from same culture).

Distribution : INDIA : Tamil Nadu; SRI LANKA.

34. *Oryzaephilus genalis* Halstead

1980. *Oryzaephilus genalis* Halstead, *Zool. J Linn. Soc.*, **69** : 295-297 (Type-loc. Kantala, Sri Lanka; Type deposition British Museum Nat. Hist., London).

This species is closely related to *O. surinamensis* but can be distinguishable by its antennal segments 6 to 8 being elongated; head with lateral sides of frons more distinctly elevated, eyes slightly larger, hind angles of temple more distinctly angulate; aedeagus with median lobe slightly longer, paramere with a few long setae only near apex, fewer chitinous bars (about 8) in each group near base of median strut.

Description : General form (Fig. 185) elongated, moderately depressed, moderately elevated carinae of pronotum, long temple of head, blackish-brown and covered with short, semierect, golden pubescence.

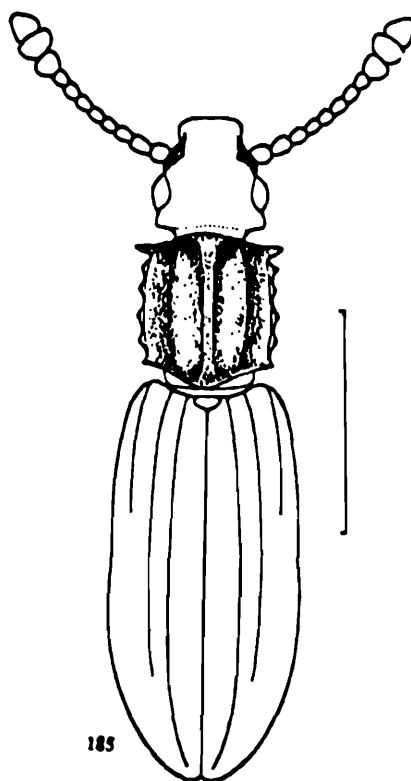
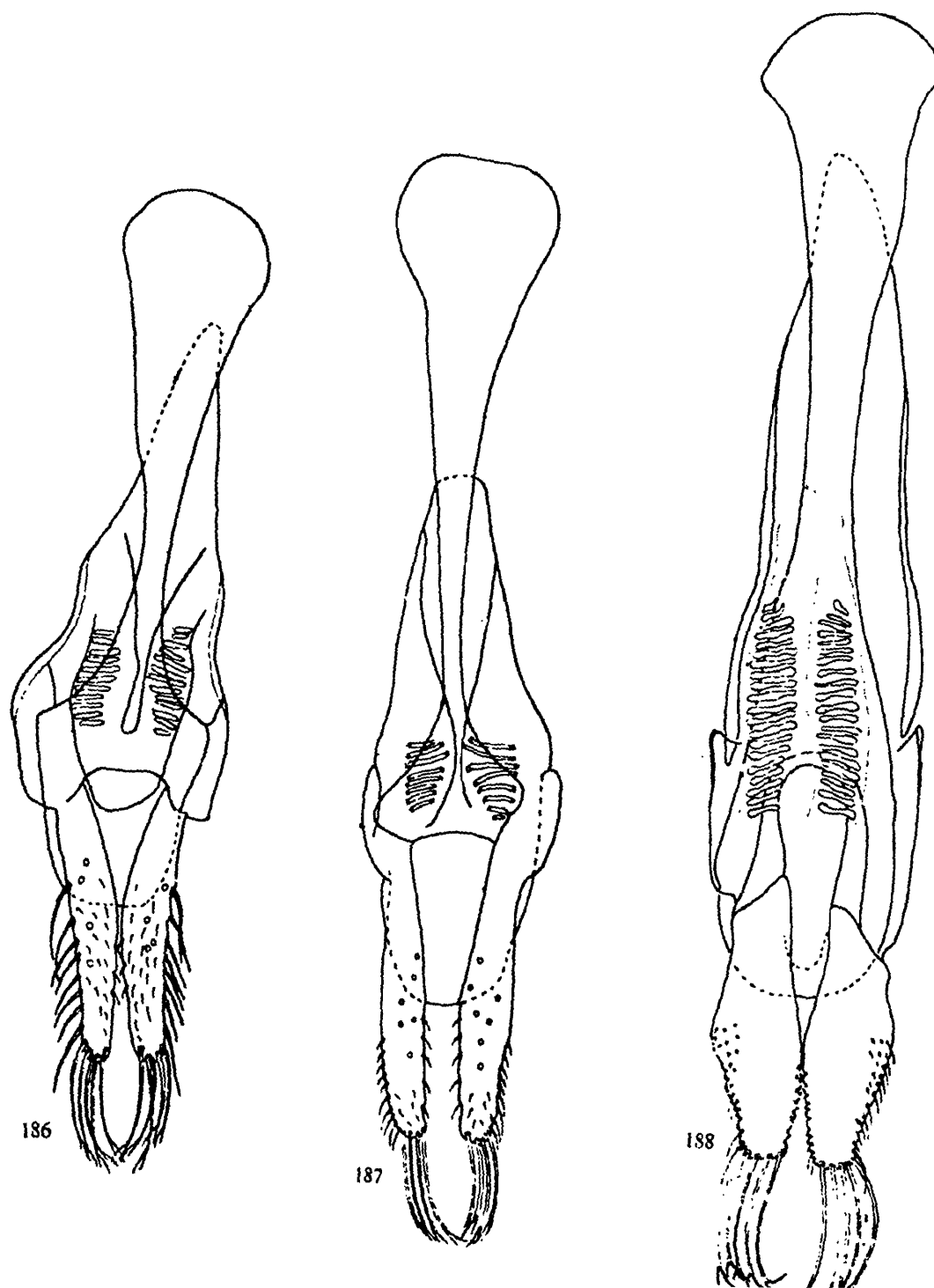


Fig. 185. *Oryzaephilus genalis* Halstead, Dorsal view (Scale = 1.0 mm).

Head : Exposed part of head about as broad as long; eyes moderately large and length of eye about as long as one-third length of head, length of temple about as long as 4 eye facets or slightly greater than half of length of eye, lateral margin of frons strongly elevated, shallow lateral depressions on frons above antennal insertions, puncturation on vertex coarse and dense and that of towards anterior margin of clypeus slightly finer, setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel about as long as scape and slightly narrower, segment 3 slightly shorter and narrower than pedicel; segments 4-7 almost equal, elongate and slightly shorter than segment 3; segment 8 elongate and slightly shorter than segment 7, segments 9 and 10 slightly transverse and segments 11 about as broad as long. *Prothorax* elongated (1.3 : 1 excluding teeth), convex, front margin outwardly curved and almost straight near middle, anterior tooth larger than other lateral teeth and rather pointed at apex, teeth 2-5 less pointed, posterior tooth more obtuse; longitudinal carinae on pronotal disc normally raised, more parallel than in *surinamensis* and convergent more towards front; longitudinal pronotal grooves well-marked as in *surinamensis* and *mercator*; puncturation on pronotum coarse and dense and similar to that of vertex of head. *Scutellum* moderately large, transverse and pubescent. *Elytra* more than two times as long as broad, lateral margins wavy and not explanate, rows of punctures on elytra moderately large; interstices 3, 5 and 7 slightly carinate and prominent upto anterior two-thirds, elytral apex slightly forked, setae projected

posteriorly. On ventral side puncturation finer than on dorsal side. Aedeagus (Fig. 187) with parameres long, slender and rather parallel-sided; each paramere fringed with 4-5 long apical setae, tips of apical setae forked, short and fine setae on outer and inner margins of posterior half of paramere.



Figs. 186-188. Aedeagi, Dorsal view; 186, *Oryzaephilus surinamensis* (L.); 187, *O. genalis* Halstead; 188, *O. acuminatus* Halstead.

Measurements : Total length 2.55-3.16 mm., width of head across eyes 0.47-0.54 mm., length of antenna 0.90-0.98 mm., width of prothorax across middle 0.55-0.68 mm., length

of elytra 1.67-1.92 mm. and width across middle 0.74-0.90 mm.

Materials examined : 36 ex. 1 *Paratype*, INDIA : ORISSA, Baigonpal Forest, 30.iii.1973, S. K. Gupta, at light (Zoological Survey of India; Reg. No. 8859/H4A); 35 ex., data same as *Paratype*.

Distribution : INDIA : Bihar, Orissa, Tamil Nadu, Karnataka; SRI LANKA.

Genus 9. *Monanus* Sharp

1879. *Monanus* Sharp, *Trans. ent. Soc. London*, **2** : 85.

1899. *Emporius* Ganglbauer, *Die Käfer von Mitteleuropa*, **3** : 429.

1908. *Emporius* : Grouvelle, *Annls Soc. ent. Fr.*, **77** : 489.

1908. *Monanus* : Sharp and Scott, *Fauna Hawaiiensis*, **3** : 429.

1911. *Emporius* : Reitter, *Fauna Germanica*, **3** : 47.

1912. *Monanus* : Grouvelle, *Annls Soc. ent. Fr.*, **81** : 344.

1930. *Monanus* : Hetschko, *Coleopt. Cat.*, **109** : 71.

1981. *Monanus* : Pal, *Oriental Ins.*, **15** (3) : 241.

Type-species : *Monanus crenatus* Sharp.

Historical review : Sharp (1879) established this genus based on single species, *M. crenatus* Sharp from Hawaii Islands and placed it between *Psammoecus* Latreille and *Telephanus* Erichson. Later, Ganglbauer (1899) erected *Emporius* for *Silvanus singnatus* Frauenfeld under Silvaninae of Cucujidae. Sharp and Scott (1908) synonymised *Emporius* with *Monanus*, but Reitter (1911) referred *Emporius* under the tribe Psammoecini. Grouvelle (1912) in his work 'Notes sur les Silvanini' subdivided *Monanus* into two subgenera, *Monanus* (s. str.) and *Monanops*. Hetschko (1930) in Junk's 'Coleopterorum Catalogus' listed 21 speices from the World of which *M. longicornis* (Grouvelle) is from Malabar (South India); and *M. horni* (Grouvelle), *M. longipennis* Grouvelle and *M. rugosus* Grouvelle are from Sri Lanka. He also mentioned that *M. concinnulus* (Walker) is cosmopolitan in distribution. Halstead (1973) transferred *Silvanus monticola* Blackburn to *Monanus*. Pal (1981) while revising *Monanus* from India, redescribed the subgenera viz., *Monanus* (s. str.) and *Monanops* Grouvelle; described *M. (Monanops) rambicus* from the Darjeeling district (West Bengal) and larva of *M. concinnulus*.

Habit-habitat : So far as the habitat record of this genus is available, Downes and William (1950) recorded *M. concinnulus* in the roots of *Lonchocarpus* in Peru and the same species was recorded by Cornes (1964) in stored grain products in Nigeria. Wollaston (1974) recorded *Cryptamorpha fasciatus* (= *concinnulus*) in sugar in Japan. Aitken (1975) reported that *M. concinnulus* was associated with stored products in different parts of South-East Asia and Africa. Recently, Pal (1981) gave a brief habitat record of the Indian species of *Monanus*, where the species are known to inhabit haystack, leaf garbage, under leaf sheath etc.

Geographical distribution : *Monanus* is restricted to warm climatic zones, with a few species extending to warm temperate zones, but none is known to occur in the cool temperate climate. It is unrepresented in Europe, only except *concinnulus* that is imported

to Britain with various stored products (Aitken, 1975). One species, *rambicus* comes from the Darjeeling Himalaya. *M. concinnulus* is predominant, abundantly occurs in the tropical Oriental region and dispersed all over Asia and Africa through trade, since the beetle is quite often found in various stored grain products. Other 2 common species are *longicornis* (Grouvelle) and *rugosus* (Grouvelle). The former species is known from South India and the latter species from Sri Lanka, and various far east Asian countries. Rest of the species are known to be more or less restricted in distribution. The genus *Monanus* clearly represents its dominance in the Oriental region. Of the 23 species described so far, more than two-thirds (16 spp.) are restricted to this region. A single species is known from Japan and two species both from Australia and Hawaii Islands. Of the two subgenera, *Monanops* is restricted to the Oriental region, recorded so far from India and far east Asian countries, extending upto New Guinea; while *Monanus* (s. str.) possesses a wider distribution to Africa, Australia and Hawaii Islands other than the Oriental region.

Diagnosis : Elongated, moderately convex or flattened, yellowish to reddish brown and little shiny. Head devoid of fronto-clypeal suture, temple flattened beneath eye, 11-segmented antenna with 3-segmented club, mandible with vestige of dorsal cavity, maxillary lacinia narrow and elongated, apex of galea densely hairy, apical segments of maxillary and labial palpi fusiform. Lateral margin of prothorax finely denticulate, front coxae more or less contiguous, mesocoxae almost contiguous and coxal cavities opened. Wing with single anal vein, elytra with 9 rows of striae punctures. Tarsal segments 2 and 3 lobed below. Abdominal ventrites freely articulated, intercoxal process narrow to broad. Aedeagus with broad median lobe, tegmen complete, parameres well-developed; Ovipositor with well-developed paraprocts, valvifers, coxites and styli. There are two subgenera, viz., *Monanus* (s. str.) and *Monanops*.

Subgenus *Monanus* (s. str.)

1912. *Monanus* (s. str.) : Grouvelle, *Annls Soc. ent. Fr.*, **81** : 344.

1981. *Monanus* (s. str.) : Pal, *Oriental Ins.*, **15** (3) : 245.

Type-species : *Monanus crenatus* Sharp.

Description : General form (Fig. 189) elongated, moderately convex, yellowish to reddish-brown and sometimes with black spots on elytra.

Head (Fig. 192) about as broad as long, front margin of clypeus almost straight, eyes moderately large and coarsely faceted, temple flattened beneath eye and shelf-like, transverse impressed line on vertex behind eyes absent, tentorium with two long tentorial arms connected by a transverse corpora-tentorium. Antenna moderately long and slender, antennal insertions hidden under projection of frons, 11-segmented, scape broadly elongated, segments 2-8 short and subequal, club loose and 3-segmented. Mandible elongated, right mandible (Fig. 200) with 3 apical teeth and left mandible (Fig. 199) with an additional blunt tooth beneath apical teeth, mola well-developed, vestige of dorsal mandibular cavity present near base. Maxilla (Fig. 201) with lacinia narrow, elongated and without apical spine; galea elongated, broad and its apex densely hairy; palpi with segments 2 and 3 almost equal, apical segment longest and fusiform. Labium (Fig. 202) with mentum somewhat triangular and transverse, apical segment of palpi slightly longer than segment 2 and fusiform. Labrum

(Fig. 203) with apical margin slightly curved inwardly.

Prothorax (Fig. 193) about as broad as long, lateral margins with setose denticles; front coxae contiguous, broadly closed behind externally as well as internally, prosternal process broad at apex and its apical margin almost straight, sterno-pleural suture extending to anterior denticle.

Meso-metathorax (Fig. 195) : Mesocoxae contiguous, cavities broadly opened outwardly, lateral margins of mesosternal process notched near posterior two-thirds, sternal fitting between mesocoxae almost in a straight line. Metasternum transverse, median impressed line extends anteriorly near apex of mesosternal process, hind-coxae widely separated, metendosternite simple and represented by two appophyses.

Wing and Elytra : Wing (Fig. 198) with single anal vein; without radial cell, anal cell and subcubital fleck. Elytra somewhat ovoid, each elytron (Fig. 197) with 9 rows of striae punctures, without scutellary striae, alternate interstices with single and double rows of pubescence, epipleura narrow and complete upto apex.

Legs (Fig. 194) moderately long, trochanters simple and slightly broadly elongated, femora swollen towards middle, tibiae not broadened at apex and with two apical spurs; tarsal formula 5-5-5 in both sexes, tarsal segment 1 elongated, segments 2 and 3 strongly lobed below, segment 4 shortest, claws simple.

Abdomen (Fig. 196) elongated; ventrite 1 longest, intercoxal process broad and its apex slightly rounded, femoral lines closed; ventrites 2-5 subequal. Aedeagus (Fig. 204) with median lobe broad and its apical margin straight, median strut elongated and its apex spatulate; parameres well-developed, slender, elongated and with a few setae at apex. Ovipositor (Fig. 205) with well-developed valvifers, transverse paraprocts, coxites, and styli attached on outer margin of apex of coxites.

Larva known : *Monanus* (s. str.) *concinnulus* (Walker).

Sexual dimorphism : No distinct secondary sexual characters are observed.

Key to the Species of *Monanus* (S. Str.)

1. Elytra little ovoid, transverse black spot near middle; antenna moderately long, shorter than head and prothorax together; pubescence short
.....*concinnulus* (Walker) p. 141

Elytra parallel-sided, devoid of black transverse spot; antenna long, longer than length of head and prothorax together and extending upto half of length of body; pubescence long*longicornis* (Grouvelle) p. 143

35. *Monanus* (s. str.) *concinnulus* (Walker)

1858. *Monotoma concinnulus* Walker, *Ann. Mag. nat. Hist.* (3) **2** : 207 (Type-loc : Sri Lanka; Type deposition British Museum Nat. Hist., London).

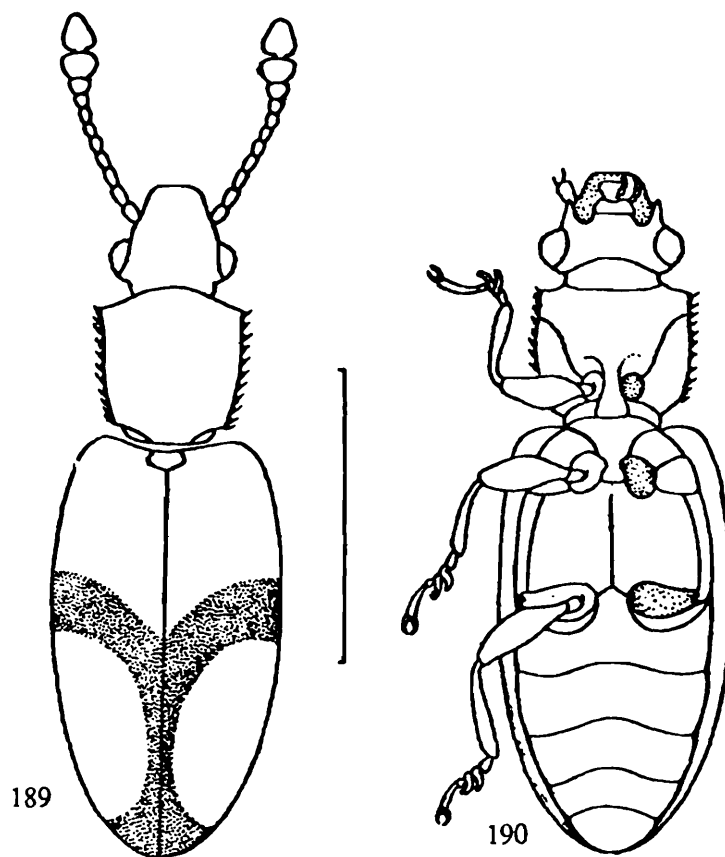
1867. *Silvanus signatus* Frauenfeld, *Verh. zool. bot. Ges. Wien.*, **17** : 438.

1874. *Cryptamorpha fasciatus* Wollaston, *Entomologist's mon. mag.*, **10** : 169.

1876. *Cryptamorphia concinnula* (Walker) : Waterhouse, *Entomologist's mon. mag.*, **13** : 122.
 1876. *Cathartus fascipennis* Reitter, *Col. Hefte*, **15** : 129.
 1899. *Emporius signatus* : Ganglbauer, *Die Käfer von Mitteleuropa*, **3** : 586.
 1908. *Emporius concinnulus* : Grouvelle, *Annls Soc.ent.Fr.*, **77** : 489.
 1911. *Emporius concinnulus* : Reitter, *Fauna Germanica*, **3** : 48.
 1912. *Monanus* (s. str.) *concinnulus* : Grouvelle, *Annls Soc. ent. Fr.*, **81** : 371.
 1981. *Monanus* (s. str.) *concinnulus* : Pal, *Oriental Ins.*, **15** (3) : 247-249.

Distinct transverse median black spot on shiny ovoid elytra, laterally denticulate prothorax and clavate antenna are the most conspicuous characters for recognising this species in the field.

Description : General form (Fig. 189) elongated, moderately convex, rather shiny, yellowish-brown to reddish-brown and with black markings on elytra; covered with short, semierect, golden pubescence.



Figs. 189-190. *Monanus* (s. str.) *concinnulus* (Walker): 189, Dorsal view; 190, Ventral view (scale = 1.0 mm).

Head : Exposed part of head broader than long, eyes large and coarsely faceted, eyes shorter than one-third of length of head, temple about as long as 1.5 eye facets and its outer apical angle slightly pointed, puncturation on vertex coarse and dense and that of towards

anterior margin of clypeus slightly finer, setae short and projected towards middle line. Antenna moderately long and slender, scape moderately large, pedicel and segment 3 about as long as scape and slightly narrower, segments 4-8 subequal and shorter than segment 3, segment 9 about as broad as long, segment 10 slightly transverse and segment 11 slightly elongated. *Prothorax* about as broad as long, convex, anterior margin outwardly curved, lateral margin with ten small and blunt denticles and each denticle bears an anteriorly directed seta, puncturation on pronotum coarse and dense and similar to that of vertex of head, setae projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* slightly less than two times as long as broad, lateral margins almost uniformly curved, a transverse black spot near middle and that extends towards apex along suture, rows of punctures large, setae projected posteriorly. On ventral side puncturation finer than on dorsal side. Aedeagus (Fig. 204) with parameres elongated, each paramere with an apical long and two short setae.

Measurements : Total length 1.60-2.35 mm., width of head across eyes 0.35-0.47 mm., length of antenna 0.58-0.76 mm., width of prothorax across middle 0.38-0.54 mm., length of elytra 1.05-1.46 mm. and width across middle 0.55-0.76 mm.

Materials examined : 438 ex. 'Type', SRI LANKA (British Museum Nat. Hist.); INDIA : ASSAM, Phulbari, 6 ex., 24.xi.1974, T. Sengupta, leaf garbage; WEST BENGAL, Darjeeling district, Sukna, 5 ex., 5.v.1976, T. K. Pal, haystack; Calcutta 1 ex., 6.viii.1950, A. P. Kapur, at light; 1 ex., 1 xi.1974, T. K. Pal, at day light; 24 Parganas district, Sagar Island, 50 ex., 24.iii.1975, T. K. Pal, haystack; Diamond Harbour, 100 ex., 25.iii.1975, T. K. Pal, haystack; Howrah district, Sankrail, 250 ex., iii.1975 - x.1975, T. K. Pal, haystack; Howrah district, Ranihati, 2 ex., 11.v.1975, T. K. Pal, haystack; BIHAR, Chaibasa, 5 ex., 19.x.1977, T. Sengupta, haystack; UTTAR PRADESH, Pantnagar, 2 ex., 24.iii.1972, T. Sengupta, haystack; Anandnagar, 25 km. from Lachmiur, 3 ex., 9.x.1976, T. Sengupta, haystack; DELHI, 2 ex., 12.v.1972, T. Sengupta, haystack of Jower; TAMIL NADU, Annamalai hills, 550 m., 1 ex., 17.xi.1972, Besuchet Löbl Mussard; KARNATAKA, Bangalore, 10 ex., 10.xii.1972, T. Sengupta, haystack.

Distribution : INDIA : Assam, West Bengal, Bihar, Uttar Pradesh, Delhi, Tamil Nadu and Karnataka. Outside India this species has a wide distribution both in the Old and New Worlds.

Remarks : This is one of the most common and fast-moving species of Indian Silvanidae. Pal (1981) recorded this species from India.

36. *Monanus* (s. str.) *longicornis* (Grouvelle)

1892. *Silvanus longicornis* Grouvelle, *Annls Soc. ent. Fr.*, **61** : 285 (Type-loc. : Singapore, Philippines; Type deposition Museum National d'Histoire Naturelle, Paris).

1902. *Emporius longicornis* : Grouvelle, *Annls Soc. ent. Fr.*, **71** : 484.

1908. *Emporius longicornis* : Grouvelle, *Annls Soc. ent. Fr.*, **77** : 489.

1912. *Monanus* (s.str.) *longicornis* : Grouvelle, *Annls Soc. ent. Fr.*, **81** : 371.

1981. *Monanus* (s. str.) *longicornis* : Pal, *Oriental Ins.*, **15** (3) : 249-250.

This species resembles *M. concinnulus* but distinguishable by its parallel-sided elytra devoid of black spot, antenna long and longer than head and prothorax together, eight small

denticles on lateral margin of prothorax with slightly larger anterior denticle, puncturation of head and prothorax coarser and pubescence long.

Description : General form (Fig. 191) elongated, moderately convex, rather shiny, reddish-brown; covered with long, semierect, golden pubescence.

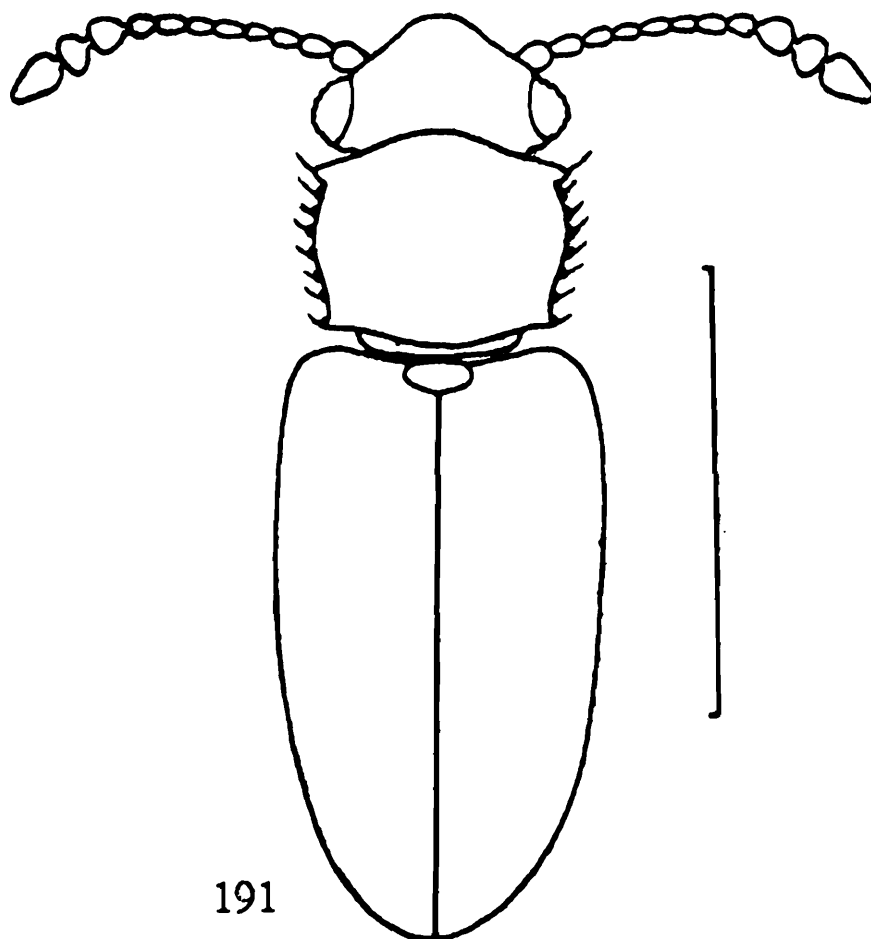
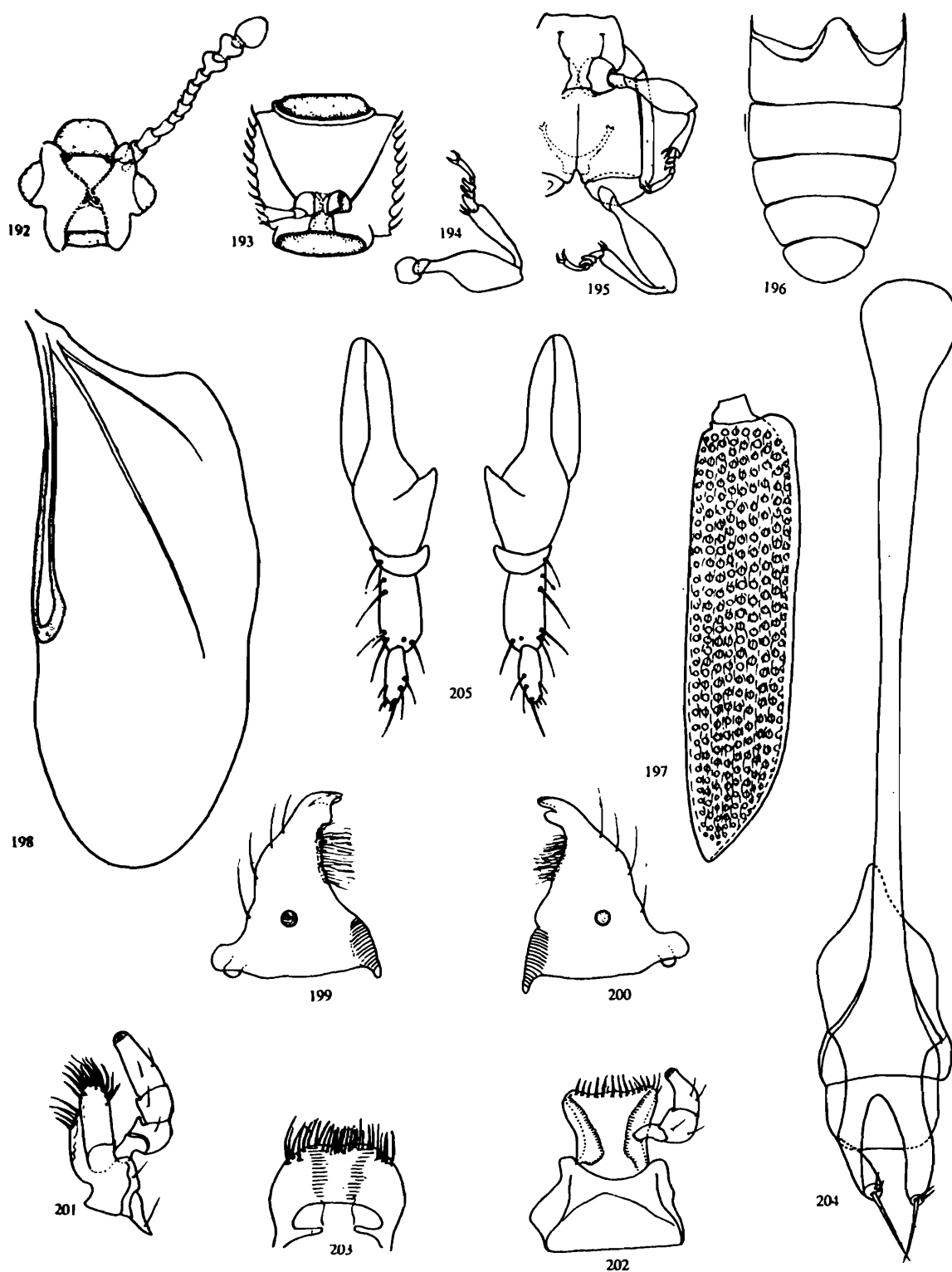


Fig. 191. *Monanus (s. str.) longicornis* (Grouvelle), Dorsal view, (scale = 1.0 mm).

Head : Exposed part of head broader than long, eyes large and coarsely faceted, eyes about half as long as head, temple about as long as one eye facet and its outer apical angle somewhat broad, puncturation on vertex coarse and moderately dense and that of towards anterior margin of clypeus slightly finer, setae long and projected towards middle line. Antenna rather long and slender, scape moderately large, pedicel and segment 3 about as long as scape and slightly narrower, segments 4-8 subequal and shorter than segment 3, segment 9 about as broad as long, segment 10 slightly transverse, segment 11 slightly elongated. *Prothorax* about as broad as long, convex, anterior margin outwardly curved, maximum width in anterior half and slightly narrowed posteriorly, lateral margin curved with eight small denticles and each denticle bears an anteriorly directed seta, anterior denticle slightly large, puncturation on pronotum coarse and moderately dense and similar to that of vertex of head. setae projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* about two times as long as broad, almost parallel-sided, rows of punctures large, setae projected posteriorly. On ventral side puncturation finer than on dorsal side.



Figs. 192-205. *Monanus (s. str.) concinnulus* (Walker): 192, Head, Ventral view; 193, Prothorax, Ventral view; 194, Front leg; 195, Meso-metathorax, Ventral view; 196, Abdomen, Ventral view; 197, Right elytron, Dorsal view; 198, Wing; 199, Left mandible, Dorsal view; 200, Right mandible, Dorsal view; 201, Right maxilla, Dorsal view; 202, Labium, Ventral view; 203, Labrum; 204, Aedeagus, Dorsal view; 205, Ovipositor.

Measurements : Total length 2.02 mm., width of head across eyes 0.55 mm., length of antenna 0.88 mm., width of prothorax across middle 0.55 mm., length of elytra 1.29 mm. and width across middle 0.69 mm.

Material examined : 1 ex., 'Type', locality and other data were not present with the specimen. (Museum National d'Histoire Naturelle, Paris).

Distribution : INDIA : Kerala (Malabar); SINGAPORE; PHILIPPINES; INDONESIA.

Remarks : Grouvelle (1908) recorded this species from South India (Malabar).

Subgenus *Monanops* Grouvelle

1912. *Monanus* (*Monanops*) Grouvelle, *Annls Soc.ent.Fr.*, **81** : 344.

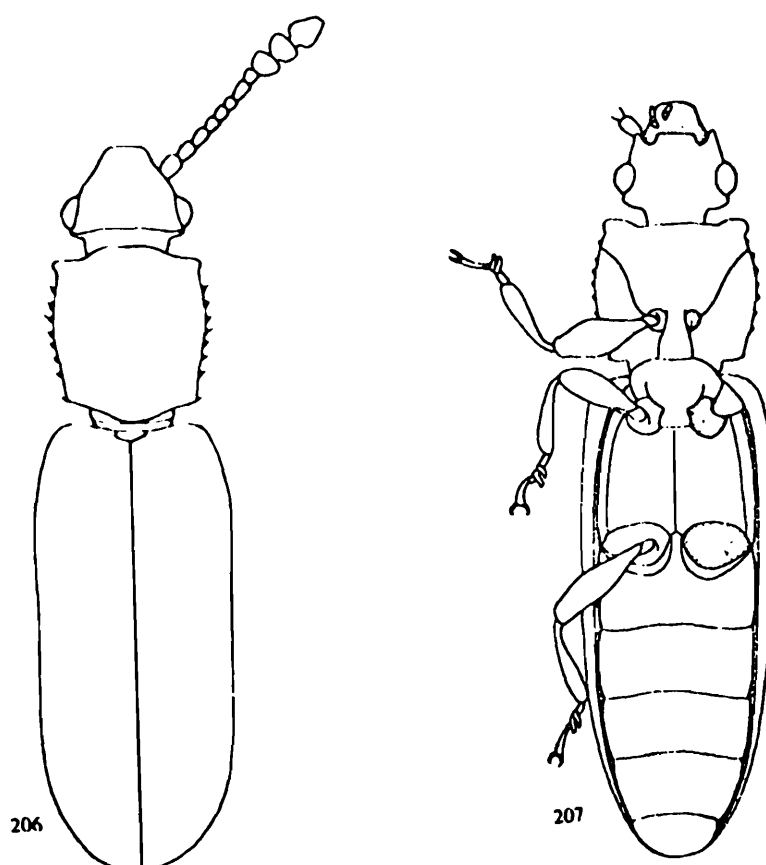
1981. *Monanus* (*Monanops*) : Pal, *Oriental Ins.*, **15** (3) : 250-251.

Type-species : Not designated.

Grouvelle (1912) included the species *Monanus albertisii* (Grouvelle) (New Guinea, Sumatra), *M. telephanoides* Grouvelle (Sumatra), *M. bouchardi* Grouvelle (Sumatra), *M. longipennis* Grouvelle (Sumatra) and *M. insolitus* Grouvelle (Sumatra) under the subgenus *Monanops*. A study of detailed morphological characters shows that Grouvelle's subgenus *Monanops* may eventually be given generic rank (Pal, 1981). The chief differences of this subgenus with *Monanus* (s. str.) are given below.

Monanus	Monanops
1. Size smaller (1.60 – 2.35 mm.).	Size larger (about 3.50 mm).
2. Elytra usually ovoid, moderately convex and hardly twice as long as broad.	Elytra parallel-sided, dorsally flattened and 2.5 times as long as broad.
3. Prothorax distinctly narrower than elytra (1.00 : 1.38 to 1.42).	Prothorax slightly narrower than elytra (1.00 : 1.15).
4. Transverse impressed line on vertex behind eyes absent.	Transverse impressed line on vertex behind eyes present.
5. Head and prothorax about as broad as long.	Head and prothorax elongated.
6. Sterno-pleural suture of prothorax extending to anterior denticle.	Sterno-pleural suture of prothorax extending to lateral margin and far below anterior denticle.
7. Front coxae and mesocoxae contiguous.	Front and mesocoxae narrowly separated.
8. Mesocoxal cavities broadly opened outwardly.	Mesocoxal cavities narrowly opened outwardly.
9. Intercoxal process of ventrite 1 broad and broadly pointed at apex.	Intercoxal process of ventrite 1 narrow and narrowly pointed at apex.
10. Elytral epipleura extending upto apex.	Elytral epipleura terminate before apex.

Description : General form (Fig. 206) elongated, rather parallel-sided, dorsally flattened and reddish-brown.



Figs. 206-207. *Monanus (Monanops) rambicus* Pal : 206, Dorsal view; 207, Ventral view.

Head (Fig. 208) elongated, front margin of clypeus almost straight, eyes moderately large and coarsely faceted, temple flattened beneath eye and slightly shelf-like, transverse impressed line on vertex behind eyes present; tentorium with two long tentorial arms and connected by a transverse corpo-tentorium. Antenna moderately long and slender, antennal insertions hidden under projection of frons, 11-segmented, scape broadly elongated, pedicel and segment 3 slightly shorter and narrower than scape, segments 4-8 shorter and subequal, club loose and 3-segmented. Mandible (Fig. 215) with 3 apical teeth, mola well-developed, vestige of dorsal mandibular cavity present near base. Maxilla (Fig. 216) with lacinia narrow, elongated and without apical spine; galea short, broad and its apex densely hairy; palpi with segments 2 and 3 nearly equal, apical segment longest and fusiform. Labium (Fig. 217) with mentum somewhat triangular and transverse, palpi with segment 2 and apical segment nearly equal in length and apical segment fusiform. Labrum (Fig. 218) with apical margin curved.

Prothorax (Fig. 209) elongated, lateral margins with few small denticles, front coxae narrowly separated, cavities broadly closed behind externally as well as internally, prosternal process broad at apex and its apical margin straight, sterno-pleural suture

extending to lateral margin below anterior denticle.

Meso-metathorax (Fig. 211) : Mesocoxae narrowly separated, cavities rather narrowly opened outwardly, lateral margins of mesosternal process notched behind middle, sternal fitting between mesocoxae almost in a straight line. Metasternum transverse, median impressed line extends upto anterior one-fourth, metendosternite simple and represented by two appophyses.

Wing and Elytra : Wing (Fig. 214) with single anal vein; without radial cell, anal cell and subcubital fleck. Elytra rather parallel-sided, each elytron (Fig. 213) with 9 rows of striae punctures, without scutellary striae, interstices pubescent, epipleura narrow and terminated before apex.

Legs (Fig. 210) moderately long and slender, trochanters short and simple, femora swollen towards middle, tibiae not broadened at apex and with two apical spurs; tarsal formula 5-5-5, segment 1 slightly elongated, segments 2 and 3 strongly lobed below, segment 4 shortest, claws simple.

Abdomen (Fig. 212) elongated, ventrite 1 longest, intercoxal process narrow and narrowly pointed at apex, femoral lines closed; ventrites 2-5 subequal. Aedeagus (Fig. 219) with median lobe rather short and broad and slightly tapered at apex, median strut long and slightly spatulate at apex; parameres well-developed, slender, elongated and with long apical seta.

Larva known : No larva has yet been described.

Sexual dimorphism : No distinct secondary sexual characters are observed.

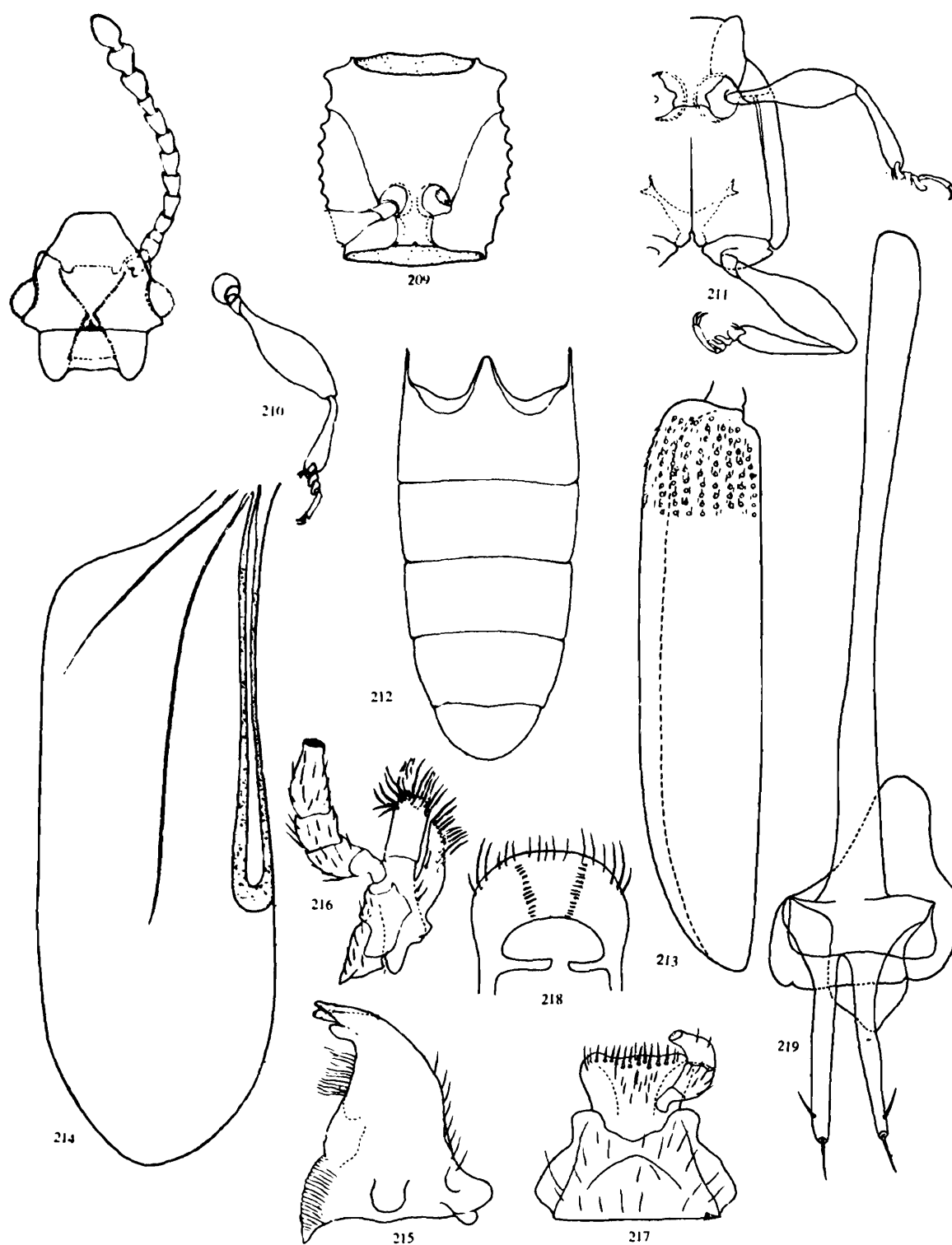
37. *Monanus* (*Monanops*) *rambicus* Pal

1981. *Monanus* (*Monanops*) *rambicus* Pal, *Oriental Ins.*, **15** (3) : 251-253 (Type-loc. : Rambh, Darjeeling district : West Bengal, India; Type deposition : Zoological Survey of India, Calcutta).

This species is closely related to *Monanus* (*Monanops*) *bouchardi* Grouvelle but can be differentiated by its prothorax being widest at anterior one-third (in the middle in *bouchardi*), puncturation of head denser, and the species larger in size.

Description : General form (Fig. 206) elongated, flattened, elongated prothorax, parallel-sided elytra, slightly shiny, uniformly reddish-brown; covered with short, semi-erect, golden pubescence.

Head : Exposed part of head broader than long, eyes large and coarsely faceted, length of eye distinctly shorter than half of length of head, length of temple about as long as 2 to 2.5 eye facets and its outer apical angle broad, puncturation on vertex coarse and dense and that of towards anterior margin of clypeus slightly finer. Antenna moderately long and slender, scape moderately large, pedicel and segment 3 slightly shorter and narrower than scape, segments 4-8 subequal and shorter than segment 3, segments 9 and 10 about as broad as long and segment 11 slightly elongated. *Prothorax* slightly elongated, widest near anterior one-third, anterior angle with a short and broad spinous projection; lateral margin rounded and slightly sinuate before posterior angle, with nine denticles; lateral depressions on pronotum slightly developed, puncturation on pronotum coarse and dense and similar to



Figs. 208-219. *Monanus (Monanops) rambicus* Pal: 208, Head, Dorsal view; 209, Prothorax, Ventral view; 210, Front leg; 211, Meso-metathorax, Ventral view; 212, Abdomen, Ventral view; 213, Left elytron, Dorsal view; 214, Wing; 215, Right mandible, Dorsal view; 216, Right maxilla, Ventral view; 217, Labium, Ventral view; 218, Labrum; 219, Aedeagus, Dorsal view.

that of vertex of head, setae short and projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* more than two times as long as broad, rather parallel-sided, lateral margins wavy and slightly explanate, rows of punctures moderately large, interstices about as broad as width of each puncture. On ventral side puncturation sparser than on vertex and pronotum. Aedeagus (Fig. 219) with median lobe slightly tapered at apex, each paramere with a long apical seta and a shorter seta above apex.

Measurements of holotype : Total length 3.47 mm., width of head across eyes 0.58 mm., length of antenna 1.02 mm., width of prothorax across middle 0.70 mm., length of elytra 2.23 mm. and width across middle 0.92 mm.

Materials examined : *Holotype* and *Paratypes* 6 ex., INDIA : WEST BENGAL, Darjeeling district, Rambhadracharya, 6.i.1974, Srivastava and Maity, *Bambusa aurandaceae* leaf sheath. 1 *Paratype* mounted on slide (Zoological Survey of India, Calcutta; Reg. No. 9174-9180/H4A).

Distribution : INDIA : West Bengal (Darjeeling district).

Remarks : So far this species is recorded only from its type-locality.

Genus 10. *Airaphilus* Redtenbacher

1858. *Airaphilus* Redtenbacher, *Fauna Austriaca Die Käfer* : 999.

1899. *Airaphilus* : Ganglbauer, *Die Käfer von Mitteleuropa*, 3 : 578.

1908. *Airaphilus* : Grouvelle, *Annls Soc. ent. Fr.*, 77 : 488.

1911. *Airaphilus* : Reitter, *Fauna Germanica*, 3 : 33, 45.

1930. *Airaphilus* : Hetschko, *Coleopt. Cat.*, 109 : 77.

Type-species : *Silvanus elongatus* Gyllenhal.

Historical review : This genus was established by Redtenbacher (1858) for the species, *Silvanus elongatus* Gyllenhal. Ganglbauer (1899) placed it under the subfamily Silvaninae : Cucujidae, and Grouvelle (1908) under the tribe Silvanini (Silvaninae : Cucujidae). Subsequently, Reitter (1911) followed Grouvelle's treatment. Hetschko (1930) in Junk's 'Coleopterorum Catalogus' listed 30 species under *Airaphilus* of which, *A. abnormis* Grouvelle, *A. serricollis* Reitter and *A. andrewesi* Grouvelle are recorded from India. Subsequent to Hetschko's catalogue Peyerimhoff (1931, 1937) added 2 species from Algeria and Portugal, Cobos (1950) added 1 species from Spain, and Ratti (1971) added 1 species from Mongolia. Hitherto the larva of *Airaphilus* is undescribed. 3 species are dealt with here and the larva of *A. serricollis* is described.

Habit-habitat : The habitat record of *Airaphilus* was not available in the earlier works. In the present study *A. serricollis* adults and larvae were collected in the haystack.

Geographical distribution : This genus is more diversely represented in the temperate climate, predominant in the Palaearctic region, with a few species are known from Africa and Orient. Of the Indian species, only *A. abnormis* possesses a wide distribution, occurring from the eastern and western India, and the remaining 2 species viz., *A. andrewesi* Grouvelle and *A. serricollis* Reitter possess restricted distributions.

Description : General form (Fig. 220) elongated, moderately depressed, laterally denticulate prothorax, deep brown to blackish and strongly pubescent.

Head (Fig. 225) distinctly elongated or about as broad as long, front margin of clypeus rounded, eyes small to large and coarsely faceted, temple flattened beneath eye to form shelf which may cover eye partly, transverse impressed line on vertex behind eyes absent, tentorium with two long tentorial arms connected by transverse corpo-tentorium. Antenna moderately long and slender, antennal insertions hidden under projection of frons, 11-segmented, scape moderately large and broadly elongated, segments 2-8 shorter and subequal, club loose and 3-segmented. Mandible (Fig. 232) elongated with two apical teeth, mola well-developed, a large mandibular cavity present near base which opened dorsally. Maxilla (Fig. 233) with lacinia narrow, elongated and with one apical spine and few setae; galea broadly elongated and its apex densely hairy; palpi with segments 2 and 3 almost equal, apical segment longest and fusiform. Labium (Fig. 234) with mentum transverse, palpi with apical segment longest and fusiform. Labrum (Fig. 235) transverse with apical margin rounded.

Prothorax (Fig. 226) transverse or elongated, lateral margins with few distinct denticles or teeth, front coxae contiguous, coxal cavities slightly elongated, cavities closed behind externally and opened internally, prosternal process broad at apex and its apical margin almost straight, sterno-pleural suture extending to anterior margin.

Meso-metathorax (Fig. 228): Mesocoxae contiguous, cavities broadly opened outwardly, margins of mesosternal process slightly notched near apex, sternal fitting between mesocoxae almost in a straight line. Metasternum transverse, median impressed line on metasternum extending anteriorly about one-third of its length, hind-coxae widely separated, metendosternite simple and represented by two appophyses.

Wing and Elytra : Wing (Fig. 231) with single anal vein; without radial cell, anal cell and subcubital fleck. Elytra somewhat parallel-sided to ovoid, each elytron (Fig. 230) with 9 rows of stria punctures, without scutellary stria, punctures and interstices pubescent, epipleura narrow and extending almost upto apex.

Legs (Fig. 227) moderately long, trochanters short and simple, femora swollen towards middle, tibiae not broadened at apex and with two apical spurs; tarsal formula 5-5-5 in both sexes, tarsal segment 1 elongated, segment 2 shorter than segment 1, segment 3 strongly lobed below, segment 4 shortest, segments gradually longer from front to hind leg, claws simple.

Abdomen (Fig. 229) elongated; ventrite 1 longest, intercoxal process broad and its apical margin almost straight, femoral lines opened or closed; ventrites 2-5 subequal. Aedeagus (Fig. 236) with median lobe broad, median strut elongated and its apex spatulate; parameres well-developed, elongated and articulated to a basal piece. Ovipositor (Fig. 237) with well-developed paraprocts, apically lobed valvifers, coxites, and styli attached on outer margin of apex of coxites.

Larva known : *Airaphilus serricollis* Reitter, by present description.

Sexual dimorphism : No distinct secondary sexual characters are observed.

Key to the Species of *Airaphilus* Redtenbacher

1. Prothorax elongated, lateral margin with 15 denticles; exposed part of head

about as broad as long, anterior part of head long and rather narrowed; elytra rather parallel-sided, more than two times as long as broad (2.31 : 1.00) (Fig. 222); femoral lines on ventrite 1 closed (Fig. 223)
..... *abnormis* Grouvelle p. 155

Prothorax transverse, lateral margin with 8-13 denticles; exposed part of head distinctly transverse, anterior part of head short and slightly narrowed; elytra somewhat ovoid, shorter than two times as long as broad (1.70 - 1.78 : 1.00) (Figs. 220, 221); femoral lines on ventrite 1 opened (Fig. 224) 2

2. Eyes short, about one-third as long as head, antennal club distinctly 3-segmented; prothorax with clearly differentiated and larger anterior denticle; elytra widest in posterior half, apex evenly rounded (Fig. 220)
..... *serricollis* Reitter p. 152

Eyes large, slightly shorter than half as long as head, antenna gradually widened from segment 7 onwards and club appears 5-segmented; prothorax with anterior denticles not differentiated or larger than other lateral denticles; elytra widest near middle and then acuminate posteriorly, apex truncated (Fig. 221). *andrewesi* Grouvelle p. 154

38. *Airaphilus serricollis* Reitter

1878. *Airaphilus serricollis* Reitter, *Stettin. ent. Ztg.*, **39**: 319 (Type-loc. : India; Type deposition ?).

Head with small eyes, distinct 3-segmented antennal club, transverse prothorax with distinctly large anterior denticle, and evenly rounded apex of elytra distinguish this species from other Indian species of *Airaphilus*.

Description : General form (Fig. 220) elongated, moderately depressed, uniformly deep brown, covered with rather long and semierect pubescence.

Head : Exposed part of head broader than long, anterior part of head in front of antennal insertions short and slightly narrowed, front margin of clypeus curved outwardly, eyes small and coarsely faceted, length of eye shorter than one-third of length of head, temple indistinctly visible, two longitudinal depressions well-marked in front of eyes; puncturation of vertex coarse, dense and that of frons and clypeus finer; setae projected posteriorly. Antenna moderately long and slender, scape moderately large, pedicel and segment 3 shorter and narrower than scape, segments 4 and 5 shorter than segment 3, segment 6 shorter than segment 5, segment 7 slightly wider than segment 6, segment 8 little shorter and narrower than segment 7, segments 9 and 10 transverse and segment 11 elongated. *Prothorax* transverse, widest slightly above middle, convex, anterior margin curved outwardly and with 10 to 11 denticles, each denticle with a long and posteriorly directed seta, anterior denticle larger with anteriorly and posteriorly directed setae; puncturation on pronotum coarse, dense and similar to that of vertex of head, setae projected posteriorly. *Scutellum* moderately large, transverse and pubescent. *Elytra* less than two times as long

as broad, widest in posterior half, rows of punctures deep and large, setae projected posteriorly. On ventral side puncturation finer than on dorsal side, femoral lines on ventrite 1 opened. Aedeagus (Fig. 236) with apical projection on median lobe broad; parameres long, slender and narrowed towards apex, each paramere with two long apical and a few short setae.

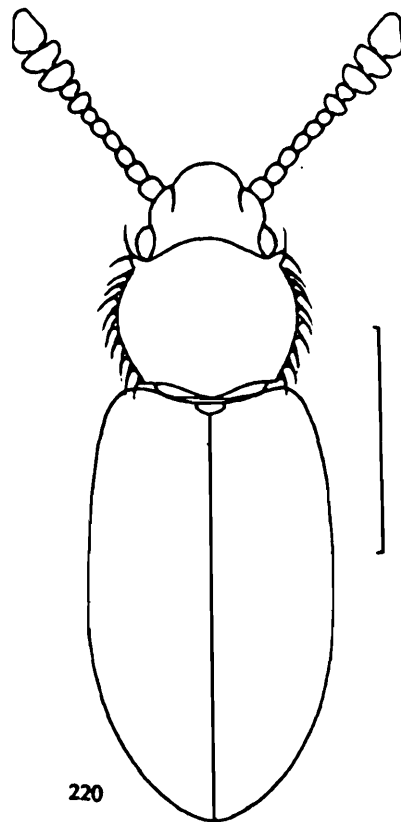


Fig. 220. *Airaphilus serricollis* Reitter, Dorsal view (scale = 1.0 mm).

Measurements : Total length 2.33 - 2.37 mm., width of head across eyes 0.38-0.39 mm., length of antenna 0.87-0.88 mm., width of prothorax across middle 0.64-0.65 mm., length of elytra 1.54-1.55 mm. and width across middle 0.86-0.87 mm.

Materials examined : 34 ex. INDIA: WEST BENGAL, Howrah district, Sankrail, 32 ex., 2.x.1975 and 7.x.1975, T. K. Pal, haystack; Hooghly district, Chuchura, 1 ex., 25.ii.1975, T. K. Pal, haystack; Dum Dum, Gopalpur, 1 ex., 14.vi.1974, T. Sengupta, haystack; BURMA ('Birma Helfer' in label, Reitter det.), 1 ex. (Institute of Zoology, Polish Academy of Sciences, Warsaw).

Distribution : INDIA : West Bengal; BURMA.

Remarks : Reitter (1878) while describing this species from India, did not mention any specific locality of collection. Dr. E. Ratti informed the authors (in litt.) that the 'cotypes' of *A. andrewesi* Grouvelle possess 8-10 denticles and *A. serricollis* possess 11-13 denticles. The examination of 32 examples collected from Sankrail, Howrah district (West Bengal)

reveals that the lateral margin of prothorax possess 10-11 denticles, are intermediate between these two species in the number of denticles is concerned. Dr. Ratti commented that, the above materials are most probably *A. serricollis*. Dr. D. G. H. Halstead commented that, these are not similar to *A. andrewesi* and well might be *A. serricollis* (in litt.)

39. *Airaphilus andrewesi* Grouvelle

1908. *Airaphilus andrewesi* Grouvelle, *Annls Soc. ent. Fr.*, **77** : 493 (Type-loc. : Nilgiri Hills : Tamil Nadu, India; Type deposition British Museum Nat. Hist, London).

The head with large eyes, indistinctly differentiated antennal club, prothorax with all similar denticles, and somewhat truncated elytral apex separate this from other Indian species of *Airaphilus*.

Description : General form (Fig. 221) elongated, moderately depressed, uniformly deep brown, covered with rather long and semierect pubescence.

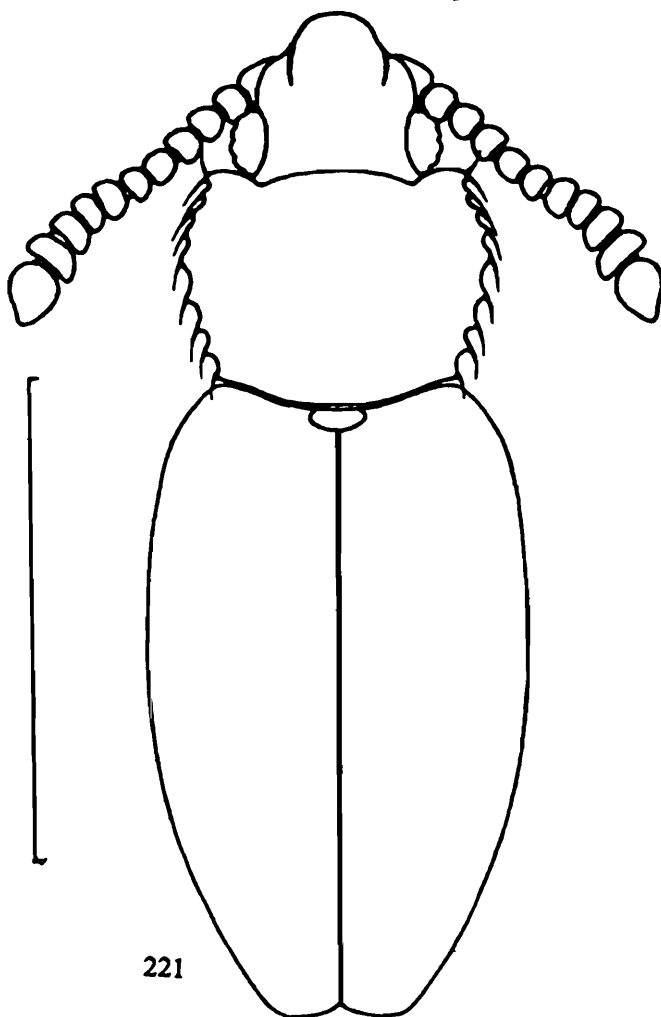


Fig. 221. *Airaphilus andrewesi* Grouvelle, Dorsal view (scale = 1.0 mm).

Head : Exposed part of head broader than long, anterior part of head short and slightly narrowed, front margin of clypeus slightly curved outwardly, eyes large and coarsely faceted, length of eye slightly shorter than half of length of head, temple slightly visible, two longitudinal depressions in front of eyes; puncturation of vertex coarse, dense and that of near anterior margin of clypeus finer, setae projected towards middle line. Antenna

moderately long and slender, scape moderately large; segments 2-6 shorter, subequal and about as broad as long or slightly transverse; segments 7 and 8 broader and transverse, segments 9 and 10 transverse and segment 11 slightly elongated. *Prothorax* transverse, widest above middle and then narrowed posteriorly, convex, anterior margin curved outwardly and with 8 to 10 denticles, each denticle with a long and posteriorly directed seta, anterior denticle with anteriorly and posteriorly directed setae, all denticles almost of equal size; puncturation on pronotum coarse, dense and similar to that of vertex of head, setae projected posteriorly. *Scutellum* moderately large, transverse and pubescent. *Elytra* less than two times as long as broad, widest near middle, then somewhat acuminate posteriorly, elytral apex rather truncate, rows of punctures deep and large. On ventral side puncturation finer than on dorsal side, femoral lines on ventrite 1 opened.

Length 2 mm.

Materials examined : 5 ex. 'Type', 1 ex., and 'Cotypes' 4 ex., Nilgiri Hills, H. E. Andrewes (British Museum Nat. Hist, London).

Distribution : INDIA : Tamil nadu.

Remarks : One 'cotype' deposited in the Zoological Survey of India (Reg. No. 3776/21) is found missing, and only the pin with the labels is present in the collection.

40. *Airaphilus abnormis* Grouvelle

1908. *Airaphilus depressus* Grouvelle (nec. Reitter), *Annls Soc. ent. Fr.*, **77** : 492.

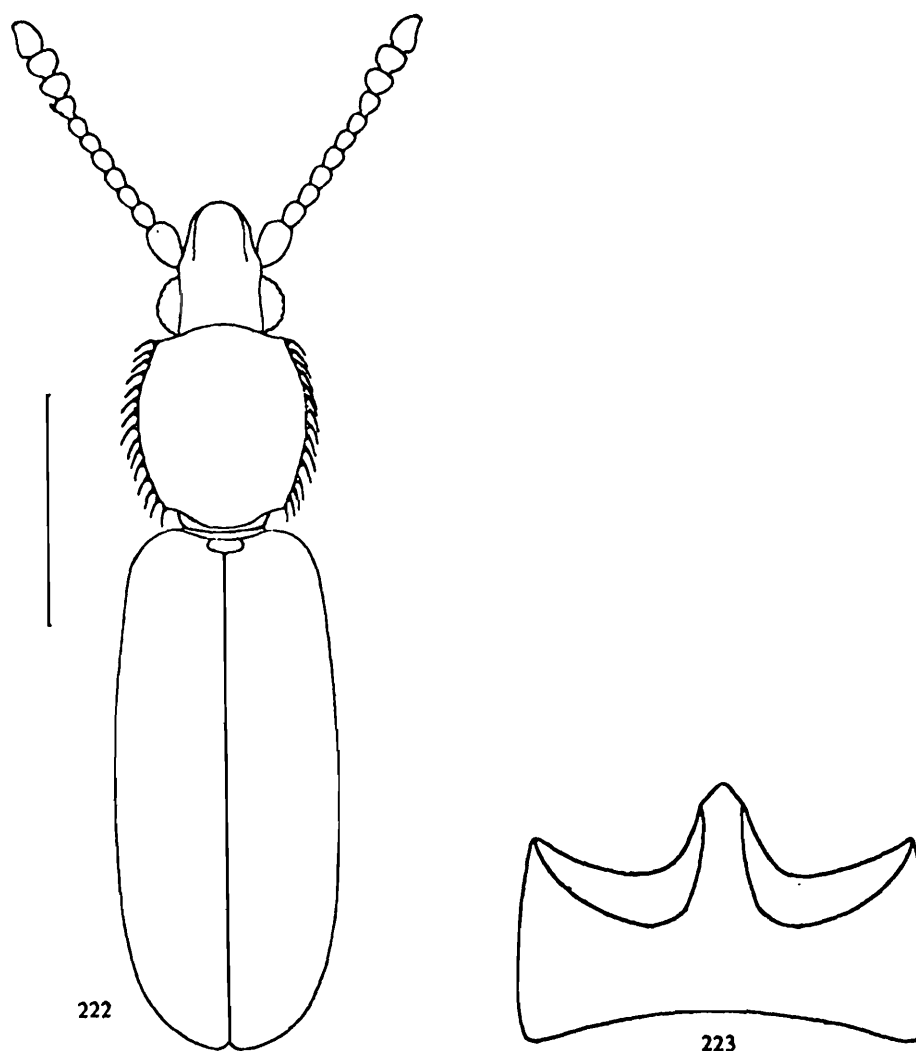
1912. *Airaphilus abnormis* Grouvelle, *Annls Soc. ent. Fr.*, **81** : 326 (Type-loc. : Barway, Chhotangpur : Bihar, India; Type deposition Museum National d' Histoire Naturelle, Paris).

This species can be easily separated from other Indian species by its larger size (3.47 mm.), elongated prothorax with more denticles, elytra more than twice as long as broad. *A. abnormis* shows close similarity in facies with the Mongolian species, *A. kaszabi* Ratti, but can be separated by its larger size, longer prothorax (1.4 : 1.00) and elytra (2.3 : 1.00) than those of *kaszabi* (1.12 : 1.00 and 1.9 : 1.00 respectively).

Description : General form (Fig. 222) elongated, moderately depressed, uniformly blackish-brown, covered with rather long and semierect pubescence.

Head : Exposed part of head about as broad as long, anterior part of head rather narrowed, eyes large and length of eye slightly shorter than half of length of head, temple not distinctly visible, lateral margins of frons near antennal insertions elevated; puncturation on vertex coarse, dense and that of frons and clypeus finer, clypeus slightly shiny; setae projected posteriorly. Antenna moderately long and slender, scape moderately large, pedicel and segment 3 shorter and narrower than scape, segments 4-6 shorter than segment 3 and subequal, segments 7 and 8 shorter than segment 6 and subequal, segments 9 and 10 about as broad as long and segment 11 distinctly elongated. *Prothorax* elongated, widest across middle, anterior margin curved outwardly with feebly sinuated near extremities; lateral margin uniformly curved outwardly with 15 to 16 denticles, each denticle with a posteriorly directed long seta; puncturation on pronotum coarse, dense and similar to that of vertex of head, setae projected posteriorly. *Scutellum* moderately large, transverse and pubescent. *Elytra* more than two times as long as broad, somewhat parallel-sided, slightly

wider and more convex in posterior half, apex rounded with a little notch appears on suture. On ventral side puncturation of head and prothorax almost similar to that of dorsal side, and meso-metathorax and abdomen finer; femoral lines on ventrite 1 closed (Fig. 223).



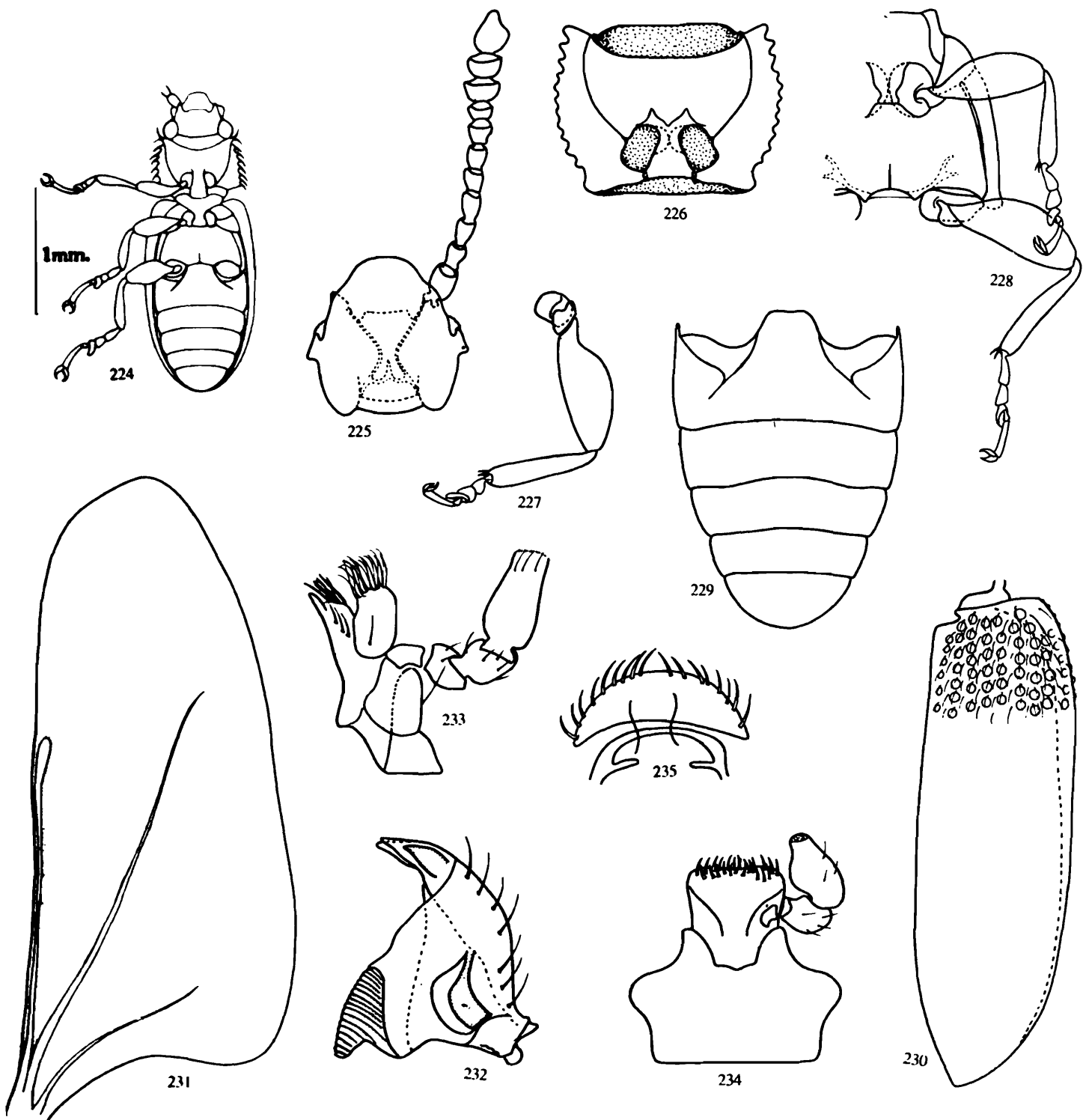
Figs. 222-223. *Airaphilus abnormis* Grouvelle : 222, Dorsal view (scale = 1.0 mm); First abdominal ventrite (scale = 0.5 mm).

Measurements : Total length 3.47 mm., width of head across eyes 0.52 mm., length of antenna 1.17 mm., width of prothorax across middle 0.69 mm., length of elytra 2.13 mm., and width across middle 0.92 mm. (n = 1).

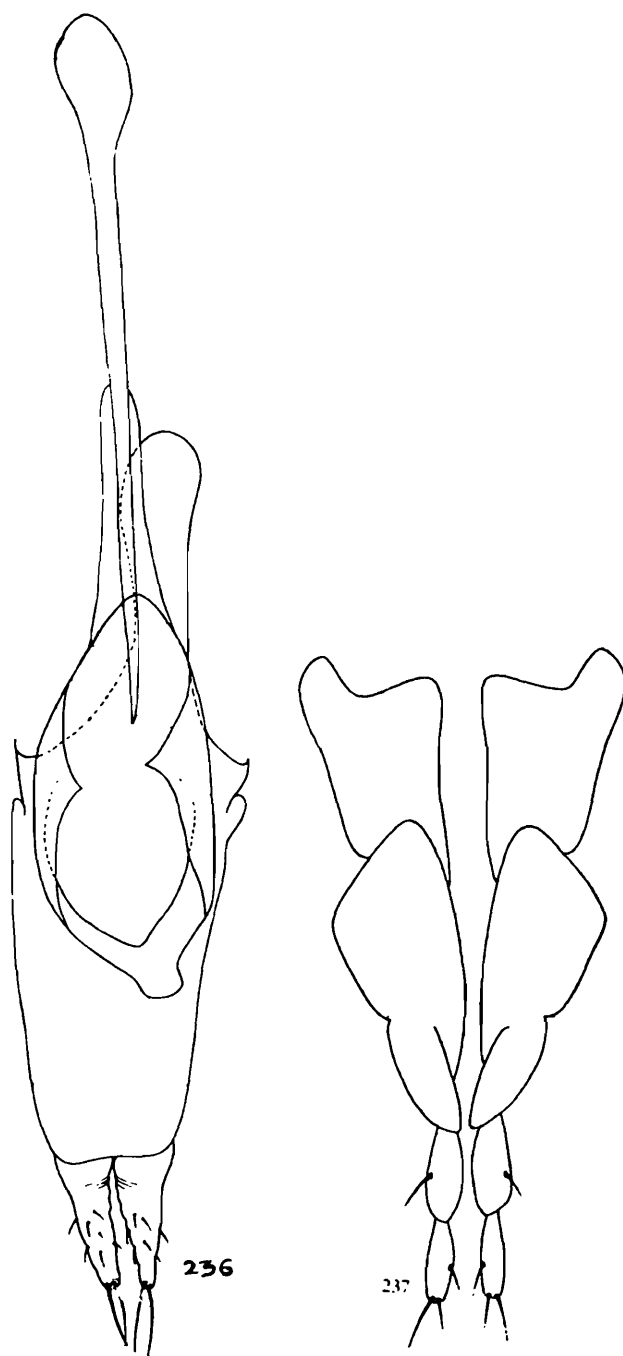
Materials examined : 2 ex. INDIA : MAHARASTRA, Karla, 1 ex., 16.vii.1967, Gy. Topal, singled material; BIHAR ('Bengal' in label), Madhupur, 1 ex., 5.x.09, C. Paiva (Z.S.I. Reg. No. 484/16).

Distribution : INDIA : Bihar, Maharashtra.

Remarks : Grouvelle (1908) recorded 2 examples of *Airaphilus depressus* Reitter from Bengal and subsequently, he in 1912 described these examples as new species, *A. abnormis*. 1 example present in the collection of Zoological Survey of India, Reg. No. 484/16, labelled as '*Airaphilus depressus* Reitter' has been examined and identified as *A. abnormis*.



Figs. 224-235. *Airaphilus serricollis* Reitter: 224, Ventral view; 225, Head, Dorsal view; 226, Prothorax, Ventral view; 227, Front leg; 228, Meso-metathorax, Ventral view; 229, Abdomen, Ventral view; 230, Right elytron, Dorsal view; 231, Wing; 232, Right mandible, Dorsal view; 233, Left maxilla, Ventral view; 234, Labium, Ventral view; 235, Labrum.



Figs. 236-237. *Airaphilus serricollis* Reitter: 236, Aedeagus, Dorsal view; 237, Ovipositor.

Subfamily II PSAMMOECINAE

Genus 11. *Psammoecus* Latreille

- 1829. *Psammoechus* Latreille, in Cuv. *Règne Anim.*, ed. 2, 5 : 135.
- 1830. *Crypta* Stephens, *Illustrations of British Entomology. Mandibulata*, 3 : 103.
- 1834. *Psammoechus* : Boudier, *Annls Soc. ent. Fr.*, 3 : 368, t. 7, f.c.
- 1846. *Psammoecus* : Erichson, *Naturgeschichte der Insekten Deutschlands*. 1, Coleoptera, 3 : 329, 333.
- 1854. *Psammaechus* : Lacordaire, *Histoire Naturelle des Insectes*, Coleoptera. 2 : 411, 414.

- 1857-59. *Psammoecus* : Jacquelin du Val, *Manuel Entomologique. Genera des Coleopteres d'Europe*, 2 : 210.
1879. *Psammoecus* : Reitter, *Verh. zool. bot. Ges. Wien*, 29 : 80.
- 1885-86. *Psammoecus* : Reitter, *Francisque Guillebeau : Tableaux Analytiques Determiner europeins*, 1 : 9.
1899. *Psammoecus* : Ganglbauer, *Die Käfer von Mitteleuropa*, 3 : 590.
1908. *Psammoecus* : Grouvelle, *Annls Soc. ent. Fr.*, 77 : 474.
1911. *Psammoecus* : Reitter, *Fauna Germanica*, 3 : 47, 48.
1985. *Psammoecus* : Pal, *Misc. Publ. Rec. zool. Surv. India*, Occ. pap. 71 : 4.
- Type-species : *Dermestes bipunctatus* (Fabricius).

Historical review : This genus was erected by Latreille (1829) for the species, *Dermestes bipunctatus* (Fabricius) under the tribe 'Sagrides' of the family 'Eupodes' Boudier (1834) characterized this genus. Erichson (1846) placed *Psammoecus* under the tribe Brontini of the family Cucujidae. Lacordaire (1854) placed this genus under the tribu (= ? tribe) 'Silvanides' of the family 'Cucujipes' Reitter (1885-86) erected the tribe Psammoecini under the family Cucujidae for this genus. Ganglbauer (1899) and Grouvelle (1908) dealt Psammoecini under Silvaninae : Cucujidae. Reitter (1911) referred Psammoecini to Cucujinae : Cucujidae. Hetschko (1930) in Junk's "Coleopterorum Catalogus" listed 73 species under this genus of which 9 species, viz., *P. andrewesi* Grouvelle (Nilgiri Hills : Tamil Nadu), *P. graciosus* Grouvelle (Nilgiri Hill : Tamil Nadu), *P. decoratus* Grouvelle (Madura : Tamil Nadu), *P. harmandi* Grouvelle (Darjeeling : West Bengal), *P. impressicollis* Grouvelle (Nilgiri Hills : Tamil Nadu), *P. lepidus* Grouvelle (Madura : Tamil Nadu), *P. nitidus* Grouvelle (Kanara : Karnataka), *P. bellus* Grouvelle (Madura : Tamil Nadu) (see under *nitidus*), and *P. incommodus* (Walker) (see under *trimaculatus*) are recorded from India. Crowson (1955) treated Silvanidae as a distinct family and Psammoecinae as a subfamily of it. Pal and Sengupta (1979) described *P. wittmeri* from Darjeeling (West Bengal) and Pal (1981) gave diagnostic features of *Psammoecus*, *Telephanus* Erichson and *Indophanus* Pal. Pal (1985) in his revision of Indian *Psammoecus* described 5 species and larva of this genus.

Habit-habitat : There is little information pertaining to the habits of *Psammoecus* in the earlier works. The major kind of habitats from which the species of *Psammoecus* have been recorded are : under haystack, leaf garbage, dry cut grass, bush, plant leaf and leaf sheath, flower etc.

Geographical distribution : This genus is known mainly from the Old World, more diversely in the Oriental region and occurs also in Africa, Europe and Australia. 16 species are so far known from India which have been collected mainly from the Himalayas and its foot hills, Gangetic West Bengal, Chotanagpur plateau and South India. The majority of the Indian *Psammoecus* have southern distribution pattern. Of these species, *P. trimaculatus* is the most common and widely distributed in India, occurs in both low and montane situations. Outside India this species has a wide distribution in South-East Asia, Japan and Madagascar. *P. decoratus*, *P. delicatus*, *P. graciosus*, *P. nitidus* and *P. impressicollis* are recorded only from South India. *P. lepidus* and *P. andrewesi* are the widely distributed of the southern forms, extending from South Indian hill ranges into the Himalayas, occurring mostly at higher elevations in association with conifers. *P. harmandi*, *P. bambusae*, *P. complexus*, *P. bhutanicus* and *P. khasia* are eastern montane species, occurring only at

higher elevations, while *P. trilochana* is occurring at higher elevations in both the eastern and western parts of Himalayas. *P. simoni*, distributed from Madagascar to South-East Asian countries is recorded within India from the Gangetic West Bengal.

Description : General form (Fig. 238) elongated, slightly ovoid, moderately convex, usually yellowish-brown or reddish-brown and rarely blackish-brown, sometimes black spots on elytra and few segments of long antenna blackish.

Head (Fig. 254) transverse, fronto-clypeal suture distinct, front margin of clypeus slightly rounded, eyes usually large and coarsely faceted, temple may or may not extend beneath eye, transverse impressed line on vertex behind eyes present, two lateral longitudinal striae on vertex originating near bases of antennae; tentorium with two longitudinal tentorial arms connected by corpora tentoria, post-tentoria present, median tentorial process absent. Antenna moderately long and slender, antennal insertions partly hidden under projection of frons. scape large and broadly elongated, segments 2-11 shorter and sub-equal, segment 11 somewhat acuminate at apex. Mandible (Fig. 261) about as broad as long, right mandible with 3 apical teeth and a blunt tooth beneath apical teeth, left mandible with 3 apical teeth, mola well developed, a large basal mandibular cavity present and opened dorsally. Maxilla (Fig. 262) with lacinia narrow, elongated and without apical spines; galea short and broad and its apex densely hairy; palpi with segment 2 larger than segment 3, apical segment largest and securiform. Labium (Fig. 263) with mentum somewhat quadrate, palpi with segment 2 short and broad, apical segment longer than segment 2 and its apex broadly rounded. Labrum (Fig. 264) transverse with apical margin slightly concave.

Prothorax (Fig. 255) usually transverse, often with few more or less large denticles on lateral sides, front coxae contiguous, coxal cavities slightly elongated, cavities closed behind externally and internally, prosternal process broad at apex and its apical margin sinuate, sterno-pleural suture extending to lateral margin.

Meso-metathorax (Fig. 257) : Mesocoxae contiguous, cavities opened outwardly, lateral margins of mesosternal process slightly constricted across posterior two-thirds, sternal fitting between mesocoxae with a single knob, Metasternum transverse, median impressed line indistinct, hind-coxae widely separated, metendosternite simple and represented by two apophyses.

Wing and Elytra : Wing (Fig. 260) with single anal vein; without radial cell, anal cell and subcubital fleck. Elytra somewhat ovoid, side margins almost uniformly rounded, each elytron (Fig. 259) with 10 rows of striae punctures, sometimes with a row of large glandular punctures along lateral margin, without scutellary striae, epipleura narrowed and extending slightly before apex.

Legs (Fig. 256) moderately long and slender, trochanters short and simple, femora swollen towards middle, tibiae not broadened at apex and with a circlet of apical spurs; tarsal formula 5-5-5 in both sexes, tarsal segments 1 to 3 elongated and lobed below, segment 4 shortest and claws simple.

Abdomen (Fig. 258) slightly elongated; ventrite 1 longest, intercoxal process broad and its apical margin broadly pointed, femoral lines indistinct; ventrites 2-5 subequal. Aedeagus (Fig. 266) with median lobe broad and narrowed towards apex, median strut long and its

apex somewhat broadened; parameres well-developed, elongated, more or less slender, with a few long apical and many short setae. Ovipositor (Fig. 265) with well-developed paraprocts, valvifers, coxites, and long styli attached on outer margin of apex of coxites.

Larva known : *Psammoecus trimaculatus* Motschulsky.

Sexual dimorphism : No secondary sexual characters are observed.

Key to the Species of *Psammoecus* Latreille

1. Elytra distinctly narrowed behind middle and subacuminate at apex; antenna unicolorous 2
 Elytra narrowed behind middle and rounded at apex, apical few segments of antenna blackish or darker than basal segments 3
2. Blackish linear longitudinal spots present on each elytron; head across eyes distinctly narrower than prothorax across anterior margin (1.00 : 1.42); lateral margin of prothorax and elytra distinctly explanate, six large glandular punctures along lateral margin of elytra (Fig. 238)
 *andrewesi* Grouvelle p. 164
 One small, rounded blackish spot in posterior half of each elytron; head across eyes about as wide as prothorax across anterior margin (1.00 : 1.09); lateral margin of prothorax not explanate and that of elytra finely explanate, thirteen large glandular punctures along lateral margin of elytra (Fig. 239)
 *khasia* Pal p. 165
3. Teeth on lateral margin of prothorax minute, indistinct, either broader than long or about as broad as long (Figs. 240-242) 4
 Teeth on lateral margin of prothorax partly long, distinct and longer than broad (Figs. 243, 252) 6
4. None of antennal segments blackish, segments 7 - 10 slightly more reddish than other segments; three transverse blackish spots on elytra which interconnected by longitudinal sutural spot; no depression on lateral sides of pronotum, lateral margins of prothorax more or less abruptly narrowed behind middle (Fig. 240) *decoratus* Grouvelle p. 167
 At least two segments of antenna blackish; no transverse blackish spots on elytra; lateral sides of pronotum more or less depressed, lateral margins of prothorax gradually narrowed behind middle (Figs. 241, 242) 5.
5. Apical part of antennal segment 7 and segments 8 - 10 blackish; head and prothorax blackish and elytra reddish-brown; lateral margin of prothorax slightly wavy and sinuate before posterior angle
 *lepidus* Grouvelle p. 168

- Antennal segments 9 and 10 blackish; head, prothorax and elytra yellowish-brown; lateral margin of prothorax not wavy and slightly rounded
 *harmandi* Grouvelle p. 170
6. Antennal segments 10 and 11 yellowish-white; prothorax markedly transverse; pronotum strongly depressed in front of prothoracic base and lateral margin widely explanate; teeth on lateral margin of prothorax narrow, markedly long and a few of them about four times as long as broad (Fig.243) 7
- Antennal segment 10 more or less blackish and segment 11 yellowish-white; prothorax not strongly depressed in front of prothoracic base and lateral margin not widely explanate; teeth on lateral margin of prothorax variable, not markedly long and maximum three times as long as broad .
 8
7. Eyes large and about half as long as head, all antennal segments distinctly elongated, scape at least three times longer than wide; scape, pedicel, apical half of antennal segment 6 and segments 7-9 blackish; apex of prothoracic teeth somewhat blunt; elytral interstices about as wide as width of each puncture, lateral margin of elytra without any large glandular puncture; body covered with short, fine pubescence
 *delicatus* Grouvelle p. 172
- Eyes smaller and about one-third as long as head, antennal scape to segment 8 and segment 11 more or less elongated, segments 9 and 10 slightly transverse, scape about two times longer than wide; scape yellowish, apical part of segment 7 and segments 8 and 9 blackish; apex of long prothoracic teeth pointed; elytral interstices narrower than width of each puncture, seven large glandular punctures along lateral margin of elytra; body covered with long, semierect and dense pubescence
 *complexus* Pal p. 173
8. Antennal segments 9 and 10 more or less blackish 9
- Antennal segments 7-10 blackish 11
9. Elytra with a transverse blackish spot near apex and two rounded spots near middle, rounded spots with its extensions connected with transverse spots, two spots near humeral angles (Fig.245)
 *wittmeri* Pal and Sengupta p. 175
- Elytra without any transverse blackish spot 10
10. Antennal segments 9 and 10 slightly darker than preceding segments and not distinctly blackish, segment 10 slightly elongated; eyes large and slightly shorter than half as long as head; a rounded indistinct blackish spot on each elytron near middle, interstices on each elytron at least as wide as

- strial punctures in anterior half and wider than them in posterior half; no depression on lateral sides of pronotum; species yellowish-brown
.....*bhutanicus* Pal p. 176
- Antennal segments 9 and 10 distinctly blackish, segment 10 transverse; eyes small and about one-third as long as head; a somewhat transverse distinct blackish spot on each elytron near middle and with extension along suture, interstices on each elytron distinctly narrower than strial punctures; lateral sides of pronotum slightly depressed; species yellowish-brown to dark brown*trilochana* Pal p. 178
11. Elytral pattern of four light patches, two on each side; antennal segments 7-10 distinctly and segment 6 slightly blackish 12
- Elytra without pattern of four light patches; antennal segments 7-10 blackish and apical part of segment 6 also blackish in cases 13
12. Two transverse light areas on each elytron, two well-marked transverse blackish spots near humeral angles; antennal segments 7-10 about as broad as long or slightly transverse; dorsal surface convex, clypeus unicolorous (Fig. 248)*simoni* Grouvelle p. 179
- Two longitudinal light areas on each elytron, without distinct blackish humeral spots; antennal segments distinctly elongated; dorsal surface subdepressed; apical part of clypeus blackish (Fig. 249)
.....*bambusae* Pal p. 181
13. A transverse blackish spot on apical part of elytra; teeth on lateral margin of prothorax small, subequal and broadly elongated; no transverse or lateral depression on pronotum (Fig. 250)
.....*gratiosus* Grouvelle p. 182
- No transverse blackish spot on elytra; teeth on lateral margin of prothorax subequal, partly long and at least twice as long as wide; a transverse depression on pronotum in front of prothoracic base and lateral depressions on pronotum sometimes present 14
14. Lateral margin of pronotum widely explanate (Fig. 251)
.....*nitidus* Grouvelle p. 184
- Lateral margin of pronotum not explanate (Fig. 252): 15
15. Longitudinal sutural spot on elytra absent; prothorax markedly transverse (1.00 : 1.80) and transverse depression on pronotum in front of prothoracic base prominent, some of teeth on lateral margin of prothorax longer than twice of their width*impressicollis* Grouvelle p. 185
- Longitudinal sutural spot on elytra present; prothorax less transverse (1.00 : 1.54-1.60) and transverse depression on pronotum in front of

prothoracic base indistinct, teeth on lateral margin of prothorax hardly twice longer than wide*trimaculatus* Motschulsky p. 186

41. *Psammoecus andrewesi* Grouvelle

1908. *Psammoecus andrewesi* Grouvelle, *Annls Soc. ent. Fr.*, **77** : 476, 477 (Type-loc. : Nilgiri Hills : Tamil Nadu, India; Type deposition British Museum Nat. Hist., London).

1979. *Psammoecus andrewesi* : Pal and Sengupta, *Entomologica Basiliensia*, **4** : 75.

1985. *Psammoecus andrewesi* : Pal, *Misc. Publ. Rec. zool. Surv. India, Occ. pap.* **71** : 10.

This is a characteristic species which can be recognised by its elytra being distinctly narrowed behind middle and subacuminate at apex, antenna unicolorous, blackish linear spots on each elytron, head across eyes distinctly narrower than prothorax across anterior margin (1.00 : 1.42), six large glandular punctures along lateral margin of elytra, both elytra and pronotum have their lateral margins distinctly explanate.

Description : General form (Fig. 238) elongated, oval, moderately convex, yellowish-brown, blackish linear spots on elytra, antenna unicolorous, body covered with moderately long and semierect pubescence.

Head : Exposed part of head broader than long, eyes moderately large, eye shorter than half of length of head, temple short and not flattened beneath eye, longitudinal striae on vertex well-marked and connected by a transverse stria posteriorly; puncturation on vertex coarse and dense, clypeus more or less smooth; setae projected forward. Antenna long and slender, scape large and about one and half times as long as broad; segments 2-10 shorter, subequal and more or less elongated; segment 11 elongated and acuminate at apex. *Prothorax* transverse, convex, width across anterior margin wider than head across eyes, anterior margin rounded and slightly sinuate on either side, maximum width across anterior one-third and slightly narrowed posteriorly, lateral sides rather explanate, lateral margin rounded and with a few moderately large and distinct teeth, anterior and posterior angles obtuse and bearing teeth, puncturation on pronotum coarse and dense and similar to that of vertex of head, setae on pronotal disc projected forward and on lateral sides directed outward. *Scutellum* subtriangular, transverse, more or less smooth. *Elytra* more than one and a half times as long as broad, ovoid and widest beyond middle and subacuminate at apex, rows of punctures deep and large, interstices on anterior half slightly narrower than width of punctures, rather broad and well-marked longitudinal depression along lateral margin, six large glandular punctures along inner part of lateral margin, lateral margin serrated in anterior half; setae moderately long and directed posteriorly, lateral margin with longer and almost erect setae; blackish linear, mainly longitudinal spots on each elytron forming a pattern and a longitudinal sutural spot present near apex.

Measurements : Total length 2.60-3.35 mm., width of head across eyes 0.66-0.73 mm., length of antenna 1.17-1.46 mm., width of prothorax across middle 0.75-0.92 mm., length of elytra 1.76-2.13 mm. and width across middle 1.11-1.36 mm.

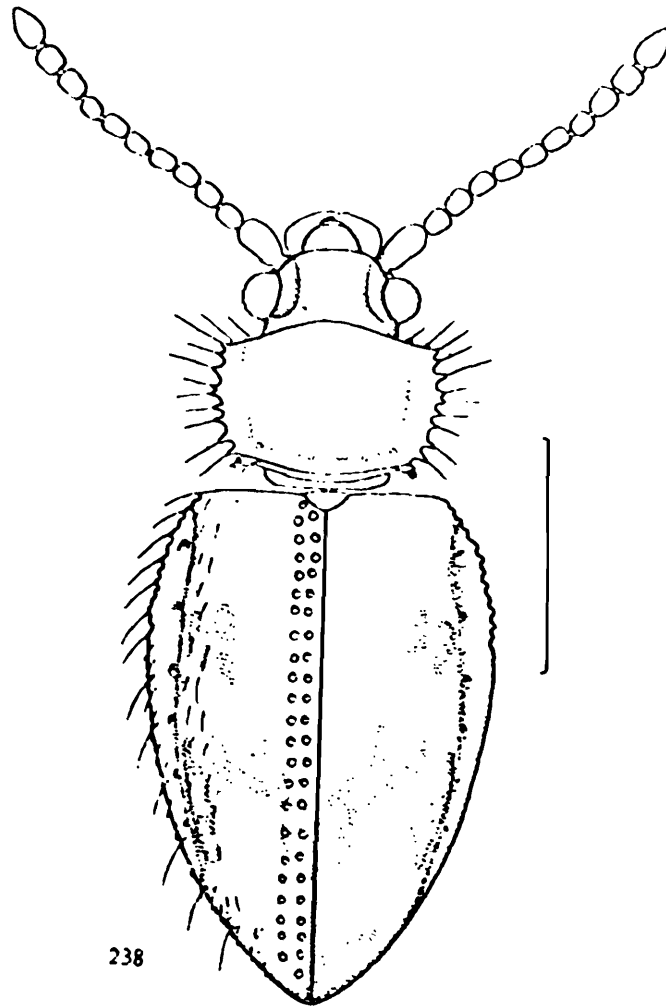


Fig. 238. *Psammoecus andrewesi* Grouvelle, Dorsal view (scale = 1.0 mm).

Materials examined : 6 ex. 'Type' + 2 ex., INDIA : TAMIL NADU, Nilgiri Hills. (British Museum Nat.Hist., London); TAMIL NADU, Nilgiri, 71 km. E. Coonoor, 1350 m., 1 ex., 19.xi.1972, Besuchet Löbl Mussard; MEGHALAYA, Garo Hills, 1 ex., 19.v.1976, W. Wittmer & C. Baroni; NEPAL : Katmandu, Gokaruban, 1 ex., 12.vi.1976, W. Wittmer & C. Baroni.

Distribution : INDIA : Meghalaya, Tamil Nadu; NEPAL.

42. *Psammoecus khasia* Pal

1985. *Psammoecus khasia* Pal, *Misc. Publ. Rec. zool. Surv. India, Occ. pap.* 71 : 12 (Type-loc. : Kaziranga : Assam, India; Type deposition Zoological Survey of India, Calcutta).

This species resembles *P. andrewesi* Grouvelle from which it can be distinguished by its elytra without linear longitudinal spots, having only two small rounded black spots in posterior half, head across eyes about as wide as prothorax across anterior margin, lateral margin of prothorax not explanate and that of elytra finely explanate with thirteen large glandular punctures.

Description : General form (Fig. 239) elongated, oval, moderately convex, slightly shiny, reddish-brown, blackish spots on elytra, antenna unicolorous, body covered with long and semierect pubescence.

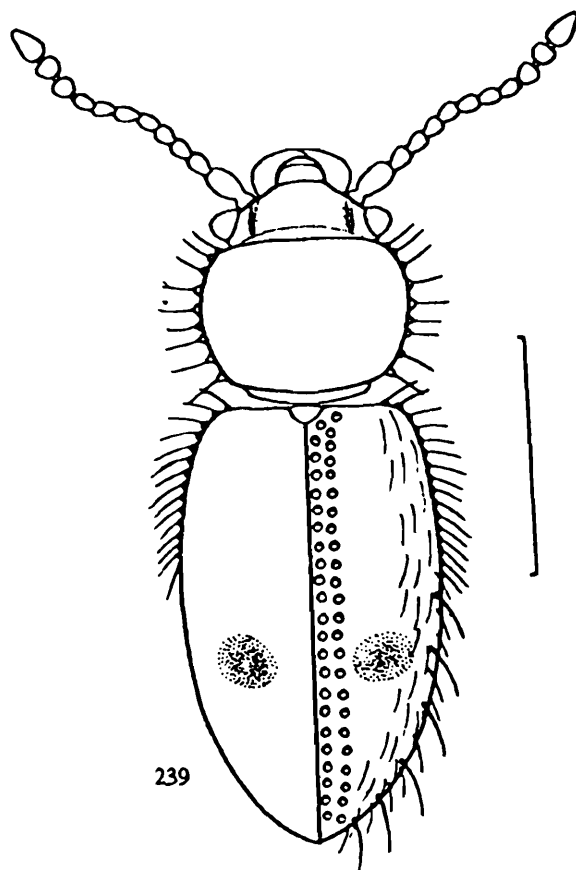


Fig. 239. *Psammoecus khasia* Pal, Dorsal view (scale = 1.0 mm).

Head : Exposed part of head wider than long, eyes moderately large, eye about one-third of length of head, temple short and not flattened beneath eye; longitudinal striae on vertex long and well-marked and connected posteriorly by a transverse stria; puncturation on vertex coarse and dense, punctures slightly elongated, clypeus more or less smooth; setae projected forward. Antenna long and slender, scape moderately large and shorter than two times as long as broad; segments 2-8 shorter, subequal and elongated; segments 9 - 11 slightly wider of which segments 9 and 10 about as long as broad and segment 11 elongated and acuminate at apex. *Prothorax* transverse, convex, across anterior margin about as wide as head across eyes, anterior margin rounded, maximum width near middle, lateral margin slightly rounded and with nine small teeth, teeth about as broad as long, anterior and posterior angles obtuse; puncturation on pronotum coarse and dense, punctures somewhat rounded; setae on pronotal disc projected towards middle line and those on lateral sides projecting outwardly. *Scutellum* subtriangular, clearly transverse and more or less smooth. *Elytra* more than one and a half times as long as broad, ovoid and widest near middle, narrowed behind middle and subacuminate at apex, rows of punctures large, interstices narrower than width of punctures, lateral margin slightly explanate and with thirteen large

glandular punctures, setae long and directed posteriorly, lateral margin with longer and **almost erect setae**, one rounded blackish spot on posterior half of each elytron.

Measurements of holotype : Total length 2.55 mm., width of head across eyes 0.75 mm., length of antenna 1.17 mm., width of prothorax across middle 0.88 mm., length of elytra 1.76 mm. and width across middle 1.10 mm.

Material examined : *Holotype*, INDIA : ASSAM, Kaziranga, Mikir Hills, 14.xi.1974, T. Sengutpa, flower of medulla tree (*Boga medulla*) (Zoological Survey of India, Calcutta, Reg. No. 9449/H4A).

Distribution : INDIA : Assam.

43. *Psammoecus decoratus* Grouvelle

1919. *Psammoecus decoratus* Grouvelle, *Mem. Ent.*, 2 : 29, (Type-loc. : Shembagnaur, Madura : Tamil Nadu, India; Type deposition Museum National d' Histoire Naturelle, Paris).

1985. *Psammoecus decoratus* : Pal, *Misc. Publ. Rec. zool. Surv. India, Occ. pap.* 71 : 14.

This species can be recognised by its lack of blackish antennal segments although segments 7–10 more reddish than other segments combined with slightly transverse, uniformly convex prothorax abruptly narrowed behind anterior two-thirds with a few minute and distinct prothoracic teeth, and two somewhat rounded unpigmented areas on each elytron.

Description : General form (Fig. 240) elongated, oval, moderately convex, slightly shiny, reddish-brown, four light areas on blackish elytra, antennal segments 7-10 more reddish than other segments, body covered with moderately long and semierect pubescence.

Head : Exposed part of head broader than long, eyes large, eye about half as long as head, temple short and slightly flattened beneath eye, longitudinal striae on vertex short and superficial; puncturation on vertex coarse and dense, clypeus more or less smooth; setae projected forward. Antenna long and slender, scape large and slightly longer than two times as long as broad; segments 2-7 shorter, subequal and elongated; segments 8-10 slightly wider than preceding segments, segment 8 about as broad as long and segments 9 and 10 slightly transverse, segment 11 elongated and acuminate at apex, scape to segment 6 reddish-brown, segments 7-10 more reddish than those preceding segments, segment 11 yellowish. *Prothorax* slightly transverse, convex, across anterior margin about as wide as head across eyes, anterior margin rounded, maximum width near middle, lateral margins more or less parallel for anterior two-thirds then somewhat abruptly narrowed and slightly sinuate near posterior angles, lateral margin with six more or less visible minute teeth, teeth broader than long, anterior and posterior angles obtuse; puncturation on pronotum coarse, dense and slightly coarser than that of vertex of head; setae on pronotal disc projected towards middle line and on lateral sides projected outwardly. *Scutellum* subtriangular, slightly transverse and smooth. *Elytra* more than one and a half times as long as broad, ovoid and widest near middle, rows of punctures moderately large and rounded, interstices about as wide as punctures in anterior half and narrowed posteriorly, setae moderately long and projected posteriorly, lateral margins with long and almost erect setae; two more or less rounded unpigmented areas on each elytron formed by three transverse blackish bands on

elytra, a humeral, a medial one and an apical band connected along suture by longitudinal sutural band and along lateral sides by lateral bands.

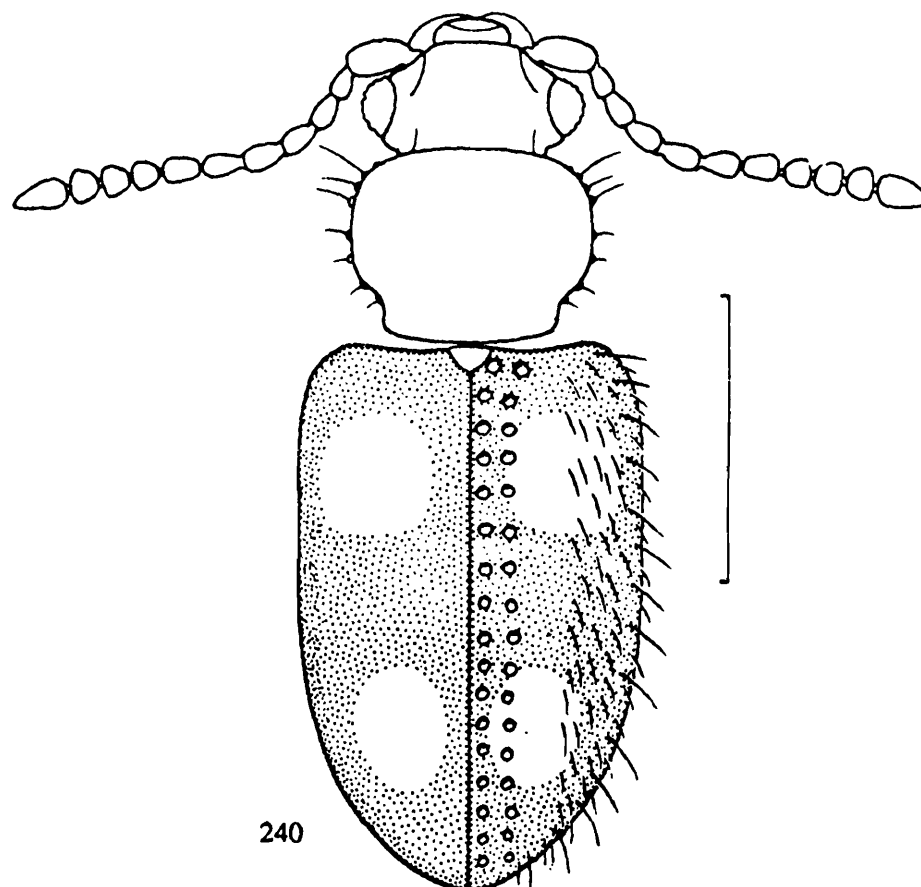


Fig. 240. *Psammoecus decoratus* Grouvelle, Dorsal view (scale = 1.0 mm).

Measurements of the 'type' : Total length 3.00 mm., width of head across eyes 0.76 mm., length of antenna 1.50 mm., width of prothorax across middle 0.82 mm., length of elytra 1.85 mm. and width across middle 1.17 mm.

Material examined : 1 ex. 'Type', INDIA : TAMIL NADU, Madura District, Shembagnaur, 'Samboangau' written on the label (Museum National d' Histoire Naturelle, Paris).

Distribution : INDIA : Tamil Nadu.

44. *Psammoecus lepidus* Grouvelle

1908. *Psammoecus lepidus* Grouvelle, *Annls Soc. ent. Fr.*, **77** : 483 (Type-loc : Shembagnaur, Madura District : Tamil Nadu, India; Type deposition Museum National d' Histoire Naturelle, Paris).

1979. *Psammecus lepidus* : Pal and Sengupta, *Entomologica Basiliensia*, **4** : 75.

1985. *Psammoecus lepidus* : Pal, *Misc. Publ. Rec. zool. Surv. India, occ. pap.* **71** : 16.

This species is closely related to *P. harmandi* Grouvelle but can be distinguished by the colour of antennal segments (see below) and the form of prothorax which has lateral margins slightly sinuate before posterior angles combined with the aedeagus with broad

median lobe abruptly narrowed towards apex and elongated parameres rather parallel-sided.

Description : General form (Fig. 241) elongated, oval, moderately convex, slightly shiny, head and prothorax usually blackish-brown, elytra yellowish-brown with blackish spots, antennal segments 8-10 and apical part of segment 7 blackish, body covered with moderately long and semierect pubescence.

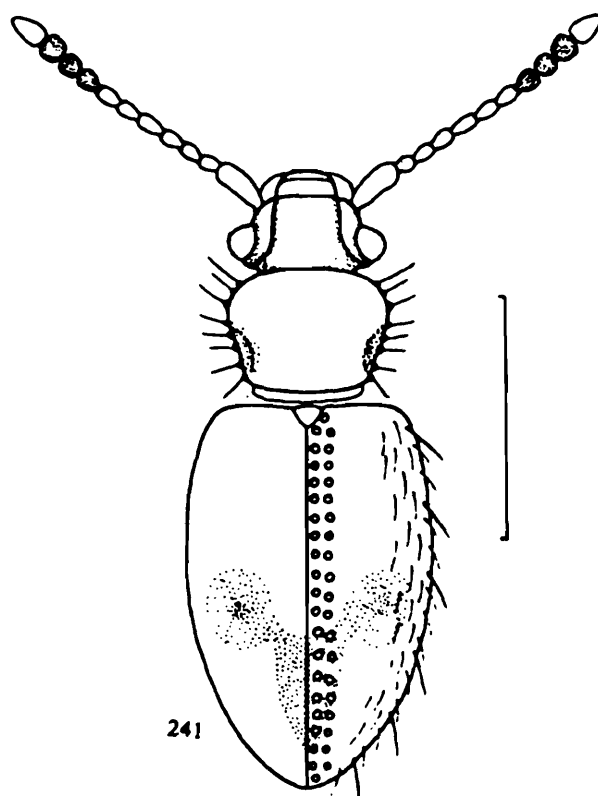


Fig. 241. *Psammoecus lepidus* Grouvelle, Dorsal view (scale = 1.0 mm).

Head : Exposed part of head broader than long, eyes large, eye about one-third as long as head, temple short and slightly flattened beneath eye, longitudinal striae on vertex long and well-marked; puncturation on vertex coarse and dense, clypeus more or less smooth; setae projected forward. Antenna long and slender, scape large and about three times as long as broad; segments 2-7 short, subequal and elongated; segments 8-10 slightly wider of which segment 8 slightly elongated, segment 9 about as broad as long and segment 10 slightly transverse, segment 11 elongated and acuminate at apex, scape to segment 7 yellowish-brown, segments 8-10 and apical part of segment 7 blackish, segment 11 yellowish. **Prothorax** about as long as broad or slightly transverse, convex, width across anterior margin slightly wider than head across eyes, anterior margin rounded, maximum width near anterior margin and narrowed posteriorly, lateral margin rounded and slightly sinuates before posterior angle; teeth on lateral margin minute, indistinct and usually broader than long; anterior and posterior angles obtuse; puncturation on pronotum coarse

and dense and slightly coarser than that of vertex of head, setae on pronotal disc projected towards middle and at sides projected outwardly. *Scutellum* subtriangular, about as broad as long and more or less smooth. *Elytra* slightly longer than one and a half times as long as broad, ovoid and widest near middle, rows of punctures large, interstices narrower than punctures, setae moderately long and projected posteriorly, lateral margin with long and almost erect setae; a more or less rounded blackish spot on posterior half each elytron, a longitudinal sutural spot more or less distinct and narrowed posteriorly, rounded spot sometimes connected with longitudinal spots. Aedeagus (Fig. 268) with median lobe broad, abruptly narrowed and rather broadly pointed at apex; parameres long, slender and parallel-sided, each paramere with a few long apical setae and some short setae on its surface.

Measurements : Total length 2.26-2.85 mm., width of head across eyes 0.61-0.69 mm., length of antenna 1.23-1.39 mm., width of prothorax across middle 0.64-0.76 mm., length of elytra 1.47-1.97 mm. and width across middle 1.00-1.25 mm.

Materials examined : 81 ex. 'Type', 1 ex., INDIA : TAMIL NADU, Madura, Shembagnaur (Museum National d' Histoire Naturelle, Paris); UTTAR PRADESH, Bhowali, 35 km. from Kathgodam, 1736 m., 1 ex., 14.x.1976, T. Sengupta, *Crysanthemum* sp. (flower); Chambal, 1 ex., 19.x.1976, T. Sengupta, haystack; KERALA, Cardamom Hills, Multapaltipres Munnar, 1700 m., 1 ex., 24.xi.1972, Besuchet Löbl Mussard; TAMIL NADU, Palni Hills, Berijam Lake, 2150 m., 56 ex., 14.xi.1972, Besuchet Löbl Mussard; Kodaikanal, 2100 m., 14 ex., 15.xi.1972, Besuchet Löbl Mussard; 10 km. N. O Kodaikanal, 2150 m., 6 ex., 15.xi.1972, Besuchet Löbl Mussard; BHUTAN : Chimakothi, 1900-2300 m., 1 ex., 22.v, Nat. Hist. Mus. Basel-Bhutan Expedition 1972.

Distribution : INDIA : Uttar Pradesh, Kerala, Tamil Nadu; BHUTAN.

45. *Psammoecus harmandi* Grouvelle

1912. *Psammoecus harmandi* Grouvelle, *Bull. Mus. Paris*, **28** : 413 (Type-loc. : Darjeeling : West Bengal, India; Type deposition Museum National d' Histoire Naturelle, Paris).

1985. *Psammoecus harmandi* : Pal, *Misc. Publ. Rec. zool. Surv. India, Occ. pap.* **71** : 19.

This species can be recognised by the combination of prothoracic characters, teeth minute, sides more or less depressed, lateral margins slightly rounded and narrowed behind middle, and the blackish antennal segments 9 and 10. This species resembles *P. lepidus* and comparisons are discussed under *lepidus*.

Description : General form (Fig. 242) elongated, oval, moderately convex, slightly shiny, yellowish to reddish-brown, blackish spots on elytra and antennal segments 9 and 10 blackish, body covered with moderately long and semierect pubescence.

Head : Exposed part of head broader than long, eyes large, eye shorter than half of length of head, temple slightly long and slightly flattened beneath eye, longitudinal striae on vertex moderately long and not strongly impressed; puncturation on vertex coarse and dense, clypeus more or less smooth; setae projected forward. Antenna long and slender, scape moderately large and about two times as long as broad, pedicel short and elongated, segments 3-7 longer than pedicel and subequal; segments 8-11 slightly wider than segment 7 of which segment 8 slightly elongated, segment 9 about as broad as long, segment 10 slightly transverse and segment 11 slightly acuminate at apex; scape to segment 8

yellowish-brown, segments 9 and 10 blackish, segment 11 yellowish. *Prothorax* transverse, convex, across anterior margin about as wide as head across eyes, anterior margin rounded, lateral margin slightly rounded and with six minute teeth, anterior and posterior angles outuse, puncturation on pronotum coarse and dense and almost similar to that of vertex of head, setae on pronotal disc projected towards middle line and on lateral sides projected outwardly. *Scutellum* subtriangular, transverse and more or less smooth. *Elytra* about one and a half times as long as broad, ovoid and widest near middle, rows of punctures moderately large and rounded, interstices narrower than punctures, with moderately long and almost erect setae, a more or less rounded blackish spot on each elytron near middle and somewhat rounded blackish sutural spot behind them. Aedeagus (Fig. 269) with median lobe broad, gradually narrowed and slightly constricted before apex; parameres rather short, broadly elongated and narrowed apically, each paramere with a few short setae on its surface and two long setae near apex, small glandular punctations on surface on parameres.

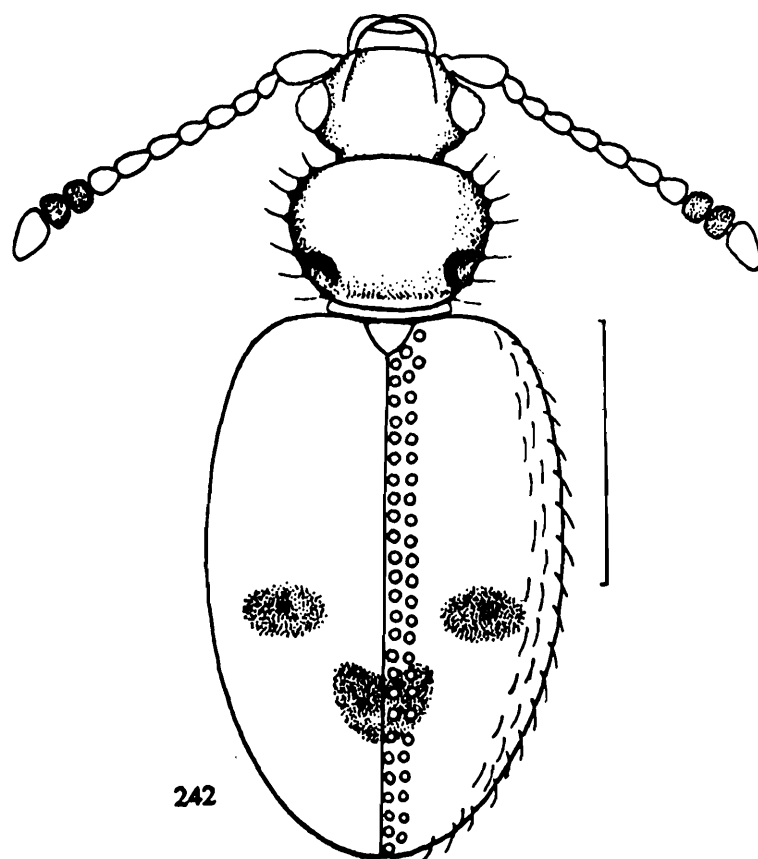


Fig. 242. *Psammoecus harmandi* Grouvelle, Dorsal view (scale = 1.0 mm).

Measurements : Total length 2.85-3.08 mm., width of head across eyes 0.36-0.41 mm., length of antenna 1.41-1.55 mm., width of prothorax across middle 0.67-0.83 mm., length of elytra 1.83-2.02 mm. and width across middle 1.17-1.33 mm.

Materials examined : 6 ex. 1 ex., 'Type' labelled : MUSEUM PARIS, DARJEELING, Harmand 1890 [printed rectangular], *Psammoecus trimaculatus* Mots., A Grouvelle det. 1903 [not Grouvelle's handwriting], TYPE [printed rectangular red], *Psammoecus harmandi*

Ty. Grouv. [Grouvelle's handwriting]; INDIA : ARUNACHAL PRADESH, Namdapha Survey 1981, Chiri Camp, 2 ex., 25.iv.1981, S. Biswas; WEST BENGAL, Darjeeling District, Jhepi, 37 km. from Ghoombanjang, 1 ex., 3.v.1978, T. K. Pal, under garbage of *Cryptomaria* leaf; SIKKIM, Gangtok, 1.ex., 25.iv.1976, T. K. Pal, under garbage of *Cryptomaria* leaf; NEPAL, Katmandu, 1 ex., 29.iii.1972, T. Sengupta, haystack.

Distribution : INDIA : Arunachal Pradesh, West Bengal (Darjeeling District), Sikkim; NEPAL.

46. *Psammoecus delicatus* Grouvelle

1906. *Psammoecus delicatus* Grouvelle, *Annls Soc. ent. Fr.*, **77** : 477 (Type-loc. : Sri Lanka; Type deposition Museum National d'Histoire Naturelle, Paris).

1985. *Psammoecus delicatus* : Pal, *Misc. Publ. Rec. zool. Surv. India, Occ. pap.* **71** : 21.

This species can be recognised by its characteristic colour and form of antennal segments (see below) combined with markedly transverse prothorax, strongly depressed pronotum in front of prothoracic base and its widely explanate lateral sides; narrow, markedly long prothoracic teeth and a few of them about four times as long as broad.

Description : General form (Fig. 243) elongated, oval, moderately convex, slightly shiny, yellowish to reddish-brown, blackish spots on elytra; antennal scape and pedicel, apical part of segment 6 and segments 7-9 blackish, body covered with moderately long and semierect pubescence.

Head : Exposed part of head broader than long, eyes large, length of eye shorter than half of length of head, temple short and slightly flattened beneath eye, longitudinal striae on vertex moderately long and well-marked; puncturation on vertex coarse and dense, clypeus more or less smooth; setae projected forward. Antenna long and slender, scape large and about three times as long as broad, pedicel short and elongated, segments 3-7 longer than pedicel and subequal, segments 8-11 slightly wider than segment 7 and elongated, segment 11 acuminate at apex; scape, pedicel, apical part of segment 6 and segments 7-9 blackish. *Prothorax* transverse, convex, across anterior margin about as wide as head across eyes, anterior margin sinuate on either side of middle; lateral margin outwardly curved and with nine teeth of variable size, teeth gradually becoming longer towards posterior side and attain its maximum length above penultimate tooth, longest tooth about four times as long as broad, all teeth somewhat blunt at apex, anterior and posterior angles outuse bearing teeth, lateral sides of pronotum widely explanate, transverse prebasal impression prominent, puncturation on pronotum coarse and dense and slightly coarser than that on vertex of head, seatae on pronotal disc scanty. *Scutellum* subtriangular, transverse and more or less smooth. *Elytra* more than one and a half times as long as broad, ovoid and widest near middle, rows of punctures large and rounded, interstices about as wide as punctures, setae moderately long and projected posteriorly, lateral margin with long and almost erect setae; two transverse blackish areas on elytra. One in anterior half and another at apex, areas connected along suture by longitudinal sutural band.

Measurements : Total length 2.41-2.57 mm., width of head across eyes 0.54-0.60 mm., length of antenna 1.38-1.44 mm., width of prothroax across middle (excluding lateral teeth) 0.58-0.66 mm., length of elytra 1.41-1.67 mm. and width across middle 0.97-1.05 mm.

Materials examined : 4 ex., 1 ex., 'Type' SRI LANKA ('Ceylan, Horn' written on label); INDIA : KERALA, Cardamom Hills, Vallara Fall, 450-500 m., 1 ex., 25.xi.1972, Besuchet Löbl Mussard; SRI LANKA (Central) : Kandy, 600 m., 1 ex., 15.i.1970, Mussard Besuchet Löbl; 1 ex., (particular locality not given), 1965, R. Mussard.

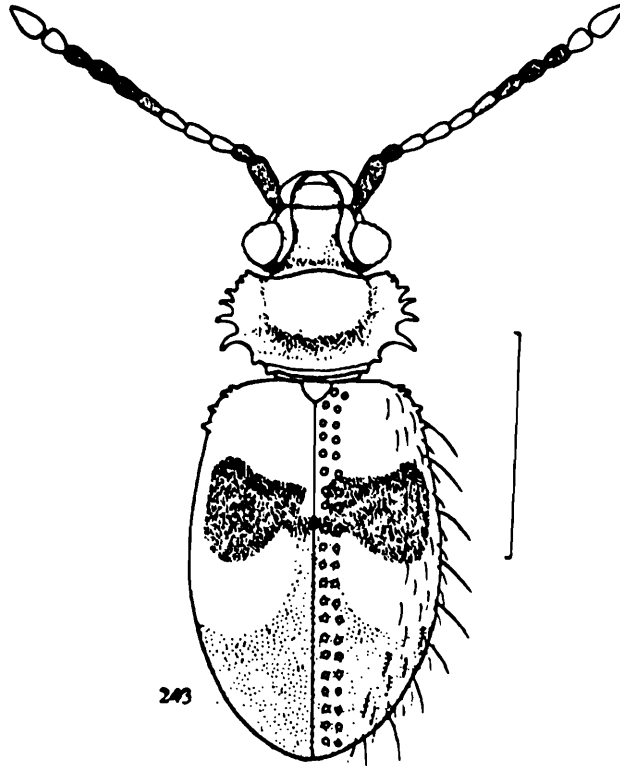


Fig. 243. *Psammoecus delicatus* Grouvelle, Dorsal view (scale = 1.0 mm).

Distribution : INDIA : Kerala; SRI LANKA.

47. *Psammoecus complexus* Pal

1985. *Psammoecus complexus* Pal, *Misc., Publ. Rec. zool. Surv. India, Occ. pap.* 71 : 23 (Type-loc : Ghum, Darjeeling District : West Bengal, India; Type deposition - Termesztudományi Múzeum, Budapest).

This species is closely related to *P. delicatus* Grouvelle but can be distinguished by its smaller eyes (about one-third as long as head), shorter antennal segments; scape, pedicel and segment 6 not blackish; pointed apex of prothoracic teeth, elytral interstices narrower than striae punctures and presence of seven large glandular punctures along lateral margin, body covered with long pubescence.

Description : General form (Fig. 244) elongated, oval, moderately convex, reddish-brown, blackish spots on elytra and antennal segments 8 and 9 slightly blackish, body covered with long and semierect pubescence.

Head : Exposed part of head broader than long, eyes moderately large, length of eye

shorter than one-third of length of head, temple slightly long and flattened beneath eye; longitudinal striae on vertex distinct, extending to point where temple joins neck; puncturation on vertex coarse and dense, that on clypeus slightly finer; setae moderately long and projected forward. Antenna long and slender, scape moderately large and about two times as long as broad, pedicel short and slightly elongated; segments 3-7 longer than pedicel, subequal and elongated; segment 8 shorter than segment 7 and slightly elongated, segments 9 and 10 slightly transverse, segment 11 elongated and acuminate at apex, apical part of segment 7 plus segments 8 and 9 blackish. *Prothorax* transverse, convex, across anterior margin wider than head across eyes, anterior margin sinuate on either side of middle, with a few small denticles; lateral margin outwardly curved and with four teeth, anterior three teeth long and somewhat pointed, longest tooth about four times as long as broad, others approximately three times as long, lateral margin of pronotum explanate, transverse prebasal impression somewhat prominent, puncturation on pronotum coarse and dense and slightly coarser than that of vertex of head, setae on pronotal disc projected forward and those at lateral sides and on teeth projected outward. *Scutellum* subtriangular, transverse and more or less smooth. *Elytra* shorter than one and a half times as long as broad, ovoid and widest near middle, rows of punctures large and rounded, seven large glandular punctures along lateral margin, interstices narrower than punctures, with moderately long and almost erect setae intermingled with longer setae; two somewhat blackish areas on each elytron, one in basal half and one covering apical two fifths, areas connected by sutural spot.

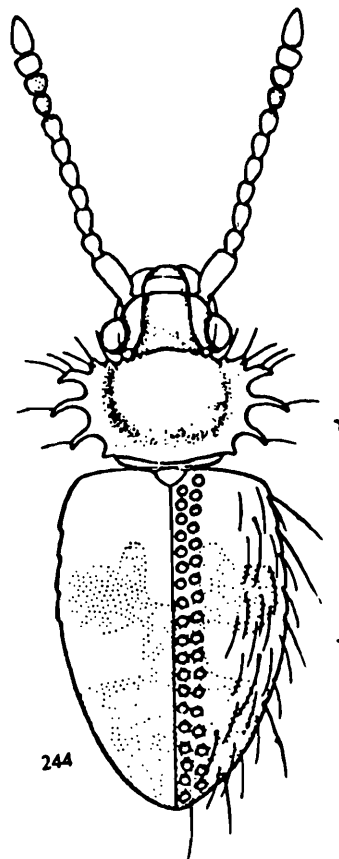


Fig. 244. *Psammoecus complexus* Pal, Dorsal view (scale = 1.00 mm).

Measurements of holotype : Total length 2.50 mm., width of head across eyes 0.64 mm., length of antenna 1.44 mm., width of prothorax across middle (excluding teeth) 0.76 mm., length of elytra 1.61 mm. and width across middle 1.11 mm.

Material examined : 1 ex., *Holotype*, INDIA : WEST BENGAL, Darjeeling District, 3 km. S. of Ghum, leg. Gy. Topal, No. 318, sifted mosses, 12.iv.1967 (Termesztudományi Múzeum, Budapest).

Distribution : INDIA : West Bengal (Darjeeling District).

48. *Psammoecus wittmeri* Pal and Sengupta

1979. *Psammoecus wittmeri* Pal and Sengupta, *Entomologica Basiliensia*, 4 : 76 (Type-loc : Lebung, Darjeeling District : West Bengal, India; Type deposition Naturhistorischen Museums, Basel).

1985. *Psammoecus wittmeri* : Pal, *Misc. Publ. Rec. zool. Surv. India, Occ. pap.* 71 : 25.

This species is closely related to *P. gratiosus* Grouvelle but can be distinguished by having only segments 9 and 10 of antenna blackish, shorter eyes and characteristic spots on elytra.

Description : General form (Fig. 245) elongated, oval, moderately convex, slightly shiny, reddish-brown with blackish spots on elytra and antennal segments 9 and 10 blackish, body covered with moderately long and semierect pubescence.

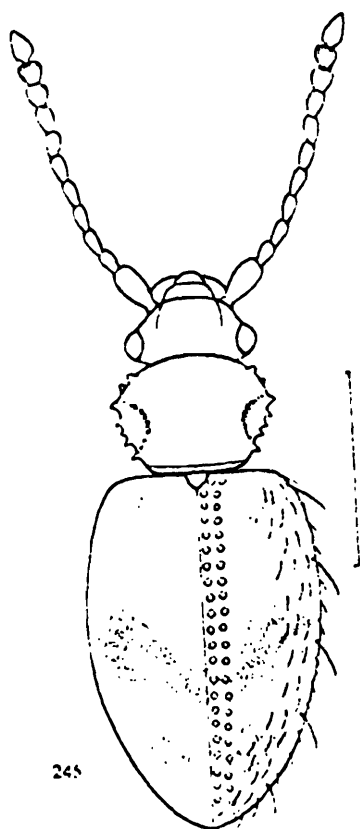


Fig. 245. *Psammoecus wittmeri* Pal and Sengupta, Dorsal view (scale = 1.0 mm).

Head : Exposed part of head broader than long, eyes large, length of eye about one-third of length of head, temple short and slightly flattened beneath eye, longitudinal striae on vertex moderately long; puncturation on vertex coarse and dense, clypeus more or less smooth; setae projected forward. Antenna long and slender, scape large and slightly longer than two times as long as broad; segments 2-7 short, subequal and elongated; segments 8-11 slightly wider of which segments 8 and 9 slightly elongated and segment 10 about as broad as long, segment 11 elongated and acuminate at apex; scape to segment 8 reddish-brown, segments 9 and 10 blackish, segment 11 yellowish. *Prothorax* convex, slightly transverse and narrowed posteriorly, slightly depressed on lateral sides, across anterior margin wider than head across eyes, anterior margin rounded and with two small teeth on either side, lateral margin almost straight and with five more or less small teeth, anterior and posterior angles obtuse, puncturation on pronotum coarse and dense and slightly coarser than that of vertex of head. *Scutellum* subtriangular, transverse and smooth. *Elytra* about one and a half times as long as broad, ovoid and widest near middle, rows of punctures deep and large, interstices about as wide as punctures, two somewhat rounded black spots present near middle and their extensions meeting at suture, posterior to above spots there is a transverse spot and anteriorly two indistinct blackish spots near humeral angles.

Measurements of holotype : Total length 2.94 mm., width of head across eyes 0.75 mm., length of antenna 1.61 mm., width of prothorax across middle 0.73 mm., length of elytra 1.91 mm. and width across middle 1.17 mm.

Material examined : 1 ex. *Holotype*, INDIA : WEST BENGAL, Darjeeling District, Lebong, 1800-1900 m., 11.v.1975, W. Wittmer (Naturhistorischen Museums, Basel).

Distribution : INDIA : West Bengal (Darjeeling District).

49. *Psammoecus bhutanicus* Pal

1985. *Psammoecus bhutanicus* Pal, *Misc. Publ. Rec. zool. Surv. India*, Occ. pap. 71 : 27 (Type-loc. : Phuntsholing, Bhutan; Type deposition Zoological Survey of India, Calcutta).

This species is closely related to *P. trilochna* Pal but can be distinguished by its eyes being distinctly larger (slightly less than half of length of head), antennal segments 9 and 10 not distinctly blackish although slightly darker than preceding segments and its indistinct elytral pattern of two blackish spots, pronotum devoid of any depression on lateral sides and comparatively wider elytral interstices.

Description : General form (Fig. 246) rather elongated, oval, moderately convex, slightly shiny, yellowish-brown, faint blackish spots on elytra and antennal segments 9 and 10 darker than preceding segments, body covered with moderately long and semierect pubescence.

Head : Exposed part of head broader than long, eyes large, length of eye slightly shorter than half of length of head, temple moderately long and slightly flattened beneath eye, longitudinal striae on vertex short and slightly prominent; puncturation on vertex coarse and dense, clypeus more or less smooth; pubescence scanty and projected forward. Antenna long and slender, scape moderately large and about two times as long as broad; segments 2-6 shorter, subequal and elongated; segments 7-11 slightly wider than segment 6 and more

or less elongated, segment 11 acuminate at apex, scape to segment 8 yellowish-brown, segments 9 and 10 brown, segment 11 yellowish. *Prothorax* transverse, convex, across anterior margin about as wide as head across eyes, anterior margin slightly rounded and slightly sinuate at sides; lateral margin outwardly curved and with six teeth, of which third, fourth and fifth from anterior side larger and obvious, others inconspicuous; anterior and posterior angles obtuse; puncturation on pronotum coarse and dense and slightly more so than on vertex of head, pubescence on pronotal disc scanty. *Scutellum* subtriangular, transverse and more or less smooth. *Elytra* slightly longer than one and a half times as long as broad, ovoid and widest near middle, rows of punctures moderately large and rounded, interstices about as wide as width of each puncture in anterior half and wider than punctures in posterior half, with moderately long and semierect setae; a more or less rounded, faint, blackish spot on each elytron near middle.

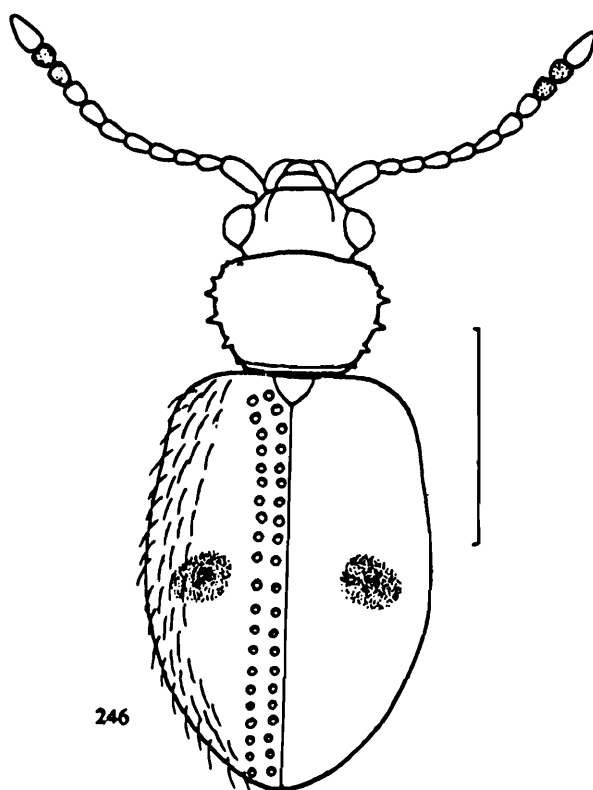


Fig. 246. *Psammoecus bhutanicus* Pal, Dorsal view (scale = 1.0 mm).

Measurements of holotype : Total length 2.79 mm., width of head across eyes 0.69 mm., length of antenna 1.44 mm., width of prothorax across middle 0.70 mm., length of elytra 1.85 mm. and width across middle 1.23 mm.

Material examined : 1 ex. *Holotype*, BHUTAN : Phuntsholing, 21.i.1969, S. K. Mitra (Zoological Survey of India, Calcutta; Reg. No. 9540/H4A).

Distribution : BHUTAN.

50. *Psammoecus trilojana* Pal

1985. *Psammoecus trilojana* Pal, *Misc. Publ. Rec. zool. Surv. India, Occ. pap.* 71 : 29. (Type-loc : Daman, Nepal; Type deposition Zoological Survey of India, Calcutta).

This species comes close to *P. graciosus* Grouvelle but can be distinguished by its blackish antennal segments 9 and 10 but segments 7 and 8 not blackish, shorter eyes, less transverse prothorax with lateral margins slightly sinuate before posterior angles, transverse blackish spot at apex of elytra absent.

Description : General form (Fig. 247) elongated, oval, moderately convex, slightly shiny, yellowish-brown to blackish-brwon, blackish spots on elytra and antennal segments 9 and 10 blackish, body covered with moderately long and semierect pubescence.

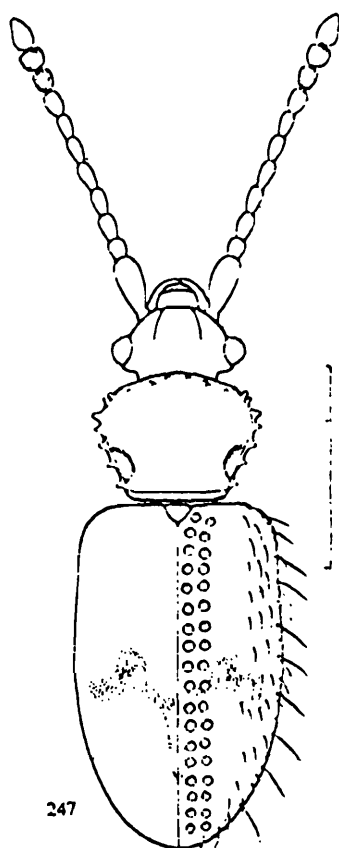


Fig. 247. *Psammoecus trilojana* Pal, Dorsal view (scale = 1.0 mm).

Head : Exposed part of head broader than long, eyes large, eye slightly longer than one-third of length of head, temple moderately long and slightly flattened beneath eye, longitudinal striae on vertex moderately long and slightly prominent; puncturation on vertex coarse and dense, clypeus more or less smooth; setae projected forward. Antenna long and slender, scape moderately large and slightly more than twice as long as broad, pedicel short and slightly elongated, segments 3-7 subequal and longer than pedicel; segments 8-11 slightly wider than segment 7, segments 8 and 9 slightly elongated and segment 10 about as broad as long, segment 11 elongated and acuminate at apex. *Prothorax* about as broad as long, convex, across anterior margin about as wide as head across eyes,

anterior margin rounded and with a few small denticles; lateral margin outwardly curved, slightly sinuate at posterior half and with seven moderately large teeth, teeth about as broad as long and somewhat blunt; anterior and posterior angles obtuse and bearing teeth, puncturation on pronotum coarse and dense and almost similar to that of on vertex of head, setae on pronotal disc projected towards middle line and on lateral sides projected outward. *Scutellum* subtriangular, transverse and more or less smooth. *Elytra* slightly less than one and a half times as long as broad, ovoid and widest near middle, rows of punctures large and round, interstices narrower than punctures, setae moderately long and projected posteriorly, lateral margins with long and almost erect setae, a somewhat oblique blackish spot on each elytron near middle with extensions along suture. Aedeagus (Fig. 267) with median lobe broad and rather pointed at apex; parameres long and slender, each paramere with two long apical setae and numerous short setae along inner margin and on surface.

Measurements of holotype : Total length 2.79 mm., width of head across eyes 0.70 mm., length of antenna 1.63 mm., width of prothorax across middle 0.73 mm., length of elytra 1.75 mm. and width across middle 1.10 mm.

Materials examined : 16 ex. *Holotype* ♂, NEPAL : Daman, 31.iii.1972, T. Sengupta, under cut long grass. Aedeagus dissected and mounted on cover slip and pinned with the holotype; *Paratyeps* 12 ex., data same as holotype; *Paratypes* 3 ex., INDIA : Himachal Pradesh, Simla, Mashobra, 2149 m., 25.vi.1975, T. Sengupta, beat of grass hanging on hills (Zoological Survey of India, Calcutta; Reg. No. 9451 9466/H4A).

Distribution : INDIA : Himachal Pradesh; NEPAL.

51. *Psammoecus simoni* Grouvelle

1892. *Psammoecus simonis* Grouvelle, *Annls Soc.ent.Fr.*, **61** : 288 (Type-loc. : Philippines; Type deposition Museum d'Histoire Naturelle, Paris).

1908. *Psammoecus simoni* Grouvelle : Grouvelle, *Annls Soc.ent.Fr.*, **77** : 476, 488.

1985. *Psammoecus simoni* : Pal, *Misc.Publ. Rec. zool. Surv. India, Occ. pap.* **71** : 31.

This is a distinct species and can be recognised by its two characteristic transverse spots on elytra and two small rounded spots near humeral angles, transverse spots interconnected by longitudinal sutural spot, distinctly blackish antennal segments 7-10.

Description : General form (Fig. 248) elongated, oval, moderately convex, slightly shiny, yellowish-brown with two transverse blackish spots on elytra, antennal segment 6 slightly and segments 7-10 distinctly blackish, body covered with moderately long and semierect pubescence.

Head : Exposed part of head broader than long, eyes large and slightly shorter than half of length of head, temple short and slightly flattened beneath eye, longitudinal striae on vertex moderately long and slightly prominent; puncturation on vertex coarse and dense, clypeus more or less smooth; setae projected forward. Antenna long and slender, scape large and about twice as long as broad, segments 2-6 shorter and subequal; segments 7-11 slightly wider than other funicular segments, segment 7 slightly elongated, segment 8 about as broad as long, segments 9 and 10 slightly transverse, segment 11 elongated and acuminate at apex; segments 7-10 distinctly blackish. *Prothorax* transverse, convex, narrowed behind middle, across anterior margin slightly wider than head across eyes, anterior margin rounded,

maximum width across fourth teeth from anterior margin; lateral margin curved and with six more or less distinct teeth; posterior three teeth larger than others, longest teeth longer than wide, apices somewhat blunt; transverse depression on pronotum in front of prothoracic base slightly prominent, anterior and posterior angles obtuse. *Scutellum* subtriangular, slightly transverse and more or less smooth. *Elytra* about one and a half times as long as broad, ovoid and widest near middle, rows of punctures moderately large and rounded, interstices usually about as wide as striae punctures, setae moderately long and projected posteriorly; two distinct transverse blackish bands near middle and at apex, two smaller areas near humeral angles, bands and to some extent humeral areas connected by longitudinal sutural spot.

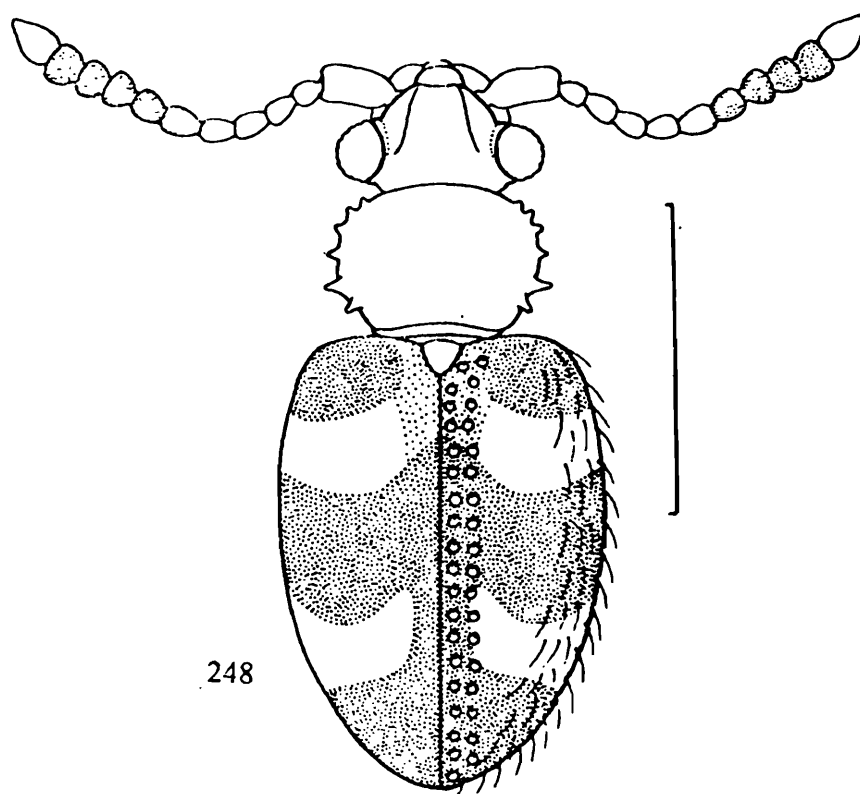


Fig. 248. *Psammoecus simoni* Grouvelle, Dorsal view (scale = 1.0 mm).

Measurements of 'type' : Total length 2.50 mm., width of head across eyes 0.68 mm., length of antenna 1.30 mm., width of prothorax across middle 0.70 mm., length of elytra 1.60 mm. and width across middle 1.10 mm.

Materials examined : 5 ex. 1 ex., 'Type', PHILIPPINES : Antipolo, E. Simon (Museum National d'Histoire Naturelle, Paris); INDIA : WEST BENGAL, Calcutta, 1 ex., 30.xi.1971, T. Sengupta, under dead pista plant beside a pond; 24 Parganas District, S. Salt Lake, 1 ex., 17.i.1967, Gy. Topal, netted at dusk; SRI LANKA (Central), Mahaweli Ganga, à 7 miles de Dandy, 450 m., 1 ex., 15.i.1970; Weligma, 1 ex., 1899, W. Horn.

Distribution : INDIA : West Bengal ; SRI LANKA ; MALAYSIA (Malacca); INDONESIA (Sumatra) ; PHILIPPINES ; SEYCHELLES IS. ; MADAGASCAR.

Remarks : In the 'type' specimen the apex of elytra is not entirely blackish.

52. *Psammoecus bambusae* Pal

1985. *Psammoecus bambusae* Pal, *Misc. Publ. Rec. zool. Surv. India, Occ. pap.* 71 : 33 (Type-loc. : Gangtok : Sikkim, India; Type deposition Zoological Survey of India, Calcutta).

The elytral pattern of four longitudinal lighter areas on a blackish back ground (humeral spots absent) plus the blackish area on clypeal margin, subdepressed dorsal surface readily distinguishes this species from its closely related species, *P. simoni* Grouvelle.

Description : General form (Fig. 249) broadly elongated, oval, subdepressed, slightly shiny, yellowish-brown with blackish spots on elytra, apical part of clypeus and antennal segments 7 to 10 blackish, body covered with long and semierect pubescence.

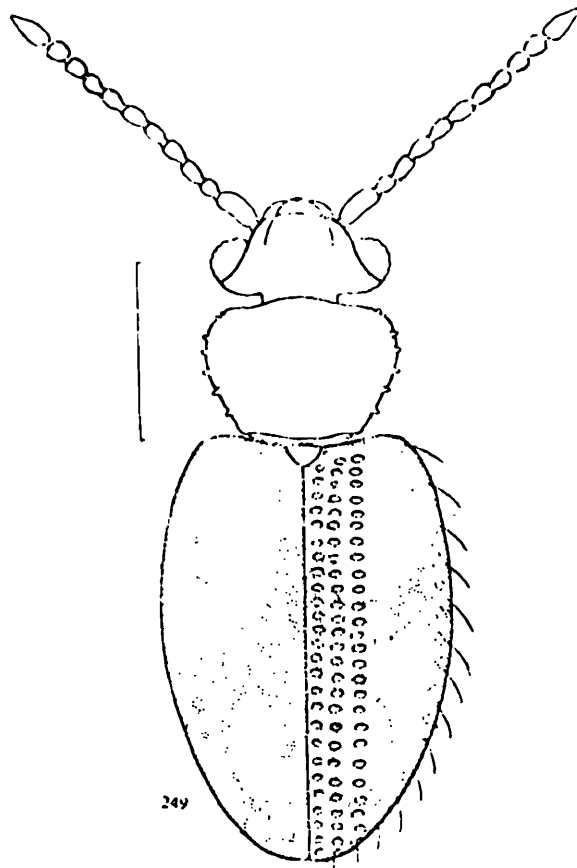


Fig. 249. *Psammoecus bambusae* Pal, Dorsal view (scale = 1.0 mm).

Head : Exposed part of head broader than long, eyes large and about half as long as head, temple moderately long and slightly flattened beneath eye, longitudinal striae on vertex moderately long and slightly prominent; puncturation on vertex coarse and dense, clypeus more or less smooth; setae projected forward. Antenna long and slender, scape moderately large and slightly more than twice as long as broad, pedicel short and slightly elongated,

segments 3-8 subequal and longer than pedicel, segments 9 and 10 slightly wider than preceding segments and elongated, segment 11 elongated and acuminate at apex; scape to segment 6 yellowish-brown, segments 7-10 blackish, segment 11 yellowish. *Prothorax* distinctly transverse and narrowed posteriorly, slightly convex, anterior margin about as wide as head across eyes and sinuate on either side of middle; lateral margin outwardly curved bearing seven distinct denticles of which third to sixth from anterior side slightly more prominent than others, all about as broad as long; anterior and posterior angles obtuse, puncturation on pronotum coarse and dense and slightly denser than that on vertex of head. *Scutellum* subtriangular, about as broad as long, punctate and pubescent. *Elytra* more than one and a half times as long as broad, ovoid and widest near middle, rows of punctures large, interstices narrower than width of punctures, setae long and projected posteriorly; two elongated yellowish areas on anterior and posterior half of blackish elytra. Aedeagus (Fig. 270) with median lobe broadly elongated and rather pointed at apex; parameres long and slender, each paramere with a few long apical setae and a few short setae on inner margin.

Measurements of holotype : Total length 3.65 mm., width of head across eyes 0.90 mm., length of antenna 1.76 mm., width of *prothorax* across middle 1.06 mm., length of elytra 2.55 mm. and width across middle 1.50 mm.

Materials examined : 11 ex. *Holotype* ♂, INDIA : SIKKIM, Gangtok, 1400 m., 4.iii.1979, S.K. Saha, under bamboo (*Bambusa aurandaceae*) sheath. Aedeagus dissected and mounted on plastic board and pinned with the holotype; *Paratypes* 10 ex., data same as holotype (Zoological Survey of India, Calcutta; Reg. No. 9467-9477/H4A).

Distribution : INDIA : Sikkim.

53. *Psammoecus gratiosus* Grouvelle

1908. *Psammoecus gratiosus* Grouvelle, *Annls Soc.ent.Fr.*, **77** : 484, (Type-loc. : Nilgiri Hills : Tamil Nadu, India; Type deposition Museum National d'Histoire Naturelle, Paris).

1985. *Psammoecus gratiosus* : Pal, *Misc.Publ.Rec.zool.Surv.India, Occ.pap.* **71** : 36.

The blackish apex of elytra distinguishes this from allied species which have an elytral pattern consisting of two medial spots and a sutural one. This species resembles *P. trilochana* Pal and the comparisons are discussed under *trilochana*.

Description : General form (Fig. 250) elongated, oval, moderately convex, slightly shiny, reddish-brown, head and prothorax slightly darker, blackish spots on elytra and antennal segments 7-10 blackish, body covered with moderately long and semierect pubescence.

Head : Exposed part of head broader than long, eyes large and about half as long as head, temple short and slightly flattened beneath eye, longitudinal striae on vertex short and slightly prominent; puncturation on vertex coarse and dense, clypeus more or less smooth; setae projected forward. Antenna long and slender, scape large and slightly more than twice as long as broad; segments 2-6 shorter, subequal and elongated; segments 7-10 slightly wider, segments 7 and 8 slightly elongated, segments 9 and 10 slightly transverse, segment 11 elongated and acuminate at apex; scape to segment 6 reddish-brown, segments 7-10 blackish and segment 11 yellowish. *Prothorax* transverse, convex, across anterior margin

about as wide as head across eyes, anterior margin rounded and slightly sinuate near either extremity, maximum width across middle and narrowed posteriorly; lateral margin rounded and with seven distinct teeth, teeth small and some of them hardly longer than broad, their apices somewhat blunt; anterior and posterior angles obtuse and bearing teeth; puncturation on pronotum coarse, dense and slightly coarser than that on vertex of head; setae on pronotal disc projected towards middle line. *Scutellum* subtriangular and about as broad as long and more or less smooth. *Elytra* more than one and a half times as long as broad, ovoid and widest near middle, rows of punctures moderately large, interstices about as wide as punctures, setae moderately long and projected posteriorly; four blackish spots present, two more or less rounded spots near middle, a sutural spot posterior to these and a transverse spot at apex.

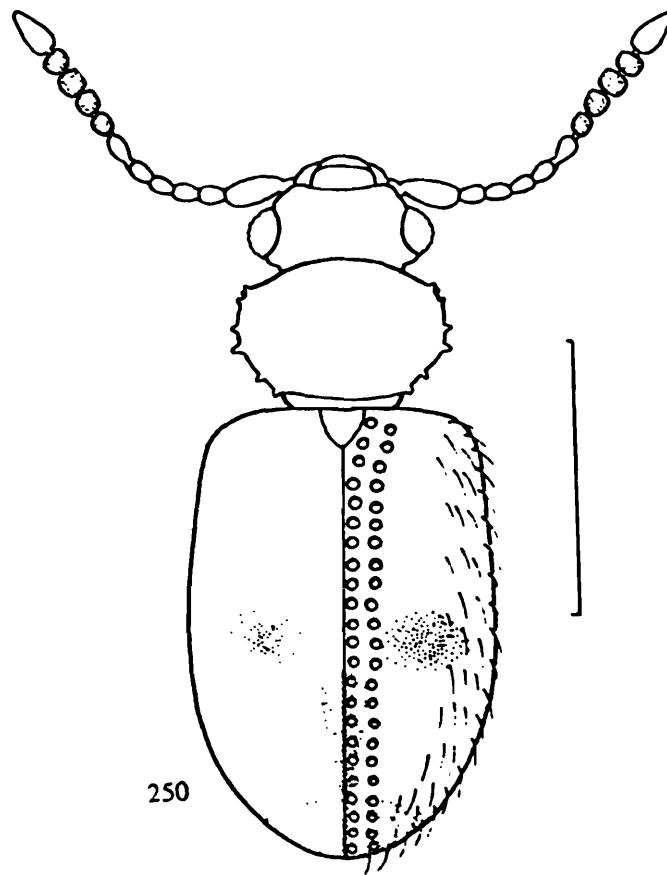


Fig. 250. *Psammoecus gratiosus* Grouvelle, Dorsal view (scale = 1.0 mm).

Measurements of 'type' : Total length 2.82 mm., width of head across eyes 0.60 mm., length of antenna 1.35 mm., width of prothorax across middle 0.64 mm., length of elytra 1.58 mm. and width across middle 1.08 mm.

Material examined : 1 ex. 'Type', INDIA : TAMIL NADU, Nilgiri Hills, Andrewes (Museum National d'Histoire Naturelle, Paris).

Distribution : INDIA : Tamil Nadu.

54. *Psammoecus nitidus* Grouvelle

1908. *Psammoecus nitidus* Grouvelle, *Annls Soc. ent. Fr.*, **77** : 479 (Type-loc : Kanara : Karanataka, India; Type deposition Museum National d'Histoire Naturelle, Paris).

1908. *Psammoecus bellus* Grouvelle, *Annls Soc. ent. Fr.*, **77** : 485.

1985. *Psammoecus nitidus* : Pal, *Misc. Publ. Rec. zool. Surv. India, Occ. pap.* **71** : 38.

The distinctly transverse prothorax with widely explanate lateral margins bearing prominent teeth distinguishes this species from the similar *trimaculatus* Motschulsky.

Description : General from (Fig.251) elongated, oval, moderately convex, slightly shiny, reddish-brown, blackish spots on elytra and apical part of antennal segment 6 and segments 7-10 blackish, pubescence scanty.

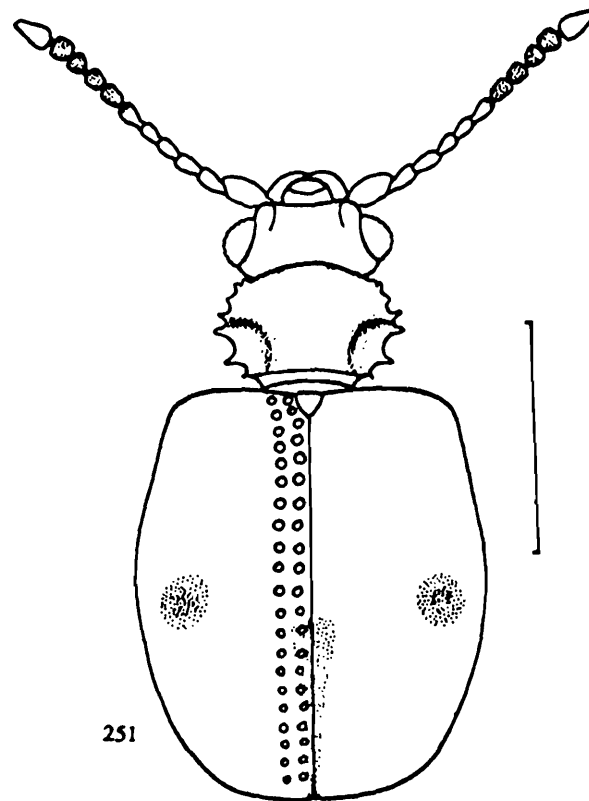


Fig. 251. *Psammoecus nitidus* Grouvelle, Dorsal view (scale = 1.0 mm).

Head : Exposed part of head broader than long, eyes large and about half as long as head, temple short and slightly flattened beneath eye, longitudinal striae on vertex short and slightly flattened beneath eye, longitudinal striae on vertex short and slightly prominent, puncturation on vertex coarse and dense, clypeus more or less smooth. Antenna long and slender, scape large and about twice as long as broad; segments 2-6 shorter, subequal and elongated; segments 7-10 slightly wider, segments 7-9 slightly elongated and segment 10 almost quadrate, segment 11 elongated and acuminate at apex, scape to segment 6 reddish-brown, segments 7-10 and apical part of segment 6 blackish, segment 11 reddish-brown. *Prothorax* transverse, convex, across anterior margin about as wide as head across eyes,

anterior margin rounded and slightly sinuate on either side of middle, maximum width at position of fifth tooth from anterior margin and then narrowed posteriorly; lateral margin rounded and with seven distinct teeth of which fourth, fifth and sixth from anterior side distinctly longer, apices of teeth somewhat blunt, longest tooth a little longer than twice its width; anterior and posterior angles obtuse and bearing teeth, puncturation on pronotum coarse and dense and slightly coarser than that on vertex of head. *Scutellum* subtriangular, about as long as broad and more or less smooth. *Elytra* about one and a half times as long as broad, ovoid and widest near middle, rows of punctures moderately large, interstices about as wide as punctures, one more or less rounded spot on each elytron near middle and a longitudinal sutural spot slightly posterior to above spots present.

Measurements of 'type' : Total length 2.67 mm., width of head across eyes 0.67 mm., length of antenna 1.48 mm., width of prothorax across middle 0.79 mm., length of elytra 1.64 mm. and width across middle 1.13 mm.

Materials examined : 2 ex. 'Type' of *Psammoecus nitidus* Grouvelle : 1 ex., INDIA : KARNATAKA ('Kanara' written on the label); 'Type' of *Psammoecus bellus* Grouvelle : 1 ex., INDIA : TAMIL NADU, Madura, 'Chambagnor' (Museum National d'Histoire Naturelle, Paris).

Distribution : INDIA : Karnataka, Tamil Nadu.

Remarks : Pal (1985) has synonymised *P. bellus* with *P. nitidus* on the basis of comparison of the 'types' of both the species.

55. *Psammoecus impressicollis* Grouvelle

1908. *Psammoecus impressicollis* Grouvelle, *Annls Soc.ent.Fr.*, **77** : 480 (Type-loc. : Nilgiri Hills : Tamil Nadu, India; Type deposition - Museum National d'Histoire Naturelle, Paris).

1985. *Psammoecus impressicollis* : Pal, *Misc.Publ.Rec.zool.Surv.India, Occ.pap.* **71** : 40.

This species is closely related to *P. trimaculatus* Motschulsky but can be separated because it lacks a longitudinal sutural spot on elytra and has a more transverse pronotum with a distinct depression near the posterior margin.

Description : General form elongated, oval, moderately convex, slightly shiny, reddish-brown, blackish spots on elytra and antennal segments 7-10 blackish, body covered with moderately long and semierect pubescence (this species is not figured here).

Head : Exposed part of head broader than long, eyes large and slightly shorter than half of length of head, temple short and slightly flattened beneath eye, longitudinal striae on vertex long and well-marked (as in *trimaculatus*), puncturation on vertex coarse and dense, clypeus more or less smooth, setae projected forward. Antenna long and slender, scape large and about twice as long as broad; segments 2-5 shorter, subequal and elongated; segments 6-10 slightly wider, segment 6 slightly elongated, segment 7 about as broad as long, segments 8-10 more or less transverse; segment 11 elongated and acuminate at apex, scape to segment 6 reddish-brown, segments 7-10 and apical part of segment 6 blackish, segment 11 reddish-brown. *Pronotum* transverse, convex, across anterior margin about as wide as head across eyes, anterior margin rounded, maximum width at position of fourth tooth from anterior end and then narrowed posteriorly; lateral margin more or less rounded and with

six distinct teeth, third, fourth and fifth from anterior margin distinctly longer than others and their apices somewhat blunt, longest tooth longer than twice as long as wide; anterior and posterior angles obtuse, transverse depression on pronotum in front of base well-marked, setae on pronotal disc projected towards middle line. *Scutellum* subtriangular, about as broad as long and more or less smooth. *Elytra* shorter than one and a half times as long as as broad, ovoid and widest near middle, rows of punctures moderately large, interstices wider than punctures, setae moderately long and projected posteriorly, more or less rounded spot on each elytron near middle.

Measurements of 'type' : Total length 2.39 mm., width of head across eyes 0.74 mm., length of antenna 1.45 mm., width of prothorax across middle 0.90 mm., length of elytra 1.89 mm. and width across middle 1.33 mm.

Material examined : 1 ex. 'Type' INDIA : TAMIL NADU, Nilgiri Hills, (Museum National d'Histoire Naturelle, Paris).

Distribution : INDIA : Tamil Nadu.

56. *Psammoecus trimaculatus* Motschulsky

1858. *Psammoecus trimaculatus* Motschulsky, *Etud.Ent.*, **7** : 45 (Type-loc : Mt. Nura Ellia, Sri Lanka; Type deposition Zoological Museum, Moscow Lomonosov State University).

1859. ? *Cucujus incommodus* Walker, *Ann.Mag.Nat.Hist.* (3) **3** : 53.

1876. *Psammoecus trimaculatus* : Waterhouse, *Entomologist's mon.Mag.*, **13** : 124.

1876. *Telephanus cruciger* Waterhouse, *Entomologist's mon.Mag.*, **13** : 125.

1879. *Psammoecus trimaculatus* : Reitter, *Verh.zool. bot.Ges. Wien*, **29** : 509.

1906. *Psammoecus trimaculatus* : Grouvelle, *Annls Soc.ent.Fr.*, **75** : 125.

1908. *Psammoecus trimaculatus* : Grouvelle, *Annls Soc.ent.Fr.*, **77** : 476.

1979. *Psammoecus trimaculatus* : Pal and Sengupta, *Entomologica Basiliensia*, **4** : 75.

1985. *Psammoecus trimaculatus* : Pal, *Misc.Publ.Rec.zool.Surv.India, Occ.pap.* **71** : 41.

This species shows similarity with *P. nitidus* Grouvelle but can be distinguished by its convex pronotum not explanate on lateral sides and shorter prothoracic teeth. This species is closely related to *P. impressicollis* Grouvelle and the comparisons are discussed under *impressicollis*.

Description : General form (Fig.252) elongated, oval, moderately convex, slightly shiny, yellowish-brown to reddish-brown, three spots on elytra and antennal segments 7-10 blackish, body covered with moderately long and semierect pubescence.

Head : Exposed part of head broader than long, eyes large, eye slightly shorter than half of length of head, temple short and slightly flattened beneath eye, longitudinal striae on vertex moderately long and slightly prominent; puncturation on vertex coarse and dense, clypeus more or less smooth; setae projected forward. Antenna long and slender, scape moderately large and shorter than twice as long as broad; segments 2-6 shorter than scape, subequal and elongate; segments 7-11 slightly wider than segment 6, segment 7 slightly elongated; segment 8 about as broad as long, segments 9 and 10 slightly transverse, segment 11 elongated and acuminate at apex. *Prothorax* transverse, convex, across anterior margin narrower than head across eyes, anterior margin feebly rounded with two minute denticles on either extremity; lateral margin outwardly curved and with six or seven teeth of variable

length, longest teeth in posterior half, slightly longer than broad and somewhat blunt at apex; anterior and posterior angles obtuse, puncturation on pronotum coarse and dense and slightly coarser than that on vertex of head, setae on pronotal disc projected forward and on lateral sides projected outwardly. *Scutellum* subtriangular, transverse and more or less smooth. *Elytra* shorter than one and a half times as long as broad, ovoid and widest near middle, rows of punctures moderately large and rounded, interstices usually slightly wider than each puncture and sometimes about as wide as each puncture, setae moderately long and projected posteriorly, a more or less rounded blackish spot present on each elytron in posterior half and longitudinal sutural spot posterior to them, rounded spots sometimes connected with sutural spot by extensions. Aedeagus (Fig.266) with median lobe long, gradually narrowed and pointed at apex; parameres long and slender, each paramere with a long apical seta, and a few short setae along inner margin, a few short and rather dense setae also present at its broad base.

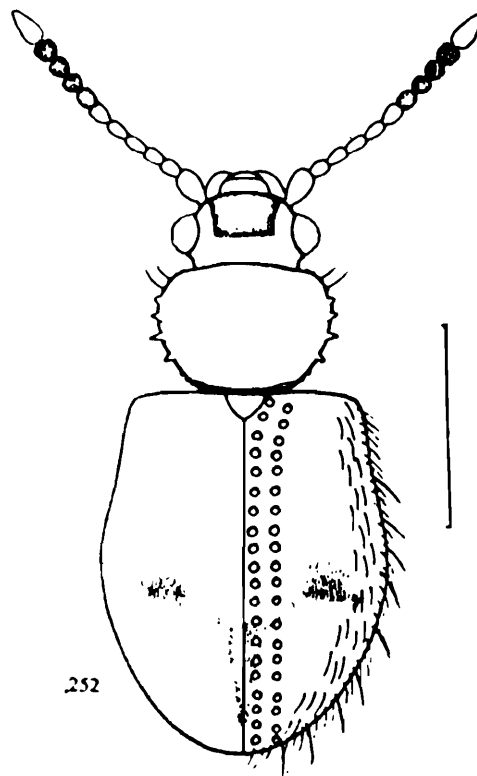


Fig. 252. *Psammoecus trimaculatus* Motschulsky, Dorsal view (scale = 1.0 mm).

Measurements : Total length 2.23 - 2.94 mm., width of head across eyes 0.64 - 0.73 mm., length of antenna 1.38 - 1.44 mm., width of prothorax across middle 0.64 - 0.79 mm., length of elytra 1.47 - 1.88 mm. and width across middle 1.00 - 1.32 mm.

Materials examined : 95 ex. 'Types' 5 ex. (of which 1 ex. only is intact) mounted on single rectangular board, SRI LANKA ('Ceylon' written on the label) : Mt. Nura Ellia (Zoological Museum, Moscow Lomonosov State University), INDIA : ARUNACHAL PRADESH, Namdapha Survey 1981, Chiri Camp, 1 ex., 25.iv.1981, S. Biswas; ASSAM,

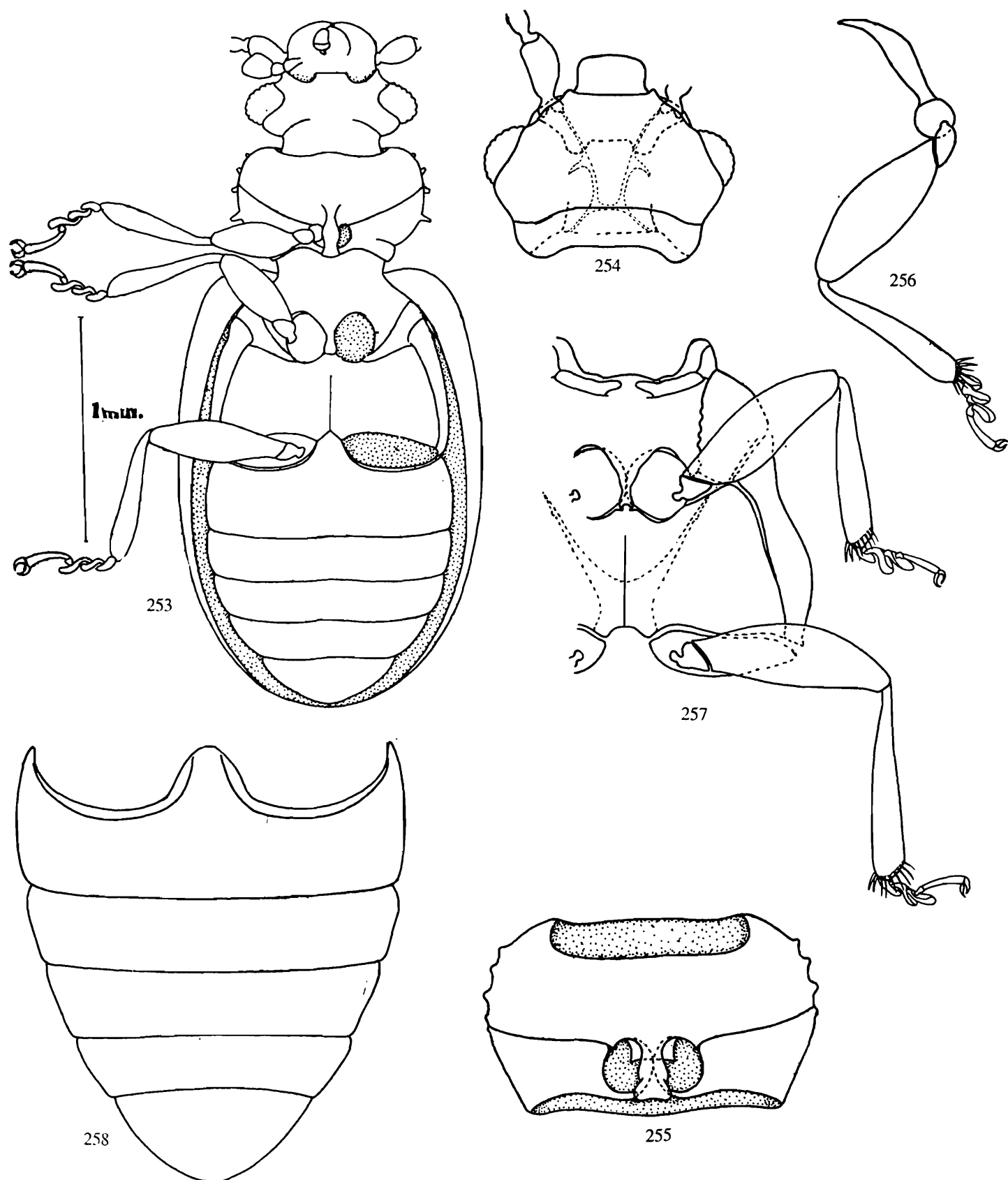


Fig. 253-258. *Psammoecus trimaculatus* Motschulsky : 253, Ventral view; 254, Head, Dorsal view; 255, Prothorax, Ventral view; 256, Front leg; 257, Meso-metathorax, Ventral view; 258, Abdomen, Ventral view.

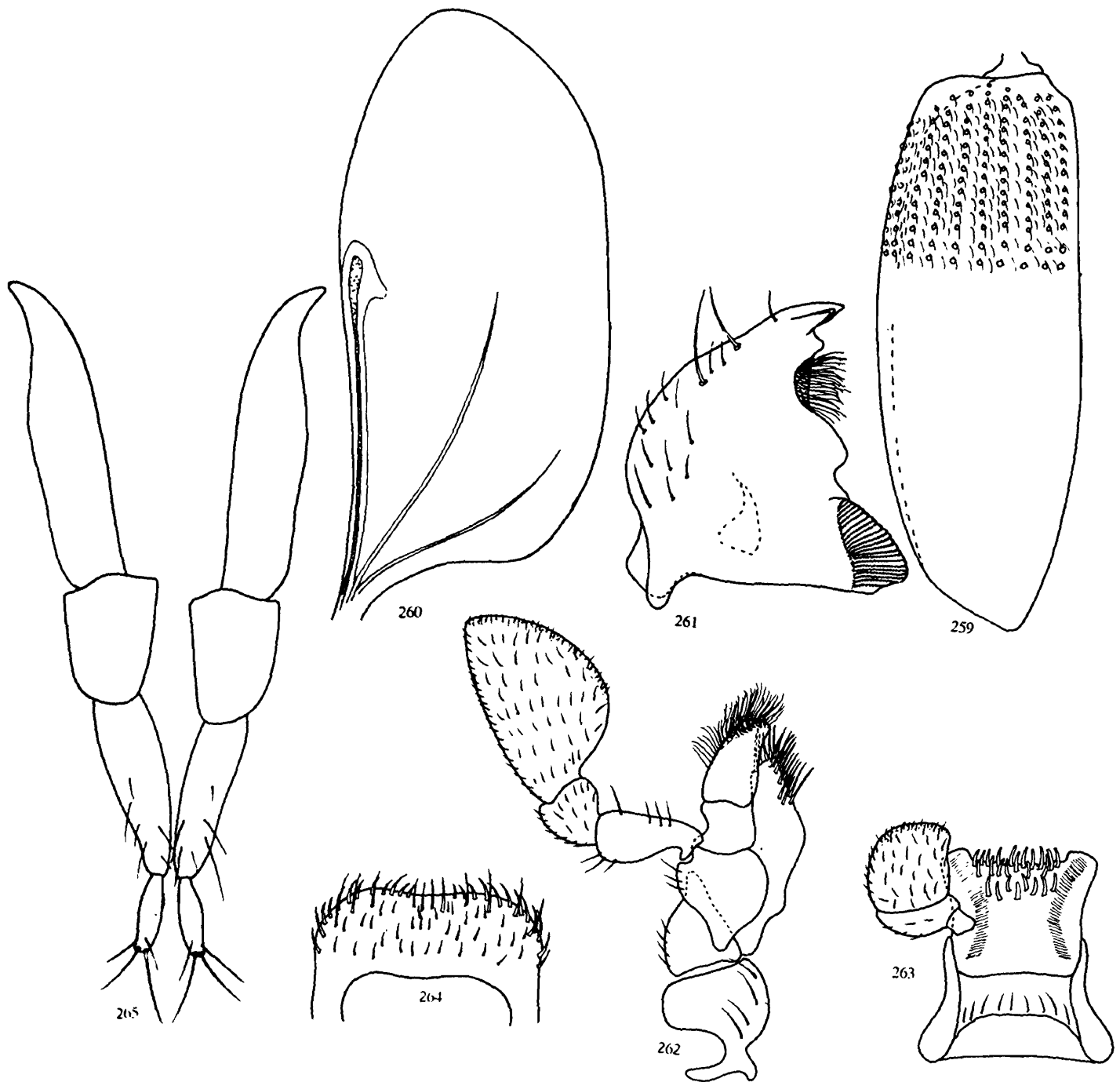
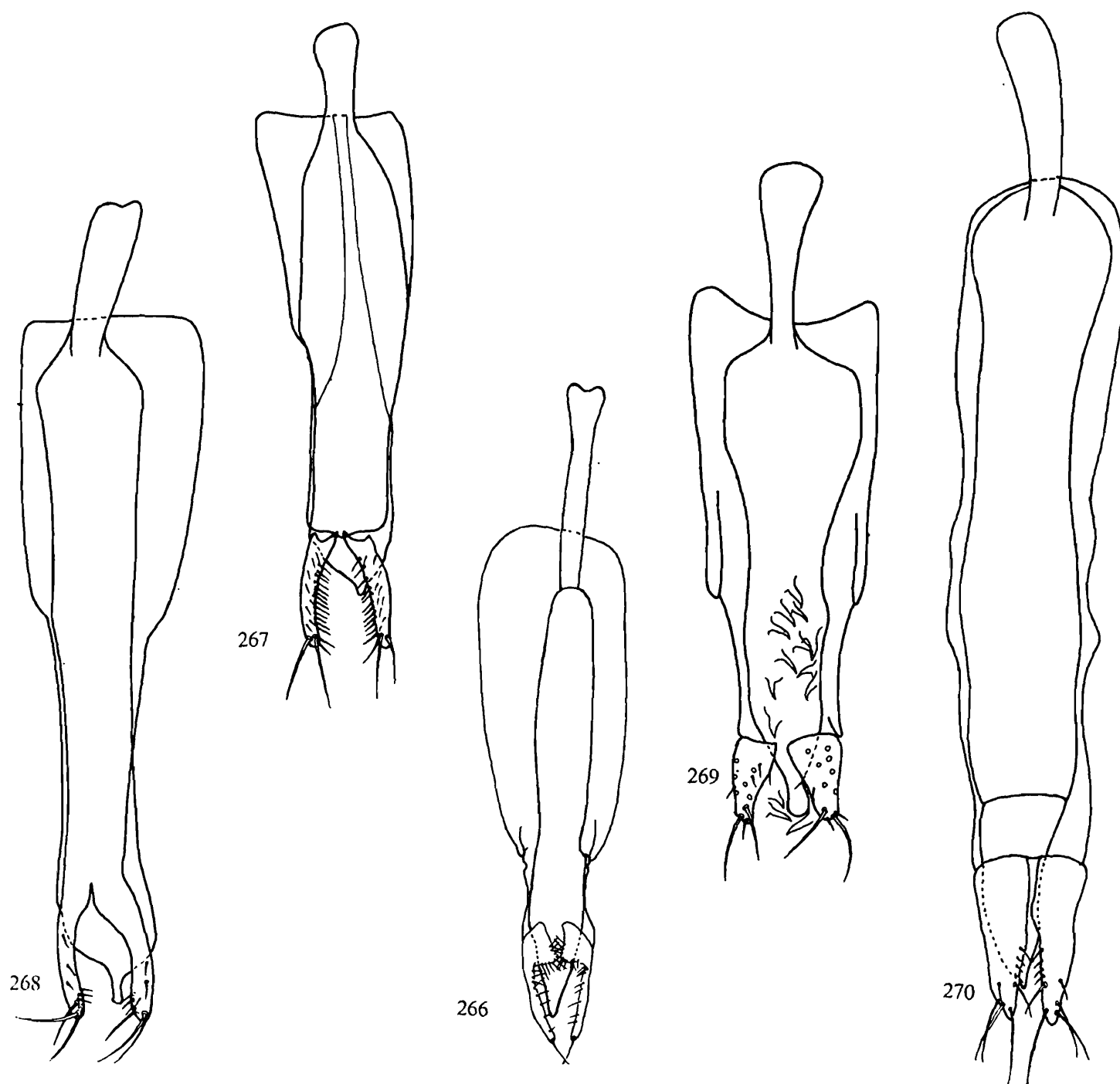


Fig. 259-265. *Psammoecus trimaculatus* Motschulsky : 259, Left elytron, Dorsal view; 260, Wing; 261, Right mandible, Ventral view; 262, Maxilla; 263, Labium, Ventral view; 264, Labrum; 265, Ovipositor.



Figs. 266-270. Aedeagi, Dorsal view : 266, *Psammoecus trimaculatus* Motschulsky; 267, *P. trilocchana* Pal; 268, *P. lepidus* Grouvelle; 269, *P. harmandi* Grouvelle; 270, *P. bambusae* Pal.

Kaziranga, 1 ex., 14.xi.1974, T. Sengupta, garbage with hays; **Phulbari**, 1 ex., 24.xi.1974, T. Sengupta, leaf garbage; **MEGHALAYA**, Tura, 2 ex., 23.xi.1974, T. Sengupta, under dry cut grass; **Shillong**, 1 ex., 29.xi.1974, T. Sengupta, leaf garbage; 1 ex., 27.iv.1971, T. Sengupta, haystack; **WEST BENGAL**: Howrah district, Sankrail, 2 ex., 14.ii.1976, T. K. Pal, haystack; **Sarda**, 1 ex., H. G. Champion; **BIHAR**, Chaibasa, 2 ex., 8.i.1971, T. Sengupta, under dead grass; 1 ex., 19.x.1976, T. Sengupta, haystack; **ORISSA**, Daitari district, Jajpur-Keonjhar, 1 ex., 27.xi.1967, beaten material; **Bhubaneswar town**, 1 ex., 11.xi.1967, Gy. Topal, singled material; **UTTAR PRADESH**, Anandnagar, 25 km. from Lachmipur, 3 ex., 9.x.1976, T. Sengupta, haystack; **Natanwa**, 24 km. from Lachmipur, 1 ex., 11.x.1976, T. Sengupta, by beating bush; **Kosi**, 4 ex., 18.x.1976, T. Sengupta, haystack; **Pantnagar**, 2 ex., 21.iii.1971, T. Sengupta, haystack; **JAMMU & KASHMIR**, Jammu, 1 ex., 25.v.1972, T. Sengupta, haystack; **DELHI**, 4 ex., 12.v.1972, T. Sengupta, hays of Jower; **KARNATAKA**, North Coorg, Fraserpet, 1 ex., xii. 30, N. C. Chatterjee; **Bangalore**, 50 ex., 10.xii.1971, T. Sengupta, under stack of hay of Rai Crop (Mustard); **TAMIL NADU**, **Madras**, 1 ex., 29.xi.1971, T. Sengupta, leaf garbage; **Coimbatore**, 440 m., 2 ex., 22.xi.1972, Besuchet Löbl Mussard; **Trichinopoly**, 1 ex.; **KERALA**, Cardamom Hill, Vallara Fall, 950 m., 1 ex., 4.xi.1972; **BHUTAN**, Chimakothi, 1900-2300 m., 1 ex., Nat. Hist. Museum Basel-Bhutan expedition 1972; **Changra**, 18 km., S. Tongsa, 1900 m., 1 ex., Nat. Hist. Museum Basel-Bhutan Expedition, 1972; **Kamjee**, 850 m., 1 ex., Nat. Hist. Museum Basel Bhutan Expedition 1972; **NEPAL**: **Kathmandu**, 1371 m., 7 ex., 28.iii.1972; **Daman**, 2316 m., 1 ex., 29.iii.1972, T. Sengupta, dead grass.

Distribution : **INDIA** : Arunachal Pradesh, Assam, Meghalaya, West Bengal, Bihar, Orissa, Uttar Pradesh, Jammu & Kashmir, Delhi, Karnataka, Tamil Nadu, Kerala; **NEPAL**; **BHUTAN**; **SRI LANKA**; **BURMA**; **MALAYSIA**; **JAPAN**; **MADAGASCAR**.

Genus 12. *Indophanus* Pal

1981. *Indophanus* Pal, *Oriental Ins.*, 15 (3) : 259.

Type-species : *Indophanus dakshinus* Pal.

Historical review : Pal (1981) described the monotypic genus, *Indophanus* and compared it with the related genera.

Habit-habitat : The only described species, *dakshinus* is recorded from the littered soil in the forest floor.

Geographical distribution : Till now this genus is recorded only from the South India.

Description : General form (Fig. 271) elongated, moderately convex, slightly ovoid, lateral margins of prothorax and elytra spinose, yellowish-brown with blackish spots on pronotum and elytra.

Head : about as broad as long, fronto-clypeal suture distinct, front margin of clypeus slightly rounded; eyes moderately large and coarsely faceted, temple extended beneath eye, constriction behind temple distinct; transverse impressed line on vertex behind eyes present, no striae or longitudinal impressed lines on vertex between eyes. Antenna long and slender, 11-segmented, antennal insertions somewhat dorso-lateral, scape markedly long, broad at base and narrower towards apex; pedicel and segment 3 short, narrower than scape

and subequal, segment 4 markedly long and about twice as long as segments 2 and 3 combined, segments 5-11 shorter and subequal, segment 11 somewhat acuminate at apex. Maxillary palpi with segment 2 longer than segment 3, apical segment longest and securiform. Labial palpi with segment 2 short and broad, apical segment longer than segment 2 and securiform.

Prothorax transverse, with long spines on lateral sides, front coxae contiguous, coxal cavities almost rounded and closed behind externally; prosternal process broad at apex, sterno-pleural suture extending to lateral margin.

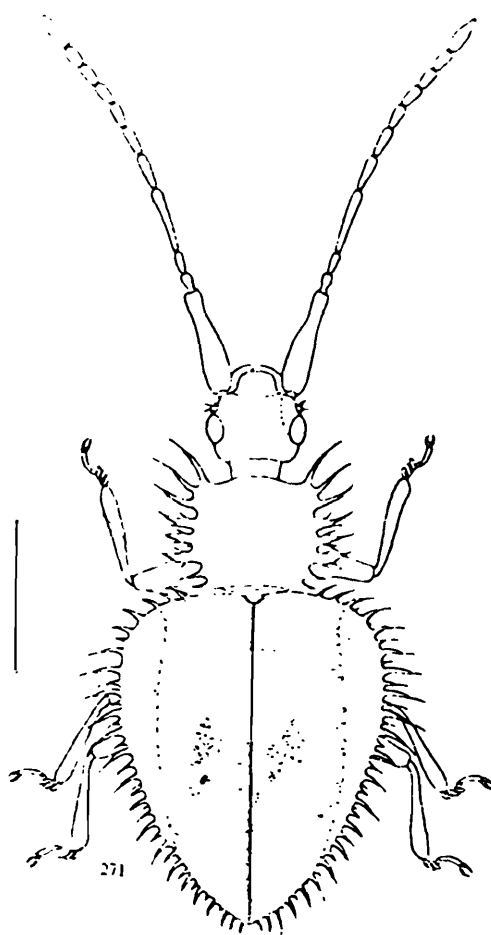


Fig. 271. *Indophanus dakshinus* Pal, Dorsal view showing colour pattern (scale = 1.0 mm).

Meso-metathorax (Fig 273) : Mesocoxae contiguous, cavities opened outwardly; lateral margins of mesosternal process slightly constricted near posterior end, sternal fitting between mesocoxae with a single knob, metasternum transverse, median impressed line indistinct; hind-coxae widely separated.

Elytra ovoid, sides spinose, markedly explanate laterally, each elytron with 8 rows of striae punctures, without scutellary striae; due to explanated sides epipleura appear broad and extended up to apex. Wings absent.

Legs moderately long and slender, trochanters short and simple, femora slightly swollen towards middle, hind-femora longer than front and middle-femora; tibiae not broadened

at apex; tarsal formula 5-5-5, tarsal segments 1-3 elongated and lobed below, segment 4 shortest, claws simple.

Abdomen about as broad as long; ventrite 1 longest; intercoxal process broad and its apical margin broadly pointed, femoral lines indistinct, ventrites 2-5 subequal.

Larva known : No larva has yet been described.

Sexual dimorphism : Only the female is hitherto known.

Remarks : *Indophanus* exhibits resemblances with *Psammoecus* Latreille and *Telephanus* Erichson. The chief differences of *Indophanus* from *Psammoecus* and *Telephanus* are given below :

PSAMMOECUS	TELEPHANUS	INDOPHANUS
1. General form broadly elongated	General form rather narrowly elongated and usually subparallel	General form elongate-ovoid
2. Antenna somewhat moniliform, scape moderately long and widest near apex, segment 4 normal	Antenna filiform, scape longer and subparallel, segment 4 normal	Antenna filiform, scape moderately long and narrowed at apex, segment 4 markedly long
3. Prothorax usually transverse	Prothorax more or less elongated	Prothorax transverse
4. Lateral margin of prothorax usually finely denticulate or rarely with a few moderately long spines	Lateral margin of prothorax smooth or finely denticulate	Lateral margin of prothorax armed with long spines
5. Sides of elytra rarely explanate, epipleura moderately developed, lateral margin usually smooth	Sides of elytra not explanate, epipleura moderately developed, lateral margin usually smooth	Sides of elytra markedly explanate, epipleura markedly developed, lateral margin distinctly spinose
6. Longitudinal striae on vertex between eyes distinct	Longitudinal striae on vertex between eyes absent	Longitudinal striae on vertex between eyes indistinct
7. Metasternum normal	Metasternum normal	Metasternum markedly short
8. Wing with single anal vein and no trace of R-m cross vein	Wing with five anal veins and trace of R-m cross vein	Species apterous
9. Predominant in the Oriental region, rather rare in Africa and some Palearctic countries	Predominant in the Neotropical and Nearctic regions, except <i>pictus</i> Waterhouse (Borneo) and <i>spinosus</i> Grouvelle (Madagascar).	South India.

57. *Indophanus dakshinus* Pal

1981. *Indophanus dakshinus* Pal, *Oriental Ins.*, **15** (3) : 260. (Type-loc. : Silent valley : Kerala, India; Type-deposition Zoological Survey of India, Calcutta).

Description : General form as figured (Fig. 271); dorsal surface moderately shiny, yellowish-brown with blackish markings on pronotum and elytra, pubescent.

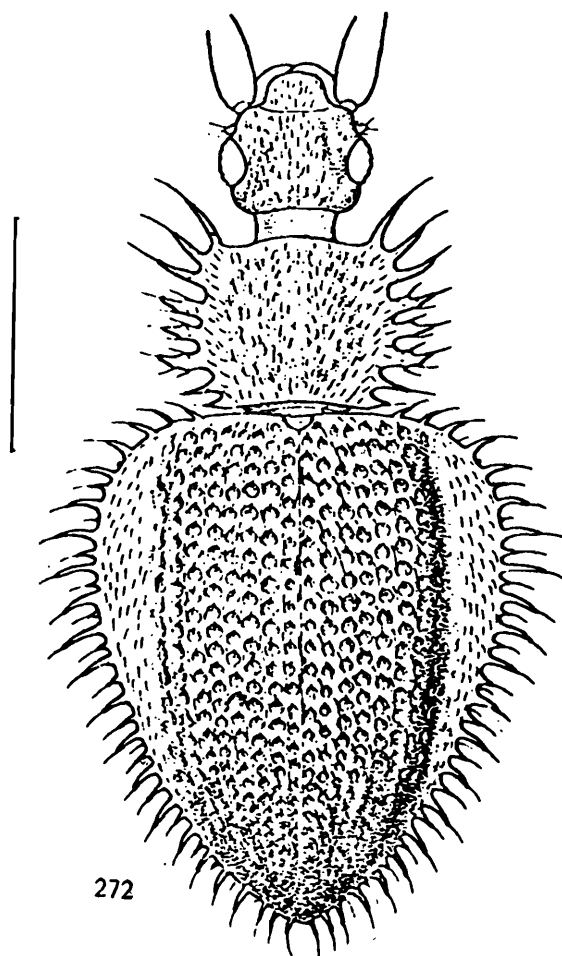


Fig. 272. *Indophanus dakshinus* Pal. Dorsal view showing surface configuration (scale = 1.0 mm).

Head : Exposed part of head broader than long, eyes moderately large and about one-third as long as head, temple slightly shorter than eye and flattened beneath eye; lateral longitudinal depressions on vertex, puncturation on vertex coarse and dense and that of clypeus slightly finer, pubescence fine. Antenna long, slender, unicolorous; scape markedly large, broad at base and narrowed towards apex; segments 2-11 shorter and narrower than scape, segments 2 and 3 short and subequal, segment 4 long and about twice as long as segments 2 and 3 combined, segment 5 about half as long as segment 4; segments 6-10 slightly shorter than segment 5 or subequal, segment 11 acuminate at apex; on ventral side a setose prominence between eye and antennal base. *Prothorax* transverse, convex, with lateral and prebasal depressions, front margin rounded, excluding lateral spines slightly wider than head across eyes, narrowed posteriorly; lateral margin with 8 long spines, spines shorter towards posterior side, posterior angles obtuse; puncturation on pronotum coarse, dense and slightly coarser than that on vertex, pubescence fine. *Scutellum* somewhat

pentagonal, transverse and impunctate. *Elytra* excluding lateral spines slightly longer than **broad**, ovoid, widest on anterior half and narrowed posteriorly, punctures in rows large and **rounded**, interstices distinctly narrower than width of punctures, setae moderately long and **projected** posteriorly. sides explanate like flanks, lateral margin with moderately long **spines**; excluding explanate portion, surface of elytra blackish except a rounded median portion and two posterior longitudinal portions; legs yellowish.

Measurements of holotype : Total length 4.23 mm., width of head across eyes 0.75 mm., length of antenna 3.50 mm., width of prothorax (excluding spines) 0.82 mm., length of elytra 2.47 mm. and width (excluding spines) 1.88 mm.

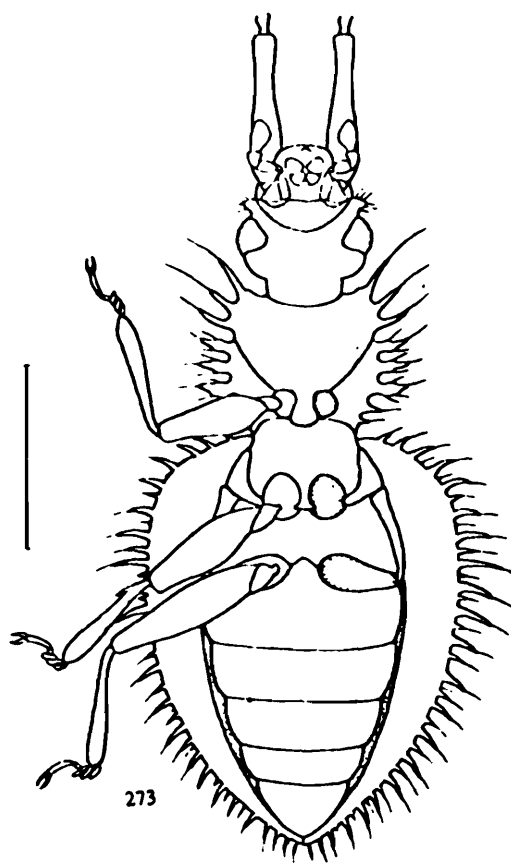


Fig. 273. *Indophanus dakshinus* Pal, Ventral view (scale = 1.0 mm).

Material examined : *Holotype* ♀, INDIA : KERALA, Silent valley Expedition 1980, 26.i.1980, S. K. Bhattacharyya and party, littered soil (Zoological Survey of India, Calcutta; Reg. No.9181/H4A).

Distribution : INDIA : Kerala.

Subfamily III CRYPTAMORPHINAE

Genus 13 *Cryptamorpha* Wollaston

1854. *Cryptamorpha* Wollaston, *Insecta Maderensia* : 156.

1859. *Pseudophanus* Leconte, *Proc. Acad. Philadelphia* : 84.

1867. *Parabrantes* Redtenbacher, *Reise Novara Zool.*, **2** : 40.
 1879. *Cryptamorphia* : Reitter, *Verh. zool. bot. Ges. Wien*, **29** : 80.
 1884. *Cryptamorphia* : Casey, *Trans. Am. ent. Soc.*, **11** : 104.
 1899. *Cryptamorphia* : Ganglbauer, *Die Käfer von Mitteleuropa*, **3** : 589.
 1908. *Cryptamorphia* : Grouvelle, *Annls Soc. ent. Fr.*, **77** : 474.
 1930. *Cryptamorphia* : Hetschko, *Coleopt. Cat.*, **109** : 88.

Type-species : *Cryptamorphia musae* Wollaston [= *desjardinsi* (Guérin Méneville)].

Historical review : *Cryptamorphia*, a fairly large genus was established by Wollaston (1854) for the species, *Cryptamorphia musae* Wollaston and placed it between the genera, *Psammoecus* Latreille and *Dendrophagus* Schönherr. Wollaston (*loc. cit.*) and Casey (1884) described its tarsal formula, 5-5-4 in male and 5-5-5 in female, but the genus possesses 5-5-5 tarsal formula in both sexes. Casey (*loc. cit.*) erected a separate tribe Cryptamorphini under Telephaninae : Cucujidae, but Reitter (1885-86) placed *Cryptamorphia* under Psammoecini : Cucujidae. Ganglbauer (1899) noted *Cryptamorphia* under the tribe Psammoecini of Silvaninae : Cucujidae, but considered a separate status for this genus on the basis of Casey's justification. Grouvelle (1908) synonymised *Pseudophanus* Leconte and *Parabrantes* Redtenbacher with *Cryptamorphia*. Hetschko (1930) in Junk's 'Coleopterorum Catalogus' considered *Cryptamorphia* under the monogeneric tribe Cryptamorphini of Silvaninae : Cucujidae, listed 24 species under this genus of which, *C. sculptifrons* Reitter and *C. infans* Grouvelle are recorded from India. Pal and Sengupta (1979) described 2 species, viz., *C. kaszabi* from Assam and Darjeeling district of West Bengal, and *C. bhutanensis* from Bhutan. Pal, Sengupta and Crownson (1984) considered *Cryptamorphia* under Cryptamorphinae : Silvanidae. Hitherto the larva of this genus is undescribed.

Habit-habitat : Wollaston (1854) described *C. musae* infesting banana (*Musa* sp.) stems in Madeiran Archipelago but the habitat records of other species are not available from the subsequent literature. Recently, Pal and Sengupta (*loc. cit.*) recorded *C. kaszabi* from bush and grasses. In India the representatives of *Cryptamorphia* have been collected from haystack, flower, spiny flowering bush, grass, under bark of fallen tree etc. (details under *Materials examined*).

Geographical distribution : This genus predominates in the Australian region, occurs in South America, India and adjacent Palaearctic countries. In India *Cryptamorphia* is recorded from North-East Himalayas and higher altitude in Southern India. All the Indian species of *Cryptamorphia* except *C. infans*, have northern distribution patterns. *C. sculptifrons* possesses a wide distribution and is recorded from Darjeeling, Sikkim, Bhutan, China and Japan. The remaining species represent restricted and localised distributions.

Description : General form (Fig. 274) elongated, moderately depressed, indistinguishable antennal club, usually yellowish to reddish-brown, sometimes blackish spots on elytra and a few segments of antenna blackish, pubescent body.

Head (Fig. 283) slightly transverse, fronto-clypeal suture distinct, front margin of clypeus slightly rounded, eyes usually large and coarsely faceted, temple slightly flattened beneath eye, transverse impressed line on vertex behind eyes absent, two longitudinal grooves present on lateral sides and often united posteriorly, additional longitudinal impressed lines originating from lateral grooves and extending posteriorly to outer margin,

anterior part of gular region with a transverse groove; tentorium simple, with two long **tentorial arms** connected by a transverse corpo-tentorium near middle. Antenna moderately long and slender, antennal insertions partly hidden under projection of frons, 11-segmented, **scape** moderately large and broadly elongated, segments 2-11 shorter and subequal, **segment 11** somewhat pointed at apex. Mandible elongated, right mandible (Fig. 291) with 3 and left mandible (Fig. 290) with 2 apical teeth, mola well-developed, a large basal mandibular cavity present. Maxilla (Fig. 292) with lacinia narrow, elongated and without apical spines; galea short, broad and its apex densely hairy; palpi with segments 2 and 3 almost equal, apical segment longest and fusiform. Labium (Fig. 293) with mentum somewhat triangular and its length and breadth almost equal; palpi with segment 2 large and somewhat rounded, apical segment narrower than segment 2 and fusiform. Labrum (Fig. 294) transverse and its apical margin rounded.

Prothorax (Fig. 284) elongated to transverse, front coxae contiguous, coxal cavities slightly elongated, cavities closed behind externally and opened internally, prosternal process broad at apex and its apical margin sinuate, sterno-pleural suture extending to lateral margin.

Meso-metathorax (Fig. 286) : Mesocoxae contiguous, cavities broadly opened outwardly, lateral margin of mesosternal process notched behind middle, sternal fitting between mesocoxae in a slight curved line. Metasternum slightly transverse, median impressed line absent, metendosternite represented by two appophyses and anterior tendons moderately closely situated.

Wing and Elytra : Wing (Fig. 289) with 5 anal veins; without radial cell, anal cell and subcubital fleck. Elytra somewhat parallel-sided, each elytron (Fig. 288) with ten rows of stria punctures, with scutellary striae, interstices pubescent, epipleura slightly developed and extending upto posterior one-third.

Legs (Fig. 285) long and slender, trochanters short and simple, femora swollen towards middle, tibiae not broadened at apex and with two apical spurs; tarsal formula 5-5-5 in both sexes, tarsal segment 1 long and slightly lobed below, segment 2 longer than segment 1, segment 3 bilobed, segment 4 shortest, claws simple.

Abdomen (Fig. 287) elongated, ventrite 1 longest, intercoxal process narrow and its apical margin slightly rounded, femoral lines almost a marginal striae of hind-coxae; ventrites 2 to 5 subequal. Aedeagus (Fig. 296) with median lobe broad, median strut elongated and spatulate at apex; parameres slender, elongated and with few setae near apex. Ovipositor (Fig. 295) with well-developed paraprocts, valvifers, coxites, and long styli attached on outer margin of apex of coxites.

Larva known : *Cryptamorpha brevicornis* (White), by present description.

Sexual dimorphism : In some species hind-trochanters of male bears a spinous projection (*nepalensis* and *bhutanensis*), in *abnormis* middle-trochanters of male with a spine. In other species no distinct secondary sexual characters were observed.

Key to the Species of *Cryptamorpha* Wollaston

1. Longitudinal grooves of head not unite on posterior side but converge

- towards middle line, eyes small and projecting
 *infans* Grouvelle p. 199
- Longitudinal grooves of head unite on posterior side of vertex and forming an U-shaped structure, eyes large and not projecting 2
2. Prothorax distinctly transverse and pronotal disc with a distinct median longitudinal depression; lateral margin of elytra distinctly wavy; middle tibia explanate like a flank and its posterior margin toothed, middle trochanter with a spine in male (Fig. 276); apex of ventrite 5 notched at middle (Fig. 277); antennal segments 9-11 slightly narrower than segments 4-8 *abnormis* sp. nov. p. 200
- Prothorax elongated or slightly transverse and uniformly convex; lateral margin of elytra not distinctly wavy; tibiae not flanked, middle trochanter devoid of spine in male; apex of ventrite 5 uniformly rounded; antennal segments 9-11 usually slightly wider than segments 4-8 3
3. Lateral margins of prothorax widest across middle, uniformly curved and not sinuate near posterior angles (Fig. 278); species uniformly deep reddish-brown *sculptifrons* Reitter p. 202
- Lateral margins of prothorax widest near anterior margin, slightly wavy and sinuate near posterior angles; species yellowish and usually with black markings on elytra (Figs. 279-281) 4
4. Punctuation of head inconspicuous and sparse; elytral interstices distinctly narrower than width of each puncture; hind-trochanter of male devoid of spine *kaszabi* Pal and Sengupta p. 204
- Punctuation of head prominent, moderately coarse and dense; width of elytral interstices equal or slightly wider than width of punctures; hind trochanter of male with a spine 5
5. Prothorax elongated (1.12 : 1.00); antenna comparatively shorter and ratio of lengths of body and antenna 2.09 : 1.00; median lobe of aedeagus bifid at apex (Fig. 299); elytral interstices about as wide as width of punctures *nepalensis* sp. nov. p. 205
- Prothorax slightly transverse (0.97 : 1.00); antenna longer and ratio of lengths of body and antenna 1.72 : 1.00; median lobe of aedeagus not bifid at apex (Fig. 3.00); elytral interstices slightly wider than width of punctures *bhutanensis* Pal and Sengupta p. 207

58. *Cryptamorpha infans* Grouvelle

1908. *Cryptamorpha infans* Grouvelle, *Annls Soc. ent. Fr.*, **77**: 474 (Type-loc. Shembaganur, Madura : Tamil Nadu, India; Type deposition-British Museum Nat.Hist., London).

This is a distinct species, easily separated from other Indian species of *Cryptamorpha* by its longitudinal grooves on vertex of head converge posteriorly but not united, eyes projecting and punctulation on vertex and pronotum coarse and dense.

Description : General form (Fig. 274) elongated, moderately depressed; yellowish to reddish-brown with head, prothorax and apical three segments of antenna more blackish; covered with long, moderately dense and semierect golden pubescence.

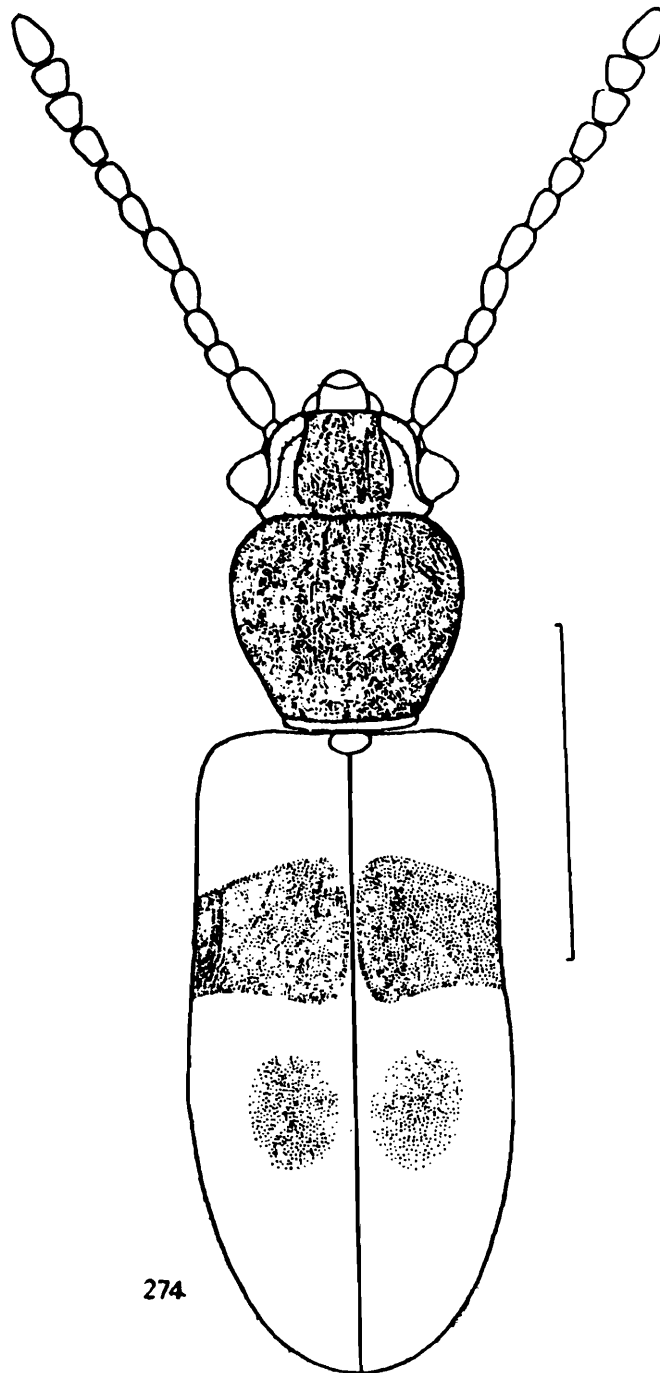


Fig. 274. *Cryptamorpha infans* Grouvelle. Dorsal view (scale = 1.0 mm),

Head : Exposed part of head broader than long; eyes moderately large, prominent and projected, length of eye about one-third of length of head; longitudinal grooves not united on posterior side of vertex, additional longitudinal impressed lines distinct, puncturation on vertex coarse and dense and that of clypeus finer and sparser, setae long and projected anteriorly. Antenna long and slender, scape moderately large, pedicel shorter and narrower than scape, segments 3-8 subequal and longer than pedicel; segments 9-11 slightly wider than segment 8, of which segments 9 and 11 elongated and segment 10 about as broad as long, segment 11 slightly acuminate at apex; segments 9-11 and apical part of segment 8 slightly blackish. *Prothorax* about as broad as long or slightly transverse, convex, widest near anterior margin and slightly narrowed in posterior half, lateral margins curved, puncturation on pronotum coarse and dense and similar to that of vertex of head, setae long and projected towards middle line. *Scutellum* moderately large, transverse, with moderately large punctures and without pubescence. *Elytra* less than two times as long as broad, widest in posterior half, lateral margins of elytra slightly wavy and not explanate; three transverse blackish spots usually distinct, of which anterior one broadest and extends from base to near middle of elytra; scutellary striole short and consists of 6 to 9 punctures, rows of punctures deep and large, interstices distinctly narrower than width of each puncture, setae projected posteriorly. On ventral side puncturation of head to meso-metathorax coarse and slightly less denser than that of vertex and pronotum, puncturation on ventrites finer. Aedeagus (Fig. 296) with apex of median lobe unilobed, parameres short and each paramere with one long apical seta.

Measurements : Total length 2.33–2.69 mm., width of head across eyes 0.51–0.59 mm., length of antenna 1.26–1.35 mm., width of prothorax across middle 0.52–0.58 mm., length of elytra 1.47–1.73 mm. and width across middle 0.88–0.94 mm.

Materials examined : 39 ex. INDIA : TAMIL NADU, 1 ex., Shembaganur, Madura, Grouvelle Coll., 1908-107; Oote, 3 ex., 31.xii.1972, T. Sengupta, under bark of fallen tree; 3 ex., 6. xii. 1971, T. Sengupta, dry hays; 1 ex., 6.xii. 1971, T. Sengupta, spiny flowering bush; 22 ex., 4.iv.1977, T. Sengupta, grass beside lake; Palni Hills, Kodaikanal, 2200 m., 5 ex., vii.22, S. Kemp; 3 ex., 12.xi.1972, Besuchet Löbl Mussard; Palni Hills, Berijam Lake, 2150 m., 1 ex., 14.xi.1972, Besuchet Löbl Mussard.

Distribution : INDIA : Tamil Nadu.

59. *Cryptamorpha abnormis* sp. nov.

This is a distinct species, differentiated from any other Indian species of *Cryptamorpha* by its prothorax being distinctly transverse (1.00 : 1.14) and median longitudinal depression on pronotum distinct, vertex of head impunctate, apical three segments of antenna slightly narrower than segment 8, punctures of elytra progressively smaller towards posterior half, posterior side of middle tibia explanate like a flank and its margin toothed (Fig. 276), middle-trochanter of male with a spine, apex of ventrite 5 broadly notched (Fig. 277).

Description : General form (Fig. 275) elongated, moderately depressed, reddish-brown; covered with short, semierect, golden pubescence.

Head : Exposed part of head broader than long, eyes large, length of eye slightly longer than one-third of length of head, longitudinal grooves not distinctly unite on posterior side

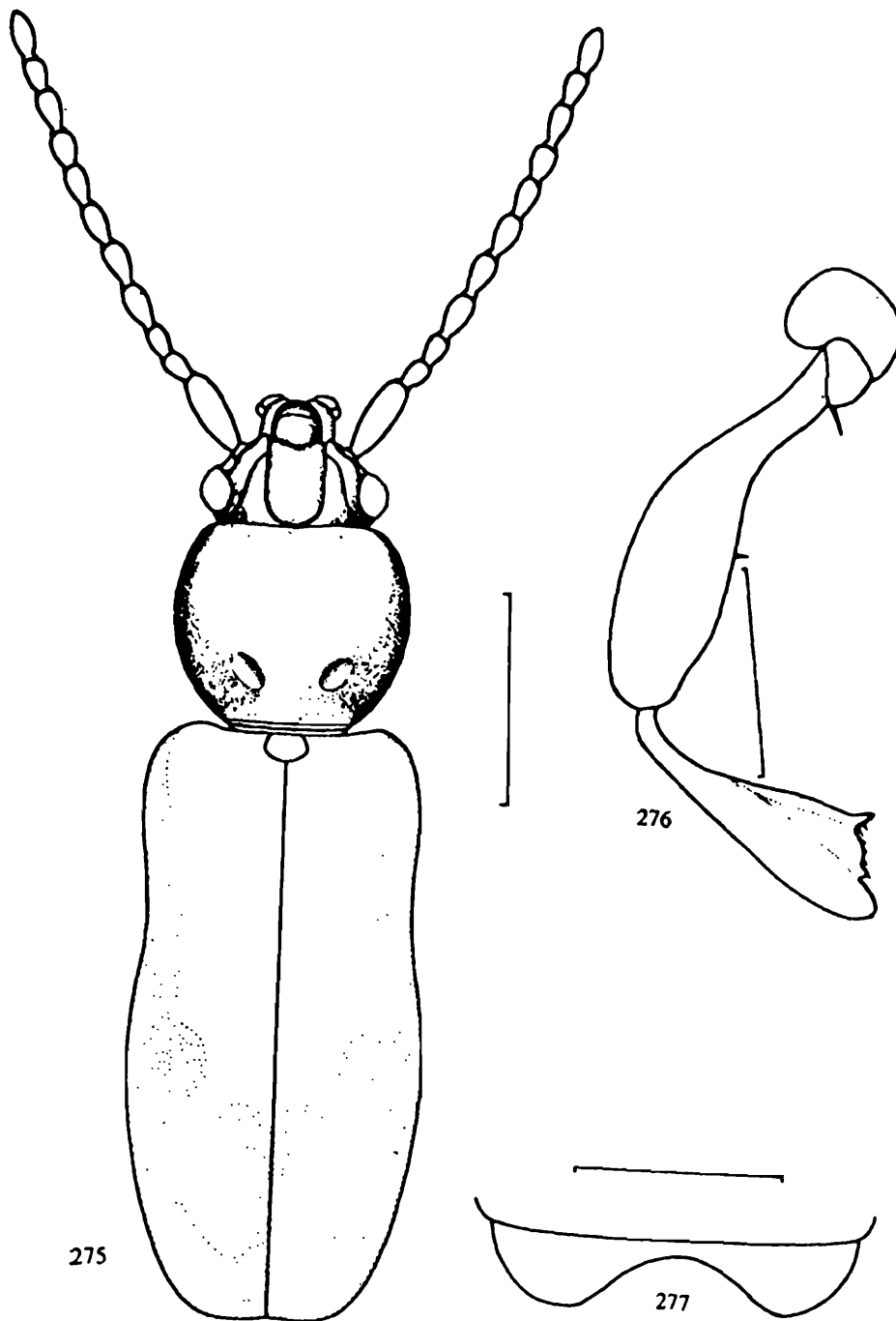


Fig. 275-277. *Cryptamorpha abnormis* sp. nov.: 275, Dorsal view (scale = 1.0 mm); 276, Middle leg (scale = 0.5 mm); 277, Last abdominal ventrite (scale = 0.5 mm).

of vertex but an impression of a tendency to unite, additional longitudinal impressed lines distinct, vertex and clypeus impunctate, clypeus shiny and setae projected anteriorly, vertex devoid of any pubescence. Antenna moderately long and slender, scape moderately large, pedicel shorter and narrower than scape, segment 3 slightly longer than pedicel; segments 4-8 subequal, slightly longer and broader than segment 3; segments 9-11 slightly narrower than segment 8, segment 11 slightly acuminate at apex. *Prothorax* transverse, convex,

widest near middle, anterior margin almost straight with slightly sinuate near middle, lateral margins curved outwardly, pronotum with wide median longitudinal depression which comparatively more wider towards extremities, transverse impressed line near base of pronotum less distinct; puncturation on pronotum coarse, moderately dense and towards lateral sides sparse; setae short and scanty. *Scutellum* moderately large, transverse, impunctate and with a few setae. *Elytra* slightly longer than two times as long as broad, lateral margins wavy and not explanate, widest in posterior half, scutellary stria short and consists of 8 punctures, rows of punctures deep and large towards anterior side, behind middle punctures gradually smaller towards posterior end, interstices wider than rows of punctures; two longitudinal blackish bands along lateral sides and unite posteriorly, transverse extensions arise from lateral bands behind middle, and a longitudinal extension along suture from apex to more than posterior one-third of elytra. Ventral side shiny, puncturation slightly sparser than that of pronotum, and that of ventrites 2-5 finer. Legs with posterior side of middle-tibia explanate like a flank and its margin toothed, middle-trochanter of male with a spine. Apex of ventrite 5 widely notched.

Measurements of holotype : Total length 4.47 mm., width of head across eyes 0.88 mm., length of antenna 2.50 mm., width of prothorax across middle 1.14 mm., length of elytra 2.86 mm. and width across middle 1.41 mm.

Holotype ♂, INDIA : WEST BENGAL, Darjeeling district, Sinchal, 26. vi. 18, S. Kemp (Zoological Survey of India, Calcutta Reg. No. 11132/H4A).

Distribution : INDIA : West Bengal (Darjeeling district).

60. *Cryptamorphia sculptifrons* Reitter

1889. *Cryptamorphia sculptifrons* Reitter, *Wien. ent. Ztg.* **8** : 320 (Type-loc. : Japan; Type deposition - British Museum Nat. Hist., London).
 1908. *Cryptamorphia sculptifrons* : Grouvelle, *Annls Soc. ent. Fr.*, **77** : 474.
 1908. *Cryptamorphia sculptifrons* var. *punctifrons* Grouvelle, *Annls Soc. ent. Fr.*, **77** : 474.
 1908. *Cryptamorphia sculptifrons* var. *opacifrons* Grouvelle, *Annls Soc. ent. Fr.*, **77** : 474.
 1979. *Cryptamorphia sculptifrons* : Pal and Sengupta, *Entomologica Basiliensia*, **4** : 77.

This species is characterised by its head with large eyes and longitudinal grooves unite on posterior side forming U-shaped structure, prothorax elongated with widest near middle, and insect uniformly reddish-brown.

Description : General form (Fig. 278) elongated, moderately depressed, uniformly reddish-brown; covered with short, semierect, golden pubescence.

Head : Exposed part of head broader than long, eyes large, length of eye shorter than half of length of head, longitudinal grooves united on posterior side and U-shaped, additional longitudinal impressed lines rather indistinct; puncturation on vertex minute, rather indistinct and sparse; clypeus impunctate and shiny; setae on vertex projected towards middle line and that of clypeus projected anteriorly. Antenna long and slender, scape moderately large, pedicel shorter and narrower; segments 3-11 subequal and longer than pedicel, of which segments 9-11 slightly broader and segment 11 slightly acuminate at apex. *Prothorax* elongated, convex, widest near middle, lateral margins curved outwardly,

a transverse impressed line near posterior margin of pronotum, puncturation of pronotum coarse and dense, setae short and projected towards middle line. *Scutellum* moderately large, transverse, with fine and sparse punctures and pubescent. *Elytra* less than two times as long as broad, widest behind middle, lateral margins slightly wavy and not explanate, scutellary striole short and consists of 7 punctures, rows of punctures deep and large, interstices about as wide as width of each puncture, setae short and projected posteriorly. On ventral side puncturation similar as on pronotum and that of ventrites 3-5 finer. Aedeagus (Fig. 297) with apex of median lobe broadly pointed; parameres long and slender, each paramere with two setae near apex and a few setae near base.

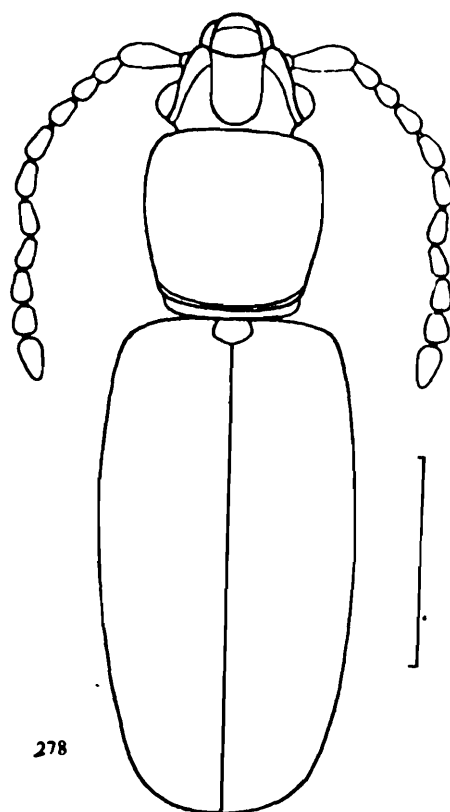


Fig. 278. *Cryptamorpha sculptifrons* Reitter, Dorsal view (scale = 1.0 mm).

Measurements Total length 3.62 mm., width of head across eyes 0.44 mm., length of antenna 2.00 mm., width of prothorax across middle 0.77 mm., length of elytra 2.29 mm. and width across middle 1.35 mm. (n = 1).

Materials examined : 3 ex. INDIA : WEST BENGAL, Darjeeling, 2080 m., 1 ex., 22.iv-14.v.15, F.H. Gravely; Darjeeling district, Lebong, 1800-1900 m., 1 ex., 11.v.1975, W. Wittmer; BHUTAN : 21 km. O Wangdi Phodr., 1700-2000 m., 1 ex., Nat. Hist. Museum Basel Bhutan expedition, 1972.

Distribution : INDIA : West Bengal (Darjeeling district), Sikkim; BHUTAN; JAPAN; CHINA.

61. *Cryptamorpha kaszabi* Pal and Sengupta

1979. *Cryptamorpha kaszabi* Pal and Sengupta, *Entomologica Basiliensia*, 4 : 78 (Type-loc. : Cherapunji, Musami : Meghalaya, India; Type deposition - Termesztudományi Múzeum, Budapest).

This species is closely related to *C. nepalensis* sp. nov. but can be distinguished by its hind trochanter of male devoid of any spine, elytral interstices markedly narrower than rows of punctures, aedeagus (Fig. 298) with apex of median lobe not bifid, antenna longer, and ratio of lengths of body and antenna lesser (1.56-1.81 : 1.00).

Description : General form (Fig. 279) elongated, moderately depressed, yellowish-brown with apical three segments of antenna darker and blackish spots on elytra; covered with short, semierect, golden pubescence.

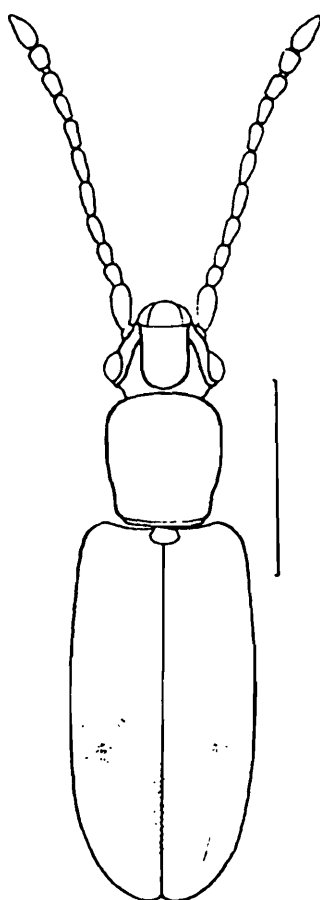


Fig. 279. *Cryptamorpha kaszabi* Pal and Sengupta, Dorsal view (scale = 1.0 mm).

Head : Exposed part of head broader than long, eyes large, length of eye about one-third of length of head, longitudinal grooves unite on posterior side of vertex and U-shaped, additional longitudinal impressed lines well-marked, puncturation on vertex fine and sparse, clypeus finely punctate and shiny, setae projected anteriorly. Antenna long and slender, scape moderately large, pedicel shorter and narrower than scape, segment 3 about as long as pedicel, segments 4-8 subequal and longer than segment 3, segments 9-11 slightly broader than segment 8 and of which segment 11 slightly acuminate at apex. *Prothorax* slightly elongated, convex, anterior half almost parallel-sided and broader than posterior half, transverse impressed line on pronotum across base indistinct, puncturation on

pronotum coarse and dense, setae short and projected towards middle line. *Scutellum* moderately large, transverse, with fine and sparse punctures and pubescent. *Elytra* about two times as long as broad, almost parallel-sided and widest below middle, lateral margins slightly wavy and explanate, scutellary striole short and consists of 9 punctures, rows of punctures deep and large, interstices distinctly narrower than width of each puncture, setae short and projected posteriorly; a blackish spot on either side of suture in posterior half and one median longitudinal spot along sutural line behind lateral spots, median spot sometimes extend laterally and unite with lateral spots. On ventral side puncturation slightly finer and sparser than that of pronotum, portion of metasternum on either side of middle line impunctate. Aedeagus (Fig. 298) with apex of median lobe somewhat pointed at tip, parameres long and slender and each paramere with a few long apical setae.

Measurements of holotype : Total length 2.82 mm., width of head across eyes 0.58 mm., length of antenna 1.67 mm., width of prothorax across middle 0.57 mm., length of elytra 1.79 mm. and width across middle 0.91 mm.

Materials examined : *Holotype* ♂, INDIA : MEGHALAYA, ('Assam' in label), Cherapunji, Musami, 18.xi.1967, Gy. Topal, beaten material (Col. No. 912). Aedeagus dissected and mounted on cover slip and pinned with the holotype (Termesztudományi Múzeum, Budapest); *Paratypes* 10 ex., same data as holotype; *Paratypes* 2 ex., Cherapunji, Musami, 18.xi.1967, Gy. Topal, netting in grasses (Col. No. 913); *Paratype* 1 ex., Cherapunji, 19.xi.1967, Gy. Topal, beaten material (Coll. No. 916) of the above 13 *Paratypes*, 7 in Termesztudományi Múzeum, Budapest; and 6 in Zoological Survey of India; Reg. No. 8411/H4A to 8416/H4A); *Paratypes* 3 ex., INDIA : WEST BENGAL, Darjeeling district, Lebong, 1600–1800 m., 8.v.1975, W. Wittmer; *Paratype* 1 ex., Darjeeling district, Lopchu, 9. v. 1975, W. Wittmer; *Paratype* 1 ex., Darjeeling district, Singamari - Bharapatca Bung, W. Wittmer (of the above 5 *Paratypes*, 3 in Naturhistorischen Museum, Basel; and 2 in Zoological Survey of India; Reg. No. 8417/H4A to 8418/H4A).

Distribution : INDIA : Meghalaya, West Bengal (Darjeeling district).

Remarks : This species was named in honour of Dr. Z. Kaszab of Termesztudományi Múzeum, Budapest.

62. *Cryptamorpha nepalensis* sp. nov.

This species is closely related to *C. sculptifrons* Reitter but can be separated by its prothorax being widest near anterior margin and lateral margins distinctly sinuate before posterior angles, transverse impressed line across base of pronotum indistinct, species smaller (3.00 mm.), antenna shorter and ratio of lengths of body and antenna greater (2.09 : 1.00) than in *sculptifrons* (1.81 : 1.00), pedicel about as long as antennal segment 3, species yellowish brown with faint blackish spots on elytra, and puncturation on vertex of head slightly coarser. This species shows similarity also with other Indian species, viz., *kaszabi* Pal and Sengúpta and *bhutanensis* Pal and Sengupta, and the comparisons are discussed under respective species.

Description : General form (Fig. 280) elongated, moderately depressed, uniformly yellowish-brown with apical three segments of antenna darker and two faint blackish spots on elytra; covered with short, semierect, golden pubescence.

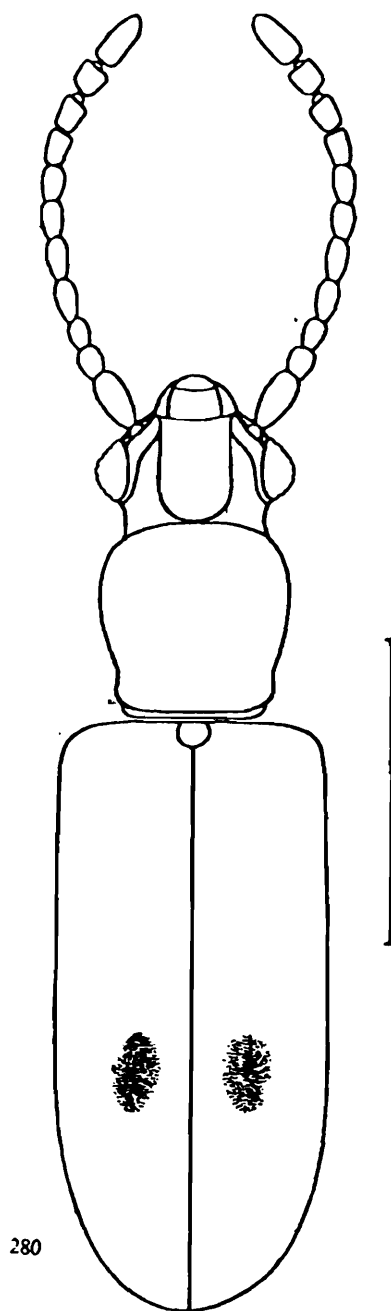


Fig. 280. *Cryptamorpha nepalensis* sp. nov., Dorsal view (scale = 1.0 mm).

Head : Exposed part of head broader than long, eyes large, length of eye about one-third of length of head, longitudinal grooves unite on posterior side of vertex and U-shaped, additional longitudinal impressed lines well-marked, puncturation on vertex rather coarse and moderately dense, clypeus finely punctate and shiny, setae projected anteriorly. Antenna long and slender, scape moderately large, pedicel shorter and narrower than scape, segment 3 slightly longer than pedicel, segments 4-8 subequal and slightly longer than segment 3, segments 9-11 slightly wider than segment 8, segment 11 slightly acuminate at apex. *Prothorax* elongated, convex, widest in anterior half, lateral margins curved and sinuate posteriorly behind middle, transverse impressed line on pronotum across base indistinct. puncturation on pronotum coarse and dense, setae short and projected towards

middle line. *Scutellum* moderately large, transverse, with fine and sparse punctures and pubescent. *Elytra* more than two times as long as broad, almost parallel-sided and slightly wider near anterior margin, lateral margins slightly wavy and not explanate, scutellary striae short and consists of 8 punctures, rows of punctures deep and large, interstices about as wide as width of each puncture, setae short and projected posteriorly, two lateral blackish spots slightly distinct. On ventral side puncturation slightly finer and sparser than that of pronotum, portion of metasternum on either sides of middle line impunctate. Legs simple, hind-trochanter of male with a spine. Aedeagus (Fig.299) with apex of median lobe bifid.

Measurements of holotype : Total length 3.00 mm., width of head across eyes 0.58 mm., length of antenna 1.44 mm., width of prothorax across middle 0.58 mm., length of elytra 1.94 mm. and width across middle 0.94 mm.

Holotype ♂ NEPAL : Daman, 31.iii.1972, T. Sengupta, flower. Aedeagus dissected and mounted on cover slip and pinned with the holotype (Zoological Survey of India, Calcutta; Reg. No. 11133/H₁A)

Distribution : NEPAL.

63. *Cryptamorpha bhutanensis* Pal and Sengupta

1979. *Cryptamorpha bhutanensis* Pal and Sengupta, *Entomologica Basiliensia*, 4 : 80. (Type-loc. : Nobding : Bhutan: Type deposition Naturhistorischen Museum, Basel).

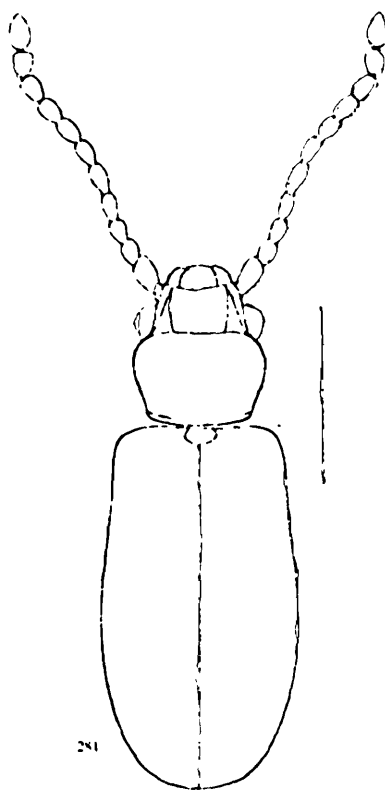
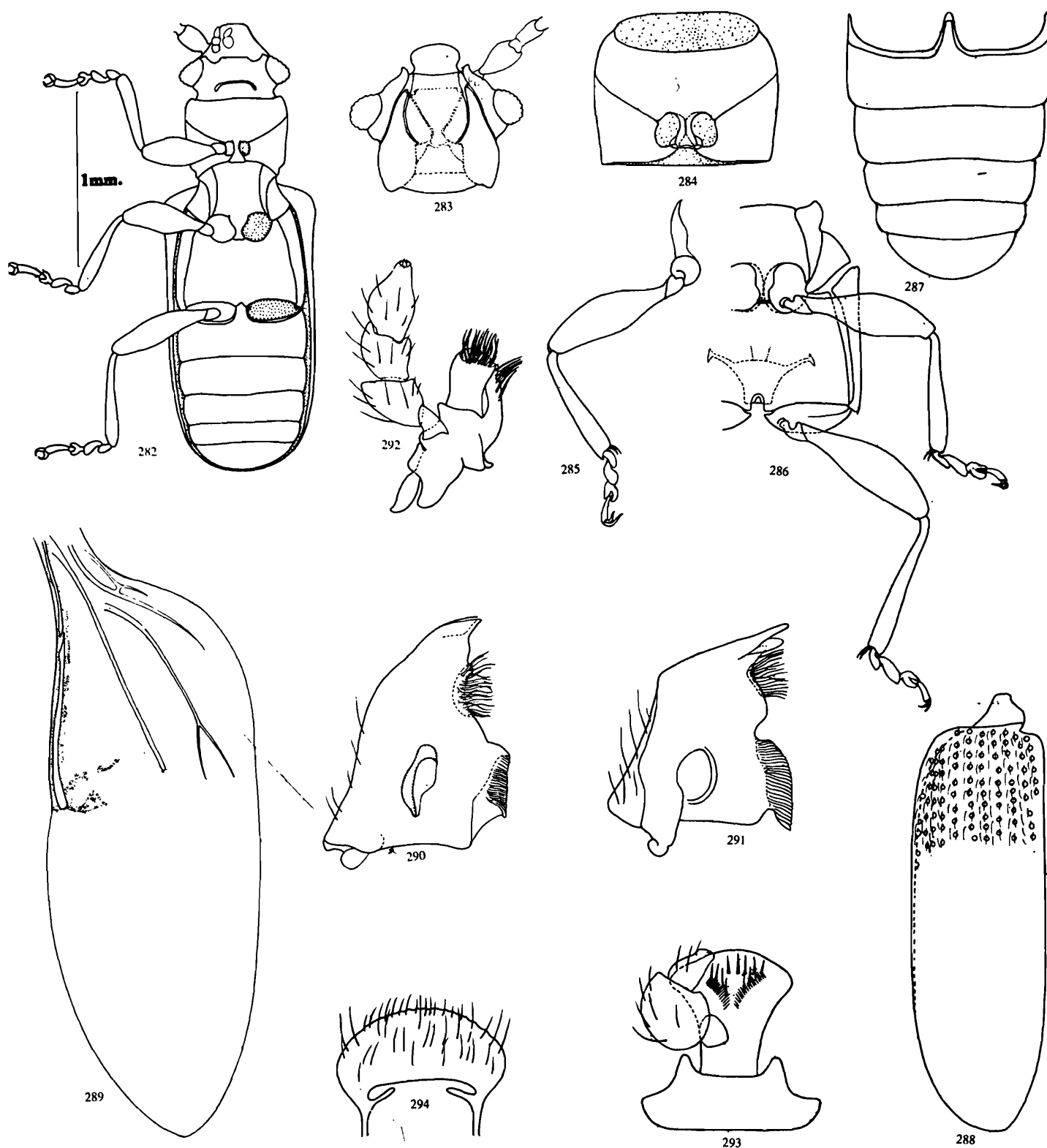


Fig. 281. *Cryptamorpha bhutanensis* Pal and Sengupta, Dorsal view (scale = 1.0 mm).



Figs. 282-294. *Cryptamorpha infans* Grouvelle : 282, Ventral view; 283, Head, Dorsal view; 284, Prothorax, Ventral view; 285, Front leg; 286, Meso-metathorax, Ventral view; 287, Abdomen, Ventral view; 288, Left elytron, Dorsal view; 289, Wing; 290, Left mandible, Dorsal view; 291, Right mandible, Ventral view; 292, Right maxilla, Ventral view; 293, Labium, Ventral view; 294, Labrum.

This species is closely related to *C. nepalensis* sp. nov. but can be separated by its prothorax being slightly transverse (0.97 : 1.00), antenna comparatively longer, elytral interstices slightly wider than width of each puncture, and median lobe of aedeagus not bifid at apex.

Description : General form (Fig. 281) elongated, moderately depressed, yellowish-brown with a blackish spot on each elytron in posterior half; covered with short, semierect, golden pubescence.

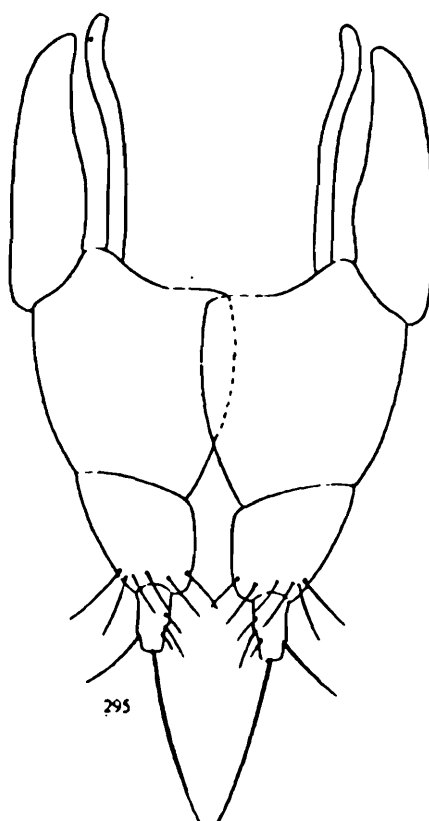
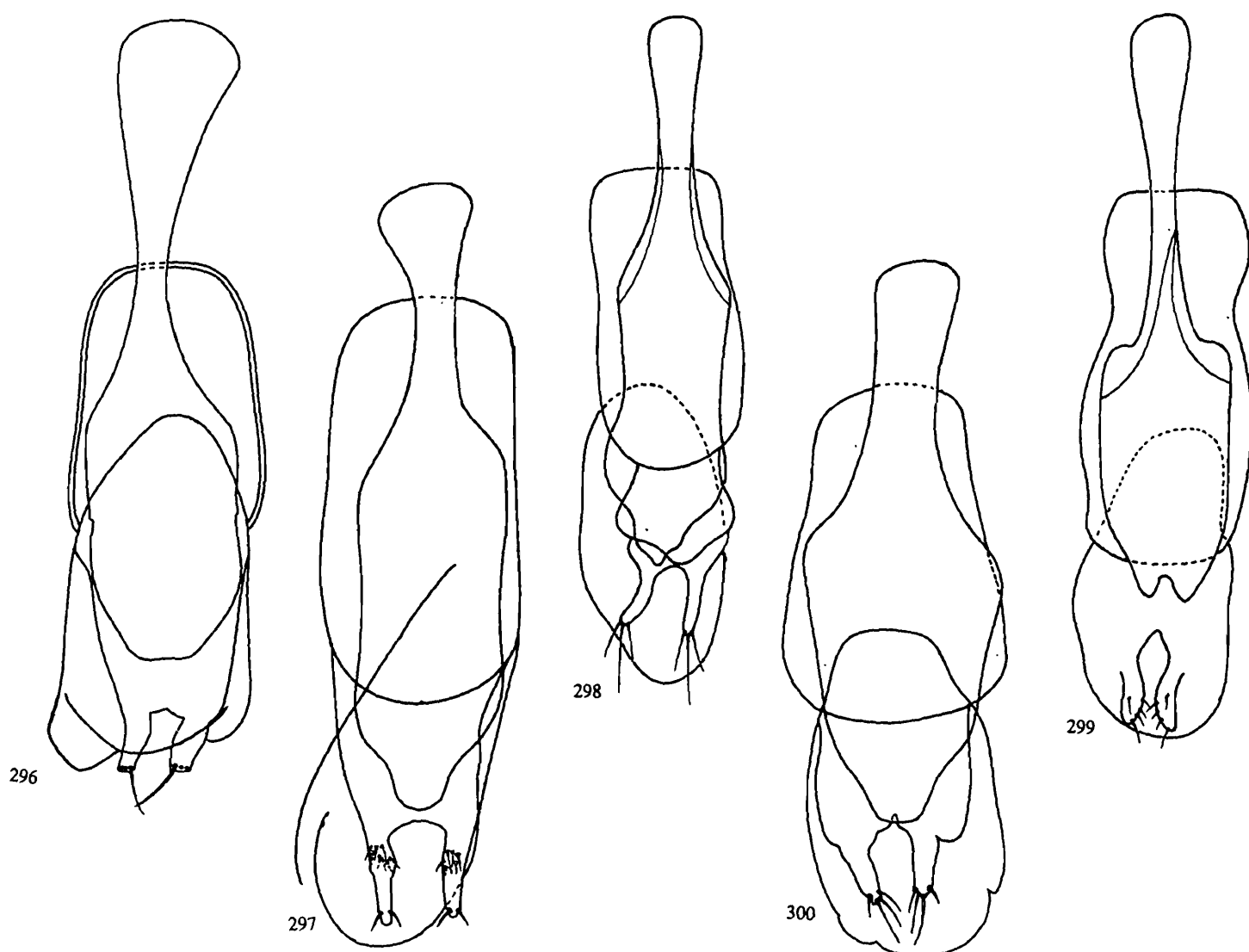


Fig. 295. Ovipositor of *Cryptamorpha infans* Grouvelle.

Head : Exposed part of head broader than long, eyes large, length of eye about one-third of length of head, longitudinal grooves unite on posterior side of vertex and U-shaped, additional longitudinal impressed lines well-marked, puncturation on vertex rather coarse and moderately dense, clypeus finely punctate and shiny, setae projected towards middle line. Antenna long and slender, scape moderately large, pedicel and segment 3 shorter and narrower than scape, segments 4-8 subequal and slightly longer than segment 3, segments 9-11 slightly wider than segment 8, segment 11 acuminate at apex. **Prothorax** slightly transverse or about as broad as long, widest near anterior margin and narrowed posteriorly, lateral margins curved and sinuate posteriorly, puncturation on pronotum coarse and dense, setae short and projected towards middle line. **Scutellum** moderately large, transverse, with fine and sparse punctures and pubescent. **Elytra** about two times as long as broad, almost parallel-sided and widest below middle, lateral margins slightly wavy and not explanate,



Figs. 296-300. Aedeagi, Dorsal view : 296, *Cryptamorpha infans* Grouvelle; 297, *C. sculptifrons* Reitter; 298, *C. kaszabi* Pal and Sengupta; 299, *C. nepalensis* sp. nov.; 300, *C. bhutanensis* Pal and Sengupta.

scutellary striole consists of 9 punctures, rows of punctures deep and large, interstices slightly wider than width of each puncture, setae short and projected posteriorly, a small rounded indistinct blackish spot present on each elytron in posterior half. On ventral side puncturation slightly finer and sparser than that of pronotum, portion of metasternum on either side of middle line impunctate. Aedeagus (Fig. 300) with apex of median lobe broadly pointed, parameres long and slender, each paramere with a few moderately long apical setae.

Measurements of holotype : Total length 3.34 mm., width of head across eyes 0.75 mm., length of antenna 1.80 mm., width of prothorax across middle 0.67 mm., length of elytra 2.05 mm. and width across middle 1.04 mm.

Materials examined : *Holotype* ♂, BHUTAN : Nobding, 41 km. O. Wangdi Ph., 2800 m., Nat. Hist. Museum Basel-Bhutan Expedition 1972. Aedeagus dissected and mounted on a plastic board and pinned with the holotype. (Naturhistorischen Museum, Basel); *Paratype* ♀, Chimakothi, 22.v.1972, Nat. Hist. Museum Basel-Bhutan Expedition 1972 (Zoological Survey of India, Calcutta; Reg. No. 8419/H4A).

Distribution : BHUTAN

Subfamily IV ULEIOTINAE

Genus 14. *Uleiota* Latreille

- 1796. *Uleiota* Latreille, *Précis des caractères génériques des Insectes disposés dans un ordre naturel* : 46.
- 1801. *Brontes* Fabricius, *Systema Eleutheratorum*, 2 : 97.
- 1804. *Uleiota* : Latreille, *Histoire Naturelle, générale et particulière, des crustacés et des Insectes*, 11 : 257.
- 1807. *Uleiota* : Latreille, *Genera crustaceorum et Insectorum*, 3 : 26.
- 1846. *Brontes* : Erichson, *Naturgeschichte der Insekten Deutschlands*, 3 : 329, 331.
- 1854. *Brontes* : Lacordaire, *Histoire Naturelle des Insectes*, 2 : 408.
- 1858. *Brontes* : Redtenbacher, *Fauna Austriaca Die Käfer*, ed. 2 : 353.
- 1879a. *Hyliota* : Reitter, *Verh.zool. bot. Ges. Wien*, 29 : 80.
- 1879b. *Hyliota* : Reitter, *Bestimmung-Tabellen der europäischen Coleopteren* 1 : 80.
- 1884. *Brontes* : Casey, *Trans. Am. ent. Soc.*, 11 : 97, 98.
- 1885-86. *Hyliota* : Reitter, *Francisque Guillebeau : Tableaux Analytiques Determiner les Coleopteres europeins*, 1 : 8
- 1888. *Hyleota* : Seidlitz, *Fauna Baltica*, ed 2 : Gatt p. 55.
- 1899. *Uleiota* : Ganglbauer, *Die Käfer von Mitteleuropa*, 3 : 592, 593.
- 1901. *Hyliota* : Arrow, *Trans. Ent. Soc. London* : 593.
- 1908. *Uleiota* : Grouvelle, *Annls Soc. ent. Fr.*, 77 : 459, 460.
- 1911. *Uleiota* : Kuhn, *Illustrierte Bestimmungs tabellen der Käfer Deutschlands* : 504, 509.
- 1911. *Uleiota* : Reitter, *Fauna Germanica*, 3 : 48, 49.
- 1930. *Uleiota* : Hetschko, *Coleopt. Cat.*, 109 : 4.
- 1984. *Uleiota* : Pal, Sengupta and Crowson, *Oriental Ins.*, 18 : 217.

Type-species : *Cerambyx flavipes* (Fabricius) [= *planata* (Linnaeus)].

Historical review : *Uleiota*, a large genus was established by Latreille (1796) for the

species, *Cerambyx flavipes* (Fabricius). Later, Fabricius (1801) erected the genus *Brontes* for *Brontes dubia* Fabricius. Subsequently, several species were described under *Brontes* Fabricius. Erichson (1846) synonymised *Uleiota* Latreille with *Brontes*, erected the group 'Brontini' under the family Cucujipes, and the generic name, *Brontes* instead of *Uleiota* was accepted by the subsequent workers for a long time. Lacordaire (1854) erected the tribe 'Brontides' under the family 'Cucujipes' to include *Brontes*. Reitter (1879) used the name 'Hyliota' in lieu of *Uleiota*, for Latreille's genus, and placed this genus under the division Hyliotini of the family Cucujidae. Ganglbauer (1899) reused the name *Uleiota*, mentioned all synonyms of this genus and placed it under the tribe Uleiotini of Cucujinae : Cucujidae. Böving (1921) erected the subfamily 'Hyliotinae' (=Uleiotinae) under Cucujidae on the basis of larval characters. Hetschko (1930) in Junk's 'Coleopterorum Catalogus' listed 29 species under *Uleiota* of which, 3 species are from India and 1 species from Sri Lanka. Crowson (1973) mentioned that Uleiotinae should be included in the Silvanidae. Recently, Pal, Sengupta and Crowson (1984) revised this genus from India, described 1 new species from Meghalaya and West Bengal, and dealt with its systematic position.

Habit-habitat : The habitat records of this genus is not available in the earlier works. Pal, Sengupta and Crowson (*loc.cit.*) recorded this genus only under bark of dead and fallen trees in wet forests and woodland. As is supposed, all the representatives occur primarily beneath bark of various tree species.

Geographical distribution : This genus is distributed to all zoo-geographical regions and is represented more diversely in the warm climatic zones with a few species extending to temperate zones. *Uleiota*, on the whole, represents its predominance in the Oriental region. 6 species are known from India. The majority of the Indian species have northern distribution patterns and occur mostly in the montane and submontane situations. *U. indica* and *U. serricollis* are representing the only southern forms, of which *U. serricollis* is recorded also from Sri Lanka. *U. spinicollis* possesses a wide distribution, recorded from North-East India and is extending as far as Burma and Java. The remaining 3 Indian species are known from the North-eastern part of the country and of them, *U. puberula* and *U. fallax* are recorded also from the adjacent Burmese territory.

Description : General form (Fig. 301) elongated, flat, with long antenna, usually yellowish-brown to dark reddish-brown.

Head : (Fig. 308) broader than long, eyes large and moderately coarsely faceted, front margin of clypeus slightly rounded, temple flattened beneath eye and shelf-like, transverse impressed line on vertex behind eyes distinct; tentorium with two long tentorial arms, lateral process (post-tentorina) and corpo-tentorium well-developed. Antenna long, slender and filiform, 11-segmented, antennal insertion partly hidden under projection of frons, scape large and broadly elongated, pedicel small, segments 4-11 long and subequal, segment 11 acuminate at apex. Mandible (Fig. 315) partially exposed, its outer margin with an elongated discal area, with 3 apical teeth, mola well-developed, a large mandibular cavity present near base and opens dorsally. Maxilla (Fig. 316) with lacinia narrow, elongated and without apical spine; galea short, broad and its apex densely hairy; palpi with segments 2 and 3 nearly equal, apical segment longest and fusiform. Labium (Fig. 317) with mentum somewhat triangularly transverse, palpi with apical segment longest and somewhat securiform. Labrum (Fig. 318) with apical margin rounded.

Prothorax (Fig. 309) transverse, lateral margins finely or distinctly dentate, anterior margin slightly sloped towards sides, pronotum flat and usually with more or less distinct lateral carinae, front coxae widely separated, coxal cavities almost round and with hidden tochantins, cavities opened externally and internally, prosternal process broad at apex, sterno-pleural suture extending to lateral margin.

Meso-metathorax (Fig. 311) : Mesocoxae widely separated, cavities opened outwardly, sternal fitting between mesocoxae almost in a straight line, median impressed line on metasternum extends anteriorly near middle to apex of mesosternal process, a pair of small pit-like structure present at apical margin of metathorax, hind-coxae slightly closer than mesocoxae; metendosternite with broadly elongate furcal stalk and moderately widely separated anterior tendons.

Wing and Elytra : Wing (Fig. 314) with three anal veins, r-m cross vein present; radial cell, anal cell and subcubital fleck not distinguishable. Elytra parallel-sided, each elytron (Fig. 313) with 9 rows of strial punctures, without scutellary striole, interstices pubescent, 7th interstice more or less carinate, epipleura narrow and extending near apex.

Legs (Fig. 310) moderately long and slender, trochanters short and simple, femora swollen towards middle, tibiae not broadened at apex and with two apical spurs; tarsal formula 5-5-5 in both sexes, tarsal segment 1 elongated, segments 2 and 3 shorter than segment 1, segment 4 shortest, claws simple.

Abdomen (Fig. 312) elongated; ventrite 1 longest, intercoxal process broad at base, slightly narrowed and broadly rounded at apex, femoral lines almost marginal striae of hind-coxal cavities, a pair of small glandular cavity-like structures present behind coxal cavities; ventrites 2-5 subequal. Aedeagus (Fig. 320) with median lobe broadly elongated, median strut single and elongated; parameres moderately well-developed, slender and with a few setae. Ovipositor (Fig. 319) with well-developed paraprocts, valvifers, coxites, and long styli attached on outer margin of apex of coxites.

Larva known : *Uleiota indica* (Arrow).

Sexual dimorphism : The males are distinguished from the females by the larger size, longer antennae and more truncate elytral apex.

Key to the Species of *Uleiota* Latreille

- 1. Lateral sides of prothorax with large and distinct teeth (Fig. 301); aedeagus with markedly long parameres (Fig. 320) *spinicollis* (Gory) p. 214
Lateral sides of prothorax with small denticles, aedeagus with short parameres 2
- 2. Temple of head long, about as long as 4 to 5 eye facets and its outer apical angle broad 3
Temple of head short, about as long as 1 to 2 eye facets and its outer apical angle somewhat pointed 4

3. Elytral interstices distinctly wider than rows of punctures, a transverse depression on vertex near base of antenna (Fig.303); aedeagus with outer margins of parameres with a few small setae, parameres slightly recurved and converging towards apex, median strut about as broad as median lobe (Fig.321); species yellowish-brown*serricollis* (Candeze) p. 217

Elytral interstices distinctly narrower than rows of punctures, transverse depression on vertex absent (Fig. 304); aedeagus with inner margins of parameres with a few small setae, parameres not recurved, median strut distinctly narrower than median lobe (Fig. 322); species blackish-brown*alticola* Pal, Sengupta and Crowson p. 219

4. Elytral interstices more than two times wider than rows of punctures; aedeagus with parameres narrow, slender, distinctly elongated, slightly constricted above apex and with short apical seta (Fig. 323)*indica* (Arrow) p. 221

Elytral interstices distinctly narrower than rows of punctures; aedeagus with parameres broadly elongated, narrowed towards apex and with a long apical seta (Fig. 324, 325).....5

5. Antennal segment 3 about as long as pedicel and distinctly shorter than segment 4; vertex devoid of transverse impression; elytral interstices 3 and 5 not carinate or raised; median impressed line on metasternum extending upto middle; aedeagus with median lobe broadly pointed at apex, paramere with only single long apical seta (Fig. 324)*puberula* (Reitter) p. 223

Antennal segment 3 distinctly longer than pedicel and about as long as segment 4; prominent transverse depression near antennal base on vertex; elytral interstices 3 and 5 distinctly raised and more or less carinate; median impressed line on metasternum extending almost upto apex of mesosternal process; aedeagus with median lobe acuminate and narrowly pointed at apex, paramere with a few short setae on inner margin in addition to single long apical seta (Fig. 325)*fallax* (Grouvelle) p. 224

64. *Uleiota spinicollis* (Gory)

- 1829-44. *Brontes spinicollis* Gory : In Guérin-Méneville, *Iconographie du Règne Animal de G. Cuvier. Insects* : 205 (Type-loc. : Java, Indonesia; Type deposition - Museum d'Histoire Naturelle, Geneve).
1877. *Hyliota atrata* Reitter, *Mitt. Munch. Ent. Ver.*, **1** : 427.
1901. *Hyliota spinicollis* : Arrow, *Trans. Ent. Soc. London*, **1901** : 596.
1930. *Uleiota spinicollis* : Hetschko, *Coleopt. Cat.*, **109** : 7.
1984. *Uleiota spinicollis* : Pal, Sengupta and Crowson, *Oriental Ins.*, **18** : 219.

This species can be easily recognised by its lateral sides of prothorax with large and

distinct teeth, antennal segments 5-10 about as broad as scape, and large species (9.3–11.5 mm.).

Description : General form (Fig.301) broadly elongated, rather parallel-sided, markedly flattened, blackish-brown; covered with short, semierect, golden pubescence.

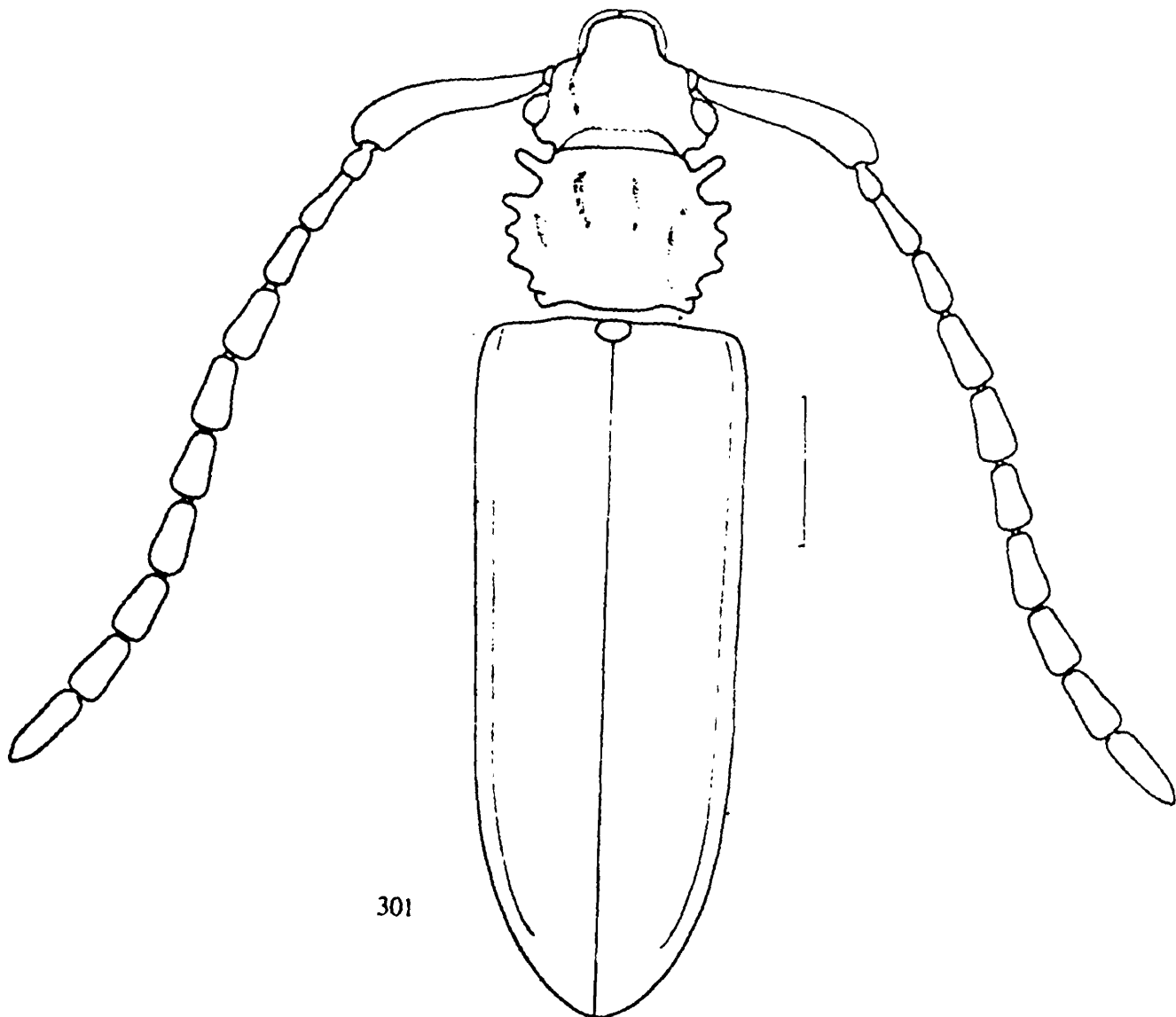


Fig. 301. *Uleiota spinicollis* (Gory), Dorsal view (scale = 2.0 mm).

Head : Exposed part of head broader than long, eyes moderately large, length of eye shorter than one-third of length of head, length of temple about as long as 4 to 5 eyes facets and its tip broad, an elongated oval area on vertex encircled by a well-marked depression; puncturation on vertex coarse, dense and that of towards anterior margin of clypeus slightly

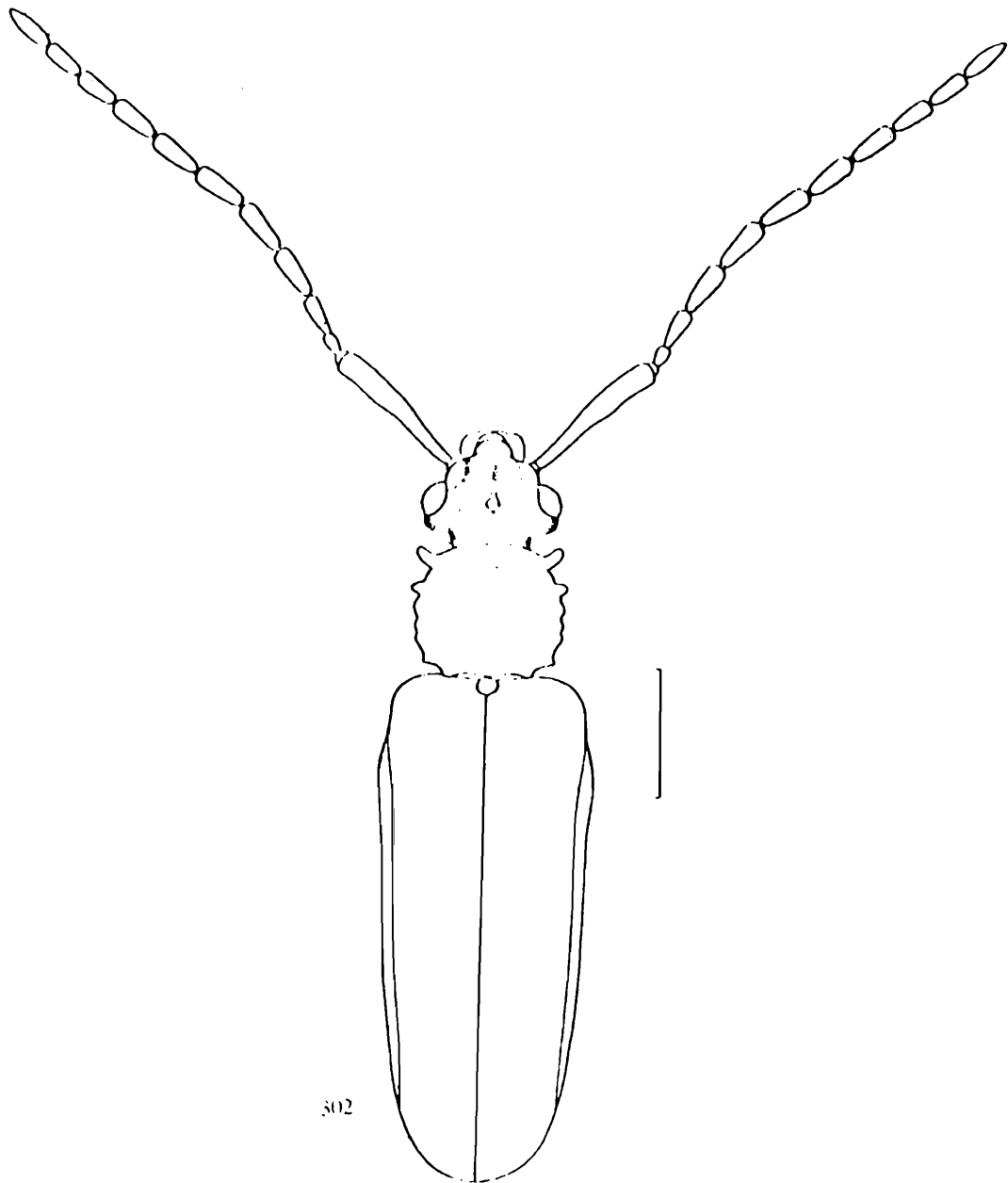


Fig. 302. *Uleiota spiniocollis* (Gory), Dorsal view of variant (scale = 2.0 mm).

finer; setae projected towards middle line. Antenna long and slender; scape large, broadly elongated, curved and wider towards apex; pedicel shorter and narrower than scape, segment 3 about twice as long as pedicel, segment 4 about as long as segment 3 and slightly wider; segments 5-10 subequal, about as long as segment 4 and slightly wider; segment 11 slightly longer than segment 10 and acuminate at apex. *Prothorax* slightly broader than long excluding lateral teeth, anterior margin straight and sloped near extremities, widest near middle and narrowed towards anterior and posterior ends, lateral margin with five distinct teeth, anterior tooth distinctly elongated, other teeth about as broad as long or slightly elongated, all teeth somewhat blunt at apex, in some examples (Fig. 317) lateral teeth except anterior ones not distinguishable, pronotum flat with two shallow median and two lateral

depressions, puncturation on pronotum coarse, dense and slightly coarser than that of vertex of head, setae projected towards middle line. *Scutellum* moderately large, transverse and pubescent. *Elytra* more than three times as long as broad, parallel-sided, lateral margin slightly wavy, rows of punctures deep and large, interstices slightly narrower than width of punctures, 7th elytral interstice strongly carinate and extending almost upto apex, setae projecting posteriorly. On ventral side puncturation finer than on dorsal side. Aedeagus (Fig. 320) with median lobe elongated and broadly rounded at apex; parameres slender, markedly long, fringed with a group of long apical setae and a few setae on surface.

Measurements : Total length 9.37-11 mm., width of head across eyes 1.58-2.08 mm., length of antenna 8.33-10.83 mm., width of prothorax excluding lateral teeth 1.75-2.40 mm., length of elytra 6.45-8.02 mm., and width across middle 2.08-2.91 mm.

Materials examined : 14 ex. *Type*, INDONESIA : JAVA, "Colln. Gory" (in label) (Museum d' Histoire Naturelle, Geneve); INDIA : ARUNACHAL PRADESH, Rotung, 4100 m., 8 iii (19) 12, 1 ex., S Kemp; Namdapha Survey 1981, Hornbill Camp, 35 Km. from Miao, 5 ex., S. Biswas, under bark; MEGHALAYA, Shillong, Mowphlong, 27.xi.1974, 2 ex., T. Sengupta, under bark of *Shorea robusta*; Shillong 1960 m., v. 1925, 1 ex., C. F. C. Beeson; BURMA, Bondaung, S. Toungoo, 18.v.1918, 4 ex., C. F. C. Beeson.

Distribution : INDIA : Arunachal Pradesh, Meghalaya; BURMA; INDONESIA (Java).

Remarks : Arrow (1901) synonymised *Hyliota atrata* Reitter with this species.

65. *Uleiota serricollis* (Candeze)

1861. *Brontes serricollis* Candeze, *Mém. Soc. R. Sci. Leige*, (1) **16** : 341 (Type-loc. : Sri Lanka; Type deposition Institute of Zoology, Polish Academy of Sciences, Warsaw).

1863. *Brontes ? ceylonicus* Motschulsky, *Bull. Moscou*, **36** : 500.

1901. *Hyliota serricollis* : Arrow, *Trans. Ent. Soc. London*, **1901** : 596.

1930. *Uleiota serricottis* : Hetschko, *Coleopt. Cat.*, **109** : 7.

1984. *Uleiota serricollis* : Pal, Sengupta and Crowson, *Oriental Ins.*, **18** : 220.

This species is confused with *U. fallax* Grouvelle due to its transverse depression on vertex, but can be separated by its longer and broad outer apical angle of temples, eyes shorter than one-third of length of head, transverse depressions on vertex especially above antennal insertions more prominent, prothorax less transverse (0.93 : 1.00) in comparison to distinctly transverse prothorax of *fallax* (0.77 : 1.00), sublateral pronotal ridges less carinate, elytral interstices distinctly wider than rows of punctures, interstices 3 and 5 not prominently raised, median impressed line on metasternum extending upto middle; aedeagus with broader median strut, short slender parameres recurved near apex.

Description : General form (Fig. 303) broadly elongated, rather parallel-sided, markedly flattened, yellowish-brown; covered with short, semierect, golden pubescence.

Head : Exposed part of head broader than long, eyes large, length of eye shorter than one-third as long as head, temple about as long as 3 to 4 eye facets and its tip broad, a transverse broad depression on vertex near base of antenna; puncturation on vertex fine, dense and that of towards anterior margin of clypeus almost similar; setae projected towards anterior side. Antenna long and slender; scape large, broadly elongated, curved and wider

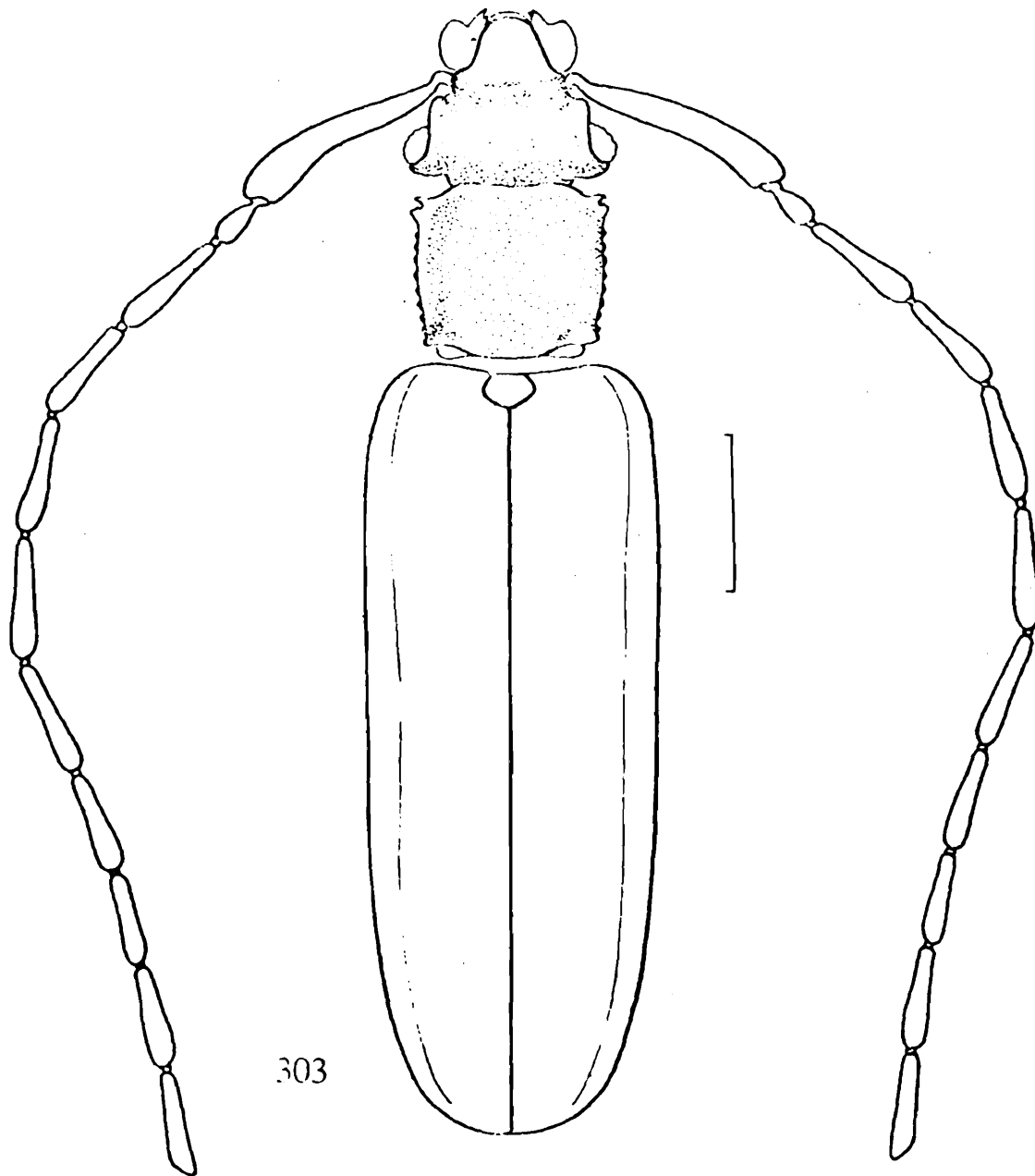


Fig. 303. *Uleiota serricollis* (Candeze), Dorsal view (scale = 1.0 mm).

than rest of antenna; pedicel short, segments 3-11 subequal and distinctly longer than pedicel of which segment 11 acuminate at apex. *Prothorax* slightly broader than long, slightly wider near anterior angles, anterior margin straight and slightly sloped near extremities, lateral margin slightly curved with 11 to 14 denticles, tip of denticles somewhat pointed, in some examples few denticles indistinguishable, pronotum flat with sublateral ridges, with shallow broad median depression, puncturation on pronotum coarser than that of vertex of head, setae projected towards middle line. *Scutellum* moderately large, distinctly transverse, punctate-pubescent. *Elytra* more than two times as long as broad, parallel-sided, lateral margins slightly wavy, rows of punctures deep and moderately large, interstices distinctly wider than rows of punctures, (interstices narrower than rows of

punctures in *type* specimen). 7th elytral interstice strongly carinate and extending almost upto apex, setae projected posteriorly. On ventral side puncturation finer than on dorsal side. Aedeagus (Fig. 321) with median lobe broadly elongated, tapered and pointed at apex; parameres short, moderately slender and narrowed towards apex, each paramere with an apical seta and a few short setae on its surface, parameres recurved and converging towards apex.

Measurements : Total length 6.04 - 7.75 mm., width of head across eyes 1.33 - 1.45 mm., length of antenna 7.50-9.16 mm., width of prothorax 1.10 - 1.28 mm., length of elytra 3.84 - 4.96 mm. and width across middle 1.44 - 1.80 mm.

Materials examined : 9 ex. *Type*, 1 ex., SRILANKA (stated in the label as 'Ceyl Humb') (Institute of Zoology, Polish Academy of Sciences, Warsaw); INDIA : KERALA, Nelliampathi Hills, Kaikalty, 900 m., 1 ex., 30.xi.1972, Besuchet Löbl Mussard; SRI LANKA: North Central, Alut Oya, 3.ii.1970, 6 ex., Mussard Besuchet Löbl; SRILANKA : Central, Horton Plains, 2100 m., 15.ii.1970, Mussard Besuchet Löbl.

Distribution : INDIA : Kerala; SRI LANKA.

Remarks : Arrow (1901) synonymised *Brontes ceylonicus* Motschulsky with this species. This species is recorded from South India (Pal *et al.*, 1984).

66. *Uleiota alticola* Pal, Sengupta and Crowson

1984. *Uleiota alticola* Pal Sengupta and Crowson, *Oriental Ins.*, 18 : 221 (Type-loc. : Shillong : Meghalaya, India; Type deposition Zoological Survey of India, Calcutta).

This species shows resemblance with *U. serricollis* (Candeze) but can be distinguished by its elytral interstices distinctly narrower than rows of punctures, transverse depression on vertex absent, parameres not recurved and their inner margins with few small setae, and species blackish brown.

Description : General form (Fig. 304) broadly elongated, rather parallel-sided, markedly flattened, blackish-brown with head and antenna reddish-brown; covered with short, semierect, golden pubescence.

Head : Exposed part of head broader than long, eyes moderately large, length of eye slightly shorter than one-third of length of head, temple about as long as four eye facets and its outer apical angle broad, a short longitudinal depression near base of antenna, puncturation on vertex moderately coarse and dense and that of towards anterior margin of clypeus almost similar, setae projected towards anterior side. Antenna long and slender; scape large, broadly elongated, curved and wider than rest of antenna, pedicel short, segment 3 longer than pedicel, segments 4-10 subequal and slightly longer than segment 3, segment 11 slightly longer than segment 10 and acuminate at apex. *Prothorax* broader than long, anterior margin straight and slightly sloped near extremities, widest near anterior margin and slightly narrowed posteriorly, lateral margin almost straight and with 10-11 denticles, tip of denticles somewhat pointed, pronotum flat with shallow lateral depressions, puncturation on pronotum moderately coarse and dense and almost similar to that of vertex of head, setae projected towards middle line. *Scutellum* moderately large and transverse, punctate-pubescent. *Elytra* more than two times as long as broad, parallel-sided, lateral

margins slightly wavy, rows of punctures deep and large, interstices narrower than width of punctures, alternate interstices slightly wider and narrower, 7th interstice strongly carinate and extending almost upto apex, setae projected posteriorly. On ventral side puncturation finer than on dorsal side. Aedeagus (Fig. 322) with median lobe broadly elongated, tapered and narrowly pointed at apex; parameres short and slender, each paramere with single long apical seta and a few short setae on inner margin.

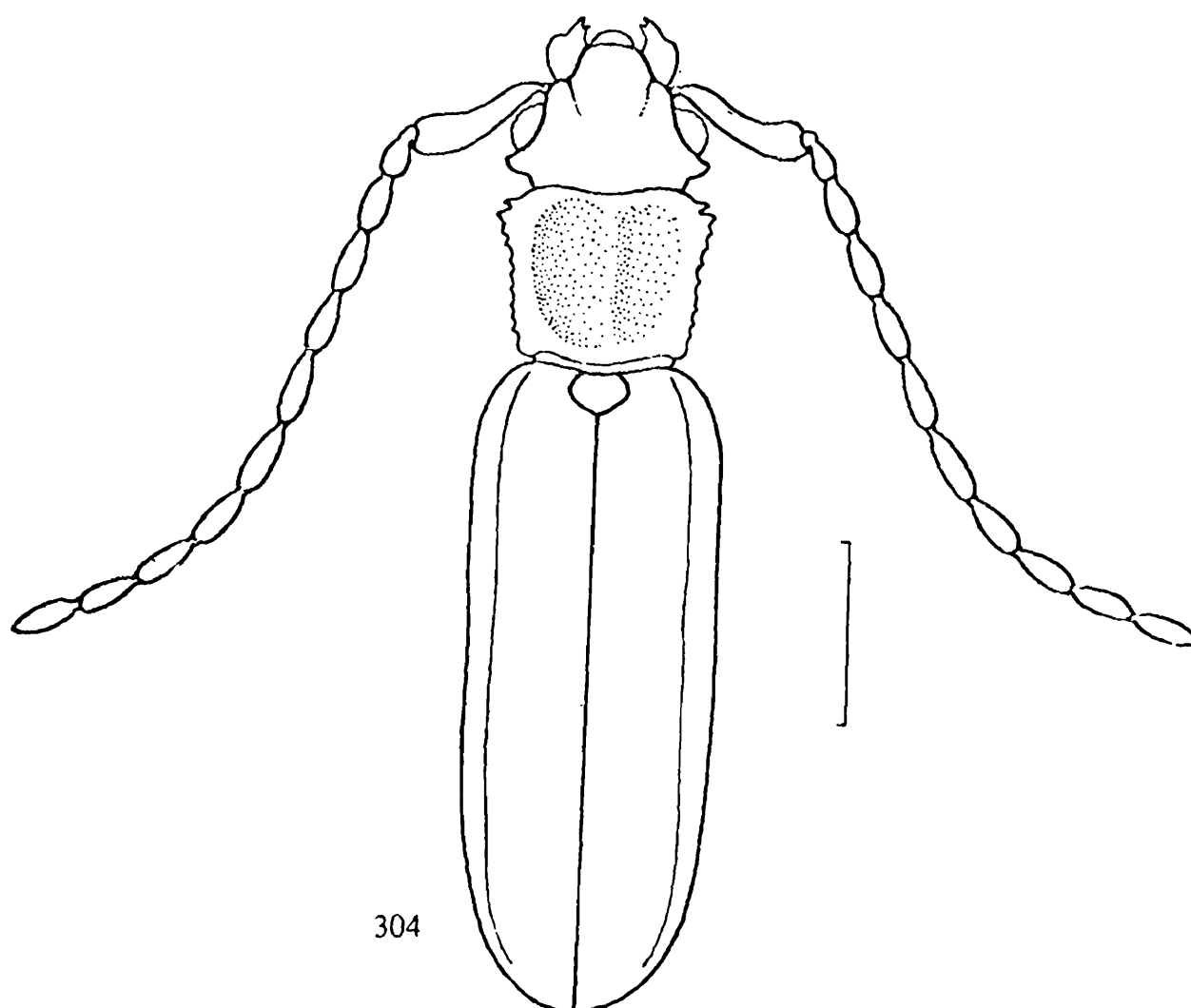


Fig. 304. *Uleiota alticola* Pal, Sengupta and Crowson, Dorsal view, (scale = 1.0 mm).

Measurements : Total length 5.20 - 5.50 mm., width of head across eyes 1.04-1.12 mm., length of antenna 4.50 - 6.58 mm., width of prothorax 1.08 - 1.25 mm., length of elytra 3.50 - 3.75 mm. and width across middle 1.35 - 1.45 mm.

Materials examined : 27 ex. *Holotype* ♂, INDIA : MEGHALAYA, Shillong, nr. Police Bazar, 28.xi.1974, T. Sengupta, under bark of Orkhol tree. Aedeagus dissected and mounted on plastic board and pinned with the holotype (Z.S.I. Reg. No. 10122/H₄A); *Paratypes*, 3 ex., data same as holotype (Z.S.I. Reg. No. 10123/H₄A–10125/H₄A); *Paratypes*, 2 ex., WEST BENGAL, Darjeeling district, Kurseong, 880-1760 m., v. 1912, P. Newton (Z.S.I. Reg. No. 989/41 and 990/41) (all types in Zoological Survey of India, Calcutta); ARUNACHAL PRADESH, Namdapha Survey 1981, Hornbill Camp, 35 km. from Miao, 15 ex., 14.iv.1981, S. Biswas, under bark; Namdapha Camp, 5 ex., 21.iv.1981, S. Biswas; Deban, 1 ex., 28.v.1981, S. Biswas, under bark.

Distribution : INDIA : Arunachal Pradesh, Meghalaya, West Bengal (Darjeeling district).

Remarks : 2 examples labelled as 'SIKKIM : Kurseong, 3-6000 ft., P. Newton, Mai 1912 (Reg. No. 989/41 and 990/41)' identified as *Uleiota alticola* Grouv. by A. Grouvelle, are present in the collection of Zoological Survey of India. But this species remained undescribed. While describing this species, Pal, Sengupta and Crowson (1984) retained the species name, *alticola* in honour of Grouvelle.

67, *Uleiota indica* (Arrow)

1901. *Hyliota indica* Arrow, *Trans. Ent. Soc. London* 1901 : 599 (Type-loc. : North Kanara : Karnataka, India; Type deposition British Museum Nat. Hist., London).

1908. *Uleiota indica* : Grouvelle, *Annls Soc. ent. Fr.*, 77 : 460.

1930. *Uleiota indica* : Hetschko, *Coleopt. Cat.*, 109 : 6.

1984. *Uleiota indica* : Pal, Sengupta and Crowson, *Oriental Ins.*, 18 : 222.

This species shows resemblance with *U. fallax* Grouvelle but can be easily distinguished by its elytral interstices distinctly wider, vertex of head devoid of transverse depression, species less pubescent, narrow and slender parameres with subapical constriction (Fig. 323).

Description : General form (Fig. 305) broadly elongated, rather parallel-sided, markedly flattened, yellowish or reddish-brown; covered with short, semierect, golden pubescence.

Head : Exposed part of head broader than long, eyes large, length of eye about one-third of length of head, temple shorter than two eye facets and its outer apical angle somewhat pointed; two moderately large, well-marked depressions near antennal insertions and two shallow, lateral longitudinal depressions on posterior side of vertex; puncturation on vertex coarse and moderately dense and that of towards anterior margin of clypeus almost similar, setae scanty. Antenna long and slender; scape large, broadly elongated, curved and wider than rest of antenna; pedicel short, segment 3 longer than pedicel, segments 4-10 subequal and slightly longer than segment 3, segment 11 slightly longer than segment 10 and acuminate at apex. *Prothorax* broader than long, anterior margin straight and slightly sloped near extremities, widest near anterior margin and slightly narrowed posteriorly; lateral margin almost straight and with 9 to 10 denticles, anterior two denticles distinct and its tip somewhat pointed, other teeth small and rather indistinguishable; pronotum flat with indistinct sublateral ridges, pronotal disc slightly depressed and two rather well-marked

depressions near posterior angles, puncturation on pronotum slightly denser than that of vertex of head, setae scanty. *Scutellum* moderately large, transverse and finely punctate. *Elytra* more than two times as long as broad, parallel-sided, lateral margins slightly wavy, rows of punctures moderately deep and large, interstices distinctly wider than width of punctures, 7th elytral interstice strongly carinate and extending almost upto apex, setae scanty and projected posteriorly. On ventral side puncturation finer than on dorsal side. Aedeagus (Fig. 323) with median lobe broadly elongated, tapered and pointed at apex; parameres short, slender and slightly constricted above apex, each paramere with a short apical setae.

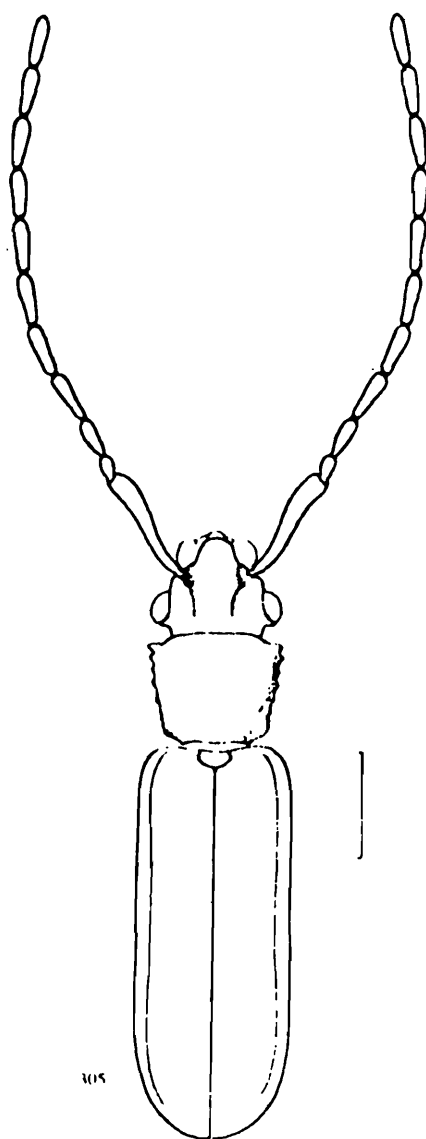


Fig. 305. *Uleiota indica* (Arrow), Dorsal view (scale = 1.0 mm).

Measurements : Total length 6.04 mm., width of head across eyes 1.25 mm., length of

antenna 6.45 mm., width of prothorax 1.35 mm., length of elytra 4.06 mm., and width across middle 1.66 mm. (n = 1 ♂).

Materials examined : 5 ex. 'Type' ♂ , INDIA : KARNATAKA, N. Kanara, H. E. Andrewes (British Museum Nat. Hist., London); 'Cotype', 2 ex., data same as 'type' (Zoological Survey of India, Calcutta; Reg. No. 3788/21 and 3789/21); KERALA, Parambikulam, 500-900 m., 2 ex., 16-24.xi. (19) 14, F. H. Gravely.

Distribution : INDIA : Karnataka, Kerala.

68. *Uleiota puberula* (Reitter)

1878. *Uliota puberula* Reitter, *Stettin ent. Ztg.*, **39** : 316 (Type-loc. : India; Type deposition - ?).

1888. *Hyliota puberula* : Grouvelle, *Ann. Mus. civ. Stor. Nat. Giacomo Doria*, (2) **6** : 625.

1930. *Uleiota puberula* : Hetschko, *Coleopt. Cat.*, **109** : 7.

1984. *Uleiota puberula* : Pal, Sengupta and Crowson, *Oriental Ins.*, **18** : 223.

This species is closely related to *U. indica* (Arrow) but can be readily separated by its elytral interstices distinctly narrower than rows of punctures and antennal segment 3 about as long as pedicel. This species has also some resemblance with *U. fallax* (Grouvelle) but can be distinguished by its shorter antennal segment 3 and vertex of head devoid of transverse depression.

Description : General form (Fig. 306) broadly elongated, rather parallel-sided, markedly flattened, reddish-brown; covered with short, semierect, golden pubescence.

Head : Exposed part of head broader than long, eyes large, length of eye about half as long as head, temple shorter than two eye facets and its outer apical angle somewhat pointed, a shallow lateral depression on either side of middle line; puncturation on vertex fine, moderately dense and that of towards anterior margin of clypeus finer, setae projected towards middle line. Antenna long and slender; scape large, broadly elongated and wider than rest of antenna; pedicel and segment 3 shorter and subequal, segments 4-10 longer than segment 3 and subequal, segment 11 slightly longer than segment 10 and acuminate at apex. **Prothorax** broader than long, anterior margin straight and slightly sloped near extremities, lateral margin almost straight with 9 to 10 small denticles, tip of denticles somewhat pointed, pronotum flat with prominent sublateral ridges, pronotal disc depressed with well-marked depressions near posterior angles, puncturation on pronotum coarser and denser than that of vertex of head, setae projected towards middle line. **Scutellum** moderately large, transverse. **Elytra** more than two times as long as broad, parallel-sided, lateral margins slightly wavy, rows of punctures deep and large, interstices narrower than width of punctures, 7th elytral interstice strongly carinate and extending almost upto apex, setae projected posteriorly. On ventral side puncturation finer than on dorsal side. **Aedeagus** (Fig. 324) with median lobe broadly elongated and broadly pointed at apex, each paramere with single long apical seta.

Measurements : Total length 5.22 - 5.68 mm., width of head across eyes 1.25 - 1.37 mm., length of antenna 4.37 - 4.58 mm., width of prothorax 1.25 - 1.45 mm., length of elytra 3.33 - 3.95 mm. and width across middle 1.58 - 1.75 mm.

Materials examined : 35 ex. INDIA : WEST BENGAL, Jalpaiguri district, Hasimara,

24 ex., 15.xii.1974, T. Sengupta, under bark of *Shorea robusta* ; MEGHALAYA, Tura, Garo Hills, 350 - 440 m., 1 ex., 15.vi.-15.vii. (19) 17, S. Kemp; BIHAR, Singbhum, 10 ex., 11-12. i. 1921, C. F. C. Beeson, under bark of *Shorea robusta*.

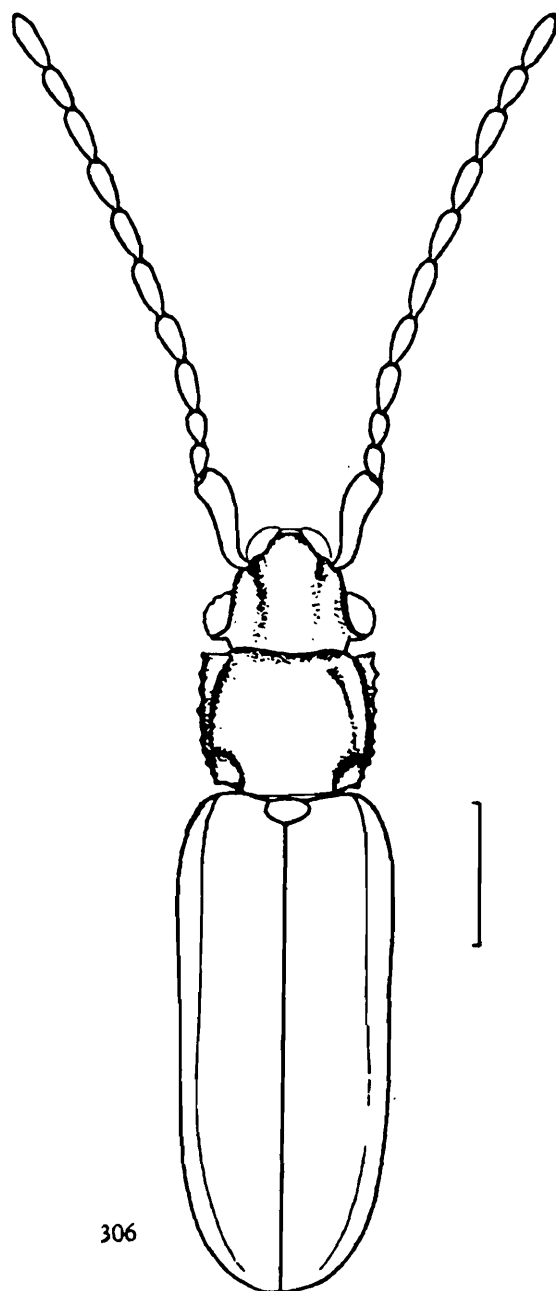


Fig. 306. *Uleiota puberula* (Reitter), Dorsal view (scale = 1.0 mm).

Distribution : INDIA : Meghalaya, West Bengal, Bihar; BURMA.

69. *Uleiota fallax* (Grouvelle)

1892. *Hyliota fallax* Grouvelle, *Annali Mus. civ. Stor. nat. Giacomo Doria*, (2) **12** : 859 (Type-loc. : Plapoo : Burma; Type deposition Museum National d' Histoire Naturelle, Paris).

1930. *Uleiota fallax* : Hetschko, *Coleopt. Cat.*, **109** : 6.

This species shows close resemblance with *U. serricollis* (Candeze) and *U. puberula*

(Reitter). This species can be separated from *serricollis* by its short temple with somewhat pointed outer apical angle, eyes longer than one-third of length of head, transverse depressions above antennal insertions less prominent, prothorax more transverse (0.77 : 1.00), sublateral pronotal ridges distinctly carinate, elytral interstices narrower than rows of punctures, and median impressed line on metasternum extending almost upto apex. This species can be distinguished from *puberula* by its transverse depression on vertex and long antennal segment 3. The facies of this species also shows similarity with Burmese species, *U. costicollis* (Reitter), but *costicollis* is devoid of prominent transverse depression on frons, prominently carinate sublateral ridge on pronotum, distinctly raised 5th elytral interstice, and dull in appearance.

Description : General form (Fig. 307) broadly elongated, rather parallel-sided, markedly flattened, reddish-brown, slightly shiny; covered with short, semierect, golden pubescence.

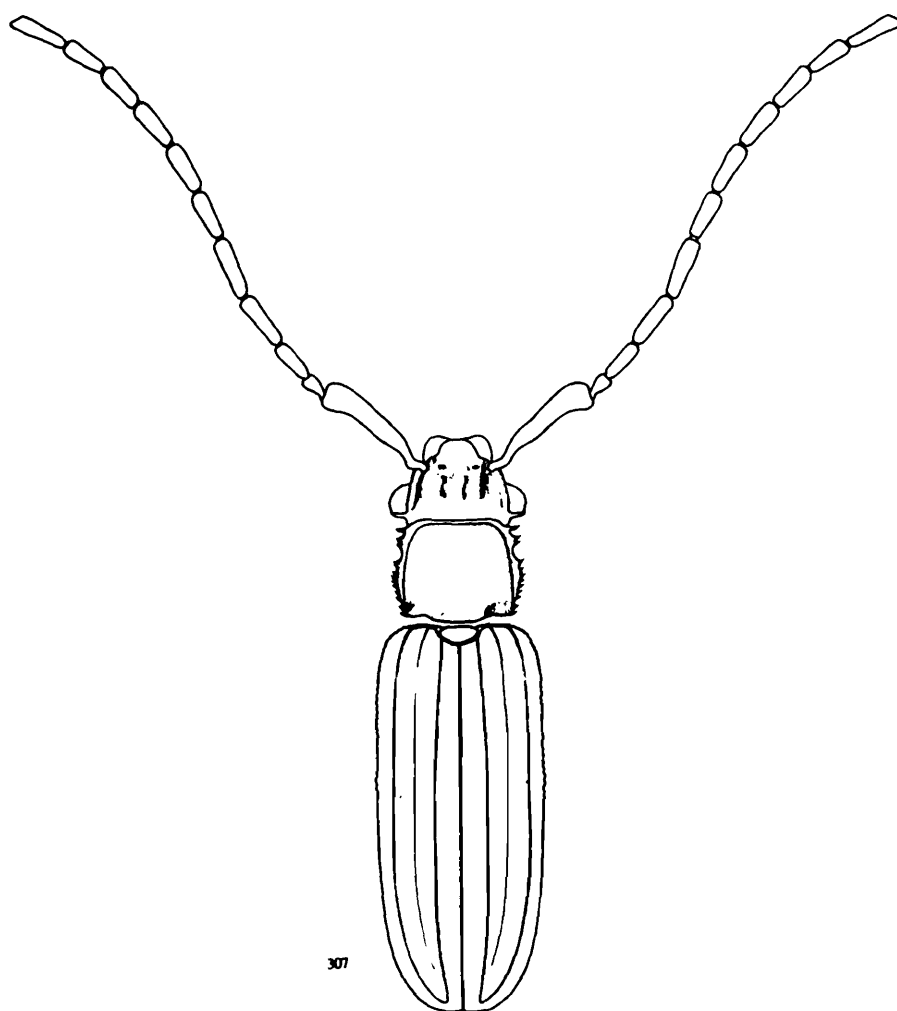
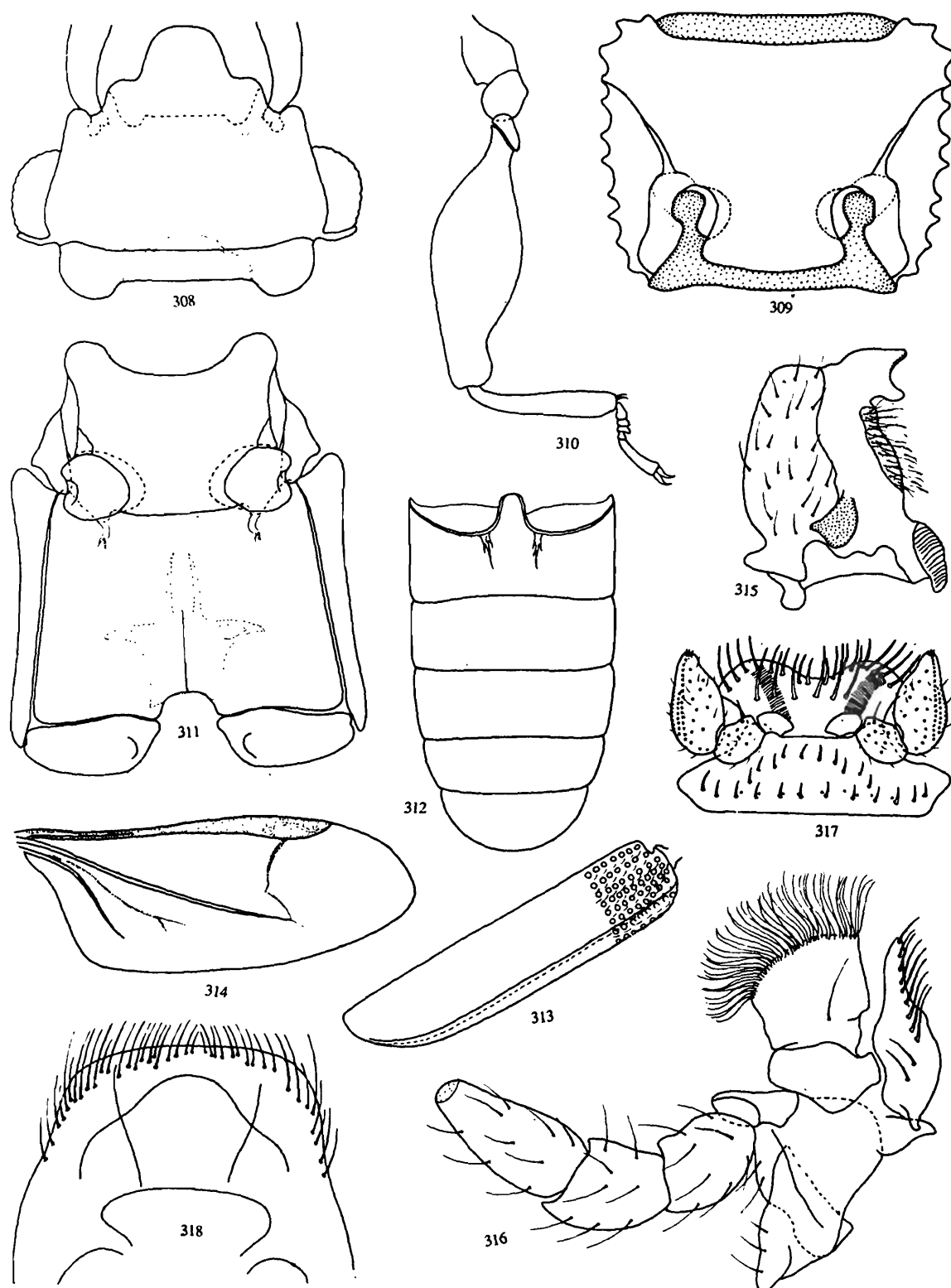


Fig. 307. *Uleiota fallax* (Grouvelle), Dorsal view (scale = 1.0 mm).



Figs. 308-318. *Uleiota puberula* (Reitter) : 308, Head, Dorsal view; 309, Prothorax, Ventral view; 310, Front leg; 311, Meso-metathorax, Ventral view; 312, Abdomen, Ventral view; 313, Right elytron, Dorsal view; 314, Wing; 315, Right mandible, Dorsal view; 316, Right maxilla, Ventral view; 317, Labium, Ventral view; 318, Labrum.

Head : Exposed part of head broader than long, eyes large, length of eye shorter than half of length of head, temple about as long as two eye facets and its outer apical angle somewhat pointed; a broad transverse depression on vertex across base of antennae, a short longitudinal median ridge in male; puncturation on vertex fine, moderately sparse and that of towards anterior margin of clypeus slightly sparser; setae projected towards middle line. **Antenna** long and slender; scape large, broadly elongated, curved and wider than rest of antenna, pedicel short, segment 3 longer than pedicel, segments 4-10 subequal and slightly longer than segment 3, segment 11 slightly longer than segment 10 and acuminate at apex. **Prothorax** broader than long, anterior margin straight and slightly sloped near extremities, lateral margin almost straight with 9 to 10 denticles, tip of denticles somewhat pointed, pronotum flat with prominent sublateral ridges, pronotal disc slightly depressed with well-marked depressions near posterior angles, puncturation on pronotum coarser and denser than that of vertex of head, setae projected towards middle line. **Scutellum** moderately large, transverse and punctate-pubescent. **Elytra** more than two times as long as broad, parallel-sided, lateral margins slightly wavy, rows of punctures deep and large, interstices narrower than width of punctures, 7th elytral interstice strongly carinate and extending almost upto apex, 3rd and 5th interstices prominently raised and slightly carinate, 3rd interstice unite posteriorly with 7th. On ventral side puncturation finer than on dorsal side, median impressed line on metasternum extending almost upto apex of mesosternal process. **Aedeagus** (Fig. 325) with median lode broadly elongated, acuminate and narrowly pointed at apex; parameres short, broad and narrowed towards apex, each paramere with a few short setae on inner margin in addition to single moderately long apical seta.

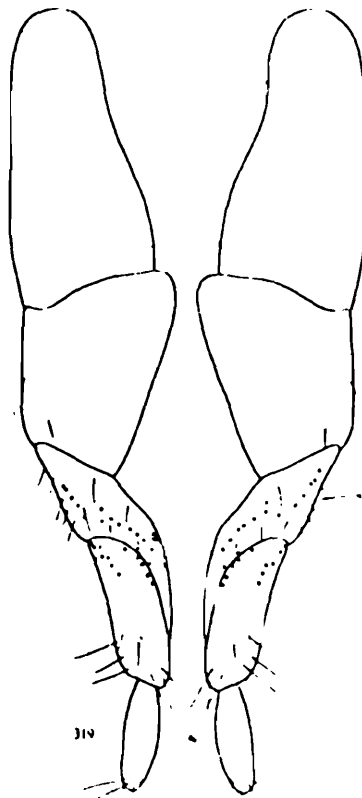
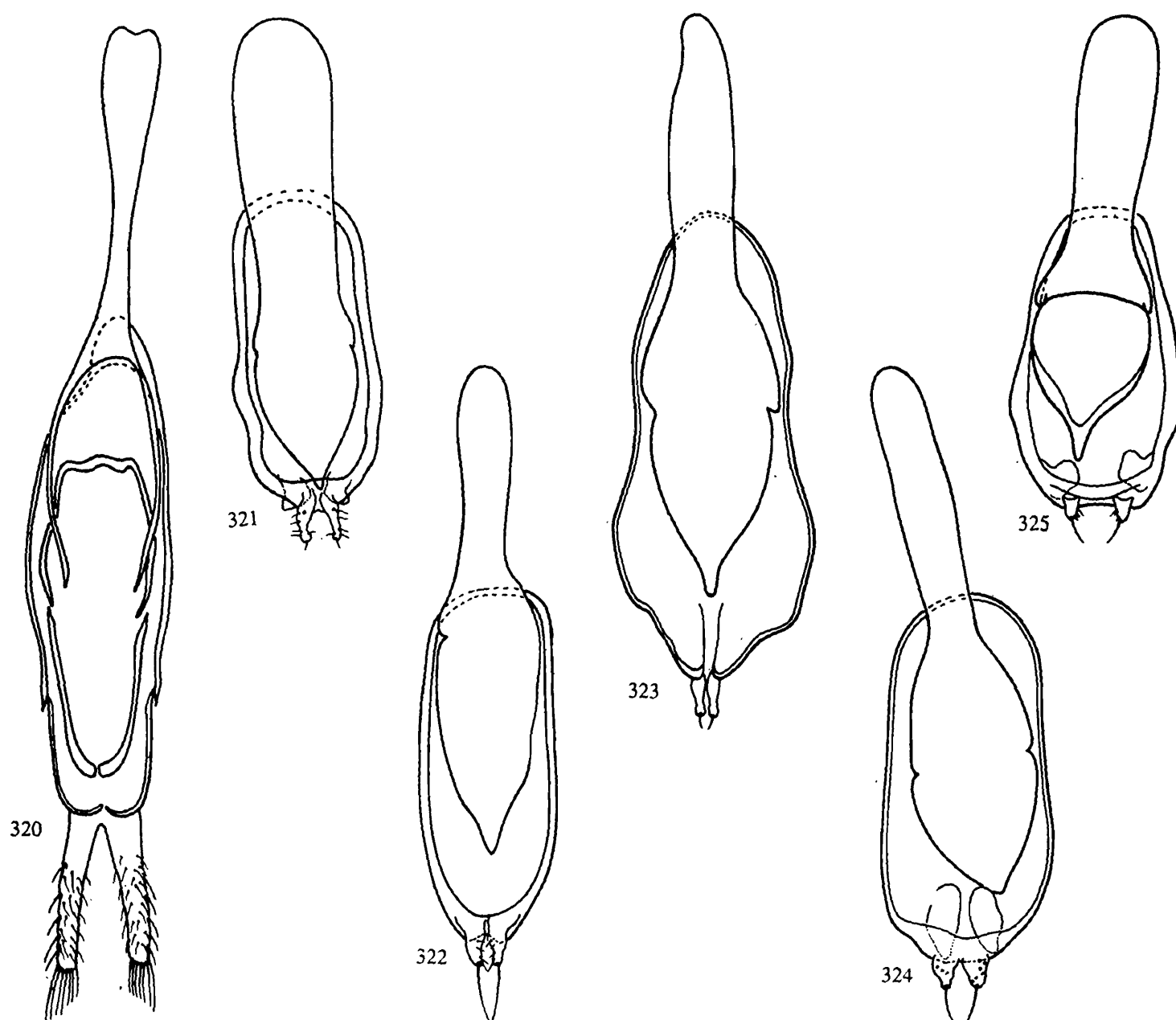


Fig. 319. Ovipositor of *Uleiota puberula* (Reitter).



Figs. 320-325. Aedeagi, Dorsal view : *Uleiota spinicollis* (Gory); 321, *U. serricollis* (Candeze); 322, *U. alticola* Pal, Sengupta and Crowson; 323, *U. indica* (Arrow); 324, *U. puberula* (Reitter); 325, *U. fallax* (Grouvelle).

Measurements : Total length 6.52 - 6.91 mm., width of head across eyes 1.25-1.54 mm., length of elytra 4.58-4.66 mm. and width across middle 1.76-2.04 mm.

Materials examined : 3 ex. *Type*, 1 ♂, labelled : Tenasserim, Plapoo, Fea. Apr. 1887 [printed, rectangular, black-bordered], *TYPE* [printed, rectangular, red], Museum Paris, Collection Grouvelle [printed + handwriting] *fallax* Ty. Grouv. [Grouvelle's handwriting]; BURMA, Tenasserim, Plapoo, 1 ♀, Apr. 1887; INDIA : WEST BENGAL, Jalpaiguri district, Hasimara, 1 ♂, 2.xii.1974, T. sengupta, under bark of dead standing tree.

Distribution : INDIA : West Bengal; BURMA.

Remarks : 1 ♀, labelled; Tenasserim, Plapoo, Fea. Apr : 1887 [printed, rectangular, black-bordered] *Uleiota fallax* [Grouvelle's handwriting, 991/H1 printed] present in the collection of Zoological Suvey of India, coincides with the data given in the type-specimens, and most probably is a member of the type-series.

TAXONOMY OF LARVAE

Key to the Larvae of Silvanid Subfamilies

- 1. Urogomphi present, posterior angles of 8th abdominal sternite with setose prolongations (Figs. 413, 419) 2

Urogomphi absent, posterior angles of 8th abdominal sternite without setose prolongations 3
- 2. Upper surface almost glabrous; maxillary mala with three apical spines (Fig. 416); basal one of mandibular apical teeth bidentate (Fig.415); apical segment of labial palpi slightly longer but as wide as basal one (Fig. 417) Uleiotinae p. 253

Upper surface with many small setae; maxillary mala with single apical spine (Fig. 411); basal one of mandibular apical teeth not bidentate (Fig. 410); apical segment of labial palpi about twice as long as and distinctly narrower than basal one Cryptamorphinae p. 251
- 3. Antennal segment 3 well-developed and more or less equal in length to segment 2 (Fig. 398); dorsal surface not sclerotized Psammoecinae p. 249

Antennal segment 3 minute and markedly shorter than segment 2; dorsal surface sclerolized Silvaninae p. 233

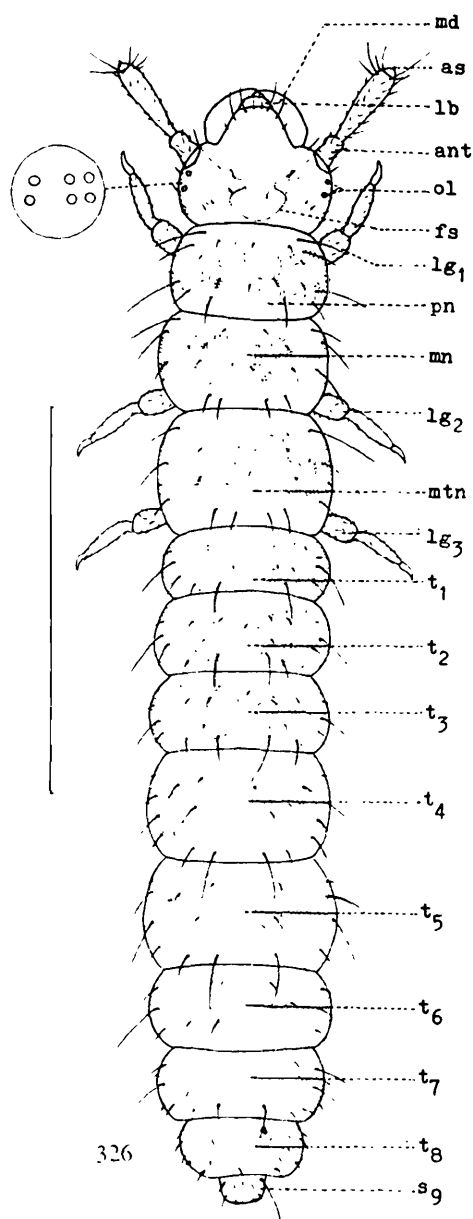


Fig. 326. Larva of *Oryzaephilus mercator* (Fauvel), Dorsal view (scale = 1.0 mm).

Key to the Larvae of Silvanid Genera

1. Urogomphi present; posterior angles of 8th abdominal sternite with setose prolongations 2
- Urogomphi absent; posterior angles of 8th abdominal sternite without setose prolongations 3
2. Upper surface almost glabrous; maxillary mala with three apical spines; basal one of mandibular apical teeth bidentate; apical segment of labial

plapi slightly longer but as wide as basal one; claw with two tarsungular setae lying side by side; larva moderately large (4.23 mm.)
 *Uleiota* Latreille p. 253

Upper surface with many small setae; maxillary mala with single apical spine; basal one of mandibular apical teeth not bidentate; apical segment of labial plapi about twice as long as and distinctly narrower than basal one; claw with two tarsungular setae lying one above another (Fig. 412); larva large (9 mm.)
 *Cryptamorphia* Wollaston p. 251

3. Antennal segment 3 well-developed and more or less equal in length to segment 2 (Fig. 398); dorsal surface not sclerotized
 *Psammoecus* Latreille p. 249

Antennal segment 3 minute and markedly shorter than segment 2 (Figs. 327, 334); dorsal surface sclerotized 4

4. Antenna shorter than length of head, antennal segment 2 distinctly broadened towards apex (Figs. 327, 380, 389) 5

Antenna distinctly longer than length of head, antennal segment 2 more or less parallel-sided and not broadened towards apex (Figs. 334, 343, 362) 7

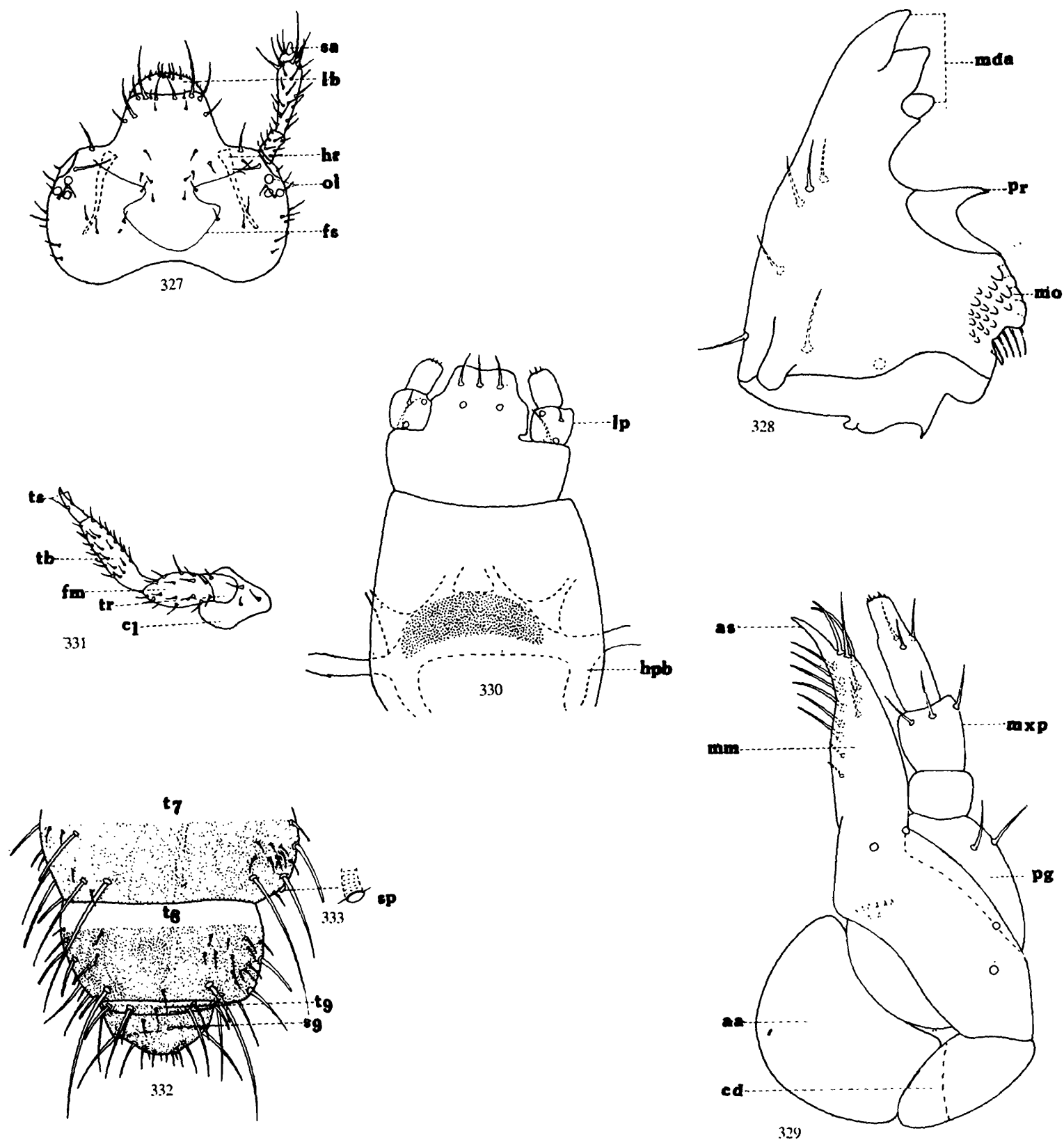
5. Each tergite with a transverse black pigmented area; basal one of mandibular apical teeth not bifid at apex (Figs. 374, 392) 6

Tergite devoid of transverse black pigmented area; basal one of mandibular apical teeth bifid at apex (Fig. 383) *Monanus* Sharp p. 245

6. Posterior abdominal tergites covered with transverse bands of small setae (Fig. 396); arrangement of setae on dorsal side of head dense and their arrangement as seen in figure (Fig. 389); toothed apex of mandible tapering from base to apex (Fig. 392) *Airaphilus* Redtenbacher p. 247

Setae on posterior abdominal tergites confined mainly towards lateral sides (Figs. 332, 378); setae on dorsal side of head sparser and its arrangement different (Figs. 327, 371); toothed apex of mandible not tapering from base to apex (Figs. 328, 374)
 *Oryzaeophilus* Ganglbauer p. 242

7. Head and antenna with a few setae, five ocelli on lateral side of head (Fig. 354) *Protosilvanus* Grouvelle p. 237



Figs. 327-333. Larva of *Oryzaephilus mercator* (Fauvel) : 327, Head, Dorsal view; 328, Left mandible, Ventral view; 329, Left maxilla, Ventral view; 330, Labium, Ventral view; 331, Leg; 332, Posterior abdominal segments, Dorsal view; 333, Abdominal spiracles.

Setae on head and antennae more dense, six ocelli on each side of head.
..... 8

8. Two admedial long setae within frontal suture of head, sensory appendage of antenna shorter than antennal segment 3 (Figs. 334, 343); maxillary mala with single apical spine; apical segment of labial palpi slightly narrower than apical margin of basal segment (Figs. 339, 348) 9

No long setae within frontal suture of head, sensory appendage of antenna about as long as antennal segment 3 (Fig. 362); maxillary mala with two apical spines (Fig. 366); apical segment of labial palpi distinctly narrower than apical margin of basal segment (Fig. 367)
..... *Ahasverus* Gozis p. 240

9. Six ocelli on lateral side of head arranged in two groups: 4 and 2 (Fig. 335); claw with two tarsungular setae lying side by side (Fig. 340); basal one of mandibular apical teeth bifid, single long seta on outer margin of mandible, fewer (about 5) rows of dorsal fine transverse ridges on mola (Fig. 337)
..... *Silvanus* Latreille p. 233

Six ocelli arranged in two groups: 3 and 3 (Fig. 344); claw with single tarsungular seta (Fig. 349); basal one of mandibular apical teeth not bifid, a few (about 4) long setae on outer margin of mandible, many rows (15-16) of dorsal fine transverse ridges on mola (Fig. 346)
..... *Silvanoprus* Reitter p. 235

Subfamily I. SILVANINAE

Genus 1. *Silvanus* Latreille

1. *Silvanus difficilis* Halstead

Description : General body form elongated, narrow, parallel-sided, somewhat depressed, mouthparts yellowish.

Head transverse, side margins evenly rounded, frontal suture slightly distinct and Cucujoid-type, clypeus fused with frons, arrangement of setae on dorsal surface as seen in figure (Fig. 334), endocarina and metopic suture absent. Ocelli (Fig. 335) six on each side of head, in two groups behind antenna, four in upper group and two in lower group. Antenna rather long, 3-segmented, length of segments 2 : 5 : 1, all segments elongated, sensory appendage minute, lying ventrally and shorter than segment 3. Mandible (Fig. 337) with three apical teeth and basal one bifid, prosthema translucent at base with chitinized and sharply pointed at apex; mola well-developed, chitinized, with about 5 rows of dorsal fine transverse ridges and 15-16 rows of ventral curved longitudinal asperated ridges. Maxillary mala (Fig. 338) moderately sharply pointed at apex, with a strong spine at tip, towards outer margin from base of apical spine with a longitudinal row of 4 short setae, a row of about 6 setae present on dorsal side of inner margin of mala, 4 ventral setae on inner margin,



Figs. 334-342. Larva of *Silvanus difficilis* Halstead: 334, head, Dorsal view; 335, Ocelli; 336, Prothorax, Dorsal view; 337, Left mandible, Ventral view; 338, Left maxilla, Ventral view; 339, Labium, Dorsal view; 340, Tarsungulus; 341, Posterior abdominal segments, Dorsal view; 342, Abdominal spiracle.

towards apex, at base of mala with a group of dorsal denticles, cardo well-developed, maxillary articulating area well-defined and oval, length of palpal segments 2 : 4 : 5. Labium (Fig. 339) narrowed anteriorly, 2-segmented palpi, apical segment narrower and shorter than basal one, hypopharynx well-developed, hypopharyngeal bracon present, hypopharyngeal rods and hypostomal margins distinct and diverging posteriorly.

Thorax and abdomen : Tergites with sparsely distributed simple and moderately long setae. Pro-, meso- and metathorax about equal in length and progressively wider, arrangement of setae on pronotum as seen in figure (Fig. 336). Abdominal segment 1 shortest, segments 2 and 3 shorter than metathorax and abdominal segment 4, abdominal segments 5-8 progressively slightly narrower; segment 9 with very short tergite, its sternite forming an elongated tubular pygopod-like projection (Fig. 341); without urogomphi, segment 10 represented by a sclerite attached at the apex of pygopod-like projection.

Spiracles and legs : All spiracles annular, lying on body surface (Fig. 342). Legs narrow and moderately long, coxae small and widely separated; claw simple, rather long with two tarsungular setae lying side by side, outer seta shorter than inner one (Fig. 340).

Measurements : Total length 4.00 mm., length of head including labrum 0.40 mm. and width across middle 0.48 mm., width of prothorax across middle 0.40 mm., width of 9th abdominal segment across front margin 0.24 mm. (n = 1).

Material examined : 1 ex. INDIA : HIMACHAL PRADESH, Solan, 19.x.1981, T. K. Pal, under bark in association with adults.

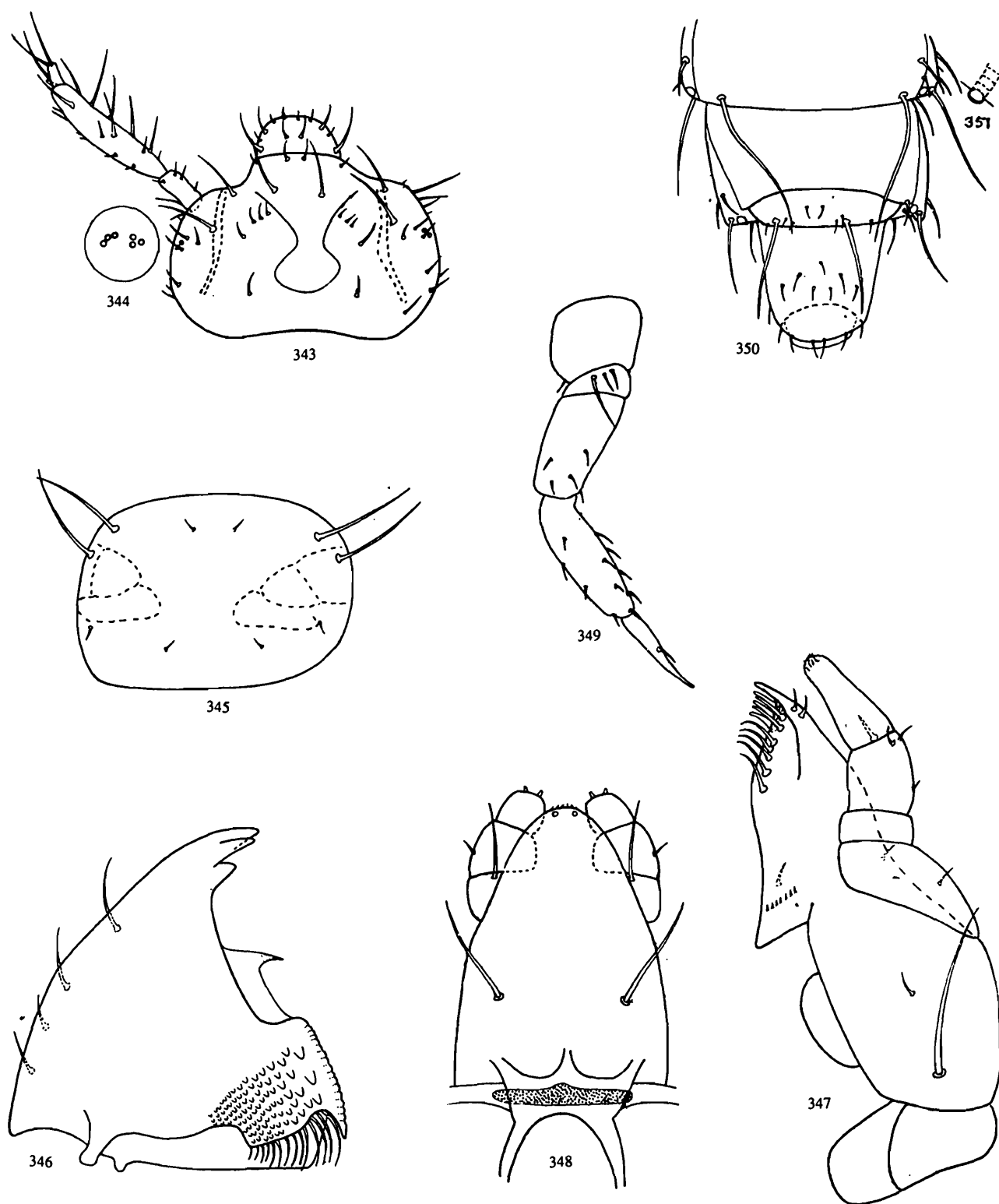
Genus 2. *Silvanoprus* Reitter

2. *Silvanoprus angusticollis* (Reitter)

Description : General body form elongated, narrow, parallel-sided, somewhat depressed, whitish soft bodied, mouthparts yellowish.

Head transverse, side margins evenly rounded, frontal suture rather indistinct and Cucujoid-type, clypeus fused with frons, arrangement of setae on dorsal surface as seen in figure (Fig. 343), endocarina and metopic suture absent. Ocelli (Fig. 344) six on each side of head, in two groups behind antenna, three in each group. Antenna rather long, 3-segmented, length of segments 2 : 7 : 1, all segments elongated, sensory appendage lying ventrally and shorter than segment 3. Mandible (Fig. 346) with three apical teeth, prosthema translucent at base and sharply pointed at apex; mola well-developed, chitinized, with about 16 rows of dorsal fine transverse ridges and 15-16 rows of ventral curved longitudinal asperated ridges. Maxillary mala (Fig. 347) moderately sharply pointed at apex, with a strong spine at tip, at base of apical spine on outer margin with 2 setae, a row of about 7 setae present on dorsal side of inner margin of mala, 3 ventral setae on inner margin towards apex, at base of mala with a group of dorsal denticles, cardo well-developed, maxillary articulating area well-defined and oval, length of palpal segments 2 : 6 : 7. Labium (Fig. 348) narrowed anteriorly, 2-segmented palpi, apical segment narrower and shorter than basal one, hypopharynx well-developed, hypopharyngeal bracon present, hypopharyngeal rods and hypostomal margins distinct and diverging posteriorly.

Thorax and abdomen : Tergites with sparsely distributed simple and moderately long



Figs. 343-351. Larva of *Silvanoprus angusticollis* (Reitter) : 343, Head, Dorsal view; 344, Ocelli; 345, Prothorax, Dorsal view; 346, Right mandible, Ventral view; 347, Left maxilla, Ventral view; 348, Labium, Dorsal view; 349, Leg; 350, Posterior abdominal segments, Dorsal view; 351, Abdominal Spiracles.

setae. Pro-, meso- and metathorax about equal in size, arrangement of setae on pronotum as seen in figure (Fig. 345). Abdominal segments 1-3 about equal in size and shorter than metathorax and abdominal segment 4, abdominal segments 6-8 progressively slightly narrower; segment 9 with very short tergite, its sternite forming an elongated tubular pygopod-like projection (Fig. 350), without urogomphi, segment 10 represented by a sclerite attached at the apex of pygopod-like projection.

Spiracles and legs : All spiracles annular lying on body surface (Fig. 351). Legs (Fig. 349) narrow and moderately long, coxae small and widely separated; claw simple, rather long and with single tarsungular seta.

Measurements : Total length 2.83 mm., length of head including labrum 0.35 mm. and width across middle 0.41 mm., width of prothorax across middle 0.51 mm., width of 9th abdominal segment across front margin 0.19 mm. (n = 1).

Materials examined : 5 ex. INDIA : SIKKIM, Gangtok, 1704 m., 24.iv.1976, T. K. Pal, in association with adults under bark of *Schima wallichii*.

Genus 3. *Protosilvanus* Grouvelle

3. *Protosilvanus lateritius* (Reitter)

1984. *Protosilvanus lateritius* : Pal and Sengupta, *Oriental Ins.*, 18 : 239.

Description : General body form (Fig. 352) elongated, somewhat depressed, slightly narrowed in front and behind, head yellowish-white, tergites slightly paler, mouthparts yellowish.

Head transverse, side margins evenly rounded, frontal suture rather indistinct and Cucujoid-type, clypeus fused with frons, arrangement of setae on dorsal surface as seen in figure (Fig. 353), endocarina and metopic suture absent. Ocelli (Fig. 354) five on each side of head, four in a vertical row behind antenna, other one behind vertical row. Antenna rather long, 3-segmented, length of segments 1 : 4 : 0.33, segments 1 and 2 elongated, sensory appendage minute. Mandible (Fig. 335) with three apical teeth, prostheca translucent at base with chitinized and sharply pointed at apex; mola well-developed, chitinized, with 9 rows of dorsal fine transverse ridges and 14 to 15 rows of ventral curved longitudinal asperated ridges. Maxillary mala (Fig. 356) moderately sharply pointed at apex, with a strong spine at tip, at base of apical spine on outer margin with 2 setae, a row of about 12 setae present on dorsal side of inner margin of mala, 3 ventral setae on inner margin towards apex, at base of mala with a group of dorsal denticles, cardo well-developed, maxillary articulating area well-defined and oval, length of palpal segments 2 : 4 : 5. Labium (Fig. 357) narrowed anteriorly, 2-segmented palpi, apical segment narrower and shorter than basal one, hypopharynx well-developed. hypopharyngeal bracon present, hypopharyngeal rods and hypostomal margins distinct and diverging posteriorly.

Thorax and abdomen : Tergites with sparsely distributed simple and moderately long setae. Prothorax about as broad as head and slightly narrower than meso- and metathorax. Pro-, meso- and metanotum with an anterior and a posterior pairs of setae. First abdominal segment shorter than metathorax and second abdominal segment, abdominal segments 1-5 slightly wider, segments 6-8 progressively slightly narrower; segment 9 with very short

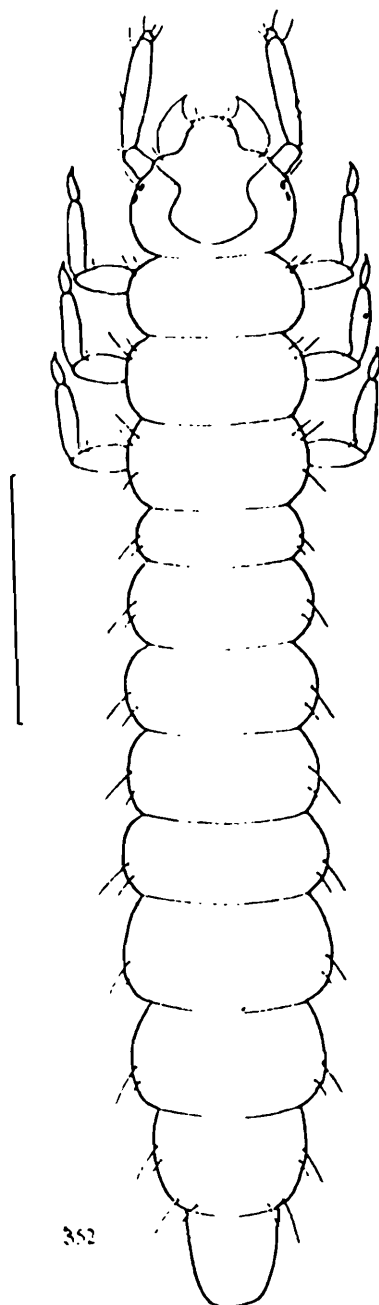


Fig. 352. Larva of *Protosilvanus lateritius* (Reitter), Dorsal view (scale = 1.0 mm).

tergite, its sternite forming a tubular pygopod-like projection (Fig. 359) which about as broad as long; without urogomphi, segment 10 represented by a sclerite attached at the apex of pygopod-like projection.

Spiracles and legs : All spiracles annular lying on body surface (Fig. 360). Legs (Fig. 358) narrow and moderately long, coxae small and widely separated; claw simple, rather long and with single tarsungular seta.

Measurements : Total length 4.26 mm., length of head including labrum 0.48 mm. and width across middle 0.63 mm., width of prothorax across middle 0.61 mm., width of 9th abdominal segment across front margin 0.35 mm. (n = 1).



Figs. 353-360. Larva of *Protosilvanus lateritius* (Reitter) : 353, Head, Dorsal view; 354, Ocelli; 355, Left mandible, Ventral view; 356, Right maxilla, Ventral view; 357, Labium, Ventral view; 358, Leg; 359, Posterior abdominal segments, Dorsal view; 360, Abdominal spiracle.

Materials examined : 177 ex. INDIA : WEST BENGAL, Calcutta (Ultadanga), 100 ex., iii.1975 to viii.1975, T. K. Pal, in association with adults under bark of *Bombax* sp., *Tamerindus indica*, *Albizia indica*, Harul and several unknown logs; Burdwan district, Burdwan, 15 ex., 10.vii.1976, T. K. Pal, in association with adults under bark; UTTAR PRADESH, Anandanagar, 25 km. from Lachmipur, 12 ex., 8.x.1976, T. Sengupta, in association with adults under bark of *Shorea robusta*; SIKKIM, Rangpo, 450 m., 50 ex., 22.iv.1976, T. K. Pal, in association with adults under bark of *Duabangha sonneretioides*.

Genus 4. *Ahasverus* Gozis

4. *Ahasverus advena* (Waltl)

1877. *Cathartus advena* : Perris, *Larves de Coléoptères* : 65.

1921. *Cathartus advena* : Böving, *Zoologica N. Y.*, 3 : 203; pl. 8, f. 12.

1931. *Cathartus advena* : Böving and Craighead, *Entomologica Americana*, 11 (n.s.) : p. 146; pl. 30, f. B.

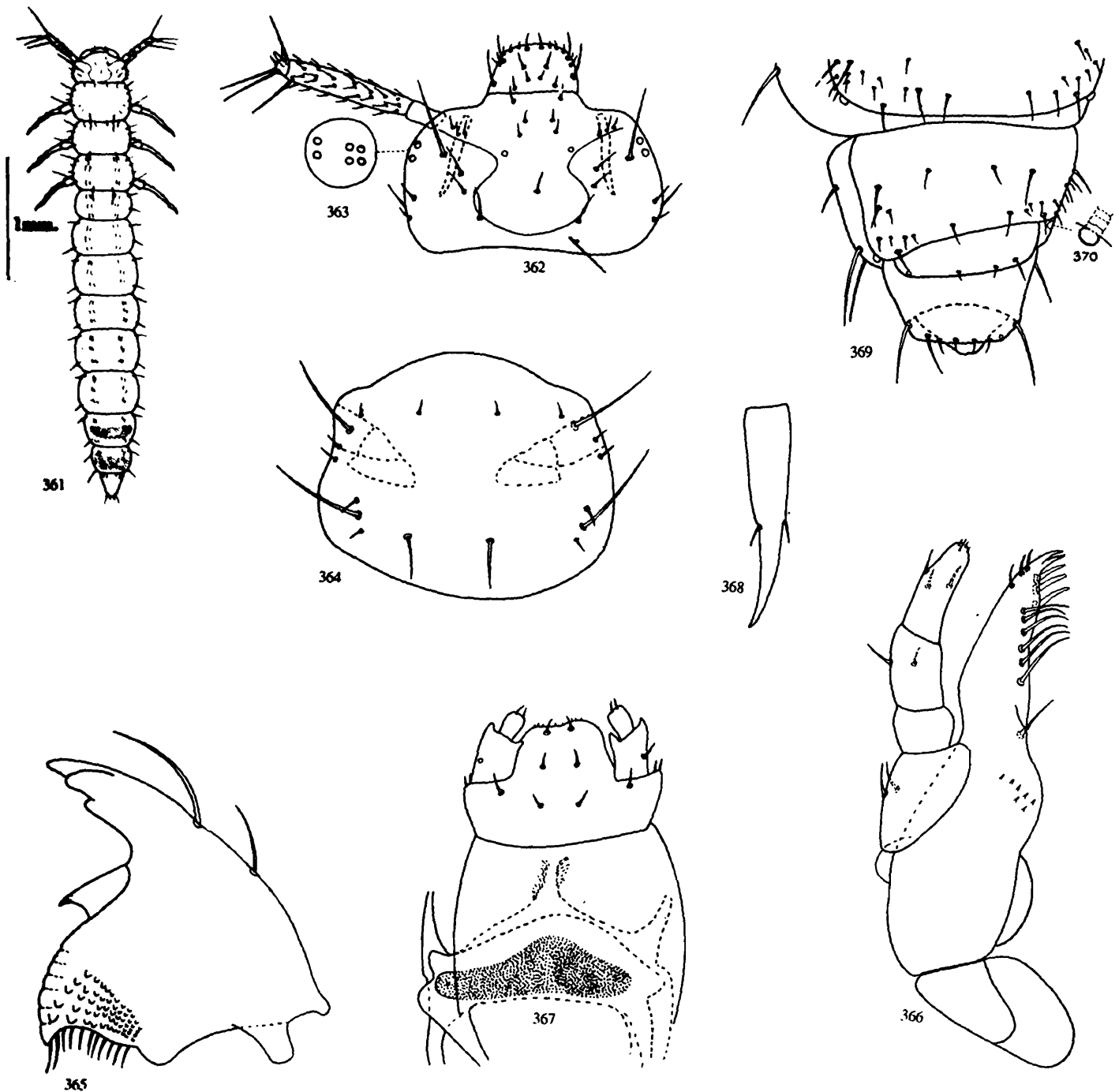
1971. *Ahasverus advena* : Cutler, *J. stored Prod. Res.*, 7 : 125, 126.

Description : General body form (Fig. 361) elongated, parallel-sided, somewhat depressed, whitish soft-bodied, dorsal surface of abdominal segments 6-8 with rather prominent transverse brownish pigmented area, head and mouthparts yellowish-brown, dorsal surface with many short setae.

Head transverse, side margins evenly rounded, frontal suture slightly distinct and Cucujoid-type, clypeus fused with frons, arrangement of setae on dorsal side as seen in figure (Fig. 362), endocarina and metopic suture absent. Ocelli (Fig. 363) six on each side of head, in two groups behind antenna, four in upper group and two in lower group. Antenna rather long, 3-segmented, length of segments 2.5 : 9 : 1, segments 1 and 2 elongated, sensory appendage lying ventrally and about as long as segment 3. Mandible (Fig. 365) with three apical teeth, prostheca translucent at base and sharply pointed at apex, mola well-developed, chitinized, with 7 rows of dorsal fine transverse ridges and 11 rows of ventral curved longitudinal asperated ridges. Maxillary mala (Fig. 366) moderately sharply pointed at apex, with two strong spine at tip, at base of apical spine on outer margin with single seta on dorsal side and two setae on ventral side, a row of about 6 setae on dorsal side of inner margin of mala, 3 ventral setae on inner margin towards apex, at base of mala with a group of dorsal denticles, above dorsal denticles a seta on ventral side of inner margin, cardo well-developed, maxillary articulating area well-defined and oval, length of palpal segments 2 : 3 : 4. Labium (Fig. 367) slightly narrowed anteriorly, 2-segmented palpi, apical segment narrower and shorter than basal one, hypopharynx well-developed, hypopharyngeal bracon present, hypopharyngeal rods and hypostomal margins distinct and diverging posteriorly.

Thorax and abdomen : Tergites with sparsely distributed simple and moderately long setae, prothorax slightly wider than head and about as broad as meso- and metathorax, arrangement of setae on pronotum as seen in figure (Fig. 364). First abdominal segment shorter than metathorax and second abdominal segment. Abdominal segments 7 and 8 progressively narrower; segment 9 with a very short tergite, its sternite forming a transverse tubular pygopod-like projection (Fig. 369); without urogomphi, segment 10 represented by a sclerite attached at the apex of pygopod-like projection.

Spiracles and legs : All spiracles annular lying on body surface (Fig. 370). Legs narrow



Figs. 361-370. Larva of *Ahasverus advena* (Waltl) : 361, Dorsal view; 362, Head, Dorsal view; 363, Ocelli; 364, Prothorax, Dorsal view; 365, Left mandible, Ventral view; 366, Right maxilla, Ventral view; 367, Labium, Ventral view; 368, Tarsungulus; 369, Posterior abdominal segments, Dorsal view, 370, Abdominal spiracle.

and moderately long, coxae small and widely separated; claw simple, rather long and with two tarsungular setae lying side by side (Fig. 368).

Measurements : Total length 4.04 mm., length of head including labrum 0.35 mm. and width across middle 0.44 mm., width of prothorax across middle 0.52 mm., width of 9th abdominal segment across front margin 0.32 mm. (n = 1).

Materials examined : 68 ex. INDIA : BIHAR, Chaibasa, 8 ex., 15.i.1978, T. Sengupta., infested plum (*Zizyphus jujuba*) in association with adults; ENGLAND, 60 ex., sent by Dr. D. G. H. Halstead in August 1977 from the culture maintained at P.I.C.L., Slough.

Genus 5. *Oryzaephilus* Ganglbauer

Key to the Larvae of *Oryzaephilus*

1. Transverse blackish pigmented bands on thoracic and abdominal tergites distinctly splitted longitudinally along median line; 6 ocelli on lateral side of head arranged in two groups : 4 upper and 2 lower; sensory appendage short and situated apically on antennal segment 3; maxillary mala with single apical spine*mercator* (Fauvel) p. 242

Transverse pigmented band on thoracic and abdominal tergites greyish and lighter, splitted longitudinally along median line on thoracic tergites but splitting indistinct on abdominal tergites; 6 ocelli on lateral side of head arranged in three groups : 3 upper, 1 middle and 2 lower; sensory appendage longer than antennal segment 3 and situated ventrally; maxillary mala with two apical spines*surinamensis* (Linnaeus) p. 243

5. *Oryzaephilus mercator* (Fauvel)

1971. *Oryzaephilus mercator* : Cutler, *J. stored Prod. Res.*, 7 : 125, 126.

Description : General body form (Fig. 326) elongated, somewhat depressed, slightly narrowed in front and behind; dorsal surface of thoracic and abdominal tergites with transverse, blackish pigmented area, splitted longitudinally along median line, thoracic tergites and head darker; mouthparts blackish, dorsal surface with many short and moderately long setae.

Head transverse, side margins evenly rounded, frontal suture slightly distinct and Cucujoid-type, clypeus fused with frons, arrangement of setae on dorsal surface as seen in figure (Fig. 327), endocarina and metopic suture absent. Ocelli six on each side of head, in two groups behind antenna, four in upper group and two in lower group situated at a distance with upper group. Antenna moderately long, 3-segmented, length of segments 3 : 7 : 1, segments 1 and 2 elongated, sensory appendage lying at apical part of segment 3 and slightly shorter than it. Mandible (Fig. 328) with three apical teeth, prostheca translucent at base and sharply pointed at apex; mola well-developed and chitinized, with 5 rows of dorsal fine transverse ridges and about 6 rows of ventral curved longitudinal asperated ridges. Maxillary mala (Fig. 329) moderately sharply pointed at apex, with a strong spine at tip, at

base of apical spine on outer margin with 2 setae on ventral side, a row of about 8 setae present on dorsal side of inner margin of mala and another row of 4 setae on dorsal side before marginal row of setae, at base of mala with a group of dorsal denticles, cardo well-developed, maxillary articulating area well-defined and oval, length of palpal segments 2 : 3 : 5. Labium (Fig. 330) narrowed anteriorly, 2-segmented palpi, apical segment narrower and shorter than basal one, hypopharynx well-developed, hypopharyngeal bracon present, hypopharyngeal rods and hypostomal margin distinct and diverging posteriorly.

Thorax and abdomen : Tergites with sparsely distributed simple and moderately long setae. Pro- and mesothorax shorter than metathorax, arrangement of setae on pronotum as seen in figure (Fig. 326), transverse blackish area of thoracic tergites divided in middle line. First abdominal segment shorter than metathorax and second abdominal segment. Abdominal segments 6 - 8 progressively narrower; segment 9 with very short tergite, its sternite forming a transverse tubular pygopod-like projection (Fig. 332); without urogomphi, segment 10 represented by a sclerite attached at the apex of pygopod-like projection.

Spiracles and legs : All spiracles annular lying on body surface (Fig. 333). Legs (Fig. 331) narrow and long, coxae small and widely separated; claw simple, rather long, with two tarsungular setae lying side by side.

Measurements : Total length 2.87 mm., length of head including labrum 0.36 mm. and width across middle 0.41 mm., width of prothorax across middle 0.44 mm., width of 9th abdominal segment across front margin 0.20 mm. (n = 1).

Materials examined : 151 ex. INDIA : WEST BENGAL, Calcutta, 1 ex., 16.vii.1976, T. K. Pal, in association with adults in infested rice; 150 ex., T. K. Pal, from culture on cashewnut.

6. *Oryzaephilus surinamensis* (Linnaeus)

1839. *Oryzaephilus surinamensis* : Westwood, *An introduction to the modern classification of Insects*. 1 : 154, f. 13.

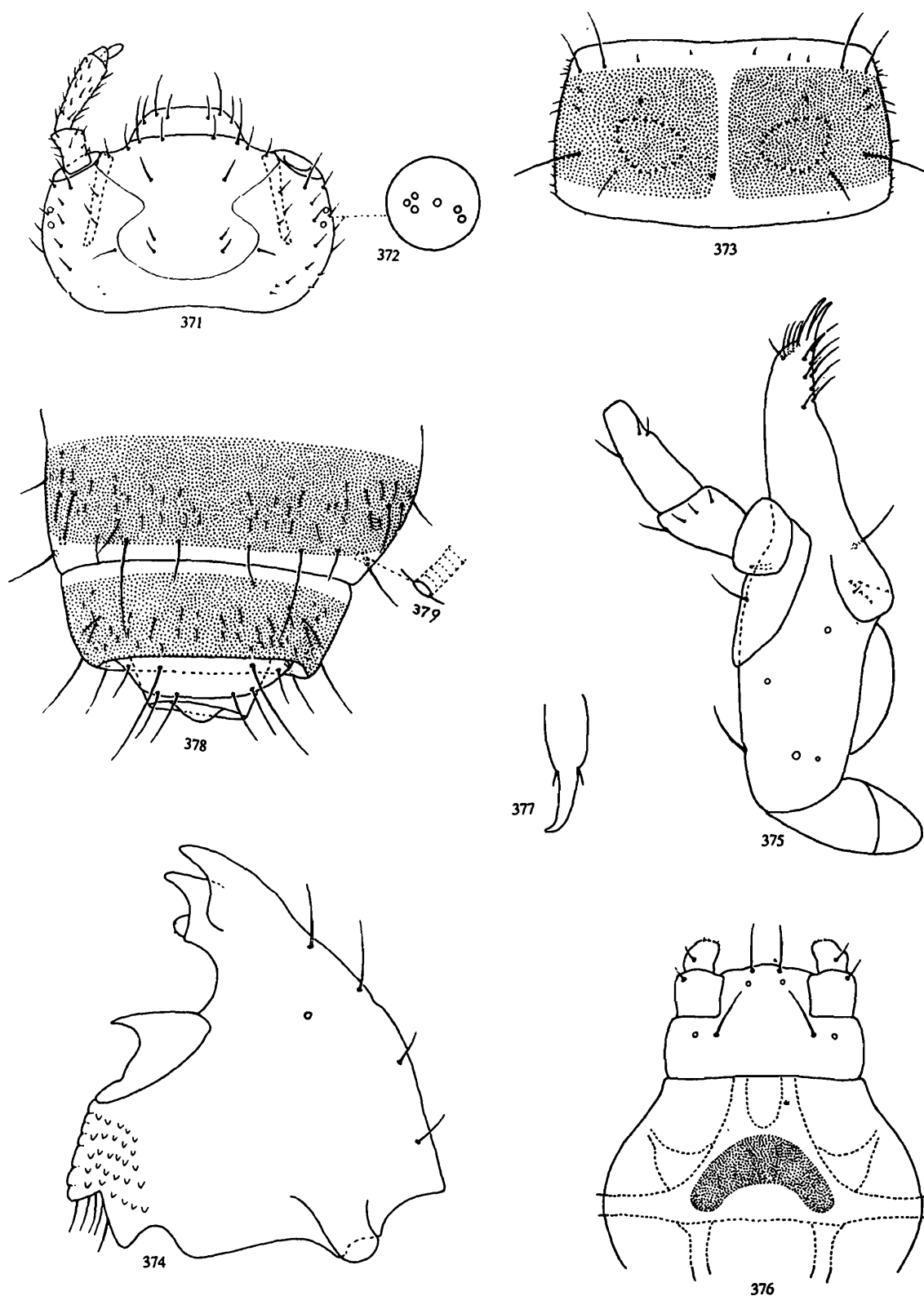
1926. *Oryzaephilus surinamensis* : Back and Cotton, *J. Agric. Res.*, **33** (5) : 446.

1931. *Oryzaephilus surinamensis* : Böving and Craighead, *Entomologia Americana*, **11** (n.s.) : p. 146; pl. 30; f. A, C, E.

1971. *Oryzaephilus surinamensis* : Cutler, *J. stored Prod. Res.*, **7** : 125, 126.

Description : General body form similar to *O. mercator* ; elongated, somewhat depressed, slightly narrowed in front and behind, dorsal surface of thoracic and abdominal tergites with a transverse grey pigmented area, thoracic tergites and head darker, pigmented area on thoracic tergites splitted longitudinally along median line but splitting on abdominal tergites indistinct, mouthparts greyish, dorsal surface with many short and moderately long setae.

Head transverse, side margins evenly rounded, frontal suture slightly distinct and Cucujoid-type, clypeus fused with frons, arrangement of setae on dorsal surface as seen in figure (Fig. 371), endocarina and metopic suture absent. Ocelli (Fig. 372) six on each side of head, in three groups behind antenna, three in upper, one in middle and two in lower groups. Antenna moderately long, 3-segmented, length of segments about 3 : 6 : 1, segments 1 and 2 elongated, segment 2 broader towards apex, sensory appendage lying ventrally and



Figs. 371-379. *Oryzaephilus surinamensis* (L.) : 371, Head, Dorsal view; 372, Ocelli; 373, Prothorax, Dorsal view; 374, Left mandible, Ventral view; 375, Right maxilla, Ventral view; 376, Labium, Ventral view; 377, Tarsungulus; 378, Posterior abdominal segments, Dorsal view; 379, Abdominal spiracle.

longer than segment 3. Mandible (Fig. 374) with three apical teeth, prostheca translucent at base and sharply pointed at apex; mola well-developed and chitinized, with 6 rows of dorsal fine transverse ridges and about 5-6 rows of ventral curved longitudinal asperated ridges. Maxillary mala (Fig. 375) moderately sharply pointed at apex, with two strong spines at tip, at base of apical spines on outer margin with 5 setae on ventral side, row of about 5 setae on dorsal side of inner margin of mala and another row of 4 setae on dorsal side before marginal row of setae, at base of mala with a group of dorsal denticles, above dorsal denticles a seta on ventral side of inner margin, cardo well-developed, maxillary articulating area well-defined and oval, length of palpal segments 2 : 3 : 4. Labium (Fig. 376) narrowed anteriorly, 2-segmented palpi, apical segment narrower and shorter than basal one. Hypopharynx well-developed, hypopharyngeal bracon present, hypopharyngeal rods and hypostomal margins distinct and diverging posteriorly.

Thorax and abdomen : Tergites with sparsely distributed simple and moderately long setae, mesothorax shorter than pro- and metathorax, arrangement of setae on pronotum as seen in figure (Fig. 373), transverse blackish area of thoracic tergites divided in middle line. First abdominal segment shorter than metathorax and second abdominal segment. Abdominal segments 5-8 progressively narrower; segment 9 with very short tergite, its sternite forming a transverse tubular pygopod-like projection (Fig. 378); without urogomphi, segment 10 represented by a sclerite attached at the apex of pygopod-like projection.

Spiracles and legs : All spiracles annular lying on body surface (Fig. 379). Legs narrow and moderately long, coxae small and widely separated; claw simple, rather long, with two tarsungular setae lying side by side (Fig. 377).

Measurements : Total length 4.00 mm., length of head including labrum 0.40 mm. and width across middle 0.54 mm., width of prothorax across middle 0.68 mm., width of 9th abdominal segment across front margin 0.24 mm. (n = 1).

Materials examined : 30 ex. INDIA : WEST BENGAL, Calcutta, 20 ex., 5. viii. 1974, from laboratory culture on rice; ENGLAND, 10 ex., sent by Dr. D. G. H. Halstead in August, 1977 from the culture maintained in P.I.C.L., Slough.

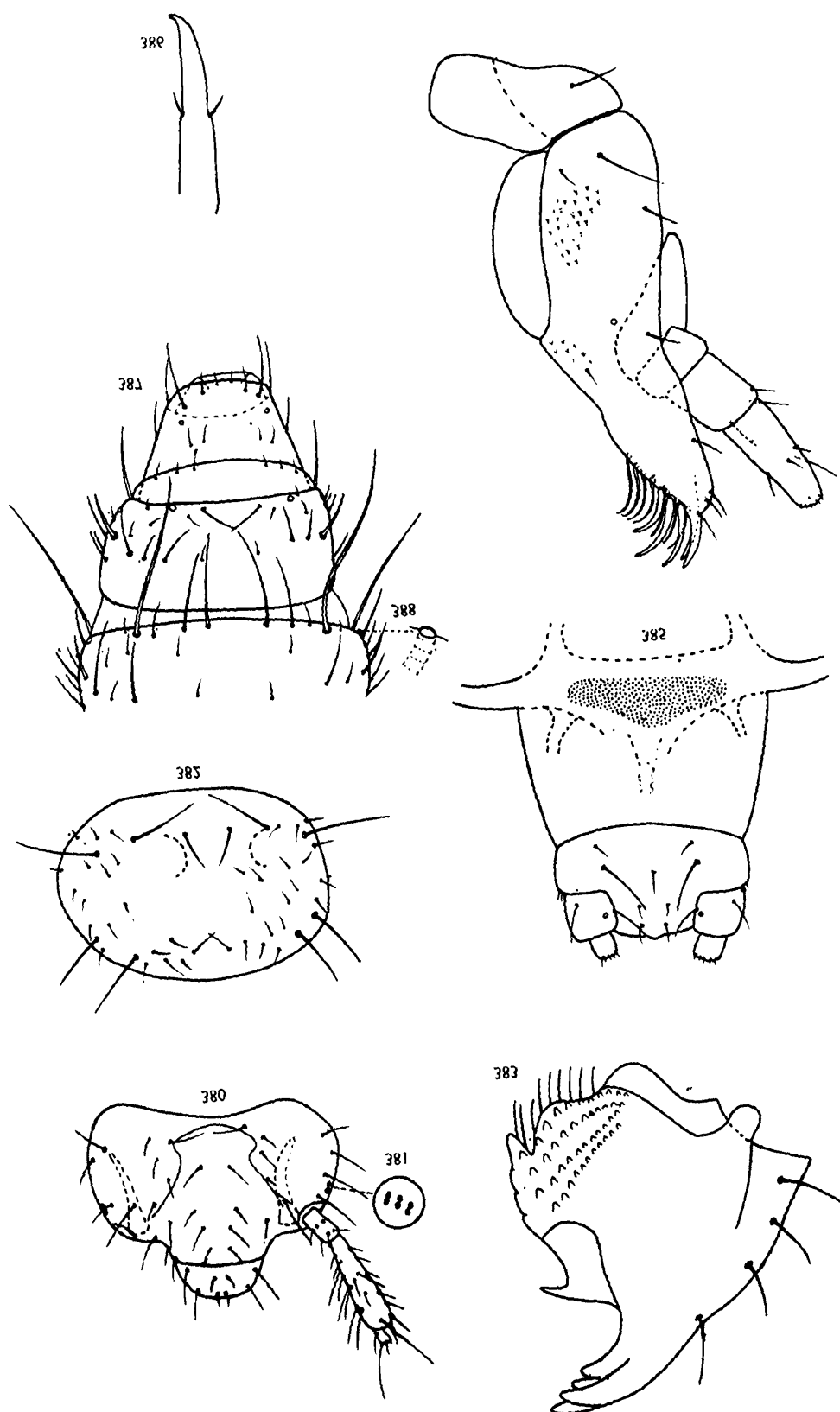
Genus 6. *Monanus* Sharp

7. *Monanus* (s.str.) *concinnullus* (Walker)

1981. *Monanus* (*Monanus*) *concinnullus* : Pal, *Oriental Ins.*, 15 (3) : 252.

Description : General body form elongated, somewhat depressed, slightly narrowed in front and behind, whitish soft bodied, mouthparts yellowish.

Head transverse, side margins evenly rounded, frontal suture rather indistinct and Cucujoid-type, clypeus fused with frons, arrangement of setae on dorsal surface as seen in figure (Fig. 380), endocarina and metopic suture absent. Ocelli (Fig. 381) six on each side of head, in three groups behind antenna, two in each group closely situated and assumed single. Antenna rather long, 3-segmented, length of segments 2 : 6 : 1, segments 1 and 2 elongated and segment 3 about as broad as long, segment 2 slightly broader towards apex, sensory appendage lying dorsally and about as long as segment 3. Mandible (Fig. 383) with three apical teeth with basal one bifid at apex, prostheca translucent at base and sharply



Figs. 380-388. *Monanus* (s. str.) *concinnulus* (Walker) : 380, Head, Dorsal view; 381, Ocelli; 382, Prothorax, Dorsal view; 383, Left mandible, Ventral view; 384, Right maxilla, Dorsal view; 385, Labium, Ventral view; 386, Tarsungulus; 387, Posterior abdominal segments, Dorsal view; 388, Abdominal spiracle.

pointed at apex; mola well-developed, chitinized, with 4 rows of dorsal fine transverse ridges and 11 rows of ventral curved longitudinal asperated ridges. Maxillary mala (Fig. 384) moderately pointed at apex, with two strong spines at tip, 3 setae at base of apical spines on outer margin - 2 ventral and 1 dorsal, posterior to above setae another seta present on ventral surface, a row of about 7 setae present on dorsal side of inner margin of mala, 3 ventral setae on inner margin towards apex, at base of mala and near base of palpi with two groups of dorsal denticles, cardo well-developed, maxillary articulating area well-defined and oval, length of palpal segments 2 : 3 : 5. Labium (Fig. 385) slightly narrowed anteriorly, 2-segmented palpi, apical segment narrower and shorter than basal one, hypopharynx well-developed, hypopharyngeal bracon present, hypopharyngeal rods and hypostomal margins distinct and diverging posteriorly.

Thorax and abdomen : Tergites with sparsely distributed simple and moderately long setae. Pro-, meso - and metathorax almost equally long, arrangement of setae on pronotum as seen in figure (Fig. 382). First abdominal segment shorter than metathorax and second abdominal segment, abdominal segments 7 and 8 progressively narrower; segment 9 with a very short tergite, its sternite forming an elongated tubular pygopod-like projection (Fig. 387), without urogomphi, segment 10 represented by a sclerite attached at the apex of pygopod-like projection.

Spiracles and legs : All spiracles annular, lying on body surface (Fig. 388). Legs narrow and moderately long, coxae small and widely separated; claws simple, rather long and with two tarsungular setae lying side by side (Fig. 386).

Measurements : Total length 3.00 mm., length of head including labrum 0.35 mm. and width across middle 0.38 mm., width of prothorax across middle 0.38 mm., width of 9th abdominal segment across front margin 0.23 mm. (n = 1).

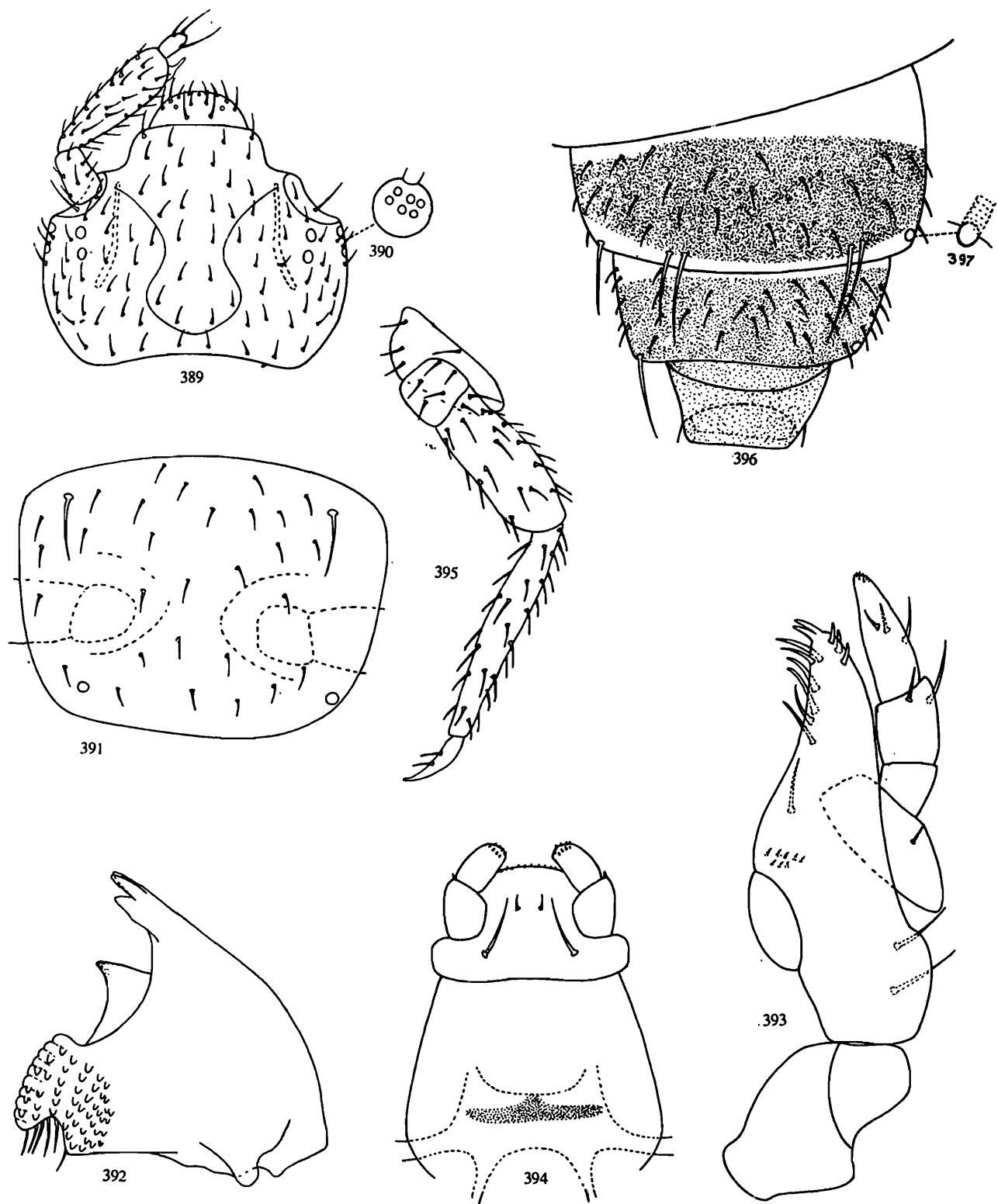
Materials examined : 8 ex. INDIA : WEST BENGAL, Howrah district, Sankrail, iv vi, 1975, T. K. Pal, in association with adults under haystack.

Genus 7. *Airaphilus* Redtenbacher

8. *Airaphilus serricollis* Reitter

Description : General body form elongated, somewhat depressed, slightly narrowed in front and behind, dorsal surface of each segment with a transverse blackish pigmented area, head blackish, mouthparts yellowish, dorsal surface with many short setae.

Head transverse, side margins evenly rounded, with distinct Cucujoid-type of frontal suture, clypeus fused with frons, moderately long and sparsely distributed setae arranged as seen in figure (Fig. 389), endocarina and metopic suture absent. Ocelli (Fig. 390) six on each side of head, in three groups behind antenna, two in each group. Antenna rather long, 3-segmented, length of segments 2 : 9 : 1, segments elongated, segment 2 distinctly broader towards apex, sensory appendage indistinct. Mandible (Fig. 392) with three apical teeth, prostheca translucent at base and sharply pointed at apex; mola well-developed, chitinized, with 9 rows of dorsal fine transverse ridges and about 9 rows of ventral curved longitudinal asperated ridges. Maxillary mala (Fig. 393) moderately sharply pointed at apex, with two strong spines at tip, 3 setae at base of apical spines on outer margin - 2 ventral and 1 dorsal,



Figs. 389-397. Larva of *Airaphilus serricollis* Reitter: 389, Head, Dorsal view; 390, Ocelli; 391, Prothorax, Dorsal view; 392, Left mandible, Ventral view; 393, Right maxilla, Dorsal view; 394, Labium, Ventral view; 395, Leg; 396, Posterior abdominal segments, Dorsal view; 397, Abdominal spiracle.

a row of about 6 setae present on dorsal side of inner margin of mala, 1 ventral seta on inner margin towards apex, at base of mala with a group of dorsal denticles, cardo well-developed, maxillary articulating area well-defined and oval, length of palpal segments 2 : 3 : 4. Labium (Fig. 394) slightly narrowed anteriorly, 2-segmented palpi, apical segment narrower and slightly shorter than basal one, hypopharynx well-developed, hypopharyngeal bracon present, hypopharyngeal rods and hypostomal margins distinct and diverging posteriorly.

Thorax and abdomen : Tergites with densely distributed, simple and moderately long setae. Prothorax wider than head. Pro- and mesothorax about equal in size and narrower than metathorax, arrangement of setae on pronotum as seen in figure (Fig. 391). First abdominal segment shorter than metathorax and second abdominal segment, abdominal segments 6-8 progressively narrower; segment 9 with very short tergite, its sternite forming a transverse tubular pygopod-like projection (Fig. 396); without urgomphi, segment 10 represented by a sclerite attached at the apex of pygopod-like projection.

Spiracles and legs : All spiracles annular lying on body surface (Fig. 397). Legs (Fig. 395) narrow and moderately long, coxae small and widely separated; claw simple, rather long, with two tarsungular setae lying one beyond other.

Measurements : Total length 3.67 mm., length of head including labrum 0.47 mm. and width across middle 0.50 mm., width of prothorax across middle 0.63 mm., width of 9th abdominal segment across front margin 0.23 mm. (n = 1).

Materials examined : 5 ex. INDIA : WEST BENGAL, Howrah district, Sankrail, x.1975, T. K. Pal, in association with adults under haystack.

Subfamily II. PSAMMOECINAE

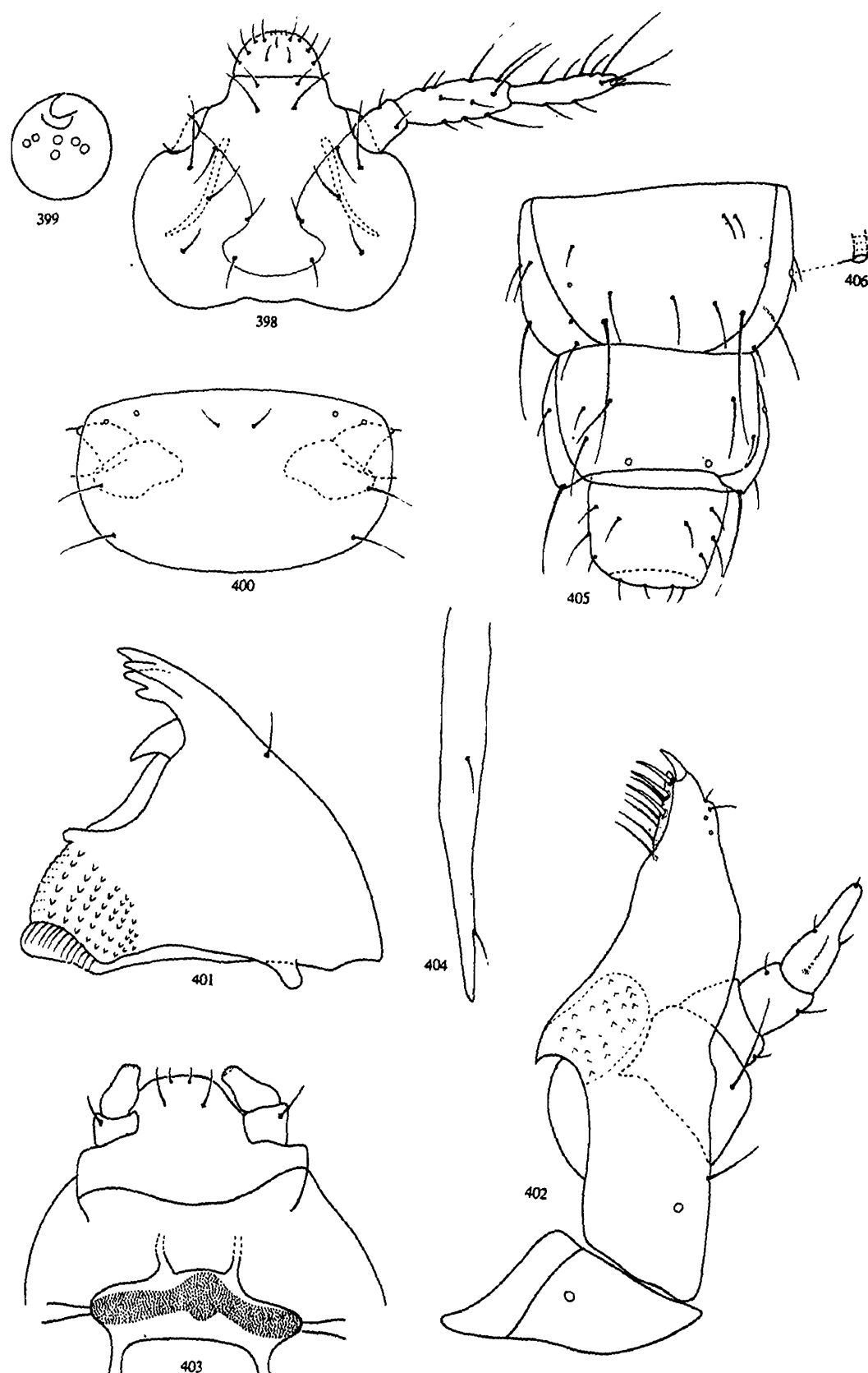
Genus 8. *Psammoecus* Latreille

9. *Psammoecus trimaculatus* Motschulsky

1985. *Psammoecus trimaculatus* : Pal, *Misc. Publ. Rec. zool. Surv. India, Occ. pap.* 71 : 46.

Description : General body form narrow-elongated, parallel-sided, slightly narrowed behind middle, subdepressed, whitish soft-bodied, with long slender legs.

Head transverse, about as wide as prothorax, frontal suture Cucujoid-type, clypeus fused with frons, labrum distinctly separated from clypeus, dorsal surface with long, sparsely distributed setae as seen in figure (Fig. 398), endocarina and metopic suture absent. Ocelli six on each side of head, in three groups behind antenna, two in each group (Fig. 399). Antenna rather long, 3-segmented, length of segments 2 : 5 : 5, all segments elongated, segment 2 broader towards apex, sensory appendage minute. Mandible (Fig. 401) with three apical teeth, middle one bidentate, prosthema translucent at base with sharply pointed at apex, mola well-developed with 10 rows of dorsal fine transverse ridges and about 9-10 rows of ventral curved longitudinal distinct asperated ridges, inner margin of mola serrated with anterior and posterior angles projecting like large teeth. Maxillary mala (Fig. 402) falciform with single apical spine, at base of apical spine on outer margin with 2 ventral setae, a dorsal row of 6 setae along apical half of inner margin, 3 ventral setae on inner margin towards apex, at base of mala with a group of dorsal denticles; cardo well-developed, maxillary articulating area oval and well-defined, length of palpal segments



Figs. 398-406. *Psammoecus trimaculatus* Motschulsky : 398, Head, Dorsal view; 399, Ocelli; 400, Prothorax, Dorsal view; 401, Left mandible, Ventral view; 402, Right maxilla, Dorsal view; 403 Labium, Ventral view; 404, Tarsungulus; 405, Posterior abdominal segments, Dorsal view; 406, Abdominal spiracle.

3 : 3 : 5, apical segment narrower towards apex. Labium (Fig. 403) slightly narrowed anteriorly, 2-segmented palpi, apical segment narrower and longer than basal one, hypopharynx well-developed, hypopharyngeal bracon present, hypopharyngeal rods and hypostomal margins distinct and diverging posteriorly.

Thorax and abdomen : Tergites with sparsely distributed simple and moderately long setae. Pro-, meso- and metathorax about equal in length, pro- and mesothorax narrower than metathorax, arrangement of setae on pronotum as seen in figure (Fig. 400). First abdominal segment shorter than metathorax and second abdominal segment, abdominal segments 6-8 progressively slightly narrower; segment 9 with very short tergite, its sternite forming a long tubular pygopod-like projection (Fig. 405), pygopod-like projection about as broad as long; without urogomphi, segment 10 represented by a sclerite attached at the apex of pygopod-like projection.

Spiracles and legs : All spiracles annular and lying on body surface (Fig. 406). Legs narrow and long, coxae small and widely separated; claw simple, rather long, with two tarsungular setae lying one beyond other (Fig. 404).

Measurements : Total length 4.20 mm., width of head 0.55 mm., width of prothorax across middle 0.55 mm., width of 9th abdominal segment across front margin 0.26 mm. (n = 1).

Materials examined : 5 ex. INDIA : WEST BENGAL, Howrah district, Sankrail, 14.ii.1976, T. K. Pal, in association with adults under haystack.

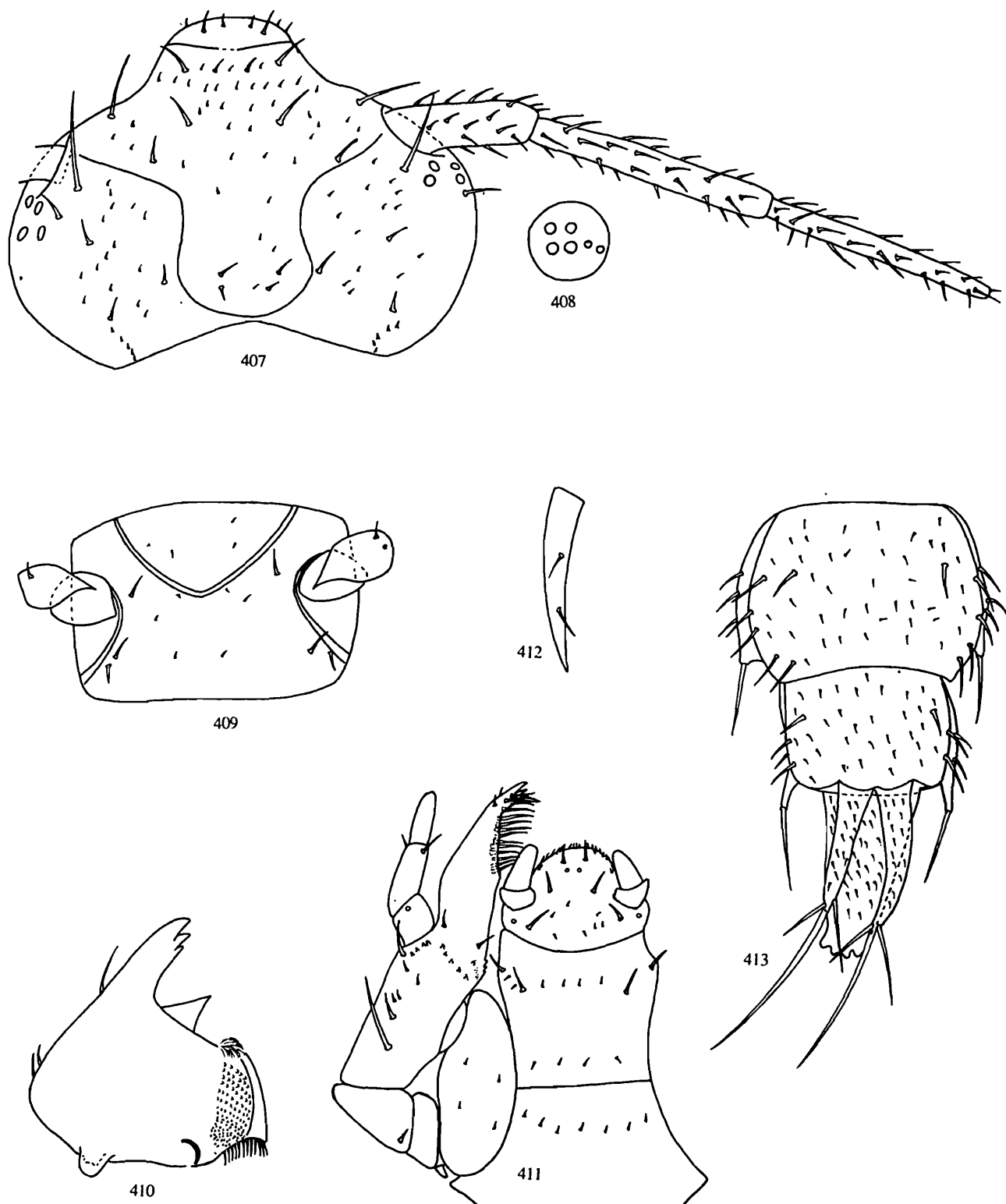
Subfamily III. CRYPTAMORPHINAE

Genus 9. *Cryptamorpha* Wollaston

10. *Cryptamorpha brevicornis* (White)

Description : General body from long, slightly flat, with long antennae and urogomphi, dorsal surface with many short setae.

Head transverse, with distinct Cucujoid-type of frontal suture; dorsal surface with minute, simple setae together with moderately long and sparsely distributed setae as seen in figure (Fig. 407). Ocelli six on each side of head, a group of four lying in a square and other two situated ventral to them (Fig. 408), clypeus fused with frons, labrum distinctly separated from clypeus and with a row of setae on anterior margin. Hypostomal rods moderately distinct, strongly diverging posteriorly. Antenna long, 3-segmented, all segments elongated, length of segments 1 : 2 : 2, sensory appendage minute. Mandible (Fig. 410) nearly triangular with three apical teeth, their inner margins smooth, protheca translucent at base with chitinized and sharply pointed at apex; mola well-developed with about 24 curved longitudinal rows of ventral asperites, its apex with a tuft of hairs, a fringe of hairs also present at its postero-ventral margin, ventral crushing tubercles moderately developed. Maxillary mala (Fig. 411) falciform with three sharp, narrow apical spines; a dorsal row of 13 setae along inner margin of mala; palpi shorter than mala, apical segment distinctly narrower and slightly shorter than segment 2; cardo well-developed and angularly attached with stipes, maxillary articulating area well-developed and rather elongated. Labium (Fig. 411) with 2-segmented palpi, apical one about double the length of basal segment; ligula



Figs. 407-413. *Cryptamorpha brevicornis* (White): 407, Head, Dorsal view; 408, Ocelli; 409, Prothorax, Ventral view; 410, Right mandible, Ventral view; 411, Labium and right maxilla, Ventral view; 412, Tarsungulus; 413, Posterior abdominal segments, Dorsal view,

projecting beyond front margin of prementum as a narrow and rounded strip. Hypopharynx well-developed with two distinct horns, hypopharyngeal bracon distinct.

Thorax and abdomen : Prothorax (Fig. 409) slightly longer than mesothorax, meso- and metathorax almost equal in size. First abdominal segment distinctly shorter than metathorax and second abdominal segment; setae on tergites minute, simple and rather numerous, a few moderately long setae on lateral margins; abdominal segments 7-9 progressively narrower, sternite 8 with its posterior angles bearing setiferous prolongations (Fig. 413), segment 9 with tergite notably short and its sternite forming a narrow elongated tubular projection, segment 10 represented by a sclerite attached at the apex of tubular projection; urogomphi markedly long, narrow and not chitinized, each urogomphi with 2 conspicuous setae.

Spiracles and legs : All spiracles annular lying on body surface. Legs long and slender, coxae small and widely separated; claw cimple, long, with two minute tarsungular setae lying one beyond other (Fig. 412).

Measurements : Total length 9.00 mm., width of head across middle 1.10 mm., maximum width across 4th abdominal segment 1.20 mm., width of 9th abdominal segment across front margin 0.56 mm.

Materials examined : NEW ZEALAND, Westland, 1.iii.1957, R. A. Crowson, under bark of a fallen tree along with adults.

Subfamily IV ULEITOTINAE

Genus 10. *Uleiota* Latreille

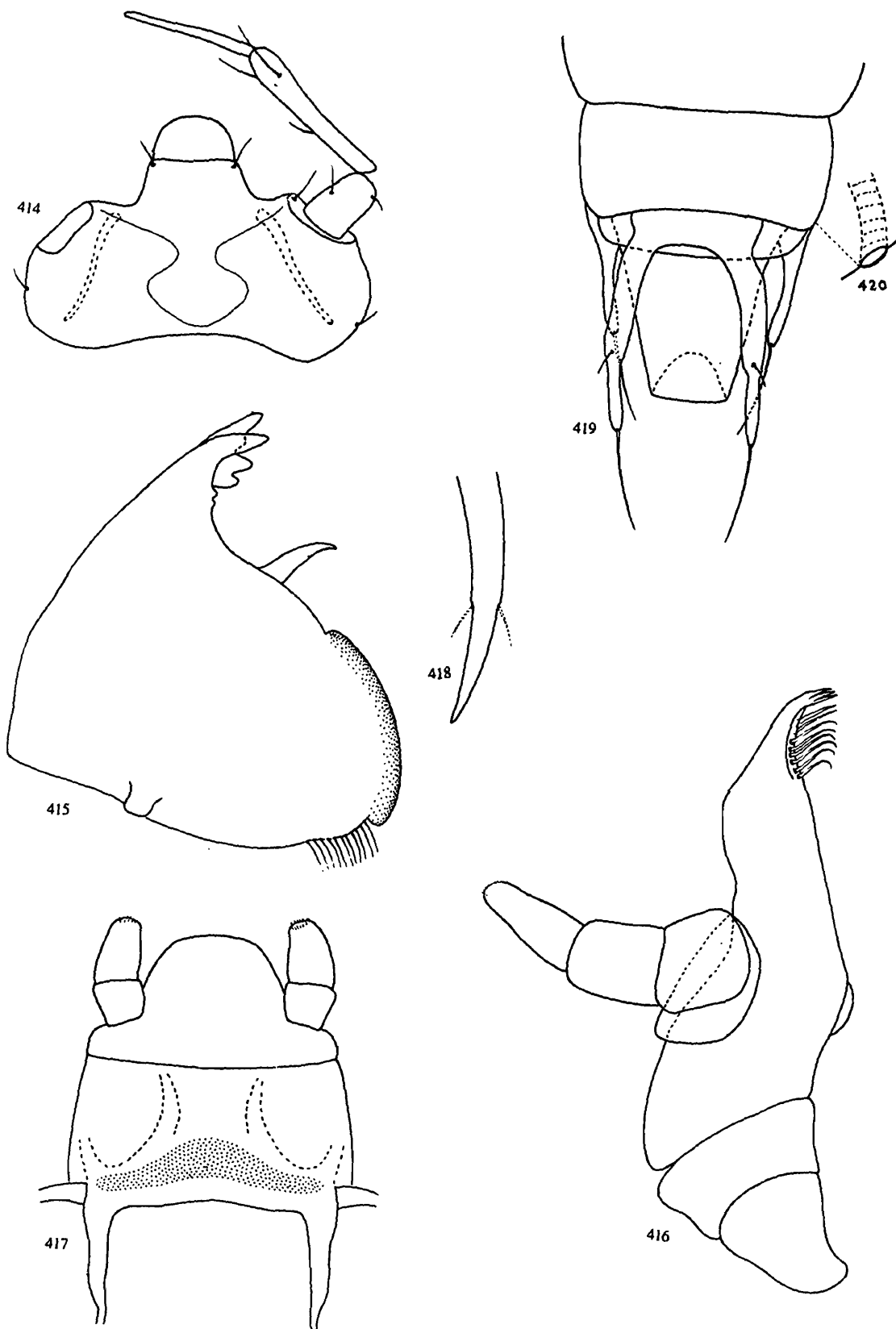
11. *Uleiota indica* (Arrow)

1915. *Uleiota indica* : Gravely, *Rec. Indian Mus.*, **11** : 353-355.

1984. *Uleiota indica* : Pal, Sengupta and Crowson, *Oriental Ins.* **18** : 224.

Description : General body form elongated, somewhat depressed, slightly narrowed posteriorly behind middle, whitish soft-bodied, with long antennae and urogomphi.

Head (Fig. 414) transverse, side margins evenly rounded, frontal suture indistinct and Cucujoid-type, clypeus fused with frons, labrum distinctly separated from clypeus, endocarina and metopic suture absent. Ocelli as mentioned by Gravely (1915), five in number, four in a row and fifth one immediately behind the middle of the space between upper two. Antenna rather long, 3-segmented, segments elongated, segment 2 about twice longer than segment 1, segment 3 slightly shorter and narrower than segment 2. Mandible (Fig. 415) with three apical teeth, basal one bifid at apex, behind apical teeth inner margin of mandible bidentulate, prosthema translucent at base and sharply pointed at apex; mola well-developed and chitinized. Maxillary mala (Fig. 416) falciform with three sharp narrow apical spines, a row of about 6 setae present on dorsal side of inner margin of mala, 2 ventral setae on inner margin towards apex, cardo well-developed, maxillary articulating area well-defined and oval; palpi shorter than mala, segments of palpi almost equal in length but progressively narrower towards apex. Labium (Fig. 417) narrowed anteriorly, 2-segmented palpi, apical segment narrower and slightly longer than basal one, hypopharynx well-developed, hypopharyngeal bracon present, hypopharyngeal rods and hypostomal margins distinct and diverging posteriorly.



Figs. 414-420. *Uleiota indica* (Arrow) : 414, Head, Dorsal view; 415, Right mandible, Ventral view; 416, Right maxilla, Ventral view; 417, Labium, Ventral view; 418, Tarsungulus; 419, Posterior abdominal segments, Dorsal view; 420, Abdominal spiracle.

Thorax and abdomen : Tergites with sparsely distributed, simple setae. Prothorax slightly narrower than head and about as broad as mesothorax, metathorax slightly wider than mesothorax. First abdominal segment shorter than metathorax and second abdominal segment, abdominal segments 1-3 slightly wider, segments 6-8 progressively narrower, sternite 8 with its posterior angles with long setiferous prolongations, segment 9 with very short tergite and its sternite forming an elongated tubular pygopod-like projection, segment 10 represented by a sclerite attached at the apex of pygopod-like projection; urogomphi markedly long, narrow and not chitinized, each urogomphus with a conspicuous long apical seta (Fig. 419).

Spiracles and legs : All spiracles annular and lying on body surface (Fig. 420). Legs narrow and moderately long, coxae small and widely separated; claw simple, rather long with impression of bases of two tarsungular setae lying side by side (Fig. 418).

Measurements : Total length 4.23 mm., length of head including labrum 0.76 mm. and width across middle 1.19 mm., width of 9th abdominal segment across front margin 0.80 mm. (n = 1).

Materials examined : 2 ex., INDIA : KERALA, Parambikulam, 500-940 m., 16.24.xi.1914, F. H. Gravely, in association with adults.

REFERENCES

- Aitken, A. D. 1975. *Insect Travellers* 1. Coleoptera. Tech. Bull. 31, MAFF publ., London, xvi + 1 - 191 pp.
- Arnet, Jr., R. H. 1968. *The beetles of the United States*. The American Entomological Institute, Ann Arbor, xii + 1 - 1112 pp.
- Arrow, G. J. 1901. The genus *Hyliota*, of the Coleopterous family Cucujidae, with descriptions of new forms and the list of the described species. *Trans. Ent. Soc. London*, **1901** : 593-601.
- Back, E. A. & Cotton, R. T. 1926. Biology of the saw-toothed grain beetle, *Oryzaephilus surinamensis* Linne. *J. Agric. Res.* **35** (5) : 435-452.
- Boudier, M. 1834. Description du genre *Psammoechus*. *Annls Soc. ent. Fr.* (1) **3** : 367-372.
- Böving, A. G. 1921. The larvae and pupae of the Social beetles *Coccidotrophus socialis* (Schwarz and Barber) and *Eunausibius wheeleri* (Schwarz and Barber) with remarks on the taxonomy of the family Cucujidae. *Zoologica* **3** (7) : 197-213, 3 pts.
- Böving, A. G. & Craighead, F. C. 1931. An illustrated synopsis of the principal larval forms of the order Coleoptera. *Entomologica Americana* **11** : 1-351.
- Breese, M. H. & Wise, T. E. The biology of *Nausibius clavicornis* (Kug.) (Col. Cucujidae). *Bull. ent. Res.* **50** (2) : 237-258.
- Candeze, C. P. 1861. *Mem. Soc. Sc. Liege*, (1) **16** : 341 (not seen).
- Casey, T. L. 1884. Revision of the Cucujidae north of Mexico. *Trans. Am. ent. Soc.* **11** : 18-112.

- Cobos, A. 1950. Dotos para el Catálogo de los Coleópteros de España. Especies de los alrededores de Málaga. *Bol. Soc. esp. Hist. nat. Madrid* **47** : 563-609.
- Corbett, G. H., Yusope, M. & Hassan, A. 1937. Insects associated with Copra in Malaya. *Sci. Ser. Dep. Agric. S. S. & F.M.S.* no. 20, 91 pp.
- Cornes, M. A. 1964. A revised list of the insects associated with stored products in Nigeria. Tech. Rep. 19, Federal Ministry of Trade, Nigeria.
- Crowson, R. A. 1955. *The natural classification of the families of Coleoptera*. Nathaniel Lloyd & Co., Ltd., London, 1-187 pp.
- Crowson, R. A. 1973. Further observation on Phloestichidae and Cavognathidae, with description of new genera from Australia and New Zealand. *Col. Bull.* **27**(2): 54-62.
- Downes, J. A. & Williams, D. 1950. The insect faunas of the dried roots of *Lonchocarpus* and derris. *Colon. Pl. and Anim. Prod.* **1** (1) : 33-51.
- Erichson, W. F. 1845-48. *Naturgeschichte der Insekten Deutschlands*. Erste Abtheilung. Coleoptera. 3 Berlin, vi + 1-968 (pp. 321-480 = 1946).
- Fabricius, J. C. 1801. *Systema Eleutheratorum*. **2**, Impensis Bibliopolii Academicii Novi, Kiliae : 687 pp.
- Fauvel, A. 1889. Liste des Coleopteres communs a l'Europe et a l' Amerique du Nord (et premier supplement). *Revue Ent.* **8** : 92-174.
- Ganglbauer, L. 1899. *Die Käfer von Mitteleuropa*. **3**, Wien : 1046 pp.
- Glover, P. M. 1937. *Lac Cultivation in India*. Indian Lac Research Institute, Namkum, Ranchi; 147 pp.
- Gozis, M. Maurice des. 1881. Quelques rectifications synonymiques touchant different genres et espèces de Coléoptères francais (3^e partie). *Annls Soc. ent. Fr.* **1** : Bull. p. cxxvi-cxxvii.
- Gravely, F. H. 1915. The larvae and pupae of some beetles from Cochin. *Rec. Indian Mus.* **11** : 353-366, 2 pts.
- Grouvelle, A. 1892. Voyage de M. E. Simon a l' le de Luzon Philippines (Mars et Avril 1890) 5^e Mémoire (1). Cucujides. *Annls Soc. ent. Fr.* **61** : 285-288.
- Grouvelle, A. 1897. Clavicornes nouveaux des Indes orientales et pays voisins. *Annali Mus. civ. Stor. nat. Giacomo Doria* **38** (series 2-18) : 342-398.
- Grouvelle, A. 1903. Clavicornes de l'Inde septentrionale récoltés per Harmand (1). Nitidulidae Colydiidae Cucujidae Monotomidae Dryopidae. *Annls Soc. ent. Fr.* **72** : 108-127.
- Grouvelle, A. 1908. Coléoptères de la région indienne. Rhysodidae, Trogositidae, Nitidulidae, Colydiidae, Cucujidae. *Annls Soc. ent. Fr.* **77** : 313-495.
- Grouvelle, A. 1912. Notes sur les Silvanini (Col. Cucujidae). *Annls Soc. ent. Fr.* **81** : 312-386.

- Grouvelle, A. 1916-1917 (1919). *Mémoires Entomologiques Déposé a la Société Entomologique de France*. Paris.
- Guérin-Méneville, F. E. 1829-44. *Iconographie du Règne Animal de G. Cuvier, Insects*. Paris and London, 576 pp., 104 pls.
- Halstead, D. G. H. 1973. A revision of the genus *Silvanus* (s.l.) (Coleoptera : Silvanidae). *Bull. Br. Mus. nat. Hist. (Ent.)* **29** (2) : 39-112.
- Halstead, D. G. H. 1980. A revision of the genus *Oryzaephilus* Ganglbauer, including descriptions of related genera (Coleoptera : Silvanidae). *Zool. J. Linn. Soc.* **69** : 271-374.
- Hamlin, J. C. & Benton, C. 1925. Control of the saw-toothed grain beetle in Raisins : A preliminary Report. *J. Econ. Ent.* **18** : 790-795.
- Hetschko, A. 1930. Cucujidae, In, *Coleopterorum Catalogus*, **109**, W. Junk, Berlin, 1-90 pp.
- Hill, S. T. 1964. Axenic culture of the foreign grain beetle *Ahasverus advena* (Waltl) (Col. Silvanidae) and the role of fungi in its nutrition. *Bull. ent. Res.* **55** (4) : 681-690.
- Hinton, H. E. 1945. *A monograph of the beetles associated with stored products*. 1, London, Brit. Mus. (Nat. Hist.).
- Howe, R. W. 1956. The biology of the common storage species of *Oryzaephilus* (Col. Cucujidae). *Ann. appl. Biol.* **44** (2) : 341-355.
- Imms, A. D. & Chatterjee, N. C. 1915. On the structure and biology of *Tachardia lacca* Kerr, with the observations on certain insects predacious or parasitic upon it. *Indian Forest Mem.* **3** (1) : 1-42.
- Korunic, Z. 1971. Study of insect pests in grain stores in Yugoslavia. I. Finding of horned (bicornis) variety of the species *Oryzaephilus surinamensis* (L.) (Coleoptera, Silvanidae). *Zastita Bilja* **22** : 91-93.
- Lacordaire, T. 1854. Coleopteres, In, *Histoire Naturelle des Insectes*. **2**, Paris, 1-548 pp.
- Latreille, P. A. 1796. *Precis des caracteres generiques des insectes, disposes dans un orde naturel*. Par le Citoyen Latreille Brive [1796] un 5 de la R; F. Bordeaux, XIII + 201 pp., without no: 6 pp.
- Latreille, P. A. 1804. *Histoire Naturelle, générale et particulière, des crustacés et des insectes*. **11** : 1-422.
- Latreille, P. A. 1807. *Genera Crustaceorum et Insectorum*. **3** : 1-258.
- Latreille, P. A. 1829. In, *Cuv. Règne Anim.* ed. 2, **5** : 135 (not seen).
- Leconte, J. L. 1861. *Classification of the Coleoptera of North America*. Part I. Smithsonian Misc. Coll. No. 136. Smithsonian Institution publ., Washington, xxiv + 214 pp.
- Leconte, J. L. & Horn, G. E. 1883. *Classification of the Coleoptera of North America*. Smithsonian Misc. Coll. No. 507, Smithsonian Institution publ., Washington. xxxviii + 567 pp.

- Linnaeus, C. von 1758. *Systema Naturae*, ed. 10, Holmiae, **1** : 824 pp.
- Mahdihassan, S. 1955. *Silvanus iyeri* var. *mysorensis* new variety. *Curr. Sci.* **24** : 418-419.
- Pal, T. K. 1981a. On *Monanus* Sharp (Coleoptera : Silvanidae) from India. *Oriental Ins.* **15** (3) : 241-255.
- Pal, T. K. 1981b. A new genus and a species of Psammoecinae (Coleoptera : Silvanidae) from South India **15** (3) : 257-261.
- Pal, T. K. 1984. Silvanidae (Coleoptera : Clavicornia) from Southern India and Sri Lanka in Museum d'Historie Naturelle de Genève. *Rec. zool. Surv. India*, **81** (3 & 4) : 339-356.
- Pal, T. K. 1985a. A revision of Indian *Psammoecus* Latreille (Coleoptera : Silvanidae). Occ. Pap. No. 71, *Misc. publ. Rec. zool. Surv. India*, 1-54 pp.
- Pal, T. K. 1985b. Insecta : Coleoptera : Silvanidae. In, Fauna of Namdapha : Arunachal Pradesh. *Rec. zool. Surv. India*, **82** : 195-200.
- Pal, T. K. & Sengupta, T. 1977. A revision of *Silvanus* (Coleoptera : Silvanidae) from India. *Oriental Ins.* **11** (2) : 269-284.
- Pal, T. K. & Sengupta, T. 1979. Ergebnisse der Bhutan Expedition 1972 des Naturhistorischen Museums in Basel. Coleoptera : Fam. Silvanidae. *Ent. Basel.* **4** : 69-82.
- Pal, T. K. & Sengupta, T. 1984. On *Protosilvanus* (Coleoptera : Silvanidae) from India. *Oriental Ins.* **18** : 235-249.
- Pal, T. K., Sengupta, T. & Crowson, R. A. 1984. Revision of *Uleiota* Latreille (Coleoptera : Silvanidae) from India and Sri Lanka and its systematic position. *Oriental Ins.* **18** : 213-233.
- Perris, E. W. 1877. *Larves de Coléoptères*. Paris.
- Peyerimhoff, P. de 1931. Mission scientifique du Hoggar. Coleopteres. *Mem. Soc. Hist. nat. Afr. N., Algiers* **2** : 172 pp.
- Peyerimhoff, P. de 1937. Un *Airaphilus* nouveau du Portugal (Col. Cucujidae). *Bull. Soc. ent. Fr.* **42** : 89-92.
- Ratti, E. 1971. I Cucujidae (sensu lato) della Mongolia. *Bull. Soc. Ent. It.* **103** : 98-103.
- Redtenbacher, L. 1858. *Fauna Austriaca Die Käfer*. ed. 2, Wien, cxxxvi + 1017 pp.
- Reitter, E. 1876. Neue Gattungen und Arten aus der Faunilie der Cucujidae. *Col. Hefte* **15** : 37-64.
- Reitter, E. 1878a. Beitrage zur kentniss assereuropäischer Coleopteren. *Stettin. ent. Ztg.* **39** : 314-322.
- Reitter, E. 1878b. Neue Cucujidae des Konigl. Museums in Berlin. *Verh. zool. bot. Ges. Wien*, **28** : 183-195.
- Reitter, E. 1882. Bemerkungen zu Herrn Maurice de Gozis Synonymische Rectificationen mehrerer Genera und Species französischer Coleopteren (Ann. Soc. Ent. France 1881. III Bul. cxii). *Dt. ent. Z.* **26** : 296.

- Reitter, E. 1885-86. *Francisque Guillebeau : Tableaux Analytiques Determiner les Coleopteres europeins*. 1.
- Reitter, E. 1911. *Fauna Germanica*. Käfer, 3, Stuttgart, 436 pp.
- Reitter, E. 1912. Coleopterologische Notizen. *Wien ent. Ztg.* 31 : 286.
- Roberts, A. W. Rymer 1930. A key to the principal families of Coleoptera in the larvae stage. *Bull. ent. Res.* 21 : 57-72.
- Sengupta, T. 1966. A new family of Cucujoid beetles based on six Australian and one New Zealand genera. *Ann. Mag. nat. Hist.*, (13) 9 : 61-85.
- Sengupta, T. & Crowson, R. A. 1969. Further observations on the family Boganiidae, with definition of two new families Cavognathidae and Phloestichidae *J. nat. Hist.* 3 : 571-590.
- Sengupta, T., Mukhopadhyay, P. & Sengupta, R. 1985. Major beetle pests of stored food products in India. Occ. pap. No. 62, *Misc. publ. Rec. zool. Surv. India*, 1-65 pp.
- Sharp, D. 1879. On some Coleoptera from the Hawaiian Islands. *Trans. Ent. Soc. London*, 1879, part 1, 77 105.
- Sharp, D. 1899. Cucujidae, *In, Biologia Centrali-Americana -Insecta-Coleoptera*. II, pt. 1, 499-563 pp.
- Sharp, D. & Scott, H. 1908. Coleoptera, *In, Fauna Hawaiiensis*, Being the land Fauna of the Hawaii Islands. 3, The University Press, Cambridge, pp.367-666.
- Slow, J. M. 1958. A morphological comparison of the adults of *Oryzaephilus surinamensis* (L.) and *O. mercator* (Fauv.) (Col., Cucujidae). *Bull. ent. Res.* 49 : 27-34.
- Spilman, T. J. 1960. Some synonymy in *Oryzaephilus* (Coleoptera : Cucujidae). *Proc. ent. Soc. Washington* 62 : 251.
- Stebbing, E. P. 1914. *Indian forest insects of economic importance, Coleoptera*. Eyre & Spottiswoode Ltd., London, xvi + 648 pp.
- Sturm, J. 1826. *Katalog meiner Insekten Sammlung* 1. Käfer, Nürnberg, 207 pp.
- Verner, P. H. 1971. Food preferences of two species of *Oryzaephilus* (Coleoptera, Cucujidae). *Acta ent. bohemoslov.* 68 : 145 148.
- Westwood, J. O. 1839. *An introduction to the modern classification of insects*. 1, London, xii + 462 pp.
- Wheeler, W. M. 1921. Notes on the habits of European and North American Cucujidae (Sen. Auct.). *Zoologica* 3 : 173-183.
- Wilson, J. W. 1930. The genitalia and wing venation of the Cucujidae and related families. *Ann. ent. Soc. Am.* 23 : 305-358.
- Wollaston, T. V. 1854. Cucujidae, *In, Insecta Maderensia : being an account of the insects of the Islands of the Maderian group*. London, 156-194 pp.
- Wollaston, T. V. 1874. On new Coleoptera from Japan. *Entomologist's mon. Mag.* 10 : 167-172, 200-203.

INDEX

Suprageneric taxa are indexed in CAPITALS; generic and subgeneric names in **bold face**; and specific in *italics*; page numbers of principal references in **bold face**.

abnormis (Airaphilus)	152, 155	Cathartosilvanus	44
abnormis (Cryptamorpha)	198, 200	Cathartus	111, 113, 114, 240
acuminatus	130, 135	cephalotes	75, 77, 78, 82
advena	111, 113, 240	cheesmanae	96, 98, 100
affinis	59, 60	clavicornis	128
Ahasverus	42, 111, 233, 240	Colydium	59, 131
Airaphilus	43, 150, 231, 247	complexus	162, 173
albertisii	146	congener	128
alticola	214, 219	Corticaria	131
andamanicus	47, 64	cribricollis	96, 98, 100, 101
andrewesi (Airaphilus)	152, 154	cruciger	186
andrewesi (Psammoeceus)	161, 164	Crypta	158
angustatus	113	Cryptamorpha	34, 43, 142, 195, 231, 251
angusticollis	78, 81, 84, 86, 88, 235	CRYPTAMORPHINAE	41, 195, 229, 251
Anobium	131	Cryptophagus	113
aridulus	128	Cucujus	186
atrata	214	cursor	131
atratus	98	dakshinus	191, 194
Australonausibius	128	decoratus	161, 167
bambusae	163, 181	dehradunicus	103, 106
bellus	184	delicatus	162, 172
bhutanensis	198, 207	Dendrophagus	196
bhutanicus (Silvanus)	48, 67	2 dentatus	59
bhutanicus (Psammoeceus)	163, 176	denticulatus	128
bicornis	131	depressus	155, 156
bidentatus	48, 59	Dermestes	131, 159
bipunctatus	159	desjardinsi	196
birmanicus	75	difficilis	46, 48, 57, 59, 233
bouchardi	146, 148	distinguendus	78, 90
brevicornis	197, 251	dubia	211
Brontes	211, 214, 217	elongatus	150
Calpus	44	Emporius	139, 142, 143
carinatus	102		
castaneum	133		

excisus	111	insolitus	146
fagi	75	Ips	44
fallax	214, 223, 224	iyeri	122, 123, 125
familiaris	47, 52	javanicus	75, 77, 89, 90
fasciatus	139, 142	kaszabi (Airaphilus)	155
fascipennis	142	kaszabi (Cryptamorpha)	198, 204 , 205
fauveli	128	lateritius	102, 103 , 104, 106, 108, 237
feai	75, 77	lepidus	162, 168
flavipes	211	Leptus	48
foveicollis	96, 98	levicollis	98
frater	75	lewisi	47, 48 , 49, 52, 55
frumentaria	131	longicollis	79, 89, 90, 92
frumentarium	131	longipennis	139
genalis	130, 136	Lyctus	131
gibbosus	128, 133	maximus	128
gibbus	44, 57, 59	mercator	130, 133 , 135, 242 , 243
gossypii	128, 133	Microsilvanus	44, 53
granosus	103, 108	minimus	53
gratiosus	163, 182	Monanus	
grouvellei	75, 77	monticola	139
guerinii	113	musae	196
halsteadi	118, 120	muticus	60
harmandi	162, 170	mysorensis	123, 125
horni	139	Nausibius	128
Hyleota	211	Neosilvanus	96, 98, 100
Hyliota	211, 212, 214, 217, 221, 223, 224	nepalensis (Cryptamorpha)	198, 205 , 209
HYLIOTINAE	212	nepalensis (Silvanoprus)	78, 88
imitatus	47, 50	nepalensis (Silvanopsis)	123, 125 , 128
impressicollis	164, 185 , 186	nigrans	48, 61
inaequalis	102	nitidus	163, 184 , 186
incommodus	159, 186	opacifrons	202
indica	213, 214, 221 , 223, 253	orientalis	75, 77
indicus	77, 81	oryzae	133
Indophanus	44, 191 , 193, 194	Oryzaephilus	43, 128 , 130, 131, 133, 135, 136, 231, 242 , 243
inermis	75, 77	palnicus	79, 92
infans	198, 199	Parabrantes	196
insidiosus	75, 77	parallelcollis	75, 77

Parasilvanus	44	SILVANIDAE	34
peculiaris	128	SILVANINAE	41, 44 , 229, 233
Pensus	44	Silvanolomus	43, 116, 118, 120
porrectus	75	Silvanoprus	42, 75 , 76, 77, 79, 81, 82, 84, 86, 88, 89, 90, 92, 233, 235
prolixicornis	78, 86	Silvanopsis	43, 122 , 123, 125, 128
Protosilvanus	42, 102 , 103, 104, 106, 108, 231, 237	Silvanus	42, 44 , 46, 48, 50, 52, 53, 55, 57, 59, 60, 61, 63, 64, 66, 67, 233
Psammoechus	158	simoni (Silvanopsis)	123 , 125, 128
PSAMMOECINAE	41, 158 , 229, 249	simoni (Psammoechus)	163, 179 , 181
Psammoechus	44, 158 , 159, 161, 164, 165, 167, 168, 170, 172, 173, 175, 176, 178, 179, 181, 182, 184, 185, 186, 231, 249	simonis (Silvanopsis)	123
Pseudophanus	195	simonis (Psammoechus)	179
Pseudonausibius	128	Sitophilus	133
puberula	214, 223 , 224, 225	striatus	113
pullus	116	sulcatum	59
pumilus	53	surinamensis	128, 130 , 131, 136, 242, 243
punctifrons	202	Telephanus	186, 193
raffrayi	122, 124	telephanoides	146
recticollis	46, 53	Tenebrio	131
reflexus	53	tenuicollis	75, 77
robustus	47, 63 , 64	triangulus	79, 81
rossi	47, 55	Tribolium	133
ruficorpus	44, 57, 59	trilochana	163, 178 , 182
rugosus	139	trimaculatus	164, 186 , 249
Scarites	131	Uleiota	40, 41, 211 , 213, 214, 217, 219, 221, 223, 224, 231, 253
scuticollis	77, 79	ULEIOTINAE	40, 211 , 229, 253
sexdentata	131	Uliota	223
sexdentatum	131	unidentata	44
sexdentatus	131	unidentatus	66
Silpha	131	vitulus	53
Silvanoides	42, 96, 98, 100	wittmeri	162, 175

