

FAUNA OF INDIA

HOMOPTERA MEMBRACIDAE

K. S. ANANTHASUBRAMANIAN
Lloyola College, Madras — 600034, India



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Published : April, 1996

Price

India - Rs. 750.00

Foreign - £ 32.00 or \$ 60.00

Published by

The Director, Zoological Survey of India, 'M' Block, New Alipore, Calcutta-700 053

Printed by

Asian Printers, Calcutta -700 014

EDITOR'S PREFACE

The family Membracidae comprise a distinct group of small phytophagous insects belonging to auchenorrhynchous Homoptera. The group was first recognized as "Membracida" by Refinesque (1915) and the current name "Membracidae" is followed after Harris (1841). At the turn of the present century, the membracid fauna was dealt by W.L. Distant in his two volumes of Fauna of British India (1908 and 1916), and some other publication. Since then our knowledge of Indian fauna has considerably been increased, mostly due to the works of Funkhouser (1922-1933) and recent works of Prof. Ananthasubramanian and colleagues. This necessitated the need to revised the earlier fauna volumes. The present document is a thoroughly revised updated version of earswhile volumes of Distant's fauna. It deals with 233 species belonging to 42 genera, provides details of taxonomy, host association, ant attendance, natural enemies, colouration and mimicry, perental care, etc. These informations are of great importance since very little work has been published in the past on the biology and ecology of Membracidae as compared to their taxonomy.

Membracids colonize a number of plant species. They are both, solitary and gregarious in habit but very sluggish and raelly fly. On the whole, membracids in India are not destructive to the extent of assuming the pest status, though some injury to host plants is inflicted either due to feeding or oviposition.

This is the result of over 30 years of laborious work of Prof. Ananthasubramanian and his team at Loyala College, Madras. This will be undoubtedly helpful to the entomologists of both India and abroad.

February 28, 1996
Calcutta.

A. K. GHOSH
Director

AUTHOR'S PREFACE

Altogether 169 species of Membracidae were included by Distant (1908, 1915, 1916a-e) in his *Fauna of British India* including Ceylon and Burma and in *Annals and Magazines of Natural History*, followed by Funkhouser (1922, 1933, 1936b) who described another 13 species, making the total 182 distributed over 43 genera. The descriptions given by the above pioneers, though precise, left ut several characters of taxonomic value.

The present work is the thoroughly revised and updated form of the erstwhile two volumes of the 'Fauna of British India' written in the year 1908 (vol. 4) and 1916 (vol. 6) by W. L. Distant.

Between 1975 and 1985, 87 new species of Indian membracids were described by K. S. Ananthasubramanian, T. N. Ananthkrishnan and G. Thirumalai. Thus, the present work contains 231 species spread over 42 genera, including 7 new species. Besides taxonomic information, the present work also provides information on host association, ant-attendance, natural enemies, coloration and mimicry, parental care, and other related aspects of membracids. Only the species from the Indian subcontinent are included in the present work due to the difficulties experienced in examining the species from the adjacent countries, particularly Sri Lanka, Burma and Pakistan. Nevertheless, the membracid fauna of Pakistan and Bangladesh have been studied thoroughly by Dr. Imtiaz Ahmad and his co-workers in recent years.

ACKNOWLEDGEMENTS

At the very outset, I express my sincere thanks to Dr. B. K. Tikader, former Director, Z.S.I., for assigning this work to me, and to Prof. Dr. M. S. Jairajpuri, Director, Zoological Survey of India, Calcutta, for his encouragement. I am also thankful to Dr. R. G. Fennah, former Director, British Museum (Natural History), London, and to Dr. M. S. K. Ghauri, for their help and cooperation in the identification of the membracid specimens submitted during the years 1965-1969, and to Dr. W. J. Knight for scrutinising the lectotypes of some species of *Coccosterphus* Stål in the British Museum. Dr. R. N. Mathur, former Director, Forest Research Institute, Dehra Dun, deserves all appreciation for his kindness in enabling me to examine the extensive collections of identified membracid specimens making it possible to draw and redescribe several species of membracids. I am also thankful to Mr. G. Kesavaram, Assistant Director, Govt. Museums, Madras, for a similar help. Dr. B. Vasantharaj David will be remembered with gratitude for helping me in examining the membracid specimens in the collections of the Tamil Nadu Agricultural University College, Coimbatore. I am extremely grateful to Prof. Dr. T. N. Ananthkrishnan, Director, Entomology Research Institute, Madras, who kept the vast collections of membracids in the Z.S.I., Calcutta, at my disposal in the year 1979 while he was the Director of Zoological Survey of India, enabling me to make a thorough study of the material that forms the bulk of this work; he has been a perennial source of inspiration and sustained help, and I have great pleasure of dedicating this volume to him.

I am very much indebted to Mr. A. L. Capener, formerly of the Plant Protection Research Institute, Pretoria, for his valuable help and advice, for determining membracid specimens sent to him, and for offering constructive criticisms and comments, besides providing me with all the relevant literature, during the initial stages of my studies on the Membracidae; but for his keen interest in my investigations, I would not have been able to pursue my studies on the Membracidae.

My sincere thanks are due to Dr. B. K. Burks of the United States Department of Agriculture, Beltsville, Maryland, to Dr. John Buber, Bio-systematic Research Institute, Ontario, Canada, and to Dr. M. Hayat of the Aligarh University, for their readiness in identifying the hymenopterous egg parasitoids of membracids submitted to them.

I am very much indebted to Dr. L. K. Ghosh, Scientist, 'SD' Z.S.I., Calcutta, for helping me with xerox copies of several valuable literature and for meticulously scrutinising the manuscripts and figures, and above all for his encouragement and keen interest in my investigations.

CONTENTS

GENERAL INTRODUCTION	1
BIOECOLOGY	
Habits	4
Feeding sites and feeding beharious	5
Mating and oviposition	5
Duration of egg stage	7
Hatching	8
Number of instars and their duration	8
Ecdysis	8
Host plant relationships	8
Communal Life	11
Attendance by ants	11
Protective coloration and mimicry	14
Parental care	15
Natural enemies.....	16
Ecological factors	17
PHYLOGENY	17
Migration	19
ECONOMIC IMPORTANCE	20
COLLECTION AND PRESERVATION	21
GENERAL EXTERNAL MORPHOLOGY AND TERMINOLOGY	23
CLASSIFICATION AND SYSTEMATIC ACCOUNT	28
MEMBRACIDS—HOST-PLANTS LIST	323
REFERENCES	328
SUBJECT INDEX	530

SYSTEMATIC CONTENTS

Family Membracidae Rafinesque.....	28
Key to subfamilies.....	29
Subfamily 1. Darthulinae Metcalf.....	29
Tribe 1. Darthulini Funkhouser.....	29
Genus 1. <i>Darthula</i> Krkaldy.....	29
Species 1. <i>Darthula hardwickii</i> (Gray).....	30
Subfamily 2. Oxyrhacinae Haupt.....	31
Tribe 2. Oxyrhachini Distant.....	31
Genus 2. <i>Oxyrhachis</i> Germar.....	31
Key to Indian species.....	32
Species 2. <i>apicalis</i> Ananthasubramanian.....	35
3. <i>binsaurs</i> Distant.....	36
4. <i>brevicornutus</i> Ananthasubramanian and Ananthakrishnan.....	37
5. <i>geniculata</i> Ananthasubramanian.....	38
6. <i>grandis</i> Ananthasubramanian.....	39
7. <i>haldari</i> Ananthasubramanian.....	40
8. <i>krusadiensis</i> Ananthasubramanian and Ananthakrishnan.....	40
9. <i>lefroyi</i> Distant.....	42
10. <i>malabaricus</i> Ananthasubramanian.....	42
11. <i>mangiferana</i> Distant.....	43
12. <i>minusculus</i> Ananthasubramanian and Ananthakrishnan.....	44
13. <i>nigrodorsalis</i> Ananthasubramanian.....	46
14. <i>palus</i> Distant.....	46
15. <i>punctatus</i> Ananthasubramanian.....	47
16. <i>rufescens</i> Walker.....	48
17. <i>subjecta</i> Walker.....	49
18. <i>taranda</i> (Fabricius).....	50
19. <i>tuberculus</i> nom. nov.....	54
20. <i>uncatus</i> Melichar.....	54
21. <i>unicolor</i> Ananthasubramanian.....	56
Subfamily 3. Centrotinae Amyot and Serville.....	56
Tribe 3. Tricentrini Ahmad and Yasmeen.....	58
Genus 3. <i>Tricentrus</i> Stål.....	59
Key to Indian species.....	59
Species 22. <i>aeneus</i> Distant.....	69
23. <i>aiyuri</i> Funkhouser.....	70

Species	24. <i>ambomaculatus</i> Distant.....	71
	25. <i>allabens</i> Distant.....	72
	26. <i>ananthasubramaniani</i> Sharma and Baden.....	73
	27. <i>assamensis</i> Dstant.....	74
	28. <i>atrus</i> Ananthasubramanian.....	75
	29. <i>banguensis</i> Funkhouser.....	75
	30. <i>bicolor</i> Distant.....	76
	31. <i>bifurcus</i> Distant.....	77
	32. <i>brevis</i> Funkhouser.....	78
	33. <i>cinereus</i> Ananthasubramanian.....	79
	34. <i>compressus</i> Ananthasubramanian.....	80
	35. <i>concolor</i> sp. nov.....	81
	36. <i>congestus</i> (Walker).....	81
	37. <i>cornutus</i> Ananthasubramanian.....	83
	38. <i>decirbus</i> Ananthasubramanian and Ananthakrishnan.....	83
	39. <i>dstinctus</i> Thirumalai and Ananthasubramanian.....	84
	40. <i>elegans</i> Ananthasubramanian.....	85
	41. <i>euschistus</i> Distant.....	86
	42. <i>fairmairei</i> (Stål).....	87
	43. <i>ferruginosus</i> Funkhouser.....	88
	44. <i>gibbosulus</i> (Walker).....	88
	45. <i>hameedi</i> sp. nov.....	89
	46. <i>horizontalis</i> Distant.....	90
	47. <i>indicus</i> nom. nov.....	91
	48. <i>kamaonensis</i> Distant.....	93
	49. <i>longiceps</i> Ananthasubramanian.....	93
	50. <i>longicornis</i> Ananthasubramanian.....	94
	51. <i>minomorii</i> Ananthasubramanian.....	95
	52. <i>minusculus</i> Ananthasubramanian.....	96
	53. <i>mitrai</i> nom. nov.....	97
	54. <i>nobilis</i> Ananthasubramanian.....	98
	55. <i>pilosus</i> Ananthasubramanian and Ananthakrishnan.....	99
	56. <i>platycornis</i> Ananthasubramanian.....	102
	57. <i>projectus</i> Distant.....	102
	58. <i>pronus</i> Distant.....	103
	59. <i>pubescens</i> Funkhouser.....	104
	60. <i>recurvicornis</i> Ananthasubramanian.....	105
	61. <i>repandus</i> Distant.....	106

Species	62. <i>sissoo</i> Sharma and Badan	107
	63. <i>spathodei</i> Ananthasubramanian.....	107
	64. <i>speciosus</i> Thirumalai and Ananthasubramanian.....	109
	65. <i>subangulatus</i> Distant.....	110
	66. <i>synandricae</i> Thirumalai and Ananthasubramanian.....	111
	67. <i>transversus</i> (Distant).....	112
	68. <i>unicolor</i> Ananthasubramanian.....	113
	69. <i>varicornis</i> Ananthasubramanian and Ananthakrishnan.....	113
Genus	4. <i>Tricentroides</i> Distant.....	114
Species	70. <i>propria</i> Distant.....	115
Tribe	4. Hypsaucheniini Distant.....	116
Genus	5. Hypsauchenia Germar.....	116
Species	71. <i>ananthakrishnani</i> n. sp.....	117
	72. <i>hardwickii</i> (Kirby).....	118
	73. <i>subfusca</i> Buckton.....	119
Genus	6. <i>Hypsolyrium</i> Schmidt.....	121
Key to Indian species	121
Species	74. <i>kempi</i> (Distant).....	122
	75. <i>manni</i> (Distant).....	123
	76. <i>uncinatum</i> (Stål).....	123
Genus	7. <i>Hybanda</i> Distant.....	124
Species	77. <i>anodonta</i> (Buckton).....	124
Tribe	5. Micreunini Distant.....	125
Genus	8. <i>Leptobelus</i> Stål.....	125
Species	78. <i>dama</i> (Germar).....	126
	79. <i>gazella</i> (Fairmaire).....	127
Tribe	6. Leptocentrini Distant.....	128
Genus	9. <i>Telingana</i> Distant.....	135
Species	80. <i>balteata</i> Distant.....	136
	81. <i>campbelli</i> Distant.....	136
	82. <i>canescens</i> (Buckton).....	136
	83. <i>capistrata</i> Distant.....	137
	84. <i>consobrina</i> Distant.....	138
	85. <i>curvispina</i> (Stål).....	140
	86. <i>flavipes</i> (kirby).....	141
	87. <i>imitator</i> (Kirby).....	141
	88. <i>majuscula</i> Thirumalai and Ananthasubramanian	142
	89. <i>nigroalata</i> Ananthasubramanian and Ananthakrishnan	143
	90. <i>orlanda</i> Distant.....	144

Species	91. <i>paria</i> (Fairmaire).....	146
	92. <i>pulniensis</i> Ananthasubramanian.....	146
	93. <i>sabarigiriensis</i> Thirumalai and Ananthasubramanian.....	147
	94. <i>subsimpliis</i> (Walker).....	148
	95. <i>travancorensis</i> Distant.....	149
Genus 10.	<i>Deitzius</i> gen. nov.....	150
Species	96. <i>tomentosus</i> com. nov.....	151
Genus 11.	<i>Lanceonotus</i> Capener.....	151
Species	97. <i>cinnamomi</i> Ananthasubramanian.....	153
	98. <i>indicus</i> Ananthasubramanian.....	154
	99. <i>luteinervis</i> (Funkhouser) comb. nov.....	154
	100. <i>malabaricus</i> Thirumalai and Ananthasubramanian.....	155
Genus 12.	<i>Leptocentrus</i> Stål.....	156
Species	101. <i>acuticornis</i> Ananthasubramanian.....	161
	102. <i>albonotatus</i> Distant.....	163
	103. <i>bajulans</i> Distant.....	163
	104. <i>bauhiniae</i> Ananthasubramanian and Ananthakrishnan.....	165
	105. <i>beluri</i> Ananthasubramanian.....	166
	106. <i>carinatus</i> Ananthasubramanian.....	167
	107. <i>insignis</i> Distant.....	168
	108. <i>leucaspis</i> (Walker).....	169
	109. <i>longispinus</i> Distant.....	171
	110. <i>luteus</i> Ananthasubramanian.....	172
	111. <i>majesticus</i> Ananthasubramanian.....	172
	112. <i>major</i> Ananthasubramanian and Ananthakrishnan.....	173
	113. <i>mangiferae</i> Ananthasubramanian and Ananthakrishnan.....	175
	114. <i>maringae</i> Ananthasubramanian and Ananthakrishnan.....	176
	115. <i>nigra</i> Ananthasubramanian and Ananthakrishnan.....	177
	116. <i>obliquus</i> Distant.....	178
	117. <i>obortus</i> Distant.....	179
	118. <i>reponens</i> (Walker).....	180
	119. <i>rhizophagus</i> Ananthasubramanian and Ananthakrishnan.....	181
	120. <i>rubrinigris</i> Ananthasubramanian.....	182
	121. <i>rufescens</i> Ananthasubramanian.....	183
	122. <i>scutellatus</i> Distant.....	184
	123. <i>splendens</i> Ananthasubramanian.....	185
	124. <i>substitutus</i> (Walker).....	186
	125. <i>taurus</i> (Fabr.).....	187
	126. <i>ustus</i> Buckton.....	190

Species 127.	<i>varicornis</i> Ananthasubramanian and Ananthakrishnan.....	191
Genus 13.	<i>Nilautama</i> Distant.....	192
Species 128.	<i>typica</i> Distant.....	193
Genus 14.	<i>Dograna</i> Distant.....	194
Species 129.	<i>suffulta</i> Distant.....	194
Genus 15.	<i>Imporcitor</i> Distant.....	195
Species 130.	<i>typicus</i> Distant.....	196
Genus 16.	<i>Pogonotus</i> Thirumalai and Ananthasubramanian.....	196
Species 131.	<i>indicus</i> Thirumalai and Ananthasubramanian.....	197
Genus 17.	<i>Convector</i> Distant.....	198
Species 132.	<i>cavendus</i> Distant.....	198
Genus 18.	<i>Otinotus</i> Buckton.....	199
Species 133.	<i>albomaculatus</i> Distant.....	202
	134. <i>ammon</i> Buckton	203
	135. <i>aureus</i> Ananthasubramanian	204
	136. <i>badius</i> Distant.....	205
	137. <i>brevicornis</i> Distant	205
	138. <i>campbelli</i> Distant	206
	139. <i>elongatus</i> Distant.....	207
	140. <i>indicatus</i> (Melichar)	208
	141. <i>mimicus</i> Distant	210
	142. <i>mysorensis</i> Ananthasubramanian	211
	143. <i>obliquus</i> Ananthasubramanian and Ananthakrishnan	212
	144. <i>oneratus</i> (Walker)	213
	145. <i>pallescens</i> Distant.....	216
	146. <i>transversus</i> Distant	217
Genus 19.	<i>Emphusis</i> Buckton.....	217
Species 147.	<i>malleus</i> (Walker)	218
	148. <i>perarmatus</i> Distant.....	219
Genus 20.	<i>Centrotypus</i> Stål.....	220
Species 149.	<i>assamensis</i> (Fairmaire).....	222
	150. <i>flavescens</i> Distant	223
	151. <i>flexuosus</i> (Fabr.)	224
	152. <i>malabaricus</i> n. sp.	225
	153. <i>ortus</i> Distant	226
	154. <i>parvus</i> Funkhouser	227
	155. <i>pulniensis</i> n. sp.	228
	156. <i>securis</i> Buckton.....	229
Genus 21.	<i>Acanthuchus</i> Stål	230

Species 157. <i>minutispinus</i> Funkhouser.....	230
Genus 22. <i>Periaman</i> Distant.....	231
Species 158. <i>pilosum</i> Distant.....	232
Genus 23. <i>Centruchus</i> Stal.....	233
Species 159. <i>brevicornis</i> Funkhouser.....	234
Genus 24. <i>Neocentrus</i> Thirumala and Ananthasubramanian.....	234
Species 160. <i>rufus</i> Thirumalai and Ananthasubramanian.....	235
Tribe 7. Centrotini Distant.....	235
Genus 25. <i>Centrotus</i> Fabricius.....	235
Species 161. <i>ndicus</i> n. sp.....	236
Genus 26. <i>Anchon</i> Buckton.....	237
Species 162. <i>ecchinatum</i> Distant.....	238
163. <i>pilosum</i> (Walker).....	239
164. <i>rectangulatum</i> (Kirby).....	240
165. <i>ulniforme</i> Buckton.....	241
Genus 27. <i>Antialcidas</i> Distant.....	244
Species 166. <i>attenuatus</i> Funkhouser.....	244
Genus 28. <i>Maurya</i> Distant.....	245
Species 167. <i>bicolor</i> Funkhouser.....	246
Tribe 8. Uroxiphini Goding.....	246
Genus 29. <i>Insitoroides</i> Funkhouser.....	247
Species 168. <i>typicus</i> Funkhouser.....	248
Genus 30. <i>Aleptocentrus</i> Thirumalai and Ananthasubramanian.....	249
Species 169. <i>notabilis</i> Thirumalai and Ananthasubramanian.....	249
Genus 31. <i>Cryptaspidia</i> Stål.....	250
Species 170. <i>fasciata</i> Funkhouser.....	250
171. <i>piceola</i> (Melichar).....	251
Genus 32. <i>Sinodemanga</i> Chou and Yuan.....	252
Species 172. <i>brunnea</i> (Funkhouser).....	252
Genus 33. <i>Demanga</i> Distant.....	253
Species 173. <i>sooknana</i> Distant.....	254
Genus 34. <i>Occator</i> Distant.....	254
Species 174. <i>erectus</i> Distant.....	255
Tribe 9. Gargarini Distant.....	256
Genus 35. <i>Gargarina</i> Ananthasubramanian.....	256
Species 175. <i>carinata</i> Ananthasubramanian.....	257
Genus 36. <i>Gargara</i> Amyot and Serville.....	257
Key to Indian species of <i>Gargara</i>	258

Species	176. <i>Affinis</i> Distant	263
	177. <i>albitaris</i> Ananthasubramanian and Ananthakrishnan.....	264
	178. <i>aurae</i> Funkhouser	265
	179. <i>brevis</i> Ananthasubramanian.....	266
	180. <i>caelata</i> Distant.....	267
	181. <i>confusa</i> Distant	267
	182. <i>contraria</i> Distant.....	268
	183. <i>delimitate</i> Distant.....	269
	184. <i>discoidalis</i> Ananthasubramanian.....	270
	185. <i>extrema</i> Distant.....	270
	186. <i>flavolineata</i> Distant.....	271
	187. <i>hraswa</i> nom. nov.....	272
	188. <i>kandala</i> n. sp.....	273
	189. <i>maculata</i> Funkhouser.....	274
	190. <i>madrasensis</i> Ananthasubramanian and Ananthakrishnan.....	275
	191. <i>majuscula</i> Distant	276
	192. <i>malabarica</i> Ananthasubramanian and Ananthakrishnan.....	277
	193. <i>mixta</i> (Buckton).....	278
	194. <i>nigrofasciata</i> Stål.....	279
	195. <i>nigrolimbata</i> Ananthasubramanian.....	280
	196. <i>pellucida</i> Ananthasubramanian.....	281
	197. <i>penangi</i> Funkhouser.....	282
	198. <i>pulchripennis</i> Stål	283
	199. <i>pulniensis</i> Ananthasubramanian	283
	200. <i>rivulata</i> Distant.....	284
	201. <i>robusta</i> Distant.....	285
	202. <i>rustica</i> Ananthasubramanian and Ananthakrishnan	285
	203. <i>sikhimensis</i> Distant	287
	204. <i>splendidula</i> Distant.....	288
	205. <i>tumida</i> Melichar.....	288
	206. <i>varicolor</i> Stål.....	289
Genus 37. <i>Ebhul</i> Distant.....		290
Species	207. <i>maculipennis</i> Funkhouser	290
	208. <i>varium</i> (Walker).....	292
Tribe 10. Coccosterphini Distant.....		292
Genus 38. <i>Eucoccosterphus</i> Ananthasubramanian and Ghosh		293
Key to Indian species of <i>Eucoccosterphus</i>		294

Species	209. <i>mucronicollis</i> (de Motschusky).....	294
	210. <i>paludatus</i> (Distant)	295
	211. <i>tuberculatus</i> (de Motschulsky).....	296
Genus 39.	<i>Cocosterphus</i> Stål	297
Key to species of <i>Cocosterphus</i>		298
Species	212. <i>decoloratus</i> Distant.....	299
	213. <i>luteus</i> Funkhouser.....	299
	214. <i>minutus</i> (Fabr.).....	300
	215. <i>mysorensis</i> Ananthasubramanian and Ghosh	301
	216. <i>obscurus</i> Distant	302
Genus 40.	<i>Parayasa</i> Distant.....	303
Key to species of <i>Parayasa</i>		304
Species	217. <i>affinis</i> Distant.....	306
	218. <i>affixa</i> Distant.....	307
	219. <i>atricapilla</i> Distant.....	308
	220. <i>dissimilis</i> Distant.....	309
	221. <i>elegantula</i> Distant.....	310
	222. <i>fasciata</i> Ananthasubramanian.....	311
	223. <i>maculosa</i> Distant.....	312
	224. <i>margherita</i> Distant.....	313
	225. <i>modesta</i> Distant.....	314
	226. <i>nigrolimbata</i> Ananthasubramanian.....	315
	227. <i>nilgiriensis</i> Distant.....	315
	228. <i>pilosa</i> Ananthasubramanian.....	316
	229. <i>rustica</i> Distant.....	317
	230. <i>typica</i> Distant.....	318
	231. <i>variegata</i> Thirumalai and Ananthasubramanian.....	319
Genus 41.	<i>Insitor</i> Distant	320
Species	232. <i>exemplificatus</i> Distant.....	320
Genus 42.	<i>Kanada</i> Distant	321
Species	233. <i>irvinei</i> Distant	322

GENERAL INTRODUCTION

The family Membracidae comprises a distinct group of small phytophagous insects belonging to the auchenorrhynchos Homoptera. The members of the family can be easily recognised by the peculiar structure of the pronotum which frequently conceals the scutellum and takes different shapes. Horn-like processes of the pronotum, very often assuming curious shapes in different species, have earned them the name "cow bugs" or "horn bugs". Although endowed with powers of flight, they prefer to hop about when disturbed, and this habit has earned them the popular name "tree hoppers". They are further diagnosed by the presence of mesopleural processes.

The group was first recognised as "Membracidia" by Ratinesque (1828). Berthold (1827) and Latreille (1825, 1828) used the term "Membracides". It was Germar (1828) who first differentiated the membracides from the cicades as a distinct group. Burmeister (1835) and Walker (1851a, 1851b) designated the group as "Membracina", and the term "Membraciens" was used by Blanchard (1840). Amyot and Serville (1843), Stål (1858), Fieber (1875), Bolivar and Chicote (1879) and Griffini (1897) designated and described a number of species applying the terms "Cornidorsi", "Membracinae", "Membracida", "Membracides" and "Membracidi" respectively. Bondar (1922) used the term "Membracideos" in all his papers dealing with the economic importance of these bugs. The name "Membracidae" first applied by Harris (1841), is now used for the family in accordance with the present International Code of Zoological Nomenclature. Metcalf and Wade (1965) included the Membracidae, Aetalionidae, Nicomiidae and Biturritiidae in the Superfamily Membracoidea.

The pioneering contributions to the taxonomy of membracids which were of a general nature, embracing all the families of Homoptera, include those of Fabricius (1775, 1777, 1781, 1787, 1794, 1798, 1803). Fairmaire (1846a, 1846b, 1855) and Fairmaire and Signoret (1858) who compiled keys for the identification of families and genera of many species of Hemiptera including Membracidae, Walker (1851a, 1851b, 1858a) who studied the membracid and other hemipteran fauna of Borneo, Malacca and Singapore besides listing the membracid specimens in the collections of the British Museum, and Stål (1853, 1854, 1855, 1859, 1863, 1864, 1866a, 1866b, 1867, 1869a, 1869b, 1870) who gave precise and accurate descriptions and keys for several genera and species, especially from Africa and Philippines. Buckton (1903, 1905) published a monograph on the Membracidae, including an account of the significance of the pronotal structures in the context of competition. The contributions of Melichar (1900, 1902, 1903, 1905, 1907, 1912, 1914a, 1914b, 1922) on the taxonomy of membracids are valuable. Jacobi (1904, 1905, 1909, 1910, 1912, 1917, 1936, 1941) described several new genera and species of Homoptera including Membracidae from different parts of the world. Paláez (1935, 1936, 1940a, 1940b, 1941a, 1941b, 1943a, 1943b, 1945) described the membracid fauna from Central America, Africa, Mexico and Brazil, while the Australian Membracidae received attention from Goding (1898, 1903), Funkhouser (1927a), Evans (1966) and Kitching (1976).

The membracid fauna of Africa was thoroughly studied by Capener (1850, 1952a, 1952b, 1953a, 1953b, 1954a, 1954b, 1955, 1962, 1966, 1968a, 1968b, 1968c, 1968d, 1968e, 1969, 1971, 1972a, 1972b, 1972c, 1972d, 1972e), followed by Boulard (1966, 1967, 1968a, 1968b, 1968c,

1968d, 1969a, 1969b, 1969c, 1969d, 1971, 1973, 1974, 1976, 1977a, 1977b, 1979, 1981a, 1981b, 1983a, 1983b, 1986). A bibliographic catalogue with keys to genera and species of the membracid fauna of Africa was presented by Goding (1932); the same author (1931a, 1931b, 1934, 1939) also classified the Old World Membracidae, presenting elaborate dichotomous keys for genera and species.

The name of Funkhouser is outstanding in the field of Membracidae for his sizeable contributions on the morphology, biology and taxonomy of the Membracidae from nearly all geographical regions; in his monographic work entitled "*Genera Insectorum:Membracidae*" Funkhouser (1951) presented keys to the world genera, their salient features and distribution of the species besides providing information on the bionomics of the family.

Deitz (1975) made outstanding contributions to the classification of the higher categories of the Membracidae. Broomfield (1971) provided a catalogue of the membracid types in the British Museum. Broomfield (1976) and Kopp and Yonke (1973a, 1973b, 1973c, 1974, 1979) made excellent contributions to the taxonomy of the Neotropical membracids.

Metcalf and Wade (1963) published the Bibliography of the Membracoidea and fossil Homoptera covering the literature that appeared upto 1956, and the same authors (1965) made a monumental compilation of the General Catalogue of the Superfamily; this work was pursued by Deitz and Kopp (1987) who brought out the first supplement covering the literature upto the year 1980, and Deitz (1989) covered the literature on this superfamily to the end of the year 1987.

The contributions of Richter (1940, 1942, 1943, 1945, 1955) to the South American membracid taxonomy are of a pioneering nature. Strümpel (1972a, 1972b, 1973, 1974, 1983a, 1983b, 1985, 1986) and Strümpel and Strümpel (1975, 1978) published excellent papers on the taxonomy of Colombian Membracids.

The taxonomy of the Asian Membracidae received attention from Matsmura (1898, 1905, 1912, 1932). Kato (1928a, 1928b, 1937, 1940, 1960) compiled a catalogue of the Japanese species of membracids, while Wu (1935) gave a synonymical catalogue of the Chinese membracids. The membracids of China also received attention from Funkhouser (1935, 1937, 1938, 1942); more recently, Chou (1964, 1975, 1976, 1980), Chou and Yuan (1979, 1980, 1981, 1982, 1983), Yuan (1985), Yuan and Chou (1983a, 1983b, 1984, 1985) and Yuan, *et al.*(1986) described with excellent figures several new genera and species of membracids from China.

Evans (1947) made a thorough study of the wing venation of membracids and its significance in the classification of the family.

The taxonomy of the membracid fauna of India received little attention after the pioneering and outstanding contributions of Distant (1908, 1916) and Funkhouser (1922, 1929a, 1929b, 1933). Ananthasubramanian and Ananthakrishnan (1975a, 1975b) studied the common species of Indian membracids from their taxonomic and bioecological standpoints and stressed on the value of nymphal characters in the taxonomy of the family. Ananthasubramanian (1978, 1980a, 1980b, 1982, 1984). Thriumalai and Ananthasubramanian (1981, 1985) and Ananthasubramanian and Ghosh (1987a, 1987b) also contributed to the taxonomy of Indian Membracidae.

The value of nymphal characters in the taxonomy of the Membracidae was first suggested by Hodgkiss (1911). Matusch (1912), Funkhouser (1917), Yothers (1934) and Yothers and Allen (1941) stressed on the value of nymphal chaetotaxy and the arrangement of tubercles and spines in the diagnosis of the species. Ananthasubramanian and Ananthakrishnan (1975a) provided keys for the identification of the species on the basis of the characters of the fifth instar nymphs in 39 species of membracids from southern India, while Quisenberry, *et al.* (1978) compiled a key for the identification of the immature stages of 24 genera of membracids from Missouri.

The importance of genitalia in the membracid taxonomy was stressed for the first time by Lawson (1922). Caldwell (1949) classified the members of the tribe Ceresini on the basis of male genitalia. Dennis (1952) examined long series of *Stictocephala bubalus* and confirmed the existence of remarkable structural constancy of male and female genitalia. Deitz (1975) included descriptions and illustrations of male and female genitalia in his study of the New World subfamilies and tribes, while Strümpel (1972a, 1972b, 1973, 1974, 1975, 1978) provided excellent figures of both male and female genitalia in his studies of Colombian Membracidae. Datta *et al.* (1978) gave an illustrated account of the male genitalia of 24 species of Indian membracids in the collections of the Zoological Survey of India.

While the literature on the taxonomic and distributional aspects of the Membracidae is quite extensive as indicated from the foregoing account, comparatively very few references are available on the economics of these bugs due to their minor pest status with a few exceptions. For instance, the damage due to *Stictocephala basalis* (Fabr.) has been well documented by 142 references (Kopp and Yonke, 1973a). In the same manner, *Spissistilus festinus* (Say) has been reported injurious to apple, alfalfa, etc. (Oemler, 1888; Sanderson, 1904; Pettit, 1926; Yothers, 1934; Graham and Ellisor, 1940). In southern India, *Anchon pilosum* (Walker) was reported as a serious pest on cow pea (Ayyar, 1937). Several species of *Leptocentrus*, *Gargara*, *Otinotus* and *Oxyrhachis* have also been recorded as pests of cultivated crops in southern India (Ananthasubramanian and Ananthakrishnan, 1975b).

The life-histories of quite a number of North American species of membracids were studied by Funkhouser (1917), while those of southern India were reported by Ananthasubramanian and Ananthakrishnan (1975b).

Many workers have called attention to the mimetic nature of the membracid body form and colour that blend with buds, stipules, spines or fruits of their respective host plants (Poulton, 1891, 1898, 1903, 1913; Mann, 1912; Lutz, 1912, Howard, 1910; Ananthasubramanian and Ananthakrishnan, 1975b; Hinton, 1977b). Funkhouser (1951) while admitting the effectiveness of structural peculiarities towards cryptic value in some species, dismisses the great majority of cases as having no adaptive value, if not detrimental to the species.

Interesting accounts on the symbiotic association of membracids with ants are on record from the early part of the last century till recent years (Hardwicke, 1829; Belt, 1874; Rice, 1893; Green, 1900; Baer, 1903; Branch, 1914; Lamborn, 1914; Ball, 1915; Andrews, 1929, 1930; Capener, 1962; Way, 1963; Ananthasubramanian and Ananthakrishnan, 1975b; Wood, 1977a). The ants eagerly seek for the so-called honey-dew, an anal secretion of the membracids, and often build walls of sand and debris to enclose them and to prevent them from straying.

Parental care in membracids was first reported by Murtfelt (1887); and although it was doubted by Haviland (1925) and others, in recent years instances of maternal care have been reported and confirmed (Wood, 1976a, 1977b, 1978; Brach, 1975; Hinton, 1976, 1977; Singh and Sharma, 1980; Fritz, 1983a, 1983b; Tallamy and Wood, 1986; Eberhard, 1986).

Literature pertaining to the entomophagous predators and parasites of membracids includes the contributions of Jack (1886), Ashmead (1888), Hodgkiss (1911), Funkhouser (1951), Capener (1962), Balduf (1928), Hayat (1973), Khan (1975), Khan and Shafee (1977), Viggiani (1973), Viggiani and Hayat (1974), Hayat and Viggiani (1984) and Huber (1986). Kornhauser (1916, 1917, 1919) gave exhaustible accounts on the effect of parasitisation by *Aphelopus theliae* on the membracid nymphs of *Thelia bimaculata*. So far is known, the most susceptible stage of parasitisation by the Hymenoptera is the egg stage in all species of Indian species of membracids studied (Ananthasubramanian and Ananthakrishnan, 1975b).

BIOECOLOGY

Habits :- Membracids are rather sluggish and quiet insects, and their habits appear to be identical wherever they are encountered. They are part and parcel of their host plants where they feed and breed. Nymphs are always cryptic and escape the attention of the observe, while adults, as a rule, are aposematic. The adults of many species such as *Leptocentrus taurus*, *L. moringae*, *L. leucaspis*, *L. rhizophagus*, *Tricentrus spathoderi*, *Otinotus indicatus*, *Centrotypus malabaricus*, *Telingana nigroalata* and many species of *Oxyrhachis*, are usually found with their heads directed downward towards the base of the branch while at rest (Pl.I-A, B, C). Adults of *Tricentrus pilosus* while resting on the free-hanging prop roots of banyan trees, are found with their heads directed downward, while the nymphs of this species rest in the opposite direction. It is of interest that adults of *T.pilosus* in their resting posture on their alternative host plant, *Thespesia populnea*, are found with their heads facing either upward or downward. The significance of this peculiar posture remains conjectural, but is obvious that this posture is ideal to jump down at the slightest provocation and evade the predator. Nymphs, on the other hand, rest with their head turned upward or downward. Adults and nymphs of most species of membracids show the peculiar habit of moving around the twigs in a spiral manner to avoid the intruder, and only persistent disturbance forces the adults to take to their wings.

Adults of many species of membracids which are relatively more active, jump or fly away in response to a quick-moving object across them, but are not stimulated by slow-moving objects; this behaviour of the bugs is taken advantage of in collecting them by slowly moving the fingers behind the insect and catching them with a sudden jerk of the fingers. Species of *Oxyrhachis* are quite sluggish and do not perturbed even when gently touched; the females are especially sluggish during oviposition.

In general, membracids are sun-loving. Species of *Leptocentrus* are noticed to move to the terminal parts of the branches so as to expose themselves to light and they appear to be more active during the warmer part of the day. However, during the summer, when the day temperature

crosses 40C, *Oxyrhachis* and *O. rufescens* have been observed to move towards the lower surface of the stem. On a sunny day following a shower, adults of *Leptocentrus taurus* and *L. leucaspis* are found to move toward the terminal parts of the branches or upper surface of the leaf blades where they appear to be move active as judged from their movements.

Although equipped with normal wings, membracids are not known for long and sustained flight. Some species such as *Oxyrhachis taranda* and *Coccosterphus minutus* rarely fly, while species of *Leptocentrus*, *Lanceonotus*, *Centrotypus* and *Tricentrus* fly fast for short distances with a sharp, whirring sound. It was observed that *Centrotypus malabaricus* may cover a distance of about 75 metres at one stretch; the flight is not always in the upward direction but subhorizontally in a rather erratic, zigzag fashion. The heavy pronotum with its processes may perhaps account for the inability for sustained and straight flight. Of the three modes of locomotion, namely, walking, jumping and flying, the first one is most frequently adopted.

Membracids are not collected in light traps and they appear to be rather indifferent to a direct source of light; however, Funkhouser (1951) reports that *Aтымna castaneae* in the United States and *Tricentrus truncaticornis* of Sumatra have been taken while flying around lights.

The nymphs, unlike the adults, are always cryptic; they are usually dorso-ventrally compressed and they remain adpressed to the host plant with their colour blending with that of their background. They are sluggish and not noted for swift locomotion. Early nymphs generally prefer leaf axils or bracts of inflorescence, while later immature stages often expose themselves in the internodal regions; this is the case with reference to the later nymphs of *Oxyrhachis taranda* and *O. rufescens* (P1.II). As a rule, nymphs are green in colour, but in some species such as *Leptocentrus taurus* the colour of the nymphs varies to suit that of their host plants.

Feeding sites and feeding behaviour :- The feeding behaviour of membracids is similar in all essential respects to that of other plant bugs. As a rule, plants that are hairy are avoided. Both nymphs and adults are phloem feeders, and the process is rather slow, leisurely and prolonged. The rostrum is so deeply anchored in the host plant tissue that it becomes broken if the insect is forcefully pulled out. The feeding sites on the host plant are often specific. *Oxyrhachis taranda* and *O. rufescens* prefer twigs of acacias that are one or two years old. The gregarious adults and nymphs feed leisurely by inserting the rostral tip into the phloem. Nymphs of *Otinotus indicatus* prefer rather thick twigs of their plants such as *Psidium guajava* and *Lawsonia alba*. On the other hand, the nymphs of many species prefer soft tissues of their host plants; their feeding sites include the axils, petioles, bracts, peduncles, young buds and young fruits. *Tricentrus pilosus* and *Leptocentrus rhizophagus* regularly feed on the sap from the soft tissues of the terminal and subterminal parts of the free-hanging prop roots of *Ficus bengalensis*. This kind of rhizophagous habit also occurs rarely in *Otinotus oneratus* and *Eucoccosterphus paludatus*.

Mating and oviposition :- Mating occurs throughout the year in most of the species on the plants, and several generations may be completed in those species without prolonged life-cycles. On the other hand, species found at high altitudes do not mate throughout the year and they are highly seasonal with the consequence that only two or three generations are completed in an year. *Oxyrhachis taranda*, *Otinotus oneratus*, *Coccosterphus minutus* and *Gargara mixta* belong to the

former category while *Telingana nigroalata*, *T. consobrina*, *Otinotus mimicus* and *Parayasa elegantula*, to the latter category. There is a short pre-mating period after the last moult. In *Leptocentrus taurus*, *Otinotus oneratus*, *Oxyrhachis* and *Anchon ulniforme*, mating commences two or three days after the last moult. In *Oxyrhachis taranda*, *Otinotus oneratus* and *Gargara mixta*, all of which are gregarious, a single female is courted by two or more males. The position assumed in copula is such that the opposite sexes face away from each other. Sluggish forms such as *Oxyrhachis taranda*, *O. rufescens*, *O. krusadiensis* and *O. uncatus*, are not easily excited when disturbed, and even when they are dislodged from the branch of the host plant, they do not get disengaged. Active forms such as *Tricentrus pilosus*, *Otinotus indicatus*, *Gargara hraswa* and *Lanceonotus cinnamomi* get disengaged while in copula at the slightest disturbance. The duration of copulation varies in different species and in the same species. Sluggish species remain in copula for one or two hours and under undisturbed field conditions it may be longer. On the other hand, in active species such as *Parayasa elegantula*, *Eucocosterphus tuberculatus*, *Leptocentrus tourus* and *Gargara extrema*, copulation is of short duration and timed at 10-15, 20-35, 5-15 and 10-15 minutes respectively. In some species such as *Tricentrus albomaculatus* and *Gargara hraswa*, even careful observations were not successful to observe them in copula.

Most species of membracids prefer the bark of stems or twigs which are one or two years old for egg-laying. Species like *Leptocentrus taurus* and *Otinotus oneratus* oviposit on the tender twiners as well as on hard tissues of old stems depending on the host plant chosen by these common forms. *Leptocentrus moringae*, *L. bauhiniae*, *L. substitutus* and *Oxyrhachis minusculus* normally oviposit in tender twigs that run the risk of being snapped due to the deep oviposition punctures. Midribs and petioles are the preferred ovipositing sites of *Gargara albitarsis*, *G. madrasensis*, *Cocosterphus minutus* and *Otinotus obliquus*, while leaf axils are preferred by *Telingana nigroalata* and *Gargara malabarica*. Some species regularly oviposit on the pedicels and peduncles, while some polyphagous species often do so. For instance, *Telingana consobrina*, *Lanceonotus cinnamomi*, *Eucocosterphus paludatus* and *E. tuberculatus*, usually prefer peduncles. *Otinotus oneratus* normally oviposit on the peduncles of *Cestrum diurnum* and *Bauhinia purpurea*. Species inhabiting herbaceous or semiwoody annuals or biennials invariably oviposit on the basal part of the stem, e.g. *Tricentrus albomaculatus* on the host plant, *Datura fastuosa*. Some species oviposit on the slender, free-hanging prop roots of *Ficus bengalensis*; these species include *Eucocosterphus paludatus*, *Otinotus oneratus*, *Tricentrus pilosus* and *Leptocentrus rhizophagus*; all these except the last-mentioned one have alternative host plants for oviposition and development. The curious instance of oviposition in the roots or on the base of the stem below the surface of the ground reported by Funkhouser (1917) for *Thelia bimaculata* and *Stictocephala festina* has no parallel among the Indian species studied.

The nature of the oviposition slit varies. In many instances, the slit appears to be straight and narrow made by an oblique thrust of the ovipositor, thus, in *Leptocentrus moringae*, *Tricentrus pilosus*, *T. congestus*, *T. spathodei* and several species of *Gargara*, the eggs are arranged in a single row in the slit, and the slit soon closes up by the springing back of the bark, leaving only a streak externally. In another type of oviposition observed in *Leptocentrus tourus*, *L. bauhiniae*, *L. moringae* and *L. mangiferae*, two crescentic slits are made side by side and a single or double row of eggs are deposited; the slit does not close but remains as a deep elliptical scar. In *Gargara*

madrasensis and *G. hraswa*, the slit is a shallow excavation. In all the species of *Oxyrhachis* as also in *Otinotus oneratus*, the oviposition punctures are superficial and the eggs are partially hidden, their tips plainly projecting out. In *Oxyrhachis taranda* and *O. rufescens* the eggs are arranged in a palmate manner, the opposite rows covering at one end and diverging at the other (P1.III-A). In *Oxyrhachis brevicornutus* the eggs are arranged in two rows and the egg mass covered by a waxy material. In *Otinotus oneratus* the eggs are laid in irregularly arranged clusters, one row of eggs partially or entirely overlapped by other rows (P1.III-B).

The number of eggs in each egg mass varies even within the species. In general, different species of *Oxyrhachis* exhibit egg masses with relatively large number of eggs, while species of *Gargara* and *Coccosterphus* have egg masses with small number of eggs.

There are two types of movement of the ovipositor in the act of oviposition. In the first type exemplified by species of *Tricentrus*, *Gargara*, *Coccosterphus* and *Eucoccosterphus* as also in *Parayasa elegantula*, the female raises the abdomen as high as possible, unsheaths the valves held at right angles to the abdomen and slowly pushed into the bark; in this perpendicular thrust, the ovipositor which bends up and down, progresses steadily backward until it turns almost parallel to the body, and the eggs are laid in the slit, after which the ovipositor is withdrawn. In the second type exemplified by species of *Oxyrhachis*, *Otinotus* and *Lanceonotus*, the ovipositor is held at an angle to the abdomen and thrust obliquely into the bark; it is withdrawn after each egg is laid and reinserted for laying the next egg.

Some species of membracids having high fecundity lays eggs in slits which are close to each other in the same twig; for instance, in *Gargara mixta* as many as 32 egg masses are deposited within a distance of an inch. A comparison of the ovipositor of the different species of membracids suggests a correlation between the length of the ovipositors and the mechanics of oviposition. It is not unusual for some smaller species of membracids such as *Coccosterphus minutus*, *Gargara madrasensis*, *G. hraswa*, *G. albitarsis* and *Tricentrus albomaculatus*, to possess large and powerful ovipositors for anchoring the eggs deep in the host plant.

The eggs of all the species of membracids examined are identical in shape. They are elongate with a slight curvature on lateral margins. Normally the eggs are shining white with a smooth, vitreous chorion, while in some species they are light brown. The eggs of *Leptocentrus leucaspis*, *Hypasauchenia subfusca*, *Centrotypus malabaricus* and *Oxyrhachis rufescens* are larger, measuring 1-1.3 mm. long, while those of *Coccosterphus minutus*, *Gargara hraswa* and *Parayasa elegantula* are small, measuring 0.6-0.75 mm. long.

Duration of egg stage :- The incubation period of eggs differs in the different species of membracids as shown in Table 1. A minimum of 5 and a maximum of 16 days are noted for incubation; even within the same species the difference in the incubation period appears to be significant during different seasons of the year. Eggs laid at the same time also show variations relating to hatching and the reasons for such differences are difficult to account for.

Hatching :- Hatching occurs invariably during the early hours of the day when the ambient temperature is low. Prior to hatching, the egg slightly enlarges and stands conspicuously apart from the neighbouring eggs, and in many cases the colour turns to yellow or light brown. The hatching membrane enclosing the embryo breaks and the chorion splits near the upper end; the egg cap is forced upward by the cranial tubercles and the head of the nymph projects out; the nymph exhibits to and fro movements and squeezes its way out; then it stands on its anal tube for a few minutes; on getting a foothold, it pulls its anal tube out and slowly moves apart, rests for a while and becomes active. The entire process is completed in 15-60 minutes in the different species.

Number of instars and their duration :- There are five nymphal instars in all the membracid species studied and this number may hold good for other species as well. Each nymphal instar displays characters that are useful in the taxonomy of the family. The duration of each instar varies for the different species and even for the individuals hatching from a single egg mass. In general, the duration of the first instar or immature stage is longer than the 2nd, 3rd and 4th, while the 5th immature stage is the longest (Table: 1).

Ecdysis :- Prior to moulting, some species of membracids require a foothold, while others moult without attachment. In view of its larger size, the fifth instar nymph offer as the suitable stage for observations on moulting. Species of *Oxyrhachis* do not require a foothold for moulting, while species of *Leptocentrus*, *Lanceonotus*, *Coccosterphus*, *Gargara* and *Tricentrus*, attach themselves by their forelegs to the twigs. The exoskeleton which has become distinctly loosened, commences to split from the middle of the vertex and extends over to the rostrum, thorax, legs, wings and abdomen in that sequence. The old exoskeleton remains firmly attached to the twig and it is so perfect that it may be used to study the chaetotaxy. The newly moulted nymphs or the newly emerged adult is paler or teneral. It requires a few hours to acquire the normal colour and texture of the exoskeleton. The time required for moulting varies not only in different species but in the individuals of the same species. If the last nymphal stage is subjected to starvation, desiccation or injury, it is reflected on the adult; the abnormalities may manifest as unusual twisting of horns and posterior process and crumbled tegmina. In rare instances, abnormal adults with nymphal characters such as the retention of abdominal lateral lamellae appear, probably due to a high concentration of neotenin in the last nymphal stage.

Host-plant relationships :- Membracids exhibit host specificity to a remarkable degree. Certain species of plants, although occurring in abundance, are free from membracids. In southern India, for instance, plants belonging to the families Cucurbitaceae, Oleaceae, Asclepiadaceae, Apocyanaceae, Meliaceae and Labiatae are avoided by the membracids, while plants belonging to the Fabaceae, Mimoseae and Caesalpiniaceae harbour membracids. Many of our local species such as *Oxyrhachis taranda*, *O. rufescens*, *O. tuberculus*, *O. uncatius*, *O. brevicornutus*, *O. krusadiensis*, *Otinotus oneratus*, *Leptocentrus tourus*, *Coccosterphus minutus* and *Gargara mixta* prefer the acacias and red gram. Families such as Compositae, Rubiaceae, Solanaceae, Myrtaceae, Euphorbiaceae and Rhamnaceae are also found to harbour membracids. In the plains of southern India, membracids are not encountered on plants belonging to the monocotyledonous group.

Table : 1

Duration (in days) of egg and nymphal stages of some Indian Membracidae

Name of the membracid species	Egg	Duration of nymphal stages					Total	Total
		I	II	III	IV	V		
<i>Oxyrhachis taranda</i>	7-12	8-12	6	5-6	3-4	10-12	32-40	39-52
<i>O. rufescens</i>	7-10	4-6	4-5	4-6	5	9-12	26-34	33-34
<i>O. minusculus</i>	6-10	5-7	3-4	3-4	3-4	7-10	21-29	27-39
<i>O. krusadiensis</i>	6-10	7-9	4-6	3	3	10-15	27-36	33-46
<i>O. uncatu</i>	7-12	9-11	5	4	4	7-9	29-33	36-45
<i>O. brevicornutus</i>	7-10	8-10	3-6	3-4	5	7-10	26-35	33-45
<i>Telingana nigroalata</i>	7-11	7-9	5-6	4	5	10-13	31-37	38-48
<i>T. consobrina</i>	7-10	6	4	4	5	9	28	35-38
<i>Leptocentrus taurus</i>	6-14	5-10	3	2-3	2-5	7-11	19-32	25-46
<i>L. rhizophagus</i>	8-10	6	4	5	5	7-12	27-32	35-42
<i>L. leucaspis</i>	8-14	5-9	4	5	4	9-12	27-34	35-48
<i>L. bajulans</i>	5-9	7-8	4	6	6	7-10	30-34	35-43
<i>L. varicornis</i>	10-15	4-7	3	4	4	10-11	25-29	35-43
<i>L. moringae</i>	10-15	5-7	3-5	3-5	4	7-10	22-31	32-46
<i>L. mangiferae</i>	7-13	7	5	4	4	9	29	36-42
<i>L. bauhiniae</i>	10-15	5-7	4	3	3	7-10	22-27	32-42
<i>L. migra</i>	10-14	9	6	5	5	9	34	44-48
<i>L. major</i>	10-12	8	6	4	4	10	32	42-46
<i>Otinotus oneratus</i>	7-13	7-8	5	5	4-6	7-10	28-34	35-47
<i>O. mimicus</i>	7-10	6	3	3	3	8	23	30-33
<i>O. indicatus</i>	8-11	7-8	3	5	4	10-12	29-32	37-43
<i>O. obliquus</i>	7-12	10	3	3	3	7	26	33-38
<i>Tricentrus pilosus</i>	9-16	8-10	4	5	5	10	32-34	41-50
<i>T. albomaculatus</i>	6-11	7	3	3	3	6-12	22-28	28-39
<i>T. indicus</i>	8-14	7-10	6	4	4	7-10	28-34	36-48
<i>T. decornis</i>	7-9	7	4	3	4	7	21	28-30
<i>T. congestus</i>	10-13	7-10	5	4	4	9-12	29-35	39-48
<i>Gargara mixta</i>	7-10	4-7	5	4	3	7-9	23-28	30-38
<i>G. extrema</i>	5-10	5-7	5	4	3	7-9	24-28	29-38
<i>G. rustica</i>	8-10	4-8	3	3	3	7-10	20-27	28-37
<i>G. malabarica</i>	7-12	5	4	3	4	7	23	30-35
<i>G. madrasensis</i>	6-9	4-7	3	3	3	7-8	20-24	26-33
<i>G. hraswa</i>	6-9	4-7	3	3	3	7-9	20-25	26-34
<i>G. albitarsis</i>	6-9	3	4	4	5	8	24	30-33
<i>Anchon ulniforme</i>	6-12	3	3	3	3	10	22	28-34
<i>Parayasa maculosa</i>	7-10	7	3	4	3	7-10	21-24	28-34
<i>Coccosterphus minutus</i>	5-7	5-9	3	3	3	7-9	21-27	26-34
<i>Eucoccosterphus tuberculatus</i>	9-15	6-10	4	4	5	10-13	29-36	38-51
<i>E. paludatus</i>	7-12	7-9	6	4	4	10-13	31-36	38-48

Monophagous species such as *Leptocentrus moringae*, *L. bauhiniae*, *L. rhizophagus*, *Lanceonotus cinnamomi*, *Tricentrus spathodei*, etc. exhibit absolute host specificity. In such instances, as mentioned by Funkhouser (1917), the association between the membracid and the host plant is so specific that a knowledge of the one is sufficient for a recognition of the other. The host-plant relationship of membracids in some cases are difficult to explain. For instance, in southern India *Otinotus oneratus*, a highly polyphagous species found on several host plant species, is conspicuous by its absence on *Datura fastuosa*; in northern India this species is found abundantly on *Datura fastuosa* wherever this plant occurs. Certain species of membracids deliberately change their host plant after completing one or two generations although no morphological difference on the host plant is apparent for inducing this behaviour, for instance, *Anchon ulniforme*, normally occurring on *Cajanus cajan*, completes two generations on this host plant and switches on to *Phaseolus mungo*, *Lablab purpureus* or any other leguminous plant found in the area.

The species whose host plants have been studied appear to have all stages of one or two broods passed through on the same host plant species, unlike some American species which are stated by Funkhouser (1917) require two hosts, one for feeding of the nymphs and the other for the adults to oviposit, the former host plant being usually herbaceous and succulent, while the latter being woody shrubs or trees. Some species of membracids occurring at high altitudes, and which are highly seasonal, may breed on a herbaceous plant, and on the completion of nymphal stages, swarm about and the adults occur abundantly on several species of host plants. For example, *Telingana nigroalata*, a species occurring at high altitudes in Kodaikanal (Tamil Nadu) breed on *Agapanthus umbellatus* in the month of July and emerge as adults in August and September in large numbers. The adults swarm about and are found on several species of plants on which they feed but do not oviposit; these plants include *Prunus salicina*, *Juniperus virginiana*, *Spiraea corymbosa*, *Erythina crystogalli*, *Cestrum aurantiacum* and ferns.

Oligophagous species of membracids can utilise two or three plant species for feeding and egg-laying. For instance, *Tricentrus pilosus*, a highly polymorphic form, occurs throughout the year on *Thespesia populnea*, but during certain months it is found feeding and breeding on the free-hanging prop roots of *Ficus bengalensis*. *Oxyrhachis taranda*, though occurring on several species of host plants, confines itself to the leguminous plants, mostly belonging to the family Fabaceae besides Mimoseae and Caesalpiniaceae, and it is not found on plants belonging to other Natural Orders.

Polyphagous species occur on several of host plant belonging to different families. *Otinotus oneratus*, *Leptocentrus taurus*, *Gargara mixta* and *Coccosterphus minutus* are found on several plants belonging to different families.

The host plants are known for certain only for some species of membracids. It may be mentioned that the true host plant of an insect is the one on which the insect feeds and breeds. The host plants of some membracid species are given at the end, but it should be emphasized that some of the plants noted here may be only shelter plants and not used as true host plants.

Communal life :- Some species of membracids occur solitarily on their host plants, while others are decidedly gregarious. All species of *Oxyrhachis* appear to be gregarious. Some species such as *Eucocosterphus tuberculatus* are gregarious in their nymphal stages and solitary as adults. Some species are solitary in their nymphal stages and gregarious in their adult stage, e.g., *Lepocentrus moringae* in which the nymphs are found solitarily in the axils of the leaves while the adults remain in groups of 4 or more with their head ends directed downward. In *Leptocentrus rhizophagus*, the 1st instar nymphs are gregarious and the later stages are solitary. When the same host plant happens to harbour two gregarious species of membracids, the individuals of the two species mingle with each other harmoniously; such close harmony is noticed in *Oxyrhachis taranda* and *Otinotus oneratus* on the host plant, *Prosopis spicigera*. The egg masses of these species are laid so close to each other as to become partially overlapped. In general, the gregarious species show high fecundity and they lay egg masses in close proximity, and the nymphs and adults evince very little tendency to migrate so that several generations are passed through on the same plant, often on the same branch with the result the nymphs of the two species mingle with each other, for example, the nymphs of *Gargara rustica* and *Eucocosterphus paludatus* live gregariously on *Bauhinia*; the latter species is also found associated with *Tricentrus pilosus* in their nymphal stages on the prop roots of Banyan. Rarely an individual nymph of a solitary species is observed to be present in the midst of a gregarious one. In a few instances, two species which are normally solitary on different host plants live gregariously if they happen to find themselves on the same host plant. The different categories of communal life observed in Indian membracids are summarised in Table 2.

Attendance by ants :- That membracids are attended by ants for the sake of their anal secretion, the so-called "honey-dew" is well known. In fact, in many instances, the hiding places of the membracids are easily located by following the tract of marching ants. As stated in the general introduction, interesting accounts on this subject have been furnished by many workers. The association, though common, is undoubtedly not as indispensable and obligatory as the strict symbiotic relation between ants and some other insects. Many of the Indian species of membracids are attended by one or more species of ant, the exception so far noted being *Cocosterphus minutus*, *Telingana consobrina*, *Parayasa maculosa*, *Tricentrus purpureus*, *Otinotus mimicus* and *Parayasa elegantula*. The common species that attends on many species of membracids is undoubtedly the large black ant, viz., *Camponotus compressus*, found throughout India (plate:IV-A,B,C). The allied species, *C. sericeus* is less common and found attending on *Oxyrhachis* species, *C. sericeus* is less common and found attending on *Oxyrhachis rufescens* and *Tricentrus pilosus* during certain months. *Crematogaster* sp. attends on *Eucocosterphus tuberculatus* and *Eucocosterphus paludatus*. This small, shining black ant resting on tree trunks and exhibiting the peculiar habit of turning up its abdomen when excited, attends on other species of membracids as well, but not regularly. The red tree ant, *Oecophylla smaragdina* attends on *Oxyrhachis krusadiensis* and *O. brevicornutus*. *Anoplolepis longipes* a small red ant, on *Leptocentrus bauhiniae* and *Gargara rustica*, and *Formica* sp. on *Leptocentrus substitutus*, are noted for their active and virulent nature. *Myrmecaria brunnea* and *Meranoplus bicolor* characterised by backwardly directed prothoracic spines, are found attending on *Leptocentrus rhizophagus*, while *Solenopsis geminata* var. *rufa*, a small, brown ant nesting on the ground near trees, is associated with colonies of *Leptocentrus leucaspis*, *Otinotus oneratus* and *O. indicatus*. *Tricentrus fairmairei* has been reported to be attended by the ant, *Polyrachis dives*.

Table : 2

Types of communal life in some Indian membracids

Species of membracid	Type of solitary and communal life
Centrotypus malabaricus Coccosterphus minutus Tricentrus pilosus Otinotus indicatus Otinotus obliquus Telingana consobrina Leptocentrus varicornis Leptocentrus nigra Leptocentrus mangiferae and adults.	Species solitary as both nymphs and adults.
<i>Leptocentrus moringae</i> <i>Leptocentrus scutellatus</i> <i>Telingana nigroalata</i>	Species gregarious as adults and solitary as nymphs.
<i>Eucoccosterphus tuberculatus</i>	Species solitary as adults but gregarious as nymphs.
<i>Tricentrus spathodei</i> <i>Leptocentrus rhizophagus</i>	Species gregarious in the first instar stage, but solitary thereafter.
<i>Oxyrhachis krusadiensis</i> <i>Oxyrhachis uncatus</i> <i>Oxyrhachis minusculus</i> <i>Gargara mixta</i>	Species gregarious as both nymphs and adults, but not living with other species of membracids.
<i>Oxyrhachis taranda</i> <i>Oxyrhachis rufescens</i> <i>Otinotus oneratus</i>	Gregarious species often living with other gregarious species of membracids both as nymphs and adults.
<i>Leptocentrus taurus</i> <i>Leptocentrus bauhiniae</i>	Species gregarious as nymphs on their regular host plants, but often found solitarily as nymphs on less preferred plants, sometimes in the midst of other gregarious species of membracids.

Funkhouser (1951) in his admirable account on this subject has stated that one of the unsolved problems connected with the mutualism between membracids and ants is that while some species of membracids are ant-attended, others are unattended, although there are apparently no morphological differences to cause this distinction, and observed that nymphs of the species unattended by ants showed the same extended anal tube as do the nymphs of those that secrete the

fluid. Observations made by Ananthasubramanian and Ananthakrishnan (1975b) reveal that species without eversible anal tubes never secrete the honey dew to the extent of attracting ants. For example, *Coccoxerphus minutus*, a species collected from different localities of India, is not attended by ants; the nymphs of this membracid do not evert their anal tubes; on the other hand, *Eucoccoxerphus tuberculatus* and *E. paludatus* whose nymphs possess eversible anal tubes, are invariably attended by ants of the genus *Cremastogaster* sp.

Another factor deciding the association of ants with membracids is the altitude at which the membracid occurs. For instance, *Telingana nigroalata* recorded on the host plant *Agapanthus umbellatus* at an altitude of 5,000 ft. at Kodaikanal Hills is unattended by ants while the same species recorded from plains is found attended by *Camponotus* sp.

As a rule, each species of membracid in a particular locality is attended by the same species of ants throughout the year. But many instances point out that there are exceptions to this general rule.

A particular species of ant attending on a particular membracid species in one locality is not very often associated with the same species of membracid in other localities. For instance, *Leptocentrus taurus* is attended by *Camponotus compressus* in all localities of S. India, while the same species is attended by *Oecophylla smaragdina* in North India. This difference is attributable only to chance proximity as stated by Capener (1962).

In all the instances noted above, the ants caress the nymphs for the honey dew. Further, the behaviour of the ants towards the membracid is not uniform in all the cases, the pattern being more or less definite for each of the attending species of ant. Some species of ants care only for the honey dew, while others extend their solicitude to a greater degree. For instance, *Camponotus compressus* merely derives honey dew from *Oxyrhachis rufescens*, while *C. sericeus* a seasonal attendant on the same membracid species, drives the nymphs along the host plant in such a way as to harbour each nymphs in different leaf axils. The ants drive the sluggish adult membracids from one branch to another by nibbling their tegmina, preventing the deposition of the egg masses in the same localised spot on the host plant; they also consume the moulted skin of their "cattle"

In many instances, close observation shows dense aggregations of ants at the cephalic end of the membracids, the significance of which is unknown. Often groups of ants collect at spots previously occupied by membracid nymphs, as if nibbling at the congealed anal secretion left behind by the latter.

The advantages derived by the membracids from their relationship with ants are obvious. The ants keep away many of the predators such as spiders, coccinellids, reduviids, etc. Further, the expulsion of the anal secretion through the caressing of ants enables the nymphs to reduce the pressure with which the plant sap enters the gut. In the absence of ants, the nymphs have to eliminate the honey dew by forcible extrusion. This hypothesis of Hood (1952) is of value considering the enormous quantity of the anal secretion expelled by many membracid nymphs and their constant association with ants.

Branch (1914) observed that in the absence of ants the nymphs failed to moult successfully and died before maturity. Although Funkhouser (1917) refuted this finding, recent studies by Wood (1977a) on *Entylia bactriana* lend support to the fact that successful maturation of eggs or nymphs is dependent upon the attending ants and the parental females. Nevertheless, in the rearing experiments conducted by Ananthasubramanian and Ananthakrishnan (1975b) on several species of membracids from southern India, the nymphs passed through successful moults and metamorphosed into adults even in the absence of ants; however, field studies by Deverajan (1984, unpublished) and also by the author show that ant-attendance reduced egg parasitisation and nymphal mortality in *Oxyrhachis rufescens* to a significant extent.

Association of membracids with insects other than ants is also on record, and the account given by Hood (1952) on the relationship of two species of bees - *Trigona hyalinata* var. *brunneri* and *T. palliada* with the membracid *Aconophora* sp. is of interest. The notable feature in this case is that the same membracid colony is attended by the bees and ants. While the bees are diurnal attendants, the ants, a subspecies of *Camponotus substitutus*, is a regular nocturnal visitor. Further, each bee is stated to have "its own limited territory of exploitation, because if all the bees are removed from a group of nymphs in the morning, no other bees will take their places during the day" In India, *Oxyrhachis rufescens* and *O. taranda*, when occurring in strong colonies, are often frequented by a dipteran fly, *Silba* sp. of the family Locheidae. Usually, the fly frequents the spots of twigs on the host plant previously occupied by membracid population and dissolves and consumes the congealed mass of expelled anal fluid left behind by the nymphs. At times, the fly frequents the nymphs when the latter are found unattended by ants; the fly caresses the nymphs, licks up the honey drop and quickly moves away. An anthicid beetle, *Formicomus* nr. *semiopacus* is found to frequent the colonies of *Leptocentrus taurus* and mingles freely with the camponotine ants that attend on the membracid nymphs. The behaviour of the beetle towards the membracid nymphs in the act of caressing for getting the honey dew simulates that of the ants; usually 4 or 5 beetles attend on a nymph; when disturbed, the beetle falls down and disappears into the crevices on the ground, or feigns death on falling to the ground, or holds on the twig tenaciously and remains motionless. The beetle faces no resistance from the ants and it seems to derive most of its food from the membracid nymphs.

Protective coloration and mimicry :- The characteristic colour patterns of the membracid nymphs $\frac{3}{4}$ brown, green and gray $\frac{3}{4}$ blending very perfectly with those of the leaves and bark of the host plants, afford them perfect protection against predators (plate : V- A,B,C). The nymphs of *Cocosterphus minutus* which occupy the terminal parts of the tender twigs of *Prosopis spicigera*, *Boerhaavia repens*, *Acalypha indica* and *Parthenium hysterophorus*, closely resemble the tiny unfolded leaves. The extraordinarily long pronotal anterior process of the fifth instar nymph of *Leptocentrus varicornis* strikingly simulates the shape and colour of the stipular spines of its host plant, *Zizyphus jujuba* (pl: V-B). The nymphs of *Tricentrus pilosus*, *T. spathadei*, *T. congestus*, *Otinotus indicans* and *O. obliquus* are dorso-ventrally compressed and remain closely adpressed to their host plants and escape the attention of even the most careful observer. In some instances, the dorsal protuberances closely resemble the irregular surface of bark both in colour and texture. While the nymphs of all species of membracids are cryptically coloured, the adults of most species, particularly species of *Otinotus*, *Leptocentrus* and *Oxyrhachis*, with their characteristic pronotal processes, appear most conspicuous on their host plants. On the other

hand, *Eucocosterphus tuberculatus*, with its black or rusty brown colour, and oval shape, resembles most effectively the small undeveloped dry fruits of its host plant, *Morinda tinctoria*. The light brown colour of *E. paludatus* matches so perfectly with the colour of the prop roots of *Ficus bengalensis* as to make it inconspicuous. In general, the highly sclerotised pronotum with its developments gives the membracid adults protection against their predators. The presence of numerous trichoid articulated sensilla on the membracid pronotum suggests that it may be involved in functions other than protection. In specific cases, crypsis, mimicry, aposematic coloration, and display may prove to be the functions of the pronotum but to these must be added a possible role in sensory perception. The extreme modification of the pronotum may be a result of selection pressures to increase the surface area and the amount of directional sensory input (Wood and Morris, 1974).

Parental care :- At least 50 membracid species exhibit some form of parental involvement in egg or nymphal maturation (Hinton, 1977a). Of the several ecological factors postulated by Wilson (1975) forming a "web of causation" leading to the evolution of parental care, Wood (1979) believes predation as one major selective force guiding the evolution of sociality in the Membracidae, and significant mortality occurs when nymphs are unprotected; his studies on 3 membracid species from the New world tropics provide evidence for 2 major types of parental care in the Membracidae. In the first type, exemplified by *Umbonia crassicornis* and *Platycotis vittata*, females remain on eggs until hatch and make a series of feeding slits for nymphs in the branch of the host plant. Upon hatching, the first instar nymphs aggregate along these slits with the female positioned below; she actively maintains aggregated nymphs and defend them from potential predators; successful maturation in the field depends on both nymphs and the parent female remaining together on the same branch until offspring become adults (Wood, 1978). In the second type exemplified by *Entylia bactriana*, the parent female protects the eggs and the 1st two instars; when the female deserts 1st and 2nd instars, nymphal maturation in the field depends on protection provided by ants. Like many Neotropical species of membracids, the females of many species belonging to the genus *Oxyrhachis* exhibit parental care, while such behaviour is unknown in other described species of membracids belonging to genera other than *Oxyrhachis*. Singh and Sharma (1979) reported parental care in *Oxyrhachis taranda*, the brooding female sitting "tightly perched on her egg mass least disturbed by the approach of animals or man" The author noticed females of *O. rufescens*, *O. brevicornutus*, *O. uncatius*, *O. minusculus* and *O. krusadiensis* guarding the egg masses till the eggs hatch, and thereafter the nymphal instars remain very close to the parent females in a gregarious manner, invariably attended by ants. Devarajan (1984, unpublished data) studied in some detail the social behaviour of *O. rufescens* and observed that unless the parent female is involved in some unforeseen accident due to adverse weather conditions or predators, it does not leave her egg-mass to the mercy of nature. In counts conducted during this study, 456 of a total of 500 egg-masses of *O. rufescens* were found accompanied by the parent females. In the female's brooding posture her posterior extremity lies closest to the convergent end of the egg-mass, and her head faces the tip of the branch on which the egg-mass is deposited; in this posture the entire egg-mass except its peripheral regions is well concealed and protected not only from the vicissitudes of nature but from the enemies as well (plate : VI); very often one or two males may be observed by the side of the brooding female. The brooding females exhibit a kind of 'reversal' of behaviour in response to the same external stimulus that elicits a behaviour of counter-attack in a purposive manner; when

they are not tending their egg-masses, they usually take an evasive or escaping attitude by hopping or flying away on encountering a predator. Brooding females which move away due to persistent disturbance, eventually return to their own egg-masses. However, when several egg-masses laid by different females are involved, the females which return are not always able to recognise their own egg-masses and they readily accept the egg-masses of other females and act as 'surrogate mothers'

Natural enemies :- Many insects such as mantids, reduviids, asilids and wasps regularly visit the habitats of the membracids and feed on nymphs as well as adults. Various species of spiders many of which are cryptically coloured, catch the membracids and suck their haemolymph (plate: VII). Mites attack the eggs of membracids, damaging the developing embryos, and live in the empty shells in large numbers. Among the vertebrates, lizards such as *Calotes versicolor*, *Calodactylus* and *Sitana pontiseriana* have been seen to actively prey on membracid nymphs and adults, especially on sunny days preceded by light showers. Both diurnal and nocturnal birds appear to swallow the membracids. Toads are rather rare in the vicinity of the membracids, but their ability to swallow nymphs and adults of membracids have been confirmed experimentally.

Extensive field observations and collections as well as rearing of eggs of the membracids from southern India and some parts of northern India show that practically all species of membracids are susceptible to parasitization in their egg stage by hymenopteran insects, particularly by mymarids, trichogrammatids and aphelinids (Plate: VIII).

The eggs of *Oxyrhachis taranda* are susceptible to parasitization by 2 species of mymarids, viz., *Gonatocerus narayani* Subba Rao and *Gonatocerus* nr. *brevifuniculatus* Subba Rao, 2 species of aphelinids, viz., *Centrodora azizi* Hayat and *C. mumtazi* Hayat, and by 6 species of trichogrammatids, viz. *Brachygrammatella indica* Viggiani and Hayat, *Mirufens afrangiata* Viggiani and Hayat, *Mirufens brevifuniculata* Khan and Shafee, *Mirufens albiscutellum* Khan and Shafee, *Mirufens magniclavata* Khan and Shafee and *Marufens longiclavata* Khan and Shafee. Careful counts of thousands of eggs of *Oxyrhachis taranda* from the field show that a fairly high percentage of the eggs are parasitised mostly by *Gonatocerus brevifuniculatus*, *Centrodora azizi* and *Mirufens afrangiata*. An interesting feature of many of these chalcidoid egg parasitoids is that they lack absolute host specificity. All the above species of parasites that attack the eggs of *Oxyrhachis taranda* also parasitize the eggs of *Oxyrhachis rufescens* and *Otinotus oneratus* which are easily accessible to the parasitoids.

A common species of Strepsiptera, *Indoxenos membraciphagum* Subramanian is seen in *Otinotus oneratus*, *Tricentrus pilosus* and *Letpocentrus taurus*. The degenerate adult female parasites form gall-like protubermaces on the abdominal segments of the membracid, causing no significant damage to the host. Dissection of the parasitised individuals reveals several hundreds of microscopic 1st instar larvae of the strepsipteran; these triungulinid larvae escape from the body of the host; with the aid of their psaltatorial appendages they approach membracid nymphs and enter their bodies where they develop and undergo several moults before becoming adults as the host nymph also undergoes its last moulting. The alate male parasite leaves the host shortly after it attains sexual maturity. Styloped membracid adults often show distorted horns and posterior process.

Ecological factors :- Physical factors of the environment such as temperature, relative humidity and moisture affect the incubation period and the duration of the nymphal stages in the various species of membracids occurring in India. These factors also play an important role in the population dynamics of the species. Ananthasubramanian and Ananthakrishnan (1975b) made detailed observations on the common membracid species, *Otinotus oneratus*, with reference to the impact of temperature, relative humidity and rainfall on the duration of egg and nymphal stages. Very high or very low temperatures, low relative humidity and lack of moisture retard the embryonic development of the membracid. Excess rainfall soaks the eggs and delay their hatching. Egg masses kept in laboratory at dry conditions do not hatch; such eggs when supplied with a little amount of moisture by placing them on a wet filter paper, hatch overnight. Nymphal development also requires moisture. Nymphs reared in laboratory orient themselves towards locomotion towards the source of moisture. An optimum moisture seems to be essential for normal moulting, especially for the moulting of the last instar nymph which, when kept on a drying twig of the host plant, may take a longer time for moulting; often the adults emerging from such nymphs present abnormalities such as asymmetrical horns and impaired and crippled wings. Low relative humidities coupled with lack of moisture also retard embryonic and nymphal development. Studies on the population dynamics of *Otinotus oneratus*, *Oxyrhachis rufescens* and *Leptocentrus taurus* (Ananthasubramanian, Unpublished) show that the cumulative effect of temperature, moisture and relative humidity is very significant on the total count of individuals (nymphs and adults) though the individual impact of these physical parameters on the nymphal population and adult population is not significant.

PHYLOGENY

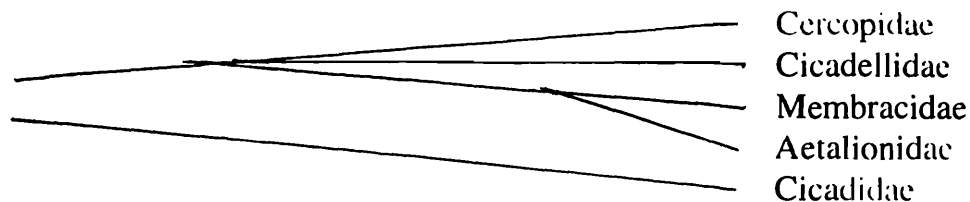
The phylogenetic position of the Membracidae among the families of Homoptera is a matter of controversy ever since this concept first entered into the minds of the nineteenth century taxonomists who based their evolutionary and phylogenetic ideas on one or two key characters such as the wings, their venation, legs and trophi. Towards the end of the nineteenth century Osborn (1895), dividing the Homoptera into Auchenorrhyncha and Sternorrhyncha, claimed that Auchenorrhyncha was the basal form of the phylogenetic tree, and the Sternorrhyncha was derived from the former by the coalescence of the rostrum with the sternum. Within the Auchenorrhyncha he considered the Cicadidae as the generalised group in terms of wing venation and body structure, and placed the Membracidae next to the Cicadidae. The Fulgoridae, though exhibiting specialisations of the head, possesses generalised wing venation and thoracic structure and was placed between the Membracidae and the Cercopidae. Considering the development of scutellum, the texture of elytra and the specialisation of the tibiae, Osborn placed Cercopidae nearer the Jassoidea. However, Kirkaldy (1910) pointed out that the Fulgoroidea are the most specialised, highly organised and differentiated of the Auchenorrhyncha, that the Cocadoidea as a whole are primitive, that the Tettigonoidea (Jassidae, Membracidae and Cercopidae) show a "slight degree of specialisation" and that the Membracidae are "only Tettigonoidea with a highly specialised pronotum" Ashmead (1888) placed the Membracidae next to the Fulgoridae near the top of the list. Distant (1908) believed that the Membracidae form a very distinct subfamily linked to the Cercopidae by the Machaerotinae.

Tillyard (1919) on the basis of his studies on the tegmina of fossil Homoptera from the Upper Triassic of Queensland, concluded that the Homoptera differentiated from a single paleohemipterous stock in the Permian, and from the same stock the Heteroptera became separated off at a later period. The oldest Homoptera, *Scytinopteridae* appears from the Triassic. The oldest existing family of Auchenorrhyncha appears to be the Jassidae. After the jassids became differentiated out, the old main stem of the Auchenorrhyncha went on and continued to be represented by many forms which, in certain directions, still preserved archaic characters which the jassids had lost. The Fulgoridac and Cercopidae could have arisen *later in point of time* than the Jassidae, though preserving certain archaic features which the jassids had lost. Tillyard's system places Membracidae closest to the Jassidae.

Spooner (1938) based on an extensive comparative study of the head capsule of Heteroptera and Homoptera, concluded that "the Fulgoridae and the Peloridiidae had originated separately very early from the ancestral stem form, the Protohomoptera, at a time when the Cercopidae also got separated. The Cercopidae then gave origin to all the other families of both Auchenorrhyncha and Stemorrhyncha" He further believed that Jassoidea had a dual origin from Cicadellidae and Tettigonidae. Evans (1941, 1942) agreed with Spooner in the separate derivation of the Fulgoridae and Peloridiidae from the Protohomopterous stem, but disagreed at the derivation of the Sternorrhyncha from the Cercopidae; he also disagreed with the dual origin for Jassoidea suggested by Spooner. In his system of classification Evans (1946, 1948) divided the Auchenorrhyncha into 3 divisions Fulgoromorpha, Cicadomorpha and Jassidomorpha. Jassidomorpha was further subdivided into 2 superfamilies - Cercopoidea and Jassoidea; the Membracidae was included in the Jassoidea. In his more recent paper on the phylogeny of Homoptera Evans (1963) expresses his opinion that the Membracidae do not merit special segregation but should be included within the Cicadelloidea; in favour of this argument, he advances the following points : 1. In the heads of both cicadellids and membracids the anterior arms of the tentorium lack association with the posterior arms; 2. the prothorax of all membracids is enlarged as it is in certain cicadellids which resemble the membracids in general head shape; 3. in the basic pattern of tegminal venation of cicadellids, M and R form a single vein proximally, and in the leafhoppers of the family Biturritiidae (which are included by many authors within the Membracidae) M and R are basally joined; 4. the pretarsal structure of membracids and cicadellids is identical; 5. the nymphs of membracids and a few species of cicadellids are ant-attended.

Funkhouser (1951) while enumerating the pioneering taxonomists who had contributed to the phylogeny of Homoptera, remarks that no two of the authorities agree on the same taxonomic arrangement. He further adds : "It would seem that the Membracidae, as considered from the standpoint of the structure and development of the more important of the physiological systems, must be assigned a very low place in phylogenetic rank" In support of his view, Funkhouser argues that 1. The sensory system of the Membracidae is very poorly developed; "the antennae are so minute as to be in most cases hardly visible and are but feebly provided with sensory apparatus"; 2. the wings of the membracids are extremely generalised, and in this aspect they are even lower than the Cicadidae; 3. the genital organs are very simple and have not made much progress from the ancient type; 4. although the pronotum is highly specialised, "it is hardly logical to weigh these modifications of purely mechanical structures against the more important

phylogenetic evidence offered by the sensory, motor and reproductive systems" Funkhouser concludes that "Fulgoridae are the most highly specialised of the families of Auchenorrhyncha; that the Cercopidae, Cicadellidae and Membracidae, in that order, have developed from a common stem; that the Aetalionidae have branched off from the membracid stem but now represent a distinct family, and that the Cicadidae are the lowest of all with an origin considerably removed from the others" Funkhouser's concept of homopteran relationships is expressed in the chart below:



Funkhouser's argument for assigning a lower position to the Membracidae in the phylogenetic system of Homoptera centres round his assumption that although the membracid pronotum is highly specialised, it is purely ornamental and therefore has no phylogenetic significance, and that the sensory system is poorly developed. This argument is no more tenable in view of the fact that studies on the function of the membracid pronotum made by Wood and Morris (1974) have brought to light the presence of numerous submicroscopic articulated sensilla on the membracid pronotum and their possible role in the neuro-sensory perception enhancing the survival value of the insects on the face of selection pressure which is significant in the context of evolution.

Strümpel (1972a) made an elaborate study to project a phylogenetic system of the Membracidae, basing his classification on morphological and zoogeographical aspects and a comparison of the apomorphies of the head structure within the Membracoidea. The differential characters and the functional significance of mesocutellum, wings and pronotum enabled the author to establish "sister groups" within the Membracoidea and Membracidea, although the biological studies have shed light on the phylogenetic significance only in some cases.

From the above account concerning the phylogeny of Homoptera and Auchenorrhyncha it would appear that there are differences of opinion regarding the origin and interrelationships of the families within the Auchenorrhyncha. The discovery of fossil forms is of immense help in determining the age of certain extinct groups of Homoptera, but our knowledge of fossils still remains fragmentary.

MIGRATION

Membracidea are sluggish insects which rarely fly over even short distances. In a given locality and on a given host plant a given membracid species may be noticed year after year. The author has seen *Tricentrus spathodei* on *Spathodea companulata* for several years in succession in a particular locality in Trivandrum and this is true with regard to several other species. However, it has been noticed that some species of membracids regularly change their host plants. After completing one or two generations, they switch over to another plant of the same species. The significance of this phenomenon is not known although there appears no notable differences

in the condition of the host plants abandoned and those adopted. For instance, *Anchon ulniforme* completes 1 or 2 generations on *Cajanus cajan*s and then selects another host plant in the same locality.

It is also noteworthy that when one host plant in a locality infested by a common species such as *Otinotus oneratus*, other plants of the same species located in the same locality may be free from attack. The reason for such phenomena stems from the fact that all species of membracids, in general, are reluctant to migrate even short distances, with the exception of those which habitually change their host plants regularly. Normally, if disturbed the membracids leave the twig with a quick leap and fly in a narrow circle, and invariably return to the same plant. Funkhouser (1951) believes that this disinclination for migration explains why the various species of Membracidae seem to be so limited in distribution, why there are no cosmopolitan species, and why there are so many species.

ECONOMIC IMPORTANCE

On the whole membracids in India are not destructive to the extent of assuming a pest status. Feeding and oviposition are the two sources of injury due to membracids. There is practically no evidence that membracids cause injury to the host plants by their feeding behaviour, because not only is the quantity of sap sucked even by dense colonies of membracid species is negligible but the feeding punctures are so microscopic that they disappear in no time and cause practically no injury to the host plants.

The ovipositing behaviour of membracids may prove to be injurious if the punctures are deep and do not heal. Oviposition punctures of *Otinotus oneratus*, *Gargara mixta* and several other species are rather superficial and do not damage the vascular tissues of the host plants. Even those species like *Leptocentrus taurus* and *L. major* which inflict deep wounds on the plant by the powerful ovipositors cause no notable damage if the stem is thick and if the wound does not extend to the cambium. Nevertheless, a crescentic scar is left behind on the stem. If the oviposition punctures are made on tender twiners, the wounds do damage the host plant. For instance, *Leptocentrus taurus* and *Anchon ulniforme* cut deep wounds in the process of egg-laying on the twiners of *Lablab purpureus* in Kerala and Karnataka states during the monsoon months of July-October. The wounds are so deep that the twiners snap by the slightest mechanical impact like heavy downpour or wind. Ayyar (1937) reported heavy damage to *Vigna eatiang*, the cow pea, due to the oviposition punctures made by *Anchon pilosum* in North Canara. Although *Leptocentrus substitutus* and *Anchon ulniforme* oviposit on the stems of *Cajanus cajan*s and *Phaseolus mungo*, both the plants do not appear to suffer from any adverse effect except for the unsightly appearance of the stem. More serious injuries are imparted by those species which lay their eggs in the buds, particularly flower buds, although this type of oviposition is observed, the extent of damage appears to be insignificant.

Although Funkhouser (1933) listed 27 species of Membracidae frequenting the foliage of sandal collected by the Forest Research Institute Survey in North Salem, in connection with the entomological investigations on the Spike Disease of Sandal, none of them were established to

have any vectorial propensities. In India membracids have not found associated with any important viral disease of economically important plants or cultivated crops.

COLLECTION AND PRESERVATION

The methods employed for collecting membracids from their natural habits include sweeping, beating and hand picking. A sweeping net is preferred to collect species like *Coccosterphus minutus*, *Leptocentrus taurus*, *Parayasa elegantula*, *P. maculosa*, *Gargara mixta*, and *Otinotus pallescens*; nymphs are also collected by this method. The main disadvantage in the sweeping method is that if the plants are in their bloom, the net becomes filled up with broken plant parts and unwanted insects such as acridids and cicadellids so that sorting out of the trapped membracids becomes extremely difficult. Moreover, the host plant of particular species of insects collected by sweeping net operated in the field of different kinds of weeds, is difficult to ascertain. In spite of these shortcomings sweeping method gives good results. Sweeping nets are however difficult to operate among thorny trees such as *Acacia arabica*, *Prosopis spicigera*, *Zizyphus jujuba* and *Aegle marmelos*, which harbour several species of membracids, because the branches of the host plants interfere with the sweep net and the thorns tear the net.

Beating method involves the use of a stout stick of about half a metre long and a collecting umbrella or a short, conical net coloured green or blue; the umbrella or net is held just below leafy bushes and the bush is beaten so as to dislodge the insects which consequently drop down into the net or umbrella from where they can be transferred into a cyanide bottle. Beating has proved to be a very effective method of collection especially in habitats with dense and bushy foliage and the membracids are hidden from view. Thorny shrubs like *Capparis horrida*, *Gymnosporia montana*, *Carissa carandas*, *Lawsonia alba*, *Flacourtia* sp., etc. which harbour several species of membracids such as *Eucoccosterphus paludatus*, *E. tuberculatus*, *Otinotus indicatus*, *O. oneratus*, *Leptocentrus scutellatus*, *L. substitutus*, *Parayasa pilosa* and *P. nigrolimbata*, are not suited for hand picking of the membracids harboured, and beating is most ideal method of collection. However, in beating method while adults are easily dislodged by the mechanical impact it imparts, the nymphs are very tenacious and do not get dislodged easily. Nevertheless, this method has been successfully used in the collection of even the nymphs of tenacious type such as *Otinotus indicatus* and *O. obliquus*.

The use of light traps is found to be totally unsuccessful in the collection of membracids for the simple reason that none of the species occurring here are attracted to light of any colour or intensity, either directed or diffused.

Hand picking or catching the membracids between the fingers is a good method. In many instances the hiding places of the membracid nymphs and adults are indicated by a trail of ants. The location of the 1st and 2nd instar nymphs of many membracids that are hardly visible to unaided eyes when they rest closely appressed to leaf axils and cryptically coloured, is readily spotted by the attending ants which are large and aposematic. As Funkhouser (1917) states, "After a little experience it is not difficult to see the insect on the plant especially after the habits of the various species have been learned. They may be approached without suspicion if care is

taken to make the movements of the hand slow and regular. When the hand is within a few inches of the insect, a quick grab secures the specimen" In practice it has been found desirable to approach the adult membracid from the front with a specimen tube having a mouth of about 2.0 cm. in diameter, and with a sudden jerk from behind, the insect is made to leap into the tube and the tube is plugged with a cotton wool. Funkhouser adds on the additional advantages of handpicking : "The natural joy of discovering and stalking a rare specimen and the satisfaction of making the capture without mechanical aid are added inducement to the true hunter; the greatest advantage of this method is the opportunity given to observe the habits of the insect in the field"

For rearing the collected specimens, the twigs harbouring the nymphs are cut off and enclosed in plastic bags. They are maintained in the laboratory on Knop's solution. The twigs are renewed once in two days. Careful rearing ensures the nymphs to undergo successive moultings and to reach the adult stage. Rearing in laboratory also makes it possible closer observations of ecdysis, feeding, mating, and oviposition. Rearing of nymphs is also necessary *in situ* on their respective host plants to compare the life history traits in natural and laboratory conditions; a glass tube specially designed for this purpose is used for rearing the nymphs under field conditions (Plate : IX).

Nymphs and adults may be preserved indefinitely in 70% ethyl alcohol or in a mixture composed of 75% ethanol and glacial acetic acid (1:1). For detailed study of chaetotaxy of early nymphs (1st, 2nd and 3rd stages) they are dehydrated and cleared by following conventional methods and either mounted on Canada Balsam or in Faure's medium (composed of Chloral hydrate 20 gm., powdered gum arabic 12 gm., glycerine 12 cc., and distilled water 40 cc.). Later nymphs (4th and 5th stages) and adults are dry mounted. In permanent dry mounting of adult membracids, care is taken to pin the specimen in such a manner that the legs are properly exposed. Small species have to be mounted on *minuten nadeln* (minute needle). The needle should pass directly downward through the pronotum on one side of the median line so that it will not interfere with the structures required for diagnosis. The specimen is mounted on a strip of polyporus and double mounted using a continental pin. The date of collection, the locality and the host plant labels are placed on each pin. Prior to mounting, it is desirable to treat the specimens with mercuric chloride to protect it from fungal attack. Insect repellents should be applied to the box containing the specimens to protect them from the attack of psocids and silverfishes.

To find out the parasitisation of membracid eggs with chalcidoid Hymenoptera, twigs containing egg masses of membracids are cut off and enclosed in glass vials and plugged with cotton wool. From the parasitised eggs the adult hymenopteran parasitoids emerge out and they can be fixed and determined. The parasites are preserved either in 70% ethanol or preserved dry.

GENERAL EXTERNAL MORPHOLOGY AND TERMINOLOGY

The external morphology of the Membracidae conforms basically to that of the other families of the Homoptera, but the remarkable pronotal development in which most of the body may be concealed, and the peculiar arrangement of the wings make it rather unique. The exposed parts of the integument exhibit punctuations of varying dimensions, and their distribution which is rather constant, is of taxonomic value, particularly at the species level. Funkhouser (1917, 1951) thought that the punctuations or pits were mere hollow extensions of the chitinized body wall, in no case perforating the entire body wall, and that their function was conjectural. Wood and Morris (1974) attributed a sensory function to them in view of the presence of numerous sensilla projecting over the pits or confined to their bases. Some species which are punctate lack hairs while in others the pits give rise to hairs.

The membracid head resembles that of other Homoptera in essential aspects. The position of the head varies, and in the Oriental species of membracids the head is directed downward as in *Oxyrhachis* or somewhat backward as in Centrotinae. The beak invariably projects backward, lying in between the coxae. The compound eyes are usually large, globose or hemispherical, and located at the extremities of the head. There are two ocelli located in between the compound eyes, one on either side of the epicranial suture of the vertex; they are on a line with each other, and situated on the centro-ocular line or slightly above it. (The term centro-ocular line or c-o line was coined by Capener (1952a) to indicate the position of the ocelli; it is the imaginary line drawn through the centre of the anterior margin of the base of the eye when the head in a horizontal position is viewed from directly above). The ocelli may be closer to the inner margins of the eyes than from each other, or closer to each other than from the eyes, or equidistant from each other and from eyes; their position offers a good taxonomic character.

The antennae are short, filiform and poorly developed; they are located in front of and beneath the eyes, and their structure is identical in all species. The three basal segments of the antenna are shorter and cylindrical; the basal segment is the shortest, the second being longer than the third; the rest of the antenna termed the filament gradually tapers to the tip and made up of many segments; the segments in the middle of the filament are short and compressed, while those at the basal and terminal regions are long. In the nymphs the antennae are found to be relatively more conspicuous.

The head capsule (Fig: 1-D) consists of the *vertex* made up of two large sclerites separated by the epicranial suture and occupying the area between the compound eyes. The two ocelli borne on the vertex are equidistant from the epicranial suture. The anterior lower edge of the vertex is folded inwards to form a sharp angle over the antennal bases, while its basal part is sinuate, planate or arcuate and fits in snugly with the anterior margin of prothorax. In Oxyrhachinae the lower margin of the vertex is produced on each side into a short acute flattened process or *tooth* below the eye and a nearly rectangular flattened plate, the *foliate lobe*, partially concealing the lateral margins of the frontoclypeus. The term *cranial callosities* is applied to the vestiges of the cranial tubercles of the last nymphal instar, they are well developed in *Oxyrhachini* and *Tricentrini*

in the form of raised areas over the ocelli. The *frons* of the membracids has been merged with the clypeus to form the *frontoclypeus* the position of which in relation to the vertex is constant. In shape, the frontoclypeus is usually nearly quadrangular, but the shape may vary in the different genera and offers a good taxonomic character. The frontoclypeus may be continuous with the lower margins of the vertex, or it may extend about two-thirds or three-fourths its length below the lower margins of the vertex. At the base of the frontoclypeus, on each side, there is a *frontoclypeal lobe* of considerable taxonomic importance; these lobes may be fused throughout their length to the frontoclypeus, or only partially fused with their lateral margins roundedly produced, weakly convex or parallel in a conspicuous manner. The frontoclypeus is densely pubescent, and its apical region is longly pilose, often covering the base of the labium. The apex may be broadly rounded or truncate.

The *labrum*, due to its inclined position, is hardly visible when the head is viewed in front, but in the cephalic view it appears as a single, subcylindrical sclerite, projecting backward from the frontoclypeus. It is more or less movable and probably serves to support and guide the rostrum (Funkhouser, 1951). Attached at the tip of the labrum is a small, triangular plate, the *epipharynx*. The *genae* forming the lateral boundaries of the head, give a definite contour to the face, and they are contiguous below with the base of the labium. The labium, which is a grooved two-segmented stylet, forms the beak or *rostrum*. The maxillary stylets originate from the interior of the vertex above the level of the ocelli and one on either side of the epicarnial suture; the tips of the maxillary stylets which are smooth and straight, gradually taper to a sharp point, and when extruded, extend for some length beyond the rostral tip; the basal parts of the maxillary stylets are club-shaped. The mandibular stylets also originate from the vertex and their bases are bicepetal and swollen, while their tips are lanceolate, blade-like and wavy on the inner edges.

The *thorax* (Fig: 1-A) of the Membracidae is characterised by the remarkable development of the pronotum along anterior, posterior, dorsal and lateral directions, giving the insect curious shapes that are of great taxonomical value at the generic and species levels. The most common type of pronotal development is its posterior extension so as to conceal the mesonotum and metanotum; and often parts of the abdomen. The pronotal processes are mostly constant within the species, and hence quite reliable in distinguishing the species. These parts are given names with a view to have a uniform terminology for technical description. The *metopidium* is the declivous front part of the pronotum reaching from the dorsum to the base of the head, below the horns or carinae and extending downwards to the anterior margin and laterally a little anterior of the humeral angles. In *Oxyrhachis*, *Otinotus*, *Telingana* and *Tricentrus*, the metopidium is wider than high.

The *supraocular callosities* are irregular shaped areas located on the metopidium above the eyes; they may be entire or divided, bare, punctate or pilose, sunken or weakly convex. The *humeral angles* are short protuberances on the lateral margins of the prothorax, one on either side, just above the bases of the tegmina. The supra-humeral horns (also termed *suprahumeral*, *horns* or *transverse processes* or *lateral processes*), which are the lateral extensions of the metopidium just above the humeral angles; when well developed, the horns show dorsal, lateral and posterior surfaces demarcated by carinae; the horns may be inconspicuous, or absent in Uroxiphini, Gargarini, Coccosterphini and some species of *Tricentrus*. Intraspecific variations in

the development of horns exist in sexually dimorphic forms and polymorphic species. The *posterior process* is the posterior extension of the pronotum. Its shape, size and degree of development are of immense taxonomic value. The posterior process is usually tricarinate, the dorsal carina being precurent through the metopidium, but in some species of the genus *Centrotypus*, the dorsal carina does not continue on the pronotum and metopidium. The lateral carinae are well developed in species having a well developed tectiform posterior process. In *Oxyrhachis* the posterior process shows a ventral carina which may be serrated. The *disc* is the dorsal area of the pronotum bounded in front by the metopidium, laterally by the bases of the horns or carinae, and behind by the base of the posterior process. The posterior process may present a strong *gibba* or elevation in all the species of Oxyrhachinae, and in some Centrotinae it is located on the disc or metathorax or slightly behind it. The prothoracic pleura present a conspicuous propleural process directed downward.

The meso- and metathoracic segments do not exhibit much variations and they are less important in the membracid taxonomy. However, the scutellum is of immense taxonomic value. The degree of development and the extent it is concealed by the pronotum and tegmina in the resting posture of the insect, are useful in diagnosis at the subfamily and even at generic levels. In Oxyrhachinae, the scutellum is rudimentary and entirely concealed by the pronotum, while in the Centrotinae it is normally well exposed; in Gargarini and Coccosterphini only the lateral margins of the scutellum are exposed. In the genus *Centrotypus*, the broadbased pronotum completely conceals the scutellum from view; the length to width ratio of the scutellum is a character useful to separate the genera; the median part of the scutellum is greatly narrowed in Tricentrini, Gargarini and Coccosterphini. In most species the apex is emarginate and acute and in some it is slightly elevated. The mesopleura is produced into a downwardly directed mesopleural process the anterior border of which is concave and fits into the posterior boundary of the propleura; the *mesopleural process* presents two anteriorly directed hook-like processes, the *upper episternal hook* and the *lower episternal hook*, distinct in the Oxyrhachinae.

The wings of the membracids are membranous. The basal one-third to one-sixth of tegmina are, however, coriaceous. In both forewings or *tegmina* and the hindwings there is a marginal membrane, the *apical limbus*; it may be narrow or broad, and is considered to have value in taxonomy at the generic level. The venation of hind wings is used in the separation of tribes; for instance, in Leptocentrini there are 4 apical cells in the hind wings, while in Centrotini there are only 3 apical cells. The venation of forewings has been used by recent workers in the separation of genera and species. The interpretation of the membracid wing venation offered by Kramer (1950) and followed by Deitz (1975) differs in some respects from those made by Evans (1948) and Capener (1962), as tabulated in (Table: 3)

Some of the important venational characters used in the separation of genera and species are: The presence or absence of a pterostigma, the number, dimensions and shape of the discoidal cells, the presence or absence of a petiole for the 1st discoidal cell, the length to width ratio of the 1st apical cell, the position of R1 and the shape of the 1st apical cell, colour of veins, presence or absence of granules on the veins, pilosity of veins, and the nature of apical veins, viz., R2+3, R4+5, M1 and M2, whether straight, slightly or strongly curved (Fig.2). In some genera such as *Pogon* and *Aleptocentrus* the apical veins are strongly curved. The colour and markings on the

tegmina are not always reliable in view of the existence of sexual dimorphism as in several species of *Gargara*. In *Darthula* the tegminal veins are densely reticulate (Fig.2).

Table : 3

Comparison of three interpretations of the membracid wing venation (after Deitz, 1975).

Evans (1948b)	Kramer (1950a)	Capener (1962a)
R _{1a}	R ₁	R ₁
R _{1b}	R ₂₊₃	• R ₂₊₃
R _s	R ₄₊₅	R ₄₊₅
M ₁₊₂	r-m	r-m
M ₃₊₄	M ₁₊₂	M ₁
CU _{1a}	M ₃₊₄	M ₂
CU _{1b}	CU ₁	CU(+M3?)

The legs of the membracids increase in length from the forelegs, and the hindlegs are invariably the longest correlated with the jumping habit of the insects (Fig:1). The coxae are stout. The trochanters are elbow shaped, those of the first and the second pairs of legs being simple. The hind trochanters in the tribe *Tricentrini* are characterised by an enlargement of the distal end into a flat plate or disc with teeth arranged around its edge. The disc is often elevated well above the body of the trochanter, and its surface between the teeth is thrown up into small nodules. The presence of such "armed trochanters" is of systematic value in the allocation of species to the genus *Tricentrus*, especially when suprahumeral are lacking. Capener (1968) discovered that in the middle legs the femora and the trochanters are fused at the articulations, and the joints are immovable. The tibiae of the metathoracic legs (Fig:2-B) may bear 3 longitudinal rows of cucullate setae with hooded bases, the arrangement of which is important at the higher levels of classification (Deitz, 1975). In some species, cucullate setae may occur in the femora also. The 3-segmented tarsi are rather uniform throughout the family; however, the comparative lengths of the hind tarsal segments, which vary in many species, may be used as a supplementary character at the species level.

The membracid abdomen is rather plumpy, dark beneath and pilose in the lateral areas of the sternum. The abdominal terminalia are of taxonomical value to a limited extent, because in many groups the male genitalia are very similar. But in some groups there is great variety in the form of the styles, aedeagus, subgenital plate (Deitz, 1975). In the males the 9th tergum or *pygofer* is saddle-shaped and it overlaps and partially surrounds the rectum. On the posteroventral aspect of the 9th sternum on each side there is a broad or narrow, flat plate termed the *lateral valve* by Funkhouser (1917); the lateral valves usually have prominent lobes or lobe-like processes which are longly setose and feebly chitinised; the shape of the lateral valve and the length of its lobe are useful in diagnosis at the generic level. The *subgenital plate* which appears to be the sternal plate of the 9th segment, bends almost directly upwards at its tip; the shape of the upturned part and the extent of division at the tip of the subgenital plate are also important characters. The pygofer, the lateral valves and the subgenital plate together constitute the *genital capsule*. Above the

subgenital plate lie a pair of elongated ribbon-like structures termed the *parameres* or *styles* which apparently arise from the lateral margins of the 9th segment near the base and between the lateral valves and the subgenital plate; the base of the paramere extends into the abdomen and originates in the 7th segment; the distal part of the paramere is bent upward in a gradual curve or sharply at an angle, and in the Oxyrhachinae, presents a fancied resemblance to the head of a snake (Capener, 1962). Between the bases of the styles and extending to the base of the aedeagus is a ringlike structure, the *connective*, the taxonomic value of which is uncertain. The aedeagus is U-shaped in lateral view, bearing minute teeth on the anterior surface of the posterior shaft (Fig:1-F).

In the females, the *ovipositor*, attached to the saddle-shaped *pygofer*, consists of three pairs of valvulae. The *first pair of valvulae* arise from the *first valvifers*, while the *second valvifers* give rise to the *second* and the *third valvulae*. It is the second valvulae that offer excellent characters at the higher taxonomic levels; the shape of the valvulae and the number and location of the dorsal teeth borne by them are of value.

The morphological characters of taxonomic value displayed by adult membracids are numerically limited. Added to this, there is much overlapping of these characters due to intraspecific variations and sexual dimorphism, making the allocation of the individuals to their correct taxa rather difficult. A careful study of the nymphal characters is found to be of immense use in diagnosis if these are associated with those of the adults. These characters to which continual references will be made are mentioned below and illustrated in figure 3:A,B,C.

Head : *Cranial tubercles* which are a pair of thorn-like or conical processes of vertex located above ocelli, rudimentary or obsolete in some, and very prominent in others; the *centro-ocular line* (already mentioned for adults) is important when ocelli are visible; the *subocular expansions* which are short, acute, toothlike or flattened processes one on either side of the vertex below eye, well developed in the Oxyrhachinae; the *foliate lobes* one on either side of the frontoclypeus partially concealing it or fused with it.

Thorax : The shape of the pronotum, the nature of the *metopidium* whether convex in front, vertical or sloping backward; the *pronotal crest*, which is a prominent ridge on the dorsum produced in some as an *anterior process* and a *posterior process*; the relative lengths of anterior and posterior processes when both are present (Fig: 3-C, Fig: 4), the *suprahumeral buds* which are the rudiments of suprahumeral horns, present in some in the fifth instar as a pair of small nodules pointed backward; the *wing pads* usually appearing in the third instar and assuming prominence in the last nymphal instar, extending backward; the *costal angles* of wing pads are distinctly demarcated in some and inconspicuous in others.

Abdomen : The abdomen of membracid nymphs, according to Funkhouser (1917), is 11-segmented; segment I of abdomen is obsolete, segment II narrow, segments III to VIII more or less identical, segment IX forming the *anal tube*, and the segments XI and XII rudimentary, telescoped and often eversible. Quisenberry *et al.* (1978) consider the anal tube as the *preanal segment*. Capener (1962a) counts the anal tube as segment VIII. Since the abdominal segment I is clearly visible in the various species of Gargara, the numeration adopted by Funkhouser (1917) is followed in the present work. The length of the anal tube bears a more or less definite relation to body length in different species.

Of particular value in the nymphal taxonomy is the chaetotaxy. The chalazae on the head, thoracic and abdominal segments, the dorsal tubercles which are pleural extensions, well developed in abdominal segments IV-VIII in some species and inconspicuous in others, the tuberculate spines borne on the lateral lamellae with particular reference to their shape (filiform, penicillate, short, short and bent or stout), are found to be of considerable value in nymphal taxonomy (Fig.5).

In general, the first instar nymph of all the species so far examined is characterised by a comparatively large head, with the rostral tip often reaching the anal segment, and the thorax is simple and devoid of crests or extensions. Another characteristic of this stage of postembryonic development in all the species studied, is the presence of only two dorsal tuberculate spines on the anal tube, the anterior one being invariably shorter than the posterior one.

The general trends in the changes occurring in successive nymphal stages following the first, consist of a regular increase in size following each moult, a progressive reduction of tuberculate spines on the head and thorax, a gradual increase in the dimensions of the pronotum, appearance and gradual development of pronotal processes and wing pads, a gradual increase in the size of the abdominal lateral lamellae and the number of tuberculate spines borne on them.

CLASSIFICATION AND SYSTEMATIC ACCOUNT

Family MEMBRACIDAE Rafinesque, 1815

1815. Membracidia Rafinesque, *Analyse de la nature ou table au de Punivers et des corps organises*, 121.
1821. Membracides Germar, *Mag. Ent.*, IV:7.
1835. Membracina Burmeister, *Handb. Ent.*, II:126.
1840. Membraciens Blanchard, *Hist. Ins. Hemip.*, 179.
1841. Membracididae Harris, *Harvest flies, etc. (Hemiptera Homoptera). A report on the insects of Massachusetts*, 178.
1843. Cornidorsi Amyot and Serville, *Hemip.*, 532.
1850. Centrotitae Spinola, *Tavola Sinot.*, 27.
1858. Membracinae Stål, *Stet. Ent. Zeit.*, XIX:234.
1875. Membracida Fieber, *Cicad. d'Eur.*, 1:39.
1878. Membracidae: Butler, *Cist. Ent.*, 2:337; Distant, 1908, *Fauna Br. India*, IV:208.

The diagnostic characters which separate the Membracidae from other Homoptera are: "Head nearly vertical, ocelli situated between the eyes; beak arising from the mentum; pronotum convex, frequently with elevated processes, and usually prolonged posteriorly; tarsi with three articles" (Goding, 1931). McAtee and Malloch (1928) add: "Mesopleurum with a process or lobe either at or near anterolateral angle, or just below middle of anterior margin, or both, processes which overlap the propleurum, in many cases fitting into excavations along posterior margin of that sclerite" Other family characters are: "The presence of minute, bristle-like antennae inserted in front of and between the eyes, tegmina with distinct corium and clavus, veins of tegmina and of hind wings homologous. The family is characterised particularly by the great development of the pronotum which usually conceals the scutellum, often extends over the entire body and sometimes completely conceals the tegmina; this peculiar enlargement of the pronotum often takes curious and grotesque forms" (Funkhouser, 1951).

The family Membracidae is represented by three Subfamilies in India. They are Darthulinae (Metcalf, 1939), Oxyrhachinae (Haupt, 1929) and Centrotinae (Amyot and Serville, 1843).

Key to Subfamilies

- | | | |
|------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| 1(4) | Scutellum not completely concealed by sides of pronotum. | |
| 2(3) | Pronotum without a posterior process. | DARTHULINAE Metcalf |
| 3(2) | Pronotum with a posterior process. | CENTROLINAE Amyot and Serville |
| 4(1) | Scutellum completely concealed by sides of pronotum; tibiae foliaceous; metathoracic tibiae lacking cuculli in setal row III. | OXYRHACHINAE Haupt |

Subfamily DARTHULINAE Metcalf

1939. Darthulinae Metcalf, *Jour. Soc. Bibliog. Nat. Hist.* 1 : 247; Evans, 1946, *Trans. R. ent. Soc. Lond.*, 97 : 39; Chou and Yuan, 1979, *Acta Zootaxonomica Sinica*, 4(1) : 34.

This Subfamily is diagnosed by the pronotum lacking a posterior process; scutellum completely exposed by sides of pronotum; suprahumeral horns absent; apical margin of tegmina multicellular.

Tribe DARTHULINI Funkhouser

1951. Darthulini Funkhouser, *Gen. Insect.*, 208 : 288.

Pronotum without a posterior process; apex of abdomen extended backward as a long, slender hairy process; median carina of pronotum lunately elevated; tegmina coriaceous, veins reticulate; hind wings with two apical cells.

Genus 1. *Darthula* Kirkaldy

1900. *Darthula* Kirkaldy, *Entomologist*, 33 : 242; Distant, 1908, *Fauna Br. India*, 4 : 77.

Distant (1908) diagnosed the genus *Darthula* as follows :-

Face concealed beneath frontal edge of pronotum, the eyes only visible as seen from above, between eyes convexly transversely ridged, before which it is foveate and beyond which it is laterally deflected; pronotum moderately compressed with a central strong longitudinal lunulate ridge, as seen from above the lateral margins narrowing anteriorly, the posterior margin carinate; scutellum distinct, triangular, apically subacute; abdomen provided with a long apical process, about or nearly as long as the whole body, covered with long bristly hairs, with a strong triangular tubercle at base, its apex inconspicuously bituberculate; femora moderately thickened, tibiae much shorter than femora, tarsi with the apical joint longer than the two basal joints

together, claws very robust; abdomen narrowing to apex, beneath concave, posterior segmental margins ridged, above convex; tegmina coriaceous, apically narrowed, the apex obtusely subacute, costal margin moderately convex, densely and reticulately veined the veins raised and prominent, costal area very broad; wings shorter and narrower than tegmina, with two long apical areas, apical area divided into irregularly shaped interspaces.

Type species : *Urophora hardwickii* Gray, 1832

1. *Darthula hardwickii* (Gray)

(Fig. 6)

1831. *Urophora hardwickii* Gray, *Griff. Anim. Kingd.*, 2 : 261.
 1900. *Darthula hardwickii* Kirkaldy, *Entomologist*, 33 : 242.
 1908. *Darthula hardwickii* : Distant, *Fauna Br. India*, 4 : 78.

Female : General colour piceous brown. Head directed backward towards frontal margin of pronotum, nearly 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, upper margin arcuate, lower margins rounded; eyes visible only from above, ferruginous, subglobose; ocelli small, black, closer to each other than to eyes and situated above c-o line; frontoclypeus about 3.0X as long as wide, parallel-sided, extending to about three-fourths of its length below lower margins of vertex, apex blunt, longly sparsely hairy, frontoclypeal lobes distinct. Pronotum piceous brown, somewhat compressed, central and posterior carinations of a lighter hue, finely rugosely punctate, lateral margins narrowing anteriorly, metopidium vertical above head, then gradually sloping backward to disc, about 1.3X as wide as high, finely punctate; suprahumeral horns and posterior process absent; humeral angles subprominent; supraocular callosities inconspicuous; scutellum piceous brown, longer than wide, triangular, exposed, apical area somewhat light brown, apex subacute; abdomen above piceous brown with the segmental margins more or less ochraceous, continued behind as a long, piceous process, about as long as or slightly shorter than body length, clothed with erect hairs, with a triangular tubercle at base the apex of which slightly bituberculate; tegmina piceous brown, veins testaceous, costal margin moderately convex, densely and reticulately veined, hind wings with 2 apical cells, anal area divided into short, irregular interspaces; abdomen and body beneath reddish brown; legs with femora testaceous, moderately thickened, tibiae shorter than femora, black, tarsi with the terminal segment longer than the combined length of the first two segments, dull black.

Length from frontal margin to tips of tegmina 13-17 mm (average 15.0 mm); length of abdominal posterior process 12-17 mm (average 14.0 mm); width across tips of eyes 2.5 mm.

Male : Similar to female in general colour and size. Genitalia with aedeagus widest subterminally, apical area clubshaped, substraight and obtusely rounded, inner margin very finely serrate; parameres ampliate apically, apex truncate, lateral valves with the process longer than the body of valves; subgenital plate broader at base, the terminal lobes indistinct, cleft extending to about one-third the length from the apex.

Material examined : 3 females and 3 males in the collections of the Forest Research Institute, Dehra Dun, collected from Shillong (6,000 ft.) and Darjeeling, Lebong (5,000 ft.).

Distribution : INDIA : Sikkim, Assam, W. Bengal, Himalayas, Shillong, Darjeeling; NEPAL, BURMA; WESTERN YUNNAN; CHINA; CENTRAL AFRICA.

Remarks : According to Chou and Yuan (1979), *D. hardwickii* is very similar to *D. xizangensis* Chou and Yuan in its appearance; but may be distinguished by the differences in the colour of pronotum, tegmina and abdominal posterior process, and in the pronotal shape; further, in *xizangensis* the last abdominal segment is prominently saddle-like and the tegminal veins are concolorous with the tegminal membrane; there are also important differences in the male genitalia of the two species.

Subfamily OXYRHACHINAE Haupt, 1929

1929. Oxyrhachinae Haupt, *Zool. Jahrb. Abt. f. System. Okol. u. Biol.*, 58 : 229.
 1962. Oxyrhachinae : Capener, *Republ. S. Afr. Dept. Agr. Tech. ser. Ent. Mem.*, 6 : 2.

This subfamily is diagnosed by the presence of a rudimentary scutellum entirely concealed by the pronotum, the presence of a propleural process developed from the lower margin of the propleura and directed downwards and backwards, and a metapleural process developed in a similar manner from the metapleura.

Tribe OXYRHACHINI Haupt, 1929

1929. Oxyrhachini Haupt, *Zool. Jahrb. Abt. f. System., Okol. u. Biol.*, 58 : 229.
 1931. Oxyrhachisni Goding, *Jl. N. Y. ent. Soc.*, 39 : 312.
 1962. Oxyrhachini : Capener, *Republ. S. Afr. Dept. Agr. Tech. ser. Ent. Mem.*, 6 : 3.

Head wider than long; vertex extended to form a foliate lower margin with a short lateral tooth and a rectangular foliate lobe. Thorax with pronotum with or without suprahumeral horns; posterior process extending beyond posterior angle of inner margin of tegmina; tegmina with 5 apical and 3 discoidal cells; wings with 3 or 4 apical cells; tibiae somewhat foliate and flattened externally. Male genitalia with U-shaped aedeagus not serrated on inner margin; lateral valves with tuberculate lobes somewhat transverse; tips of parameres club-like; sternal plate trulliform.

Nymphs in the last instar with a pair of large or rudimentary cranial tubercles; pronotal crest developed in front into a distinct horn, with a short process extending backward behind and over mesonotum; prominent spines or tubercles absent; abdominal lateral lamellae of segments IV-VIII short, bearing rudimentary spines.

Genus 2. *Oxyrhachis* Germar, 1835

1835. *Oxyrhachis* Germar, *Rev. Ent. Silb.*, 3 : 232.
 1908. *Oxyrhachis* : Distant, *Fauna Br. India*, 4 : 7.
 1866. *Xiphistes* Stål, *Hem. Afr.*, 4 : 83, 85.

1903. *Oxyrhachidia* Melichar, *Hom. Faun. Ceylon*, i-iv : 118.
 1931. *Xiphistoides* Goding, *Ann. Ent. Soc. Amer.*, 24 : 936.
 1908. *Kombazana* Distant, *Insecta Transvaaliensia*, 9 : 217.
 1910. *Gongroneura* Jacobi, *Homoptera. Sjosteds Kilimandjaru - Meru Expedition*, 12 : 119.

Head wider than long, upper margin arcuate and sinuate to eyes; eyes large and subglobose, ocelli distinct; pronotum with or without suprahumeral horns, metopidium convex, wider than high, humeral angles prominent and subacute; supraocular callosities prominent; posterior process broad and tectiform at base, with or without a distinct gibba, distal half slightly, moderately or prominently elevated, ventral keel serrate or non-serrate; a pair of episternal hooks on mesonotum; tegmina with broad apical limb; hind wings with 3 apical cells and a strong hamulus on subcostal margin.

Type species : *Membracis taranda* Fabricius, 1798.

Key to the species of *Oxyrhachis*

- 1(38) Suprahumeral moderately or well developed; apical area of posterior process slightly or strongly elevated.
- 2(23) Suprahumeral as long as or longer than the space between their bases.
- 3(6) Suprahumeral subhorizontal or horizontal; metopidium nearly vertical; ocelli closer to each other than to eyes; posterior process extending as far back as tegminal tips.
- 4(5) Suprahumeral broad, flat, their apices strongly curved; ocelli situated on c-o line. *palus* Buckton
- 5(4) Suprahumeral moderately broad, their apices moderately curved; ocelli situated above c-o line. *refescens* Walker
- 6(3) Suprahumeral directed upwards and outwards.
- 7(16) Metopidium obliquely sloping backward to disc.
- 8(15) Ocelli closer to each other than to eyes and situated above c-o line.

- 9(14) Posterior process long, distinctly extending beyond tegminal tips.
- 10(11) Posterior process with a distinct upright tubercle on the gibba. *tuberculus* Ananthasubramanian
- 11(10) Posterior process lacking a tubercle on the gibba.
- 12(13) Apex of posterior process well elevated. *malabaricus* Ananthasubramanian
- 13(12) Apex of posterior process only moderately elevated. *taranda* (Fabricius)
- 14(9) Posterior process short, not reaching the tegminal tips. *punctatus* Ananthasubramanian
- 15(8) Ocelli about equidistant from eyes and from each other, posterior process extending as far back as tegminal tips. *unicolor* Ananthasubramanian
- 16(7) Metopidium nearly vertical.
- 17(20) Ocelli closer to eyes than to each other and situated on the c-o line.
- 18(19) Posterior process long, extending beyond tegminal tips. *mangiferana* Distant
- 19(18) Posterior process extending just as far back as tegminal tips. *grandis* Ananthasubramanian
- 20(17) Ocelli closer to each other than to eyes and situated above the c-o line.
- 21(22) Posterior process long, extending beyond tegminal tips. *binsarus* Distant
- 22(21) Posterior process extending just as far back as tegminal tips. *minusculus* Ananthasubramanian and Ananthakrishnan
- 23(2) Suprahumerals shorter than the space between their bases.

- 24(29) Suprahumerals horizontal or nearly so, their apices slightly curved or not.
- 25(28) Metopidium sloping backward obliquely to disc; posterior process short.
- 26(27) Posterior process just reaching the tegminal tips; ocelli closer to eyes than to each other and situated on the c-o line; apex of suprahumeral not curved. *uncatus* Melichar
- 27(26) Posterior process not reaching the tegminal tips; ocelli closer to each other than to eyes and situated above c-o line. *krusadiensis* Ananthasubramanian and Ananthakrishnan
- 28(25) Metopidium vertical; posterior process scarcely passing the tegminal tips. *lefroyi* Distant
- 29(24) Suprahumerals directed outwards and upwards.
- 30(35) Metopidium obliquely sloping behind to disc.
- 31(34) Ocelli closer to each other than to eyes.
- 32(33) Posterior process extending slightly beyond tegminal tips; ocelli situated on c-o line. *apicalis* Ananthasubramanian
- 33(32) Posterior process extending well beyond tegminal tips; ocelli situated above c-o line. *haldari* Ananthasubramanian.
- 34(31) Ocelli closer to eyes than to each other and situated on c-o line. *geniculata* Ananthasubramanian
- 35(30) Metopidium vertical or nearly so.
- 36(37) Posterior process long, extending beyond tegminal tips, its undersurface finely serrated; ocelli equidistant from each other and from eyes. *nigrodorsalis*
Ananthasubramanian
- 38(1) Suprahumerals aborted to short stumps; apical area of posterior process not elevated. *brevicornutus*
Ananthasubramanian and Ananthakrishnan

2. *Oxyrhachis apicalis* Ananthasubramanian
(Fig. 7)

1980. *Oxyrhachis apicalis* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Paper 16* : 5.

Female : General colour reddish brown. Head wider than long, greyish yellow, vertex weakly arcuate, subquadrate, coarsely punctate with short adpressed golden hairs; cranial callosities prominent, lateral angles of foliate lobes first vertical and then acutely rounded; eyes subglobose, reddish brown; ocelli transparent, nearer to eyes than to each other and situated on c-o line; frontoclypeus light brown, lateral angles rounded, tips truncate, longly pilose; rostrum extending to posterior coxae. Thorax yellowish brown above, pronotum distinctly punctate with golden hairs; metopidium 2.5X as wide as high, verticalar basal one-third, then slightly sloping backwards, pilosity denser near bases of suprahumeral horns, suprahumeral horns as viewed from front short, just half as long as space between their bases, directed outward and slightly upward; supraocular callosities small, concolorous with metopidium; humeral angles broad, tips black, subacute; posterior process strongly tricarinate, distinctly punctate, with a weakly developed gibba behind disc at the level of abdominal segment I, apically laterally compressed, rising well above anal angle, ventral keel ampliate, as deep as dorsal keel and weakly serrate, apex acute, extending beyond the tips of tegmina; tegmina subhyaline, nearly 3.0X as long as wide, basal sixth greyish, coriaceous, veins reddish brown, 1st apical cell as long as discoidal cell I, 1st and 3rd discoidal cells nearly equal in length, apical limb broad. Legs uniformly light brown. Abdomen yellowish brown.

Length from frontal margin to tips of tegmina 7.7 mm., to tip of posterior process 7.4 mm.; width across tips of suprahumeral horns 2.7 mm., at humeral angles 2.3 mm., at eyes 2.3 mm.

Male : Similar to female, but slightly smaller, in some specimens body darker; suprahumeral horns shorter; posterior process extending backwards as far as tegminal tips.

Length from frontal margin to tips of tegmina 7.4 mm., to tip of posterior process 7.4 mm.; width across tips of suprahumeral horns 2.4 mm., at humeral angles 2.6 mm., at eyes 2.1 mm.

Material examined : Female holotype, Z.S.I. Reg. No. 609/H15; male allotype Z.S.I. Reg. No. 610/H15; 1 female and 3 male paratypes; 1 male and 2 females, Z.S.I. Reg. No. 611/H15 and 612-613/H15 from Assam, 21-1-1966.

Type locality : Majhgaon, Assam.

Distribution : INDIA (Assam).

O. apicalis is closely related to *palus* Buckton in the short suprahumeral horns and apically upturned posterior process, but differs in the distinctly punctate pronotum, unrecurved apices of the suprahumeral horns and the subhyaline tegmina.

3. *Oxyrhachis binsarus* Distant
(Fig. 8)

1916. *Oxyrhachis binsarus* Distant, *Fauna Br. India*, 6 : 148.

Female : General colour dark reddish brown with shades of black extending over suprahumeral and the distal half of posterior process. Head pale reddish brown with light black shades, vertex nearly 1.5X as wide as long, medially convex, finely punctured with short adpressed silvery pilosity, upper margin of vertex slightly convex, lateral teeth nearly acutely rectangulate, margins reddish brown; cranial callosities inconspicuous; eyes subglobose, dull reddish brown; ocelli large, succineous, closer to eyes than to each other and situated slightly above c-o line; clypeus slightly longer than wide, extending slightly below lower margins of frontoclypeal lobes, tip truncate and longly pilose. Pronotum dark reddish brown with shades of black, strongly punctate with short white hairs; metopidium vertical, obumbrant in front, about 1.5X wider than high; supraocular callosities black, prominently raised and bare; suprahumeral horns stout, strongly punctate with closely adpressed short silvery hairs, slightly longer than the space between their bases, broadly based, strongly tricarinate, viewed in front directed outward and upward, apically nearly horizontal, viewed laterally directed upward and obliquely backward; humeral angles conspicuous, their apices subacute, posterior process moderately tectiform at base, slightly sinuous, gibba inconspicuous, dorsal carina strongly percurrent through metopidium, apical half to posterior process brown with a hue of black, gradually rising upward to the level of disc, then running backward nearly horizontally, apex acute, extending beyond tegminal tips, ventrally ampliate, ventral carina serrate. Tegmina 2.5X as long as wide, subhyaline, wrinkled, talc-like, basal sixth coriaceous, reddish brown, finely punctate, veins stout, sparsely pilose, brown, apical veins shaded with black, apical limb wrinkled, about 2.0X as wide as marginal limb. Legs brown with a hue of red, basal two-thirds of femora darker.

Length from frontal margin to tips of tegmina 8.0 mm., to tip of posterior process 8.5 mm.; width across tips of suprahumeral horns 4.75 mm., at humeral angles 3.3 mm., at eyes 2.7 mm.

Male : Not known.

Material examined : One female in Agricultural University, Coimbatore; Coll. Kumaon, 8,000 ft. Holotype female in British Museum.

Distribution : INDIA (Binsar, Kumaon).

"Allied to *O. aegyptianus* Distant, but differing in colour of the head, pronotum, and legs and the length and shape of the posterior pronotal process" -Distant (1916). A comparison of the present species with the excellent figures (pp. 132, 136) and detailed description (pp. 126, 127) given by Capener (1962) in his Monograph on the Taxonomy of the African Membracidae-pt.I, corroborates the above quoted view of Distant.

4. *Oxyrhachis brevicornutus* Ananthasubramanian and Ananthakrishnan
(Fig. 9)

1975. *Oxyrhachis brevicornutus* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 180.

Female : General colour ochraceous brown. Head with vertex wider than long, vertical, declivous, slightly convex, subquadrate, strongly arcuate at base, very finely punctate, with very short adpressed sparingly distributed silvery hairs; cranial callosities inconspicuous; lateral angles of foliate lobes reddish brown, broadly obtusely rounded; eyes subglobose, pale white with shades of black; ocelli shining white, closer to eyes than to each other and situated on c-o line; frontoclypeus not extending below lower margins of foliate lobes, tip truncate, pilose, lateral lobes prominent. Pronotum finely punctate with scattered silvery pilosity, lateral areas somewhat dark ochraceous, pilosity sparse; metopidium strongly backwardly sloping to disc, its anterior margin not obumbrant, punctate, sparsely hairy; supraocular callosities rather inconspicuous; suprahumeral horns reduced to very short stumps directed forward; posterior process tricarinate, broad-based, ampliate beneath, not gibbous at base, nearly straight to two-third of its length, apical one-third slightly broader, dorsal and lateral carinae fuscous, dorsal carina conspicuous, strongly percurrent through metopidium, inferior margin very weakly serrate, tip directed downward, reaching the tip of 4th apical cell of tegmina. Tegmina hyaline, 2.5X as long as wide, basal fifth coriaceous, dark brown, finely punctate, veins strong, yellowish brown, 1st discoidal cell narrowest, discal cell as long as 3rd discoidal cell; hind wings with 3 apical cells. Abdomen reddish brown with shades of black.

Length from frontal margin to tips of tegmina 5.4 mm., to tip of posterior process 4.8 mm.; width across tips of suprahumeral horns 1.5 mm., at humeral angles 2.5 mm., at eyes 2.2 mm.

Male : Similar to female in the general colour; slightly smaller. Suprahumeral horns absent.

Length from frontal margin to tips of tegmina 5.2 mm., to tip to posterior process 4.7 mm.; width across tips of humeral angles 2.3 mm., at eyes 2.2 mm.

Materials examined : 4 females, 5 males and 6 fifth instar nymphs ex *Prosopis spicigera*, *Acacia leucophiaea*, Madras, 30-7-1968; 15 females, 1 male, numerous nymphs, from Bangalore, 1-10-1985. Types in the National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Tamilnadu (Madras), Karnataka (Bangalore).

This Indian species is nearest to the African species *brevicornis* (Jacobi) in the nature of the posterior process, and to *insularis* (Capener) in the suprahumeral horns which are obsolete, but differs from both in having only 3 apical cells in the hind wings.

5. *Oxyrhachis geniculata* Ananthasubramanian
(Fig. 10, 10A)

1980. *Oxyrhachis geniculata* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Paper No.16 : 3.*

Female : General colour ochraceous brown. Head castaneous brown, nearly 1.5X as wide as long, very finely punctate with short adpressed silvery hairs, cranial callosities inconspicuous, upper margin of vertex subplanate, lateral margins of foliate lobes rectangularly rounded, inner angles acute; eyes subglobose, pale white; ocelli succineous, convex, closer to eyes than to each other and situated on c-o line; clypeus reddish brown, not extending below lower margins of foliate lobes, tip densely pilose, a little upturned and truncate, rostrum reaching upto bases of posterior coxae. Pronotum reddish brown, strongly punctate, each puncture with a silvery hair, metopidium backwardly sloping, densely pilose, 2.0X as wide as high, supraocular callosities large, convex; suprahumeral horns highly variable in their degree of development (in the type nearly as long as distance between their bases), viewed from front directed outward and slightly upward, viewed from above directed outward and somewhat dorsoventrally compressed, tips blunt, reddish brown; disc between horns weakly convex; posterior process greyish brown, shallowly tectiform at base, slightly raised over gibba, lateral carinae dark brown, ventral keel weakly serrate, apex reddish, slightly raised and not reaching the extremities of tegmina. Tegmina hyaline, nearly 4.0X as long as wide, basal sixth coriaceous and punctate, veins reddish brown, 2nd apical cell more than half as long as 1st apical cell, 3rd discoidal cell with a spurious cross vein in the type. Abdomen greyish brown with white hairs.

Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 6.4 mm.; width across tips of suprahumeral horns 3.4 mm., at humeral angles 2.7 mm., at eyes 2.3 mm.

Male : Distinctly smaller than female. Suprahumeral horns shorter or much reduced, viewed from front obliquely turned upward, tips blunt, dark brown.

Length from frontal margin to tips of tegmina 6.6 mm., to tip of posterior process 6.1 mm., width across tips of suprahumeral horns 2.7 mm., at humeral angles 2.4 mm., at eyes 2.0 mm.

Nymph (Last instar) : General colour dull ochraceous brown. Head greyish brown, nearly 2.0X as wide as long, vertex slightly arcuate, cranial tubercles prominent, thorn-like, with subacute apices; eyes dark brown; ocelli succineous, closer to each other to eyes and situated on c-o line; frontoclypeus densely pilose, its tip extending below the lower margins of vertex, rostral tip reaching abdominal segment III. Pronotum ochraceous brown, metopidium convex, obliquely continued to the disc, suprahumeral buds prominent, pronotal anterior process robust, broad-based, obliquely continued forward and upward, making an angle of about 60°, pronotal posterior process about 0.75X as long as anterior process, extending upto abdominal segment IV, costal angles of wing buds prominent. Abdomen excluding anal tube about as long as thorax, abdominal segments IV-VIII with short, conical lateral lamellae directed backward and beset with 4 or 5 short tuberculate spines; anal tube about one-fourth of body length.

Material examined : Female holotype, Z.S.I. Reg. No. 562/H15, Male allotype, Z.S.I. 563/H15, 5th instar nymph neponotype, Z.S.I. 604/H15, Paratypes 2 females, Z.S.I. Reg. Nos. 564/H15-574/H15 and 579/H15 603/H15 from Rajasthan, Jodhpur, 17-3-1961; 15 females, 10 males, one 3rd instar nymph, two 4th instar nymphs, four 5th instar nymphs, 14-12-'56.

Distribution : INDIA (Rajasthan).

This highly polymorphic species is related to *minusculus* Ananthasubramanian and Ananthakrishnan in the disposition of the ocelli and posterior process, but differs from it by the larger size and highly variable suprahumeral horns and posterior process.

6. *Oxyrhachis grandis* Ananthasubramanian (Fig. 11)

1980. *Oxyrhachis grandis* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Paper No.16* : 7.

Male : General colour black. Head fuscous, about 0.66X as wide as long, thickly finely punctate, with adpressed white hairs, upper margin of vertex arcuate, slightly convex in the middle, lateral teeth acute, foliate lobes rectangular, inner angles broadly acute; eyes subglobose, fuscous; ocelli dull succineous, closer to eyes than to each other and situated on c-o line; clypeus almost as wide as long, densely pilose, tip obliquely truncate. Pronotum shining black, finely punctate with adpressed white hairs, median dorsal region coarsely punctate, metopidium vertical, 2.0X as wide as high, supraocular callosities conspicuous, irregular, bare, slightly convex; humeral angles black, apices subacute; suprahumeral horns moderately long, sparingly pilose, much longer than space between their bases, robust, tricarinate, black, viewed from front directed outward, rising above disc, apices weakly recurved, subacute, viewed from above flattened, directed outward and backward; posterior process tectiform, stout, median carina strongly percurrent through metopidium, gibba pitch black, apex black, beneath laminately ampliate, strongly keeled, very weakly serrate, apex moderately upturned, extending as far back as tegminal tips. Tegmina dull hyaline, about 3.5X as long as wide, basal sixth dark ferruginous, veins reddish brown, 2nd apical cell about 0.5X as long as 1st, 2nd discoidal cell slightly longer than 1st, apical limbus moderately broad. Legs black except distal halves of tibiae and entire tarsi which are light brown. Ventral surface of abdomen ferruginous brown.

Length from frontal margin to tips of tegmina 6.5 mm., to tip of posterior process 6.5 mm.; width across tips of suprahumeral horns 4.4 mm., at humeral angles 2.7 mm., at eyes 2.2 mm.

Female : Unknown.

Material examined : Male holotype, Z.S.I. Reg. No. 616/H15. Exact locality and date of collection unknown.

Distribution : INDIA.

This species is closely related to *taranda* (Fabricius) in the general disposition of the horns and general colour of body, but can be easily differentiated from it by the shorter posterior process which does not extend beyond the tegminal tips and which is broader than that of *taranda*.

7. *Oxyrhachis haldari* Ananthasubramanian

(Fig. 12)

1980. *Oxyrhachis haldari* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Paper* No.16 : 4.

Female : General colour pale fuscous brown. Head more than 1.5X as wide as long, granulate with adpressed golden pilosity, cranial callosities vestigial, lateral angles of foliate lobes laterally bluntly rectangulate, inner angles broadly acute, upper margin of vertex slightly arcuate; eyes dark brown, subglobose; ocelli reddish brown, closer to each other than to eyes and situated above co-o line; frontoclypeus light brown, its tip truncate and longly pilose. Pronotum fuscous brown, coarsely punctate, metopidium obliquely directed backward to disc, 1.5X as wide as high, disc moderately raised, supraocular callosities brown; suprahumeral horns short and broad, shorter than the space between their bases, as seen from above flat, horizontally laminate, as seen from front directed laterally and gently curved apically, apex acute, humeral angles prominent, their apices subacute; posterior process strongly tricarinate, the dorsal carination percurrent through metopidium, posterior half of posterior process moderately upwardly recurved and extends well beyond tegminal tips, ventral keel weakly serrate. Tegmina nearly 3.5X as long as wide, subhyaline, veins castaneous, basal part coriaceous, fuscous brown, 2nd apical cell more than 0.5X as long as 1st apical cell, apical limb moderately broad. Abdomen dark brown.

Length from frontal margin to tips of tegmina 9.0 mm., to tip of posterior process 8.2 mm.; width across tips of suprahumeral horns 3.4 mm., at humeral angles 2.7 mm., at eyes 2.3 mm.

Male : Unknown.

Material examined : Holotype female, Z.S.I. Reg. No. 614/H15 from Maharashtra, Pune, 20.2.1961. coll. B.K. Haldar.

Distribution : INDIA : Maharashtra (Pune).

This species resembles *taranda* (Fabricius) in the general colour and the long posterior process extending beyond tegminal tips, and to *lefroyi* Distant in the short, broad suprahumeral horns which are flatly horizontally laminate and apically recurved. However, it differs from both *taranda* and *lefroyi* in the position of the ocelli.

8. *Oxyrhachis krusadiensis* Ananthasubramanian and Ananthakrishnan

(Fig. 13)

1975. *Oxyrhachis krusadiensis* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 178.

Female : General colour reddish brown. Head vertical, vertex subquadrate, about 2.0X as wide as long, yellowish brown, coarsely punctate with short, pale, adpressed hairs arising from the punctures, upper margin slightly arcuate, lower margins gradually sloping to foliate lobes which are reddish brown, nearly truncate and inwardly deflected to the frontoclypeus; eyes prominent,

subglobose, pale white; ocelli dark brown, closer to each other than to eyes and situated above c-o line; frontoclypeus reddish brown, its apex slightly upturned and truncate; labral and rostral bases white pubescent, apex of rostrum reaching base of hind coxae. Pronotum light reddish brown, coarsely punctate with short, pale white hairs, lateral areas of sternites white pubescent; metopidium light reddish brown, nearly 1.5X as wide as high, strongly sloping backward, base convex; supraocular callosities subprominent; suprahumeral horns short, weakly carinate, subparallel, as viewed from front directed laterad with tips slightly curved downward, subacute, dark brown, as viewed from above much narrower; posterior process reddish brown, somewhat darker just behind horns, basally tectiform with a strong gibba above the level of abdominal segment II, median and lateral carinae parallel upto three-fourth of their length, apically nearly acute and only slightly raised and reaching the tip of 5th apical cell of tegmina, ventral keel ampliate and weakly serrate; tegmina hyaline, nearly 3.75X as long as wide, base very narrowly coriaceous and punctate, veins reddish brown, fringed with short hairs, 2nd apical cell smallest, 1st and 3rd discoidal cells nearly identical, apical limb broad; legs with coxae, trochanters and femora dark brown, tibiae slightly foliate, light brown, tarsi pale yellow.

Length from frontal margin to tips of tegmina 6.5 mm., to tip of posterior process 5.5 mm.; width across tips of suprahumeral horns 2.0 mm., at humeral angles 2.5 mm., at eyes 2.2 mm.

Male : Similar to female in general body colour, slightly smaller.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 5.1 mm.; width across tips of suprahumeral horns 1.85 mm., at humeral angles 2.3 mm., at eyes 2.1 mm.

Nymph : Last instar : Pale green in life, changing to greyish brown in cabinet specimens. Head about 2.0X as wide as long, cranial tubercles moderately developed; eyes fuscous brown; ocelli distinctly closer to eyes than to each other and situated on c-o line; subocular processes broadly conical and tuberculate; frontoclypeus highly arched at base, nearly truncate at lower margin, not projecting beyond the lower margins of vertex. Thorax nearly as long as abdomen; metopidium convex, slightly sloping backward; suprahumeral buds inconspicuous; pronotal anterior process conical, projecting upward and forward, its apex acute; lateral carinae distinct; posterior process less than one half as long as anterior process, extending over three-fourths of the length of mesonotum; wing pads large, extending upto abdominal segment V, costal angles not demarcated; abdominal segments V-VIII with short lateral lamellae, fringed with 5 or 6 tuberculate spines; anal tube about 0.2X as long as body.

Materials examined : 25 females, 12 males and numerous nymphs from Krusadai Islands, Pamban (Tamil Nadu), 19-9-1967; 36 females and 6 males from Ramanathapuram District (Tamil Nadu), 23-9-1984.

Host plant : *Cassia* sp.

Types in the National Pusa Collections, IARI, New Delhi.

Distribution : INDIA, Ramanathapuram, Pamban (Tamil Nadu).

This species is nearest to *crinitus* Buckton and *uncatus* Melichar in the general colour, size and disposition of the posterior process, but differs from both in the much shorter posterior process which extends only upto the 5th apical cell of tegmina; from *crinitus* it differs in the slightly larger size, and from *uncatus* in the much shorter suprahumeral horns.

9. *Oxyrhachis lefroyi* Distant
(Fig. 14)

1916. *Oxyrhachis lefroyi* Distant, *Fauna Br. India*, 6 : 147.

Female : General colour dark with shades of brown. Head fuscous brown, about 1.5X as wide as long, vertex sinuate, wider than long, punctate with pale white hairs; cranial callosities moderately raised, lateral teeth prominent and acutely upturned; eyes subglobose, dull white with a black hue; ocelli convex, rather inconspicuous, closer to each other than to eyes and situated above c-o line; frontoclypeus densely pilose, extending a little below lower margins of foliate lobes, obliquely truncate. Pronotum dark brown, punctate with adpressed pale white hairs; metopidium vertical, somewhat projecting forwards, wider than high, finely punctate with silvery pilosity; supraocular callosities not divided, bare; suprahumeral horns very short and broad, about 0.66X as long as the space between their bases, seen from above flatly horizontally laminate, seen frontally a little upwardly curved, as seen laterally obliquely turned upward and then backward, apices subacute; humeral angles prominent, finely punctate, darker than rest of the body, their apices subacute; posterior process moderately gibbous at base, finely punctate, sinuate, its apical half moderately curved upward and scarcely reaching the tegminal apices; central carination percurrent through metopidium, ventral carina finely serrate; tegmina subhyaline, nearly 4.0X as long as wide, 1st discoidal cell subequal to 1st apical cell, apical limb broad, talc-like. Legs fuscous brown, femoral and trochanteral regions black, tibial and tarsal segments light brown.

Length from frontal margin to tips of tegmina 7.5 mm., to tip of posterior process 7.2 mm.; width across tips of suprahumeral horns 3.5 mm., at humeral angles 4.5 mm., at eyes 3.3 mm.

Materials examined : 4 females from Ernakulam, 19-1979; 4 females from Coorg, 2-12-1979. Lectotype female in British Museum.

Host plants : *Cassia auriculata*, *Butea frondosa*.

Distribution : INDIA : Kerala (Ernakulam), Karnataka (Coorg).

O. lefroyi is closely related to *mangiferana* Distant in the disposition of the posterior process, but it can be easily identified by the short and broad suprahumeral horns.

10. *Oxyrhachis malabaricus* Ananthasubramanian
(Fig. 15)

1980. *Oxyrhachis malabaricus* Ananthasubramanian, *Entomon*, 5(2) : 113.

Female : General colour rusty brown. Head nearly 0.6X as long as wide, vertex coarsely punctate with silvery hairs, its upper margin sinuate, cranial callosities inconspicuous, lateral

angles of foliate lobes obtusely rounded to frontoclypeus; frontoclypeus not extending below lower margins of foliate lobes, free and truncate, fringed with long white hairs; eyes pale white, slightly extending laterad; ocelli shining white, convex, slightly closer to each other and situated on the c-o line. Pronotum dark brown; metopidium vertical 2.0X as wide as high, slightly obumbrant, densely pilose; supraocular callosities prominent, black, bare; humeral angles conspicuous, their apices subacute; suprahumeral horns black, longer than space between their bases, nearly horizontal, seen in lateral view stout, directed upward and backward, seen from above flat, seen in front slender and directed outward, lateral carinae nearly straight, dorso-posterior carina curved forward and outward; posterior process gibbous at base, apical area well elevated, apex extending backward well beyond tegminal apices and slightly declivous, ventral keel finely serrate, median carina strongly percurrent through metopidium. Tegmina nearly 3.5X as long as wide, apical limbus 2.0X as wide as marginal limbus. Legs testaceous. Abdomen dark dorsally, greyish ventrally.

Length from frontal margin to tips of tegmina 7.9 mm., to tip of posterior process 8.4 mm.; width across tips of suprahumeral horns 4.75 mm., at humeral angles 3.0 mm., at eyes 2.74 mm.

Male : Unknown.

Nymph : Fifth instar : General colour chocolate brown. Head 1.5X as wide as long, directed backward, cranial tubercles prominent, subcylindrical, apices acute; vertex subplanate at base; eyes pale brown, ocelli closer to eyes than to each other and situated on c-o line; pronotal anterior process nearly 2.0X as long as posterior process, cylindrical at basal half, gradually tapering to an acuminate tip; pronotal posterior process extending over the length of mesonotum; supraocular callosities small, taking the form of 3 irregular areas; suprahumeral buds conspicuous; wing pads ferruginous, fairly large, extending upto abdominal segment IV, costal angles more or less demarcated and bordered with short tuberculate spines. Abdomen excluding anal tube as long as thorax; lateral lamellae of abdominal segments V-VII well developed, nearly cylindrical, lacking tuberculate spines; anal tube about 0.25X as long as body; genitallic rudiments dark brown.

Material examined : 5 females and one fifth instar nymph, ex *Tamarindus indicus*, Palghat, 5-2-1979.

Distribution : INDIA : Kerala (Palghat).

O. malabaricus is closely related to *O. taranda* (Fabricius) in the disposition of the suprahumeral and in the long posterior process distinctly extending beyond the tegminal tips, but distinctly differs in the well elevated apex of the posterior process.

11. *Oxyrhachis mangiferana* Distant (Fig. 16)

1916. *Oxyrhachis mangiferana* Distant, *Fauna Br. India*, 6 : 147.

Female : General colour pale reddish brown. Head pale ochraceous, about 1.5X as wide as long, vertex sinuate and finely punctate with short, adpressed, silvery white hairs; cranial callosities moderately raised; lateral angles of foliate lobes rectangularly rounded; eyes pale white, prominently projecting laterad; ocelli slightly closer to eyes than to each other and situated

on c-o line; frontoclypeus densely and longly pilose. Pronotum shaded with reddish brown, punctate and granulose; metopidium nearly 1.75X as wide as high, vertical, granulose, punctured with adpressed silvery pilosity; dorsal carina reddish brown, strongly percurrent, continued through metopidium and posterior process, a pair of large, dark, oval spots one on either side of the posterior just behind gibba, supraocular callosities large, bare, complete; suprahumeral horns robust, broad, tricarinate, prismatic, coarsely punctate, densely pilose, about 2.0X as long as the space between their bases, viewed from front more slender, directed outward, seen from above flat, tricarinate, moderately behind gibba, laminately ampliate beneath, very finely serrate on the ventral carina, distinctly extending beyond tegminal tips, apex acute; tegmina 3.0X as long as wide, dull hyaline, basal sixth coriaceous and ochraceous, veins and costal margin reddish brown, a light black patch at the apex of clavus, apical limb broad, slightly wrinkled. Legs ochraceous, basal two-thirds of femora black, tibiae slightly dilated.

Length from frontal margin to tips of tegmina 8.75 mm., to tip of posterior process 9.75 mm.; width across tips of suprahumeral horns 7.0 mm., at humeral angles 4.4 mm., at eyes 3.5 mm.

Male : General colour dark reddish brown. Similar to female, smaller. Length from frontal margin to tips of tegmina 7.75 mm., to tip of posterior process 7.85 mm.; width across tips of suprahumeral horns 6.1 mm., at humeral angles 3.1 mm., at eyes 2.75 mm.

Material examined : 32 females and 9 males in Forest Research Institute, Dehra Dun, coll. Suraj Bagh, Dehra Dun (Coll. No. 7628). Lectotype female in British Museum.

Host plant : *Mangifera indica*.

Distribution : INDIA : Dehra Dun.

O. mangiferana Distant is closely related to *O. rufescens* Walker and *O. palus* Buckton in the general colour and nature of the suprahumeral, but differs from both in the posterior process extending beyond tegminal tips, in the position of the ocelli and the presence of two large dark oval spots at the basal part of the posterior process just behind gibba.

12. *Oxyrhachis minusculus* Ananthasubramanian and Ananthakrishnan (Fig. 17)

1975. *Oxyrhachis minusculus* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 173.

Female : General colour ochraceous brown. Head wider than long, greyish brown, vertex weakly convex, subquadrate, rather coarsely punctate with short, pale white hairs; cranial callosities vestigial; lateral angles of foliate lobes first vertical, then broadly rounded, densely pilose; eyes subglobose, dark brown shaded with red; ocelli dark brown, closer to eyes than to each other and situated above c-o line; frontoclypeus light brown, extending slightly beyond lower margins of foliate lobes, lateral angles rounded, apex truncate, densely pilose; rostrum extending slightly beyond posterior margins of hind coxae. Pronotum distinctly punctate, metopidium almost vertical, upper one-third gradually sloping backward to disc; supraocular

callosities small, irregularly divided; suprahumeral horns as viewed from lateral aspects directed upward and a little backward, viewed from front directed forward, then slightly upward and curving backward, viewed from above dorso-posterior carina slightly curved forward and outward; humeral angles prominent, apices subacute; posterior process tectiform, strongly tricarinate with a weakly developed gibba above the level of metathorax and first abdominal segment, apically laterally compressed, rising well above anal angle, ventral keel ampliate, as deep as dorsal keel; weakly serrate, apex acute, not exactly reaching the tips of tegmina; lateral areas of thorax with white tomentose patches; tegmina subhyaline, slightly wrinkled, 2.6X as long as wide, veins brown, basal sixth coriaceous and brown, a fuscous spot at anal angle, 1st apical cell as long as 2nd discoidal cell, 1st and 3rd discoidal cells equal in length. Legs with tibiae castaneous, tarsi pale brown. Abdominal sternites dark brown, lateral areas spotted with white tomentosity.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 4.8 mm.; width across tips of suprahumeral horns 3.5 mm., at humeral angles 2.6 mm., at eyes 2.2 mm.

Male : General colour black with shades of brown. Slightly smaller than female.

Length from frontal margin to tips of tegmina 4.8 mm., to tip of posterior process 4.6 mm.; width across tips of suprahumeral horns 3.4 mm., at humeral angles 2.6 mm., at eyes 2.2 mm.

Nymph : Last instar : General colour chocolate brown. Head light brown, cranial tubercles very prominent, nearly cylindrical, apex acute, vertex subplanate at base, 2.0X as wide as long; eyes dark brown, ocelli closer to eyes than to each other and situated on c-o line. Pronotum concave in front, somewhat receding, supraocular callosities in the form of three inconspicuous irregular bare areas; suprahumeral buds prominent, dark brown, anterior process conical, nearly 2.0X as long as posterior process which extends over mesonotum; wing pads dark reddish brown, large, extending over abdominal segment VI, costal angles well demarcated, fringed with tuberculate spines, abdominal segments somewhat telescoped; lateral lamellae of segments V-VIII moderately developed, nearly cylindrical, inclined backward with posterior margins fringed with 4 or 5 tuberculate spines; anal tube black, 0.2X as long as body.

Material examined : 16 females, 8 males and 10 fifth instar nymphs, *ex Casuarina equisetitolla*, Vellore, April, 1967; 20 females and 8 males, Poonamallec, May 1967. Types in the National Pusa Collections, IARI, New Delhi.

Distribution : INDIA : Tamil Nadu (Poonamallec, Vellore).

O. minusculus resembles *taranda* (Fabricius) and *rufescens* Walker in the nature of the suprahumeral horns which are stout and robust, and in the nature of the posterior process, but it differs from both in the smaller size of the body and the somewhat shorter suprahumeral horns which are as long as the space between their bases; from *taranda* it further differs in the nature of the posterior process which just reaches the tegminal apices, and from *rufescens* in the position of ocelli which are close to eyes than to each other.

13. *Oxyrhachis nigrodorsalis* Ananthasubramanian
(Fig. 18)

1980. *Oxyrhachis nigrodorsalis* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Paper No. 16* : 3.

Male : General colour black. Head fuscous brown, about 1.5X as wide as long, punctate with white hairs, upper margin of vertex more or less planate, lateral teeth and narrow, foliate lobes laterally rectangular, inner angles broadly acute, eyes subglobose, dull black; ocelli chocolate brown, very large, equidistant from each other and from eyes and situated on c-o line; frontoclypeus longly tomentose, its apex truncate. Pronotum black, punctate with adpressed white hairs; metopidium vertical, 2.0X as wide as high, obumbrant; supraocular callosities moderately large, impunctate, almost bare; humeral angles short, subacute; suprahumeral horns somewhat flattened, tricarinate, shorter than distance between their bases, viewed from front directed upward and outward, then slightly curved backward, viewed from above, directed outward and backward, planate; posterior process shallowly tectiform, broad at base, rising to a small punctate gibba behind disc, then strongly tectiform and rising in a gentle curve to apex which reaches the level of disc, apex acute, not reaching the apices of tegmina, ventral keel ampliate and strongly serrate, its depth nearly as half as dorsal ridge; propleural process very prominent, mesopleural process inconspicuous; tegmina subhyaline, 3.5X as long as wide, basal sixth coriaceous, fuscous and punctate, veins dark brown, apical limb broad, 2nd apical cell small, less than half as long as 1st apical cell, discoidal cells 2 and 3 nearly equal in length. Abdomen black at sides and white tomentose below.

Length from frontal margin to tips of tegmina 7.4 mm., to tip of posterior process 6.7 mm.; width across tips of suprahumeral horns 4.0 mm., at humeral angles 2.7 mm., at eyes 2.5 mm.

Female : Unknown

Material examined : Holotype male, Z.S.I. Reg. No. 615/15, Garh Shanker Forest, Baddowal Forest, Hoshiarpur, Dehra Dun, 21-12-1962.

Distribution : INDIA : Hoshiarpur, Dehra Dun.

This species is closely related to the African species *latipes* (Buckton) in its general disposition of suprahumeral and posterior process, but differs from it in having large ocelli which are situated on the c-o line and also in the nature of apical and discoidal cells of tegmina.

14. *Oxyrhachis palus* (Buckton)
(Fig. 19)

1905. *Ouranorthus palus* Buckton, *Trans. Linn. Soc.*, 9 : 338.

1908. *Oxyrhachis palus* Distant, *Fauna Br. India*, 4 : 6.

Female : General colour reddish brown with a hue of yellow. Head pale brown, nearly 2.0X as wide as long, vertex sinuate, punctured with pale white hairs, cranial callosities scarcely raised, lateral angles of foliate lobes nearly rectangular, eyes subglobose, dull white; ocelli convex, a little

closer to each other than to eyes and situated on c-o line; frontoclypeus clothed with long pale white hairs. Pronotum pale reddish brown, finely punctate with adpressed silvery pilosity; metopidium vertical at basal one-third and then gradually sloping backward to the disc, about as wide as high, finely punctate, densely pilose; suprahumeral horns robust, as seen from above broad, flat, somewhat short, strongly recurved at apices, about as long as the space between their bases, as seen in front nearly horizontal, apically slightly turned downward, passing the posterior angle of the inner margin of tegmina, apex acute, just reaching the tegminal tips, centrally strongly keeled, central carina continued through pronotum, ventral carina finely serrate; tegmina wrinkled, translucent, lustrous white, veins pale ochraceous, basal sixth coriaceous, yellowish brown, 3.0X as long as wide, apical limb broad, transversely wrinkled, 1st apical cell about 7.0X as long as wide. Abdomen dark brown above; legs pale ochraceous, femora black.

Length from frontal margin to tips of tegmina 8.0 mm., to tip of posterior process 7.9 mm.; width across tips of suprahumeral horns 6.1 mm., at humeral angles 3.4 mm., at eyes 3.3 mm.

Male : Unknown.

Material examined : 7 females; Bangalore, June, 1984; ex *Peltophorum ferrugineum*. Holotype female in British Museum.

Distribution : INDIA : Karnataka (Bangalore); Tamil Nadu (Coimbatore).

O. palus is very closely allied to *rufescens* Walker in the general colour and broad, long, subhorizontal suprahumeral but differs in the strongly recurved apices of the suprahumeral and position of the ocelli which are situated on the c-o line.

15. *Oxyrhachis punctatus* Ananthasubramanian (Fig. 20)

1980. *Oxyrhachis punctatus* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Paper No. 16* : 6.

Male : General colour pale reddish brown. Head greyish brown, nearly 1.5X as wide as long, very finely with short adpressed silvery hairs; cranial callosities distinct; upper margin of vertex arcuate, lateral margins of foliate lobes rectangularly rounded with inner angles acute; eyes subglobose, pale greyish; ocelli greyish black, conspicuous, closer to each other than to eyes and situated above c-o line; frontoclypeus greyish, tinged with red, extending slightly below lower margins of vertex, tip truncate, slightly upturned, longly pilose. Pronotum greyish brown, strongly punctate, each puncture with an adpressed silvery hair, metopidium obliquely sloping backward to disc, 2.3X as wide as high, supraocular callosities large, black; suprahumeral horns about as long as the space between their bases, viewed from front directed upward and outward, tips acute; disc between horns convex; posterior process greyish black, shallowly tectiform at base, lateral carinae reddish brown, ventral keel finely serrate, apex slightly raised and not reaching the tips of tegmina; tegmina subhyaline, a little more than 3.0X as long as wide, veins yellowish, stout, basal sixth punctate, conaceous, 2nd apical cell a little more than half as long as 1st apical cell, apical limb moderately broad. Abdomen greyish brown.

Length from frontal margin to tips of tegmina 6.3 mm., to tip of posterior process 6.0 mm.; width across tips of suprahumeral horns 3.4 mm., at humeral angles 2.6 mm., at eyes 2.1 mm.

Female : Unknown.

Material examined : Holotype male, Z.S.I. Reg. No. 618/15; one male paratype, Z.S.I. Reg. No. 619/15, from Nalgonda District, Daverkonda, Andhra Pradesh, 14-8-1962.

Distribution : INDIA : Andhra Pradesh (Daverkonda).

This species is closely related to *geniculata* Ananthasubramanian in the nature of suprahumeral and the posterior process and distinctly punctate pronotum, but differs from it in the colour and position of the ocelli which are nearer to each other than to eyes and situated above the c-o line, and also the frontoclypeus which extends slightly below the lower margins of foliate lobes.

16. *Oxyrhachis rufescens* Walker (Fig. 21)

1851. *Oxyrhachis rufescens* Walker, *List Hom*, ii : 506.

1851. *Oxyrhachis rudis* Walker, *List Hom.*, ii : 509.

1916. *Oxyrhachis rufescens* : Distant, *Fauna Br. India*, 6 : 146.

1975. *Oxyrhachis rufescens* : Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 171.

Female : General colour ferruginous brown. Head 2.0X as wide as long, vertex sinuate, punctate with short silvery, pilosity, cranial callosities not raised, lateral angles of foliate lobes rectangularly rounded; eyes subglobose, pale white; ocelli convex, closer to each other than to eyes and situated above c-o line; frontoclypeus extending slightly below lower margins of foliate lobes, its apex nearly truncate, fringed with long silvery hairs. Pronotum ferruginous brown, metopidium nearly vertical, densely pilose, supraocular callosities prominent, raised, bare; humeral angles prominent with their apices subacute; suprahumeral horns broad, almost horizontal, longer than the space between their bases, seen in lateral view slender with apices subacute and directed backward, seen from above flat, seen in front more slender and a little more apically acute, anterior carina dark reddish brown, directed outward, lateral carina nearly straight, dorso-posterior carina curved forward and outward joining anterior carina in narrow curve; posterior process moderately gibbous at base, apical area moderately elevated, apex acute, just reaching tegminal apices, weakly serrate, median carina strongly percurrent through metopidium, lateral carinae brown, finely punctate; tegmina 3.0X as long as wide, dull ochraceous, basal sixth coriaceous, reddish brown, punctate, veins with a brown hue, 1st apical cell 4.0X as long as wide; hind wings with 3 apical cells. Legs testaceous. Abdomen dark reddish brown above and greyish tomentose below.

Length from frontal margin to tips of tegmina 6.75-8.0 mm., to tip of posterior process 6.7-7.85 mm.; width across tips of suprahumeral horns 3.5-4.0 mm.; at humeral angles 2.4-2.5 mm., at eyes 2.25-2.5 mm.

Male : Smaller and darker than female, suprahumeral longer and their apices more acute with anterior carina more backwardly curved than in female.

Length from frontal margin to tips of tegmina 6.25-7.0 mm., to tip of posterior process 6.0-6.8 mm.; width across tips of suprahumeral horns 3.25-4.5 mm., at humeral angles 2.2-2.4 mm., at eyes 2.0-2.2 mm.

Nymph : Fifth instar : General colour dark ochraceous brown, thickly covered with a white deposit of wax giving it a greyish appearance, especially in the region of cranial tubercles, suprahumeral buds, bases of pronotal process and ventrolateral areas of abdomen. Head directed backward, vertex 2.0X as wide as long, cranial tubercles thorn-like with ribbed bases and acute tips, bearing slender setae; eyes shaded black; ocelli closer to each other than to eyes and situated above c-o line; subocular processes slender and tuberculate; frontoclypeus strongly convex, densely pilose, extending below lower margins of vertex. Pronotum ochraceous brown; metopidium convex, obumbrant; pronotal anterior process broad at base, abruptly narrowed from two-thirds of its length, apex acute, slightly inclined backward; pronotal posterior process abbreviated, extending over base of mesonotum, its apex blunt; suprahumeral buds small, black; wing pads narrow, obliquely directed downward and backward, costal angles indistinct; metanotum shallowly concave, abdominal lateral lamellae of segments IV to VIII conical, each bearing 5-7 tuberculate spines, those on segment III much shorter, anal tube one-sixth of body length.

Material examined : 60 females, 18 males and numerous nymphs; Madras; 10-8-1966; 90 females, 30 males and many nymphs; Bangalore; 21-5-1979; 113 females, 18 males and numerous nymphs; Palghat; 1-9-1984; 30 females and 4 males; Vijayawada; 9-9-1983. Holotype female in British Museum.

Host plants : The species is highly polyphagous and occurs on several species of leguminous plants, e.g., *Acacia arabica*, *Acacia melanoxylon*, *Acacia auriculiformis*, *Prosopis spicigera*, *Erythrina indica*, *Poinciana regia*, *Caesalpinia pulcherrima*, *Caesalpinia coriaria*, *Butea frondosa*, *Albizia lebbeck*, *Glyricidia maculosa*, *Sesbania aegyptiaca*, *Cassia fistula*, *Crotalaria juncea*, *Tamarindus indicus*, *Cyamopsis tetragonoloba* and *Cajanus cajan*s.

Distribution : All over India.

O. rufescens is closely related to *O. palus* Buckton in the general colour and broad, long, subhorizontal suprahumeral horns, but differs by the moderately curved apices of the suprahumeral horns and the position of the ocelli which are situated above c-o line.

17. *Oxyrhachis subjecta* Walker (Fig. 22)

1851. *Oxyrhachis subjecta* Walker, *List Hom.*, 2 : 504.
1908. *Oxyrhachis subjecta* : Distant, *Fauna Br. India*, 4 : 5.

Female : General colour black. Head subquadrate, broader than long, vertex subplanate, finely punctate with short, adpressed silvery hairs; cranial callosities slightly raised, lateral teeth acute; eyes subglobose, light brown; ocelli succineous, a little raised, closer to eyes than to each other and situated slightly above c-o line; frontoclypeus extending slightly below lower margins of foliate lobes, apex obliquely truncate, sparsely longly pilose. Pronotum black, punctured with silvery hairs; metopidium nearly vertical, about as wide as high, anterior margin weakly obumbrant, densely clothed with adpressed silvery pilosity; supraocular callosities entire, oval bare; suprahumeral horns robust, about 1.5X as long as space between their bases, as seen from above directed outward and upward, dorsal surface very broad, apex not recurved, posterior surface much shorter than dorsal and lateral surfaces and slightly forwardly inclined, lateral carinae gently curved; posterior process shallowly tectiform, mostly ferruginous, extending well beyond tegminal tips, moderately inclined upward, apex acute, ventral keel prominent, not serrate; tegmina light brown, with basal sixth ochraceous, punctate, with a brown spot on the angle of the hind border, veins stout, pale brown, with short hairs, 1st apical cell about 5.0X as long as wide, 2nd discoidal cell longer than 1st and 3rd. Legs with coxae and trochanters black, densely tomentose, tibiae and tarsi light brown.

Length from frontal margin to tips of tegmina 8.5 mm., to tip of posterior process 6.8 mm.; width across tips of suprahumeral horns 4.7 mm., at humeral angles 2.8 mm., at eyes 2.4 mm.

Male : Shorter than female. General colour black. Suprahumeral horns, distal half of posterior process, legs and abdominal terminalia black; suprahumeral horns about 1.3X as long as space between their bases; metopidium vertical, densely pilose with short silvery hairs; posterior process extending well beyond tegminal tips, moderately elevated, ventral keel not serrate. Tegmina dark brown. Genitalia typical of the genus.

Length from frontal margin to tips of tegmina 7.9 mm., to tip of posterior process 6.3 mm.; width across tips of suprahumeral horns 4.2 mm., at humeral angles 2.5 mm., at eyes 2.1 mm.

Material examined : 3 females, 2 males; Kerala State (Malampuzha, Palghat); 18-10-1969; ex *Glyricidia maculata*. Distant (1908) states that the unique type of this species is now in a most mutilated condition; Broomfield (1971) reports that the holotype male with labels "Type" and "India", with the pronotal processes broken, is in British Museum.

Distribution : INDIA : Kerala State (Malampuzha, Palghat); EAST INDIES; SUMATRA; JAVA.

O. subjecta resembles *taranda* (Fabricius) in the disposition of the suprahumeral horns and posterior process, but distinctly differs in the non-serrate ventral keel of the posterior process.

18. *Oxyrhachis taranda* (Fabricius) (Fig. 23)

1798. *Membracis taranda* Fabricius, *Ent. Syst. Suppl.* : 514.
1803. *Centrotus tarandus* : Fabricius, *Syst. Rhyng.* : 19.
1835. *Oxyrhachis tarandus* : Germar, *Rev. ent. Silb.* 3 : 232.

1908. *Oxyrhachis tarandus* : Distant, *Fauna Br. India*, 4 : 4.
 1903. *Polocentrus rufus* Buckton, *Mon. Memb.* : 254, P1.58, f.2-2b.
 1903. *Polocentrus neuter* Buckton, *Mon. Memb.* : 254, P1.58, f.3-3b.
 1962. *Oxyrhachis taranda* : Capener, *Entomology Mem. Dept. Agric. S. Afr.*, 6 : 11.

Female : General colour light brown to ochraceous brown. Head about 1.6X as wide as long, vertex subplanate, finely punctured with short, adpressed white hairs, cranial callosities distinct, but not raised, lateral angles of foliate lobes rectangularly rounded; eyes subglobose, light brown; ocelli shining white, equidistant from each other and from eyes situated on c-o line; frontoclypeus brown with a hue of black, extending very slightly below lower margins of foliate lobes, densely clothed with silvery pilosity, apex a little upturned and obliquely truncate, laterally broadly lobate, rostrum reaching hind coxae. Pronotum ochraceous brown, strongly punctate, each puncture with a pale white hair, metopidium distinctly wider than high, vertical about two-thirds of its height, then sloping backward, more or less densely pilose with adpressed silvery hairs; supraocular callosities prominent, unbroken, convex and bare; humeral angles subprominent, their apices subacute, basal parts densely pilose; suprahumeral horns exhibiting variations with reference to their length and the angles of the carinae in relation to the median carina, seen from the front recurved upward and outward, seen from above subhorizontal, apices narrowly rounded, anterior carina directed outward slightly backward and upward, lateral carina almost straight, directed outward and upward, dorso-posterior carina curved gently forward and outward, horns about 1.5X as long as space between their bases; disc slightly raised. Posterior process shallowly tectiform at base, rising a little over shallow gibba, extending beyond tegminal apices, moderately upwardly curved, beneath laminately ampliate, ventral keel finely serrate, median and lateral keels nearly parallel, apex acute; Tegmina dull hyaline, about 3.5X as long as wide, veins dark brown near costal margin, light brown in the rest of the tegmina, basal sixth coriaceous, reddish brown, apical limb broad, wrinkled. Legs with coxae, trochanters and basal halves of femora dark brown, more or less densely tomentose, distal halves of femora, tibiae and tarsi light brown. Abdomen ochraceous brown with white pilosity.

Length from frontal margin to tips of tegmina 6.8-8.2 mm., to tip of posterior process 6.2-9.1 mm.; width across tips of suprahumeral horns 4.5-5.2 mm., at humeral angles 3.1-3.3, at eyes 2.4-2.45 mm.

Male : General colour fuscous brown. Similar to female in the disposition of suprahumeral horns and posterior process, but smaller. Tip of posterior process a little more blunt; suprahumeral horns vary with reference to their length and the angles of their carinae in relation to the central carina. Male terminalia with sternal plate trulliform, convex with sides abruptly sloping, with a shallow groove along middle line, apically broadly rounded and convex, longly pilose; parameres clubshaped with hooded tips; lateral valves with well developed tuberculate lobes disposed at right angles to the long axis of the valves; aedeagus U-shaped, lacking serrations.

Length from frontal margin to tips of tegmina 6.4-7.5 mm., to tip of posterior process 6.0-8.9 mm.; width across tips of suprahumeral horns 3.0-5.0 mm., at humeral angles 2.4-3.1 mm., at eyes 2.4-3.1 mm., at eyes 2.2-2.3 mm.

Nymph : Fifth instar : General colour dark brown. Vertex nearly 2.0X as wide as long, sparsely covered with long setae, upper margin emarginate, with short, slender cranial tubercles, each terminating in a tuberculate seta, lower margin convex, sinuate; subocular expansions conical with small tubercles; eyes pale white; ocelli invisible; frontoclypeus convex at free end; rostral tip reaching abdominal sternite II. Thorax with short, sparse tuberculate setae; metopidium slightly sloping backward; supraocular callosities black, irregular, slightly convex; suprahumeral buds distinct and large, extending slightly backward; pronotal anterior process well developed, directed upward, apex acute; pronotal posterior process prominent, gradually tapering backward, extending over two-thirds of the length of mesonotum; wing pads large, extending backward beyond abdominal segment III in female nymph and abdominal segment IV in the male nymph; abdominal pleurites 5-8 with short, conical, lateral lamellae, each lamella bearing 4 or 5 short, tuberculate setae; anal tube dark brown, about one-sixth as long as body; genital rudiments distinct.

Materials examined : A long series of females, males and nymphs collected from field in and around Madras, and reared in laboratory, ex *Acacia arabica*, *Prosopis spicigera*, *Prosopis juliflora*, *Peltophorum ferrugineum*, *Pithecolobium dulce*, *Poinciana regia*, *Erythrina indica*, *Sesbania grandiflora*, *Caesalpinia coriaria* and *Cassia glauca*. According to Capener (1962), type in Fabricius' Collection at Kiel.

Distribution : All over INDIA. This species is very common on its occurrence throughout the year. According to Capener (1962) it was at one time thought that this species occurred in Africa, and specimens from that continent have frequently been identified as *O. taranda*. There is, however, no evidence that its range extends beyond India, and those species which approximate very closely to it and which have so far been examined, are believed to be distinct.

An analysis of the morphometric variations in *Oxyrhachis taranda* collected from five of its regular host plant species, viz., *Prosopis spicigera*, *Acacia arabica*, *Pithecolobium dulce*, *Peltophorum ferrugineum* and *Poinciana regia*, disclosed 4 groups of individuals with reference to differences in the degree of development of the suprahumeral horns and the disposition of the posterior process. These groups (Table : 4) are :

1) Individuals with moderately developed suprahumeral horns which are less divergent; the posterior process moderately elevated and extending slightly behind the tegmina;

2) Individuals with suprahumeral horns longer and more divergent than those of group 1, and projecting obliquely upward, width across tips of horns greater than that of group 1, posterior process moderately elevated as in group 1, but extending well beyond tegminal tips;

3) Individuals with suprahumeral horns about as long as those of group 2, but never projecting obliquely upward, the angles of their carinae more or less similar to those of group 1; posterior process shorter, less elevated and never reaching the tips of tegmina;

4) Individuals with suprahumeral horns much reduced; posterior process as in group 3.

TABLE : 4

Morphometric variations in four groups of individuals in the species complex *Oxyrhachis taranda* : Numbers indicate the mean value of five individuals in each group and in each sex (measurements in millimetres)

Morphological characters	Groups I		Groups II		Groups III		Groups IV	
	Female	Male	Female	Male	Female	Male	Female	Male
length from frontal margin to tips of tegmina	8.0	7.0	8.2	7.5	6.8	6.4	6.8	6.5
Length from frontal margin to tip of posterior process	8.5	8.0	9.1	8.9	6.2	6.0	6.2	6.0
Width across tips of suprahumeral horns	4.5	4.2	5.2	3.0	5.2	5.0	4.9	3.5
Width across tips of humeral angles	3.1	2.4	3.3	3.1	3.12	3.0	3.2	3.1
Width across eyes	2.4	2.2	2.4	2.2	2.43	2.3	2.45	2.3
length of horn	2.4	2.3	2.8	2.5	2.22	2.2	1.05	1.10
Width across bases of horns	1.25	1.19	1.4	1.35	1.2	1.9	1.26	1.9

The differences in the frequencies of occurrence of these 4 groups of individuals on the 5 species of host plants, the differential egg-laying behaviour, and the time of the initiation and termination of oviposition, show that *Oxyrhachis taranda* is a species complex (Ananthasubramanian, 1987).

19. *Oxyrhachis tuberculatus* nom. nov.

(Fig. 22)

1858. *Oxyrhachis tuberculatus* Walker, *Ins. Saund.* : 109.
 1908. *Xiphistes tuberculatus* : Distant, *Insecta Transvaaliensis*, 9 : 210.
 1932. *Xiphistes tuberculatus* : Goding, *Jl. N. Y. ent. Soc.*, 40 : 231.
 1962. *Oxyrhachis tuberculata* : Capener, *Entomology Mem. Dept. Agric. S. Afr.*, 6 : 33.
 1980. *Oxyrhachis tuberculatus* : Ananthasubramanian, *Entomon*, 5(2) : 113 (Junior homonym)

Oxyrhachis tuberculatus nom. nov. (Present work)

Male : General colour yellowish brown. Head nearly 1.50X as wide as long, vertex arcuate, punctate with short silvery hairs; cranial callosities raised, conspicuous; lateral angles of foliate lobes rectangularly rounded; eyes subglobose, black; ocelli convex, closer to eyes than to each other and situated slightly above c-o line; frontoclypeus not extending below lower margins of foliate lobes, free end truncate, fringed with long whitish hairs. Pronotum greyish brown; metopidium 2.0X as wide as high, slightly obliquely turned backward, densely pilose; supraocular callosities black, prominent; humeral angles subprominent, their apices blunt; suprahumeral horns moderately broad, longer than space between their bases, seen in lateral aspect broad and raised upward, apices turned backward, seem from above flat dorsoventrally, seen in front very slender, raised slightly upward and outward, anterior and lateral carinae sparsely pilose; posterior process moderately gibbous at base, with a prominent, vertical tubercle on the gibba, apical area moderately directed upward, apex subacute, extending well beyond tegminal tips, ventral keel weakly serrate, median carina percurrent through metopidium, lateral carinae dark brown; tegmina 3.0X as long as wide, dull yellowish, veins pale brown, 1st apical cell 6.5X as long as wide, apical limb broad. Legs ochraceous brown. Abdomen dark brown above, lighter below.

Length from frontal margin to tips of tegmina 6.4 mm., to tip of posterior process 7.6 mm; width across tips of suprahumeral horns 4.6 mm., at humeral angles 2.7 mm., at eyes 2.2 mm.

Female : Unknown.

Material examined : One male, Madras, 2-2-1979; ex *Prosopis spicigera*.

Distribution : INDIA : Tamil Nadu (Madras).

O. tuberculatus is closely allied to *taranda* (Fabricius), but differs from it in having a distinct upwardly directed tubercle on the gibba of pronotum.

20. *Oxyrhachis uncatatus* Melichar

1903. *Oxyrhachis uncatatus* Melichar, *Hom. Faun. Ceylon* : 108.
 1903. *Centrotus nectaris* Buckton, *Monogr. Membrac.* : 246.

1908. *Oxyrhachis uncatus* : Distant, *Fauna Br. India. Appen.*, 6 : 6.

1975. *Oxyrhachis uncatus* : Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 176.

Female : General colour ochraceous brown. Head wider than long, vertex subquadrate, finely punctate, with long, sparse silvery hairs, upper margin slightly arcuate, sinuate, lateral angles of foliate lobes rectangular, inner angles inwardly acute; eyes nearly subglobose, reddish brown; ocelli succineous, closer to eyes than to each other and situated on c-o line; frontoclypeus nearly as wide as long, slightly extending below lower margins of foliate lobes, apex truncate, longly pilose. Pronotum brownish ochraceous, finely punctate with sparse pale white hairs; median carina yellowish brown and strongly percurrent through metopidium; metopidium 2.0X as wide as high, convex, gradually sloping backward; supraocular callosities small, bare, margins obscure; humeral angles subprominent; suprahumeral horns about 0.66X as long as distance between their bases, subhorizontal, apices subacute, viewed from above flattened dorso-ventrally with weak yellowish brown dorsal carina, viewed from lateral aspects appearing much shorter, viewed from the front more upwardly curved, tricarinate, apices obtusely acute; posterior process slightly gibbous behind disc, hardly reaching apex of tegmina, apex slightly turned upward, inferior margin weakly serrate; tegmina subhyaline, 3.0X as long as wide, basal sixth coriaceous, punctate, veins reddish brown, 1st apical cell 3.0X as long as wide, 2nd discoidal as long as 1st apical cell. Legs ochraceous. Lateral areas of abdomen and lower surface cretaceously sericeous.

Length from frontal margin to tips of tegmina 6.5-7.0 mm., to tip of posterior process 6.2-6.8 mm.; width across tips of suprahumeral horns 3.0-3.5 mm., at humeral angles 2.3-2.5 mm., at eyes 2.0-2.2 mm.

Male : Similar to female, with horns slightly shorter. Terminalia with aedeagus U-shaped, tuberculate process of lateral valve short, parameres club-like, sternal plate black, densely pilose, its apical lobe small and inconspicuous.

Length from frontal margin to tips of tegmina 6.3-6.7 mm., to tip of posterior process 6.1-6.6 mm.; width across tips of suprahumeral horns 2.75-3.2 mm., at humeral angles 2.2-2.4 mm., at eyes 1.9-2.1 mm.

Nymph : Fifth instar : Colour greyish brown with very little deposit of waxy secretion making ventro-lateral parts of abdomen whitish; head turned backward, vertex nearly 2.0X as wide as long, cranial tubercles thin, slender, thorn-like; metopidium slightly convex, vertical, pronotal anterior process short, broadly rounded; posterior process extending over about middle of mesonotum, apex blunt; supraocular callosities indistinct, suprahumeral buds small, concolorous, wing pads greyish, their bases pale ochraceous, apices extending over abdominal segment III, costal angles fringed with tuberculate spines; abdomen brown, lateral lamellae of segments V-VIII short, inclined backward; anal tube about one-sixth of body length, normally held more or less vertically, bordered with rows of fine tuberculate spines; genital rudiments prominent.

Material examined : Numerous females, males and nymphs collected from their host plants, viz., *prosopis spicigera*, *Acacia arabica*, *Cassia tora* and *Cassia fistula*; Trichinopoly, Ramnad, Madurai and Rameswaram; January, 1968. Once recorded from Sri Lanka, this species is now found on their host plants throughout the year.

Distribution : INDIA : Tamil Nadu (Trichinopoly, Madurai, Ramnad, Rameswaram); SRI LANKA : Peradeniya.

This species is closely allied to *krusadiensis* Ananthasubramanian and Ananthakrishnan in having the metopidium sloping backward obliquely to disc and relatively short suprahumeral horns, but differs in the nature of the posterior process which is longer and reaching the tegminal apices, and also in the position of the ocelli which are closer to eyes than to each other and situated on the c-o line.

21. *Oxyrhachis unicolor* Ananthasubramanian
(Fig. 26)

1980. *Oxyrhachis unicolor* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Paper No. 16* : 7.

Male : General colour dark brown. Head fuscous brown, about 0.66X as wide as long, finely punctate with short white hairs, upper margin of vertex arcuate, lateral teeth inconspicuous, foliate lobes rectangular, inner margin broadly acute; eyes subglobose, a little oblique, dark marooned; ocelli dull succineous, equidistant from each other and from eyes and situated just above c-o line; cranial callosities indistinct; frontoclypeus almost as wide as long, sparsely pilose, apex truncate, fringed with long hairs. Pronotum shining dark brown, finely punctate with short silvery hairs; metopidium obliquely extending backward to disc, 3.0X as wide as high, median carina percurrent, supraocular callosities very prominent, dark brown, bare; humeral angles broadly obtuse, light brown; suprahumeral horns stout, short, as long as the space between their bases, viewed from sides directed upward above the level of disc, apices slightly recurved, subacute, viewed from front directed upward and outward, viewed from above directed outward, flattened; posterior process tectiform, punctate, narrow behind disc, strongly carinate, gibba prominent, posterior half slightly elevated and gently arched near apex which extends as far back as the tegminal tips, ventral keel serrate; propleural and mesopleural processes prominent; tegmina dull hyaline, more than 3.0X as long as wide, basal sixth coriaceous, dark brown, veins reddish brown, 2nd apical cell short, about 0.33X as long as 1st apical cell, apical limbus broad. Legs black. Abdomen dark brown.

Length from frontal margin to tips of tegmina 6.6 mm., to posterior process 6.6 mm.; width across tips of suprahumeral horns 3.1 mm., at humeral angles 2.5 mm., at eyes 2.0 mm.

Female : Unknown.

Material examined : Holotype male, Z.S.I., Calcutta; host, locality and date of collection not known.

This species is allied to *grandis* Ananthasubramanian in its body size and general colour, but differs by the shorter suprahumeral horns, narrow, slightly upwardly inclined posterior process, and very short 2nd apical cell of tegmina.

Subfamily CENTROTINAE Amyot and Serville

1843. Nudiscuti Amyot and Serville, *Histoire naturelle des insectes Hemipteres* : 549.

1850. Centrotoideae Spinola, *Soc. Ital. Modena Mem.*, 25(1) : 53.

1869. Centrotida Stål, *Ofv. Vet.-Ak. Forh.*, 8(1) : 47.
 1870. Centrotina Stål, *Ofv. Vet.-Ak. Forh.*, 27 : 727.
 1894. Centrotinae Fowler, *Biol. Centr. -Am., Rhynch. Hom.*, 2 : 3.
 1908. Centrotinae : *Distant, Fauna Br. India*, 4 : 9.

The Subfamily Centrotinae is diagnosed by the following characters :

"Scutellum exposed. Forewings completely exposed in repose, clavus abruptly acute apically, with two or three r-m cross veins (exception : *Brachybelus* Stål). Tibiae simple, not foliaceous. Metathoracic tibia triquetrous with three longitudinal rows of cucullate setae, row II and III double in some genera. Abdomen moderately to coarsely punctate dorsally and in some genera ventrally. Female with second valvulae variable." (Deitz, 1975).

Key to the Indian tribes of the Subfamily CENTROTINAE Amyot and Serville

- | | | |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1(2) | Pronotum with or rarely without suprahumeral horns; hind trochanters armed internally with teeth. | Tricentrini Ahmad and Yasmeen |
| 2(1) | Pronotum with suprahumeral horns, hind trochanters unarmed. | |
| 3(8) | Hind wings with 4 apical cells. | |
| 4(5) | Sides of mesonotum armed with 1 or 2 teeth; disc of pronotum elevated into a single erect, recurved or porrect process, its summit bilobed, bispined, bituberculate or compressed; posterior process impinging upon or more or less distant from scutellum, with or without subapical dorsal node. | Hypsauchenini Distant |
| 5(4) | Sides of mesonotum unarmed. | |
| 6(7) | Disc of pronotum elevated in a high, nearly erect process, its summit bilobed, or with a spine on each side; scutellum longer than wide, its apex usually acute. | Mitreunini Distant |
| 7(6) | Disc of pronotum not elevated in a high erect process. pronotum cornute above each humeral; scutellum as long as wide, its apex usually emarginate. | Leptocentrini Distant |
| 8(3) | Hind wings with 3 apical cells. | Centrotini Distant |

- 9(10) Pronotum more or less gibbous, usually without suprahumeral horns, rarely a slight tubercle or short carina above each humeral; hind wings with 4 apical cells. Uroxiphini Goding
- 10(9) Pronotum not gibbous, without suprahumeral horns; hind wings with 3 apical cells.
- 11(12) Apical angles of mesonotum more or less produced in spines; pronotum tuberculate or not; tegmina with or without pterostigma. Coccosterphini Distant
- 12(11) Apical angles of mesonotum not produced in spines; pronotum not tuberculate; tegmina without pterostigma, or with an incipient pterostigma. Gargarini Distant

Tribe TRICENTRINI Ahmad and Yasmeen

1974. Tricentrini Ahmad and Yasmeen, *Mitt. Hamburg. Zool. Mus. Inst.*, 71 : 175.

Relatively small, ovate or subovate; lateral lobes of frontoclypeus either distant or indistinctly fused with median lobe; suprahumeral horns either moderately or well developed or totally absent; humeral angles normal; sides of thorax unarmed; scutellum usually excavated at middle, usually exposed only at sides; posterior process impinging upon tegmina throughout its length, in some the apical part slightly raised; tegmina 2.0-3.0X as long as wide, with 5 apical and 2 discoidal cells; hind wings with 3 apical cells; hind trochanters armed with prominent spinules; hind tibiae simple; process of ninth segment absent or poorly developed; subgenital plate short and stubbed.

The tribe Tricentrini is separated from Gargarini Distant by the robust body form of the former in which the hind trochanters are always armed with spinules. The suprahumeral horns as a diagnostic character, are not reliable since they are absent in some species of Tricentrini.

Key to the genera of Indian Tricentrini

Posterior process moderately short, stout, its apex usually impinging on inner tegminal margin, never passing or just passing the posterior angle of the inner margin of tegmina; veins to the apical cells of tegmina straight or nearly so; scutellum mostly concealed, exposed only at its anterocentral corners; male genitalia with parameres slightly curved about the base with sharp apices.

Tricentrus Stål

Posterior process more slender and longer, its apex distinctly upwardly recurved and passing well beyond the posterior angle of the inner margin of tegmina; veins to the apical cells of tegmina strongly recurved; scutellum exposed to a greater extent; male genitalia with parameres conspicuously curved about the base with rounded and lobed apices.

Tricentroides Distant

Genus 3. *Tricentrus* Stål

1866. *Tricentrus* Stål, *Hemipt. Afr.*, 4 : 89, Distant, 1908, *Fauna Br. India*, 4 : 53; Ahmad and Yasmeen, 1974, *Mitt. Hamb. Zool. Mus. Inst.*, 71 : 183.
 1903. *Terentius* Buckton, *Monogr. Membrae.* : 270.
 1903. *Otaris* Buckton, *Monogr. Membrae* : 249.
 1905. *Taloipa* Buckton, *Trans. Linn. Soc. London*, 9 : 334.
 1912. *Centrotus* (in part), Matsumura, *Annot. Zool. Jpn.*, 8 : 20.
 1914. *Centrotoscelus* Funkhouser, *Pomona J. Entomol. & Zool.*, 6 : 72.
 1928. *Arisanagargara* Kato, *Insect World*, 32 : 48.

Head subquadrate, wider than long, base arcuate, eyes subglobose, ocelli usually closer to eyes than to each other and situated above c-o line, lower margins of vertex sloping and sinuate, frontoclypeus extending below lower margins of vertex, its lobes either fused throughout their length or two-thirds of their length, lateral margins rounded, weakly convex or parallel-sided; pronotum convex, punctate, metopidium vertical or sloping, wider than high, humeral angles strong, triangular; suprahumeral horns usually strong, simple and extending outward and upward, but varying greatly in size, length, position and structure, often showing remarkable differences in the two sexes, or totally absent in one or both the sexes; posterior process robust, impinging on tegmina, generally tectiform, nearly straight, apex sharp, not reaching or just passing the posterior angle of the inner margin of tegmina, median carina percurrent or obsolete through pronotum; scutellum as wide as long, concavely emarginate, apices acute, mostly concealed, exposed only as its anterolateral corners; tegmina hyaline, subhyaline or smoky hyaline with the base narrowly coriaceous and punctate, veins strong, 5 apical and 2 discoidal cells, veins to apical cells straight or nearly straight, apical limb broad; hind wings with 3 apical cells; legs with hind trochanters armed with spinules or teeth on the inner margins; male genitalia with subgenital plate short, stubbed; parameres smoothly curved towards the base, apices sharp; lateral valves triangular, their processes short, nodular, weakly chitinised, fringed with long bristles; aedeagus with apodeme well developed, shaft stout, its cephalic surface with fine teeth, apex acute.

Type species : *Tricentrus fairmairei* Stål

Key to Indian species of *Tricentrus*

- 1(92) Suprahumeral horns present.
 2(77) Apex of posterior process just reaching or slightly passing or passing well beyond the posterior angle of the inner margin of tegmina.

- 3(58) Apex of posterior process just reaching or slightly passing the posterior angle of the inner margin of tegmina.
- 4(25) Suprahumeral horns as long as or longer than the space between their bases.
- 5(12) Apex of frontoclypeus broadly rounded.
- 6(7) Suprahumeral horns obliquely directed forward; frontoclypeus extending for one-half its length below lower margins of vertex; suprahumeral horns much flattened, their apices obliquely truncate and recurved; tegmina hyaline, R₁, rs and part of the veins bordering 1st and 5th apical cells pitch black, remaining veins light yellow, costal margin opposite to 1st apical cell very thick; large greyish brown species. *spathodei* Ananthasubramanian
- 7(6) Suprahumeral horns not obliquely directed forward.
- 8(9) Frontoclypeus extending for two-thirds its length below lower margins of vertex; lateral areas of sternum white tomentose; apex of posterior process pitch black and slightly upturned, median carina obscurely continued on pronotum. Small black species. *albomaculatus* Distant
- 9(8) Frontoclypeus extending for one-half its length below lower margins of vertex.
- 10(11) Suprahumeral horns as long as the space between their bases, directed upward and outward, bicarinate, their apices subacute; posterior process slender, its apex gradually acuminate, median carina obsolete on pronotum; tegmina smoky hyaline; chocolate brown species. *banguensis* Funkhouser
- 11(10) Suprahumeral horns longer than the space between their bases, obliquely upturned, tricarinate, their apices subtruncate; posterior process robust, its apex subacute, median carina percurrent through pronotum; tegmina bronzy-brown, wrinkled; bronzy-brown species. *aeneus* Distant

- 12(5) Apex of frontoclypeus truncate.
- 13(14) Suprahumeral horns obliquely directed forward; frontoclypeus extending for one-half its length below lower margins of vertex; suprahumeral horns 1.5X as long as space between their bases, their apices subobliquely truncate; median carina of posterior process percurrent through pronotum; tegmina amber-hyaline, 1st discoidal cell not petiolate. *nobilis* Ananthasubramanian
- 14(13) Suprahumeral horns not obliquely directed forward.
- 15(24) Suprahumeral horns as long as the space between their bases.
- 16(19) Frontoclypeus extending for one-half its length below lower margins of vertex.
- 17(18) Suprahumeral horns transversely slightly upwardly produced, their apices acute; apex of posterior process a little upturned, acute; head and pronotum black. *euschistus* Distant
- 18(17) Suprahumeral horns obliquely upwardly produced, their apices subacute; apex of posterior process not upturned; head and pronotum pitch black. *mitrai* nom. nov.
- 19(16) Frontoclypeus extending for three-fourths its length below lower margins of vertex.
- 20(21) Median carina of posterior process finely continued through pronotum; tegmina subhyaline, with a large round pale white spot on the basal sixth, 1st discoidal cell petiolate, shorter than the 2nd. *cornutus* Ananthasubramanian
- 21(20) Median carina of posterior process strongly percurrent through pronotum.
- 22(23) Suprahumeral horns obliquely upwardly directed, their apices acute and strongly recurved; tegmina subhyaline. Dark castaneous brown species. *repandus* Distant

- 23(22) Suprahumeral horns directed outward and upward, their apices subacute and slightly curved; tegmina rusty brown with a large yellow spot following the dark basal area, 1st discoidal cell not petiolate, longer than the 2nd; rusty brown species. *longiceps* Ananthasubramanian
- 24(15) Suprahumeral horns longer than the space between their bases, very stout, directed horizontally; apex of posterior process subacute and slightly upturned, median carina percurrent through pronotum; tegmina bronzy, wrinkled, a white spot following the dark basal area; scutellum and sternum with white markings; dark bronzy brown species. *horizontalis* Distant
- 25(4) Suprahumeral horns shorter than the space between their bases.
- 26(43) Apex of frontoclypeus broadly rounded.
- 27(36) Suprahumeral horns less than one-half as long as the space between their bases.
- 28(31) Head and pronotum black; tegmina smoky hyaline.
- 29(30) Posterior process sinuate at base, median carina strongly percurrent through pronotum; tegmina with a testaceous transverse fascia beyond base. *fairmairei* (Stål)
- 30(29) Posterior process not sinuate at base; median carina faint on pronotum; tegmina with a narrow ferruginous fascia on outer margin of its apex. *brevis* Funkhouser
- 31(28) Head and pronotum brown; tegmina not smoky hyaline.
- 32(33) Suprahumeral horns set far back on pronotum behind humeral angles; median carina not percurrent on pronotum; ocelli equidistant from each other and from eyes. *aiyuri* Funkhouser

- 33(32) Suprahumeral horns set at normal position on pronotum and in front of humeral angles.
- 34(35) Suprahumeral horns highly variable in length (from hornless condition to horns about one-third as long as the space between their bases); ocelli situated above c-o line. *pilosus* Ananthasubramanian and Ananthakrishnan
- 35(34) Suprahumeral horns very short (about one-sixth as long as the space between their bases); ocelli situated on c-o line. *recurvicornis* Ananthasubramanian
- 36(27) Suprahumeral horns one-half or more as long as the space between their bases.
- 37(40) Median carina of posterior process strongly percurrent through pronotum; 2nd discoidal cell of tegmina not petiolate.
- 38(39) Pronotum reddish brown; posterior process straight, its apex acuminate. *distinctus* Thriumalai and Ananthasubramanian
- 39(38) Pronotum black; posterior process slightly sinuate, its apex subacute. *elegans* Ananthasubramanian
- 40(37) Median carina of posterior process obscurely continued on pronotum; 1st discoidal cell of tegmina petiolate.
- 41(42) Suprahumeral horns broad, horizontal, slightly upturned; tegmina bronzy brown, 1st discoidal cell with a very short petiole; medium-sized species. *gibbosulus* Walker
- 42(41) Suprahumeral horns somewhat narrow, obliquely upwardly and outwardly produced; tegmina hyaline, 1st discoidal cell with a long petiole; large species. *compressus* Ananthasubramanian
- 43(26) Apex of frontoclypeus truncate.

- 44(47) Suprahumeral horns obliquely directed forward.
- 45(46) Frontoclypeus extending for one-half its length below lower margins of vertex; pronotum purplish brown; posterior process slender, median carina strongly percurrent through pronotum; ocelli situated above c-o line. *indicus* nom. nov.
- 46(45) Frontoclypeus extending for three-fourths its length below lower margins of vertex; pronotum reddish brown; posterior process robust, flat; median carina finely continued on pronotum; ocelli situated on c-o line. *platycornis* Ananthasubramanian
- 47(44) Suprahumeral horns not obliquely directed forward.
- 48(57) Frontoclypeus extending for one-half its length below lower margins of vertex.
- 49(54) Head and pronotum black.
- 50(53) Suprahumeral horns broad, not compressed, their apices obliquely recurved; tegmina smoky brown or semihyaline, 1st discoidal cell petiolate.
- 51(52) Suprahumeral horns about two-thirds as long as the space between their bases; apex of posterior process not upturned; tegmina semihyaline, veins dark brown, a black patch opposite to 2nd apical cell. *atrus* Ananthasubramanian
- 52(51) Suprahumeral horns about one-half as long as the space between their bases; apex of posterior process slightly upturned; tegmina smoky brown, veins reddish brown. *minusculus* Ananthasubramanian
- 53(50) Suprahumeral horns narrow, compressed, their apices angularly curved; tegmina dark ochraceous. *pronus* Distant
- 54(49) Head and pronotum greyish brown or yellow.

- 55(56) Head and pronotum pale greyish brown; posterior process moderately attenuated, posterior half darker; tegmina subhyaline, wrinkled. *kamaonensis* Distant
- 56(55) Head and pronotum greyish yellow; posterior process moderately stout, not attenuated; tegmina light reddish brown, not wrinkled. *unicolor* Ananthasubramanian
- 57(48) Frontoclypeus extending for three-fourths its length below lower margins of vertex; suprahumeral horns about three-fourths as long as the space between their bases; pronotum fuscous brown; tegmina semihyaline. *cinereus* Ananthasubramanian
- 58(3) Apex of posterior process passing well beyond the posterior angle of the inner margin of tegmina.
- 59(68) Suprahumeral horns as long as or longer than the space between their bases.
- 60(65) Suprahumeral horns as long as the space between their bases.
- 61(64) Ocelli equidistant from each other and from eyes.
- 62(63) Pronotum ferruginous; posterior process slender, sharp, slightly curved; ocelli situated above c-o line, tegmina fuscous hyaline, much wrinkled. *ferrugineus* Funkhouser
- 63(62) Pronotum brown; posterior process stout, straight, not curved; ocelli situated on c-o line; tegmina hyaline, slightly wrinkled. *pubescens* Funkhouser
- 64(61) Ocelli closer to eyes than to each other; pronotum black, suprahumeral horns directed outward and upward; tegmina pale brown, a pale white rounded spot beyond the basal coriaceous area. *syrandrikae* Thirumalai and Ananthasubramanian

- 65(60) Suprahumeral horns longer than the space between their bases.
- 66(67) Pronotum black; suprahumeral horns directed outward and upward; tegmina subhyaline, a white transverse fascia beyond basal area. *allabens* Distant
- 67(66) Pronotum brown; suprahumeral horns directed obliquely forward and outward; tegmina bronzy hyaline without fascia. *speciosus* Ananthasubramanian
- 68(59) Suprahumeral horns shorter than the space between their bases.
- 69(76) Suprahumeral horns one-half to two-third as long as the space between their bases.
- 70(73) Apex of posterior process slightly but distinctly raised upward; pronotum greyish brown; suprahumeral horns projecting obliquely forward.
- 71(72) Suprahumeral horns one-half as long as the space between their bases; apex of frontoclypeus broadly rounded; 1st discoidal cell of tegmina not petiolate, 1st apical cell about 4.0X as long as wide. *minomorii* Ananthasubramanian
- 72(71) Suprahumeral horns two-thirds as long as the space between their bases; apex of frontoclypeus truncate; 1st discoidal cell of tegmina petiolate, 1st apical cell about 7.0X as long as wide. *longicornis* Ananthasubramanian
- 73(70) Apex of posterior process straight; pronotum ferruginous or dark piceous brown; suprahumeral horns not obliquely projecting forward.
- 74(75) Pronotum dark piceous brown; frontoclypeus extending for two-thirds its length below lower margins of vertex, its apex roundedly truncate; tegmina nearly 3.0X as long as wide, 1st discoidal cell petiolate, shorter than 2nd discoidal. *ananthasubramaniani* Sharma and Badan

- 75(74) Pronotum ferruginous; frontoclypeus extending for one-half its length below lower margins of vertex, its apex broadly rounded; tegmina about 3.5X as long as wide, 1st discoidal cell not petiolate, longer than the 2nd. *sissoo* Sharma and Badan
- 76(69) Suprahumeral horns less than one-half (about 1/7) as long as the space between their bases; pronotum shining black; frontoclypeus extending for one-half its length below lower margins of vertex, its apex broad and truncate; tegmina dull yellowish, basal dark coriaceous area followed by a broad light transverse fascia, 1st discoidal cell petiolate, much shorter than the 2nd; lateral areas of stemum white tomentose. *hameedi* n. sp.
- 77(2) Apex of posterior process not reaching the posterior angle of the inner margin of tegmina.
- 78(87) Suprahumeral horns as long as or longer than the space between their bases.
- 79(82) Apex of frontoclypeus broadly rounded; suprahumeral horns projecting obliquely forward and upward; ocelli situated on c-o line.
- 80(81) Pronotum black; suprahumeral horns 2.0X as long as the space between their bases; median carina of posterior process obscurely continued on pronotum; tegmina strongly wrinkled, 1st discoidal cell nearly as long as the 2nd, petiolate, petiole very short. *projectus* Distant
- 81(80) Pronotum purplish brown; suprahumeral horns 1.5X as long as the space between their bases; median carina of posterior process strongly percurrent purplish brown, 1st discoidal cell about half as long as the 2nd, petiolate, petiole long. *varicornis* Ananthasubramanian
- 82(79) Apex of frontoclypeus truncate or nearly so; suprahumeral horns directed outward and upward; ocelli situated above c-o line.

- 83(86) Suprahumeral horns as long as the space between their bases.
- 84(85) Head and pronotum black; median carina of posterior process finely continued on pronotum; apex of suprahumeral horns obtusely truncate; tegmina bronzy ochraceous with a distinct pale transverse fascia at outer margin of basal area. *bicolor* Distant
- 85(84) Head and pronotum fuscous brown; median carina of posterior process strongly percurrent through pronotum; apex of suprahumeral horns subacute; tegmina pale bronzy, without distinct fascia. *bifurcus* Distant
- 86(83) Suprahumeral horns 2.0X as long as space between their bases, horizontally extended, bicarinate, their apices broadly truncate; posterior process slightly separated from scutellum, amplified beneath, median carina strongly percurrent through pronotum; tegmina dark castaneous brown; large species. *transversus* (Distant)
- 87(78) Suprahumeral horns shorter than the space between their base.
- 88(91) Head and pronotum black; apex of frontoclypeus broad and rounded; suprahumeral horns projecting obliquely forward; tegmina pale bronzy brown.
- 89(90) Apices of suprahumeral horns subobliquely truncate; apex of posterior process not raised upward, median carina obscurely continued on pronotum; 1st discoidal cell of tegmina not petiolate. *congestus* (Walker)
- 90(89) Apices of suprahumeral horns roundedly subtruncate; apex of posterior process slightly projecting upward, median carina strongly percurrent through pronotum; 1st discoidal cell of tegmina petiolate. *subangulatus* Distant

- 91(88) Head and pronotum pale testaceous; apex of frontoclypeus truncate; apex of posterior process somewhat raised, median carina finely continued on pronotum; apices of suprahumeral horns subacute; tegmina subhyaline, talc-like, veins a little granulose. *assamensis* Distant
- 92(1) Suprahumeral horns absent.
- 93(94) Pronotum reddish brown; tegmina 3.0X as long as wide, without fascia, costal margin opposite to 1st apical cell moderately thickened, 1st discoidal cell as long as the 2nd; medium-sized species. *decornis* Ananthasubramanian and Ananthakrishnan
- 94(93) Pronotum shining black; tegmina 2.5X as long as wide, with a broad reddish brown subapical transverse fascia, costal margin opposite to 1st apical cell much thickened and chitinised, the thickening extending considerably into the 1st apical cell; 1st discoidal cell shorter than the 2nd; small species. *concolor* n.sp.

22. *Tricentrus aeneus* Distant
(Fig. 27)

1916. *Tricentrus aeneus* Distant, *Fauna Br. India*, 6 : 167.
 1927. *Tricentrus aeneus* : Funkhouser, *Gen. Cat. Heimpt.*, 1(1) : 496.
 1951. *Tricentrus aeneus* : Funkhouser, *Gen. Insect.*, 208 : 208.
 1934. *Otaris aeneus* : Goding, *Jt. N. Y. Entomol. Soc.*, 42 : 480.
 1965. *Otaris aeneus* : Metcalf and Wade, *Gen. Cat. Homopt.*, 1(1) : 421.

Female : General colour bronzy brown. Head reddish brown, vertical, 2.7X as wide across extremities of eyes as length of vertex, densely pilose, vertex about 2.0X as wide as long, upper margin strongly arcuate, lower margins obliquely continuous to frontoclypeus; eyes large, hemispherical, pale brown; ocelli reddish brown, closer to eyes than to each other and situated above c-o line; frontoclypeus extending for half its length below lower margins of vertex, densely pubescent, its lateral lobes fused along their entire length, apex broadly rounded, longly pilose. Pronotum finely punctate, with sparse golden pilosity, centrally longitudinally percurrently carinate; metopidium vertical, 2.25X as wide as high, punctate with sparse adpressed hairs, supraocular callosities conspicuous, black, impunctate, bare; humeral angles subprominent, their apices subacute; suprahumeral horns black, about 1.75X as long as space between their bases, seen from sides tricarinate, projecting obliquely forward and upward, seen from above somewhat

flattened, apices obliquely truncate, seen from front the apices subacute; posterior process robust, tricarinate, median carina percurrent through metopidium, apex subacute, impinging on tegmina and just reaching the posterior angle of the inner margins of tegmina; tegmina wrinkled, about 3.0X as long as wide, pale bronzy brown, basal angular area dark and finely punctate, 1st discoidal cell not petiolate, about as long as the 2nd. Legs with femora black, their apices and the tibiae and tarsi testaceous.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.2 mm.; width across tips of suprahumeral horns 3.2 mm., at humeral angles 2.0 mm., at eyes 1.75 mm.

Male : Unknown.

Material examined : 1 female in Tamil Nadu Agricultural College, Coimbatore, collected from Assam, 2-5-1919.

Lectotype female in British Museum, type locality Kurseong, E. Himalayas.

Distribution : INDIA : W. Bengal (E. Himalayas, Darjeeling); Assam, BANGLADESH Sreemangal. BURMA : Tenasserim, Myitta. MALAYSIA.

This species is closely related to *projectus* Distant in the long suprahumeral horns directed obliquely forward and upward, the strongly wrinkled tegmina and the broadly rounded apex of frontoclypeus, but differs in the general colour of the body and tegminal characters.

23. *Tricentrus aiyuri* Funkhouser (Fig. 28)

1933. *Tricentrus aiyuri* Funkhouser, *Indian Forest Records*, 17(10) : 5.

Male : General colour black. Head black, subquadrate, 3.2X as wide across extremities of eyes as length of vertex, finely punctate with short, adpressed pilosity, vertex 2.2X as wide as long, upper margin shallowly arcuate, lower margins rounded; eyes moderately large, black; ocelli black, subprominent, equidistant from each other and from eyes and situated above c-o line; frontoclypeus dull black, finely punctate with long, sparse pilosity, extending for two-thirds its length below lower margins of vertex, apex rounded. Pronotum black, coarsely punctate with short, silvery hairs, metopidium 2.0X as wide as high, obliquely sloping backward toward the disc; supraocular callosities subprominent, divided, bare; humeral angles prominent, extending laterad beyond the level of suprahumeral horns, their apices blunt; suprahumeral horns very short, weakly carinate, placed far back on pronotum above and behind humeral angles, triangular, about one-fifth as long as the space between their bases, extending outward, slightly upward and backward, viewed from above much flattened, not extending as far as the apices of humeral angles; posterior process strong, robust, tricarinate, gradually tapering to apex which is acute, just reaching the posterior angle of the inner margin of tegmina, median carina obsolete on pronotum; tegmina 2.6X as long as wide, smoky hyaline, wrinkled, basal fifth coriaceous, black, punctate, veins stout, ferruginous, 1st discoidal cell petiolate, about 4.0X as long as wide, apical limbus broad. Lateral areas of sternites black, punctate, sparsely pilose.

Length from frontal margin to tips of tegmina 4.2 mm., to tip of posterior process 2.9 mm.; width across tips of suprahumeral horns 1.6 mm., at humeral angles 1.8 mm., at eyes 1.6 mm.

Female : Unknown.

Material examined : One male, FRI, Dehra Dun; coll. Aiyur, Salem; Male Holotype in FRI, Dehra Dun.

Distribution : INDIA : Tamil Nadu (Salem, Aiyur).

T. aiyuri can be separated from the other known species of the genus by the fact that the suprahumeral horns are very short and located far back on the pronotum, above and behind the humeral angles.

24. *Tricentrus albomaculatus* Distant (Fig. 29)

1908. *Tricentrus albomaculatus* Distant, *Fauna Br. India*, 4 : 56.

1975. *Tricentrus albomaculatus* : Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 234.

1979. *Tricentrus albomaculatus* : Ahmad and Yasmeen, *Oriental Insects*, 12(4) : 535.

Female : General colour black. Head 3.0X as wide across extremities of eyes as length of vertex, finely pilose, base of vertex shallowly emarginate, lower margins oblique; eyes reddish brown, subovate; ocelli minute, closer to eyes than to each other and situated above c-o line; frontoclypeus sparsely covered with silvery hairs, extending for half its length below lower margins of vertex, apex rounded. Pronotum black, finely punctate, clothed with short, adpressed silvery hairs, metopidium convex, vertical supraocular callosities inconspicuous; humeral angles prominent, projecting outward, their apices blunt; suprahumeral horns short, about 0.3X as long as the space between their bases, as seen from sides directed upward and recurved, seen from above somewhat broad, apically recurved, anterior margins rounded, apices subacute, dorso-posterior carinae slightly behind the middle, as seen in front much narrower and obliquely upcurved; posterior process robust, contiguous with scutellum and inner tegminal margin, apical area black, apex reaching the posterior angle of the inner margin of tegmina and slightly upcurved, median carina obscurely continued through pronotum; tegmina 3.0X as long as wide, dull bronzy hyaline, basal sixth black, coriaceous, coarsely punctate, 1st apical cell about 5.0X as long as wide, 1st discoidal cell nonpetiolate; lateral areas of pronotum and sternum white tomentose; legs piceous.

Length from frontal margin to tips of tegmina 3.8 mm., to tip of posterior process 3.0 mm.; width across tips of suprahumeral horns 2.6 mm., at humeral angles 1.9 mm., at eyes 1.7 mm.

Male : General colour black. Smaller than female; suprahumeral horns very short.

Length from frontal horns to tips of tegmina 3.1 mm., to tip of posterior process 2.3 mm.; width across tips of suprahumeral horns 2.0 mm., at humeral angles 1.5 mm., at eyes 1.3 mm.

Fifth instar nymph : General colour pale green. Bases of suprahumeral buds, costal margins of tegminal pads, bases of abdominal dorsal tubercles and distal half of anal tube shaded with black. Head 2.0X as wide as long, rostrum directed backward, its tip reaching abdominal segment I, eyes black, subglobose, ocelli closer to eyes than to each other and situated above c-o line; apex of frontoclypeus not extending below lower margins of vertex; pronotum with scattered chalazae, its posterior process extending over meosnotum, mesonotal process very short, its apex blunt; abdominal segments III-VIII with well developed dorsal tubercles tipped with spines and with a transverse row of tuberculate spines directed backward, lateral lamellae nearly similar to those of the genus *Leptocentrus* in shape, each lamellae fringed with 7 long tuberculate spines in addition to small spines; anal tube about 0.24X as long as body.

Material examined : 75 females, 48 males and numerous nymphs, ex *Datura fastuosa* at Madras; December, 1966. Female lectotype in British Museum.

Distribution : INDIA : Madras, Bombay, Assam; BURMA : Tenasserim, Penang, Singapore; KWANGTUNG; HAINAN; HAWAII; BRAZIL.

T. albomaculatus is closely allied to *T. subangulatus* Distant but differs by the very short suprahumeral horns, general colour of the body and legs, etc.

25. *Tricentrus allabens* Distant

(Fig. 30)

1916. *Tricentrus allabens* Distant, *Fauna Br. India*, 6 : 166.

1935. *Tricentrus allabens* : Wu, *Cat. ins. sinens.* 2(1-2) : 63.

1951. *Tricentrus allabens* : Funkhouser, *Gen. Ins.*, 208 : 209.

Female : General colour black. Head black, thickly covered with golden pilosity, 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, upper margin arcuate and weakly sinuate, lower margins strongly obliquely curved to frontoclypeus; eyes large, greyish white; ocelli black, closer to eyes than to each other and situated well above c-o line; frontoclypeus slightly longer than wide, extending for three-fourths its length below lower margins of vertex, basal lobes fused with the main lobe, apex broadly rounded. Pronotum black, coarsely punctate, sparingly pilose; metopidium almost vertical, about 2.0X as wide as high, supraocular callosities conspicuous, jet black, undivided, impunctate; humeral angles moderately prominent, triangular their apices obtusely blunt; suprahumeral horns slender, viewed in front longer than the space between their bases, directed outward and upward, their apices acute, moderately recurved, viewed from above somewhat flattened and directed outward; posterior process tricarinate, posterior half dull castaneous, slightly sinuate, gradually narrowing to an acute apex which passes the posterior angle of the inner margin of tegmina, median carina finely continued through pronotum; tegmina 2.75X as long as wide; subhyaline, wrinkled, basal area black, punctate, followed by a white transverse fascia, veins fuscous brown, 1st apical cell 5.0X as long as wide, 1st discoidal cell petiolate, as long as the 2nd, apical limb broad; lateral areas of sternum white tomentose; legs with trochanters black, femora fuscous brown, tibiae castaneous, tarsi light brown.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 4.25 mm., width across tips of suprahumeral horns 3.0 mm., at humeral angles 2.5 mm., at eyes 2.2 mm.

Male : Unknown.

Material examined : 2 females in Z.S.I., Calcutta one from Darjeeling (7,000 ft.), June 4, 1917 (E. Brunetti) and the other collected from hills near Taiping, Perak, 1915 (A. Annandale) Lectotype female in British Museum.

Distribution : INDIA : Darjeeling; SUMATRA : Perak Is., Penang Is.; BORNEO: Sandakan, Betotan; CHINA : Taiping.

Tricentrus allabens is closely allied to *albomaculatus* Distant in the presence of white tomentosity on lateral areas of sternum, and to *subangulatus* Distant in the disposition of the posterior process, but differs from both by the long, slender, recurved suprahumeral horns.

26. *Tricentrus ananthasubramaniani* Sharma and Badan
(Fig. 31)

1986. *Tricentrus ananthasubramaniani* Sharma and Badan, *Reichenbachia Mus. Tierk. Dresden*, 23(30) : 165.

Female : General colour dark reddish brown. Head piceous, densely pilose, about 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, upper margin shallowly arcuate, lower margins strongly obliquely continued to frontoclypeus; eyes subglobose, piceous brown; ocelli succineous, closer to eyes than to each other and situated above c-o line; frontoclypeus brown with shades of black, densely longly pilose, extending for one-third its length below lower margins of vertex, apex truncately rounded, frontoclypeal lobes fused with the main lobe. Pronotum dark piceous brown, finely punctate with golden pilosity, metopidium vertical, about 2.0X as wide as high, supraocular callosities black, prominent, undivided; humeral angles subprominent, dark brown, their apices subacute; suprahumeral horns about half as long as the space between their bases, directed obliquely upward and outward, apical area curved backward, tricarinate, apices acute; posterior process rather slender, slightly sinuate at base, posterior half black, tapering to an acute apex which passes beyond the posterior angle of the inner margin of tegmina, tricarinate, median carina strongly percurrent through pronotum; tegmina 2.75X as long as wide, basal area black, punctate, veins black, sparsely hairy, 1st apical cell about 5.0X as long as wide, 1st discoidal cell petiolate, shorter than the 2nd, a brown spot at the apical area of costal margin, apical limbus broad. Body beneath pale brown. Legs dark brown with the exception of tarsi which are pale yellowish brown.

Length from frontal margin to tips of tegmina 4.5 mm., to tip of posterior process 3.3 mm.; width across tips of suprahumeral horns 3.0 mm., at humeral angles 1.9 mm., at eyes 1.8 mm.

Male : Slightly smaller than female. General colour black. Suprahumeral horns shorter than female.

Length from frontal margin to tips of tegmina 4.2 mm., to tip of posterior process 2.7 mm.; width across tips of suprahumeral horns 2.6 mm., at humeral angles 1.8 mm., at eyes 1.6 mm.

Material examined : 5 females and 2 males ex *Dalbergia latifolia*, at Mannarkad, Kerala. 1-7-1983; types in P. Badan collections.

Distribution : INDIA : Jammu, Kerala.

This species is closely related to *congestus* (Walker) in the nature of metopidium and suprahumeral horns, but differs by the relatively slender posterior process the apex of which passes well beyond the posterior angle of the inner margin of tegmina and also by the markings on the tegmina.

27. *Tricentrus assamensis* Distant
(Fig. 32)

1908. *Tricentrus assamensis* Distant, *Fauna Br. India*, 4 : 57.

Female : General colour pale greyish brown. Head greyish brown, 3.0X as wide across extremities of eyes as length of vertex, finely punctate, with short hairs, vertex 2.0X as wide as long, upper margin strongly arcuate, sinuate, lower margins slightly oblique; eyes large, greyish brown; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus wider than long, extending for one-third its length below lower margins of vertex, finely pilose, apex truncate. Pronotum pale testaceous, thickly coarsely punctate, very sparingly pilose; metopidium 2.0X as wide as high, obliquely sloping behind to disc; supraocular callosities conspicuous, oval, undivided, impunctate; humeral angles subprominent, their apices subacute; suprahumeral horns slightly shorter than the space between their bases, viewed from sides directed upward and backward, seen from above appearing shorter and narrower, medially carinate, apical areas slightly recurved, apices subacute, viewed in front directed more obliquely upward and the apices more acute; posterior process moderately stout, almost straight, tricarinate, the median carina finely continued through pronotum, apical area gradually tapering to an acute apex which does not reach the posterior angle of the inner margin of tegmina; tegmina subhyaline, 3.0X as long as wide, wrinkled, veins stout, a little granulose, finely ochraceous, basal area opaque, punctate, 1st apical cell narrow and long, 1st discoidal cell nonpetiolate, shorter than the 2nd, apical limb broad. Body beneath piceous, palely setose. Legs pale castaneous.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 3.5 mm., at humeral angles 2.5 mm., at eyes 2.2 mm.

Male : Unknown.

Material examined : One female from Dehra Dun; 3 females ex *Santalum album* at Aiyur, Salem (Tamil Nadu), in FRI, Dehra Dun.

Distribution : INDIA : Tamil Nadu (Aiyur, Salem); Uttar Pradesh (Dehra Dun); Assam; SINGAPORE.

T. assamensis is closely related to *selenus* (Buckton) from Tenasserim in the general colour and tegminal characters but differs by the much slender suprahumeral horns, and the posterior process short, not reaching the posterior angle of the inner margin of the tegmina.

28. *Tricentrus atrus* Ananthasubramanian
(Fig. 33)

1980. *Tricentrus atrus* Ananthasubramanian, *Rec. zool. Surv. India. Occ. Paper No. 16* : 23.

Male : General colour dull black. Head black, 2.6X as wide across extremities of eyes as length of vertex, finely punctate, with golden pilosity, vertex 1.75X as wide as long, upper margin arcuate, lower margins obliquely rounded toward frontoclypeus; eyes pale yellowish white; ocelli succineous, closer to eyes than to each other and situated above c-o line; frontoclypeus extending for half of its length below lower margins of vertex, apex truncate, basal lobes inconspicuous. Pronotum black, finely punctate and densely pubescent with adpressed golden pilosity; metopidium about 4.0X as wide as high, vertical; humeral angles prominent, their apices subacute; supraocular callosities rounded, undivided, bare; suprahumeral horns short, slender, broadbased, tricarinate, viewed from sides directed upward and strongly recurved, not reaching the level of disc, apices acute, viewed from above appearing broader and compressed; posterior process strong, tricarinate, median carina strong, percurrent through pronotum, apical area gradually tapering, apex subacute, impinging on tegmina, just reaching the posterior angle of the inner tegminal margin; tegmina semihyaline, about 2.75X as long as wide, apical limbus moderately broad, with a black patch opposite to 2nd apical cell, veins dark brown, 1st apical cell 5.0X as long as wide, 1st discoidal cell petiolate, shorter than the 2nd. Legs black upto femora, rest light brown.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 4.3 mm.; width across tips of suprahumeral horns 4.0 mm., at humeral angles 3.4 mm., at eyes 2.9 mm.

Female : Unknown.

Material examined : Holotype male, Z.S.I. Reg. No. 668/H15 from Bichalim uphill, Goa, ex *Anacardium occidentale*, 10-4-1966; coll. Pradhan and Party.

Distribution : INDIA.

T. atrus is closely allied to *gibbosulus* Walker in the disposition of the suprahumeral horns and in the nature of the posterior process, but differs by a very low metopidium and by the shape of the 1st apical cell of tegmina.

29. *Tricentrus banguensis* Funkhouser
(Fig. 34)

1914. *Tricentrus banguensis* Funkhouser, *Jt. N. Y. ent. Soc.*, 22 : 238.

1965. *Tricentrus banguensis* : Metcalf and Wade, *Gen. Cat. Hem.* : 386.

Female : Colour chocolate brown. Head nearly 3.0X as wide across extremities of eyes as length of vertex, finely pilose, vertex about 2.0X as wide as long, upper margin arcuate, lower margins rounded; eyes subglobose, yellow; ocelli cream coloured, closer to eyes than to each other and situated well above c-o line; frontoclypeus light brown, densely longly pilose, extending for half of its length below lower margins of vertex, apex rounded. Pronotum coarsely punctate, finely pubescent, metopidium dark brown, vertical, 1.75X as wide as high, supraocular callosities inconspicuous; humeral angles prominent, their apices blunt; suprahumeral horns robust, broad-based, as long as the space between their bases, viewed in front extending strongly outward and slightly backward, viewed from sides extending upward, strongly tricarinate above, faintly bicarinate below, apices acute; posterior process slender, sinuate, gradually tapering, tricarinate, median carina extending obsoletely through pronotum, apex acute, reaching the posterior angle of the inner margin of tegmina; tegmina hyaline with a hue of black, 3.0X as long as wide, chocolate brown at basal area, 1st apical cell 4.0X as long as wide, 1st discoidal cell petiolate, nearly as long as the 2nd, apex of tegmina narrow, apical limb broad. Abdomen beneath dark brown. Legs ferruginous.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.5 mm.; width across tips of suprahumeral horns 3.0 mm., at humeral angles 2.0 mm., at eyes 1.8 mm.

Male : Unknown.

Material examined : Two females in FRI, Dehra Dun, one from Darjeeling (1,800 ft.) and the other from Dehra Dun.

Distribution : INDIA : Darjeeling, Dehra Dun; MALAYSIA; SUMATRA; BORNEO; INDONESIA : Banguay.

T. banguensis is closely related to *aeneus*. Distant in the general colour and length of body, in the non-oblique apices of suprahumeral horns and in the rounded apex of frontoclypeus, but differs in the shorter suprahumeral horns and in the slender posterior process.

30. *Tricentrus bicolor* Distant (Fig. 35)

1908. *Tricentrus bicolor* Distant, *Fauna Br. India*, 4 : 55.

1979. *Tricentrus bicolor* : Ahmad and Yasmeen, *Oriental Insects*, 12(4) : 537.

Female : General colour black. Head vertical, 3.0X as wide across extremities of eyes as length of vertex, very finely punctate, densely pubescent, hairs golden brown, vertex 2.2X as wide as long, upper margin arcuate, lower margins broadly rounded; eyes large, brown; ocelli black, small, closer to eyes than to each other and situated above c-o line; frontoclypeus narrow at base, extending for half its length below lower margins of vertex, densely pubescent, apex truncate. Pronotum black, thickly coarsely punctate, with sparse golden pilosity; metopidium 2.0X as wide as high, convex, vertical; supraocular callosities prominent, jet black, impunctate; humeral angles large, black, extending beyond the level of eyes, apices subacute; suprahumeral horns as long as

the space between their bases, viewed from front narrow, obliquely extended outward and upcurved, viewed from above tricarinate, somewhat strongly recurved, centrally carinate, anterior margin rounded, posterior margin almost obliquely straight, apex obtusely subtruncate; posterior process short, robust, centrally and laterally carinate, central carina finely continued through pronotum, apex acute, a little raised, not quite reaching the posterior angle of the inner margin of tegmina; tegmina bronzy ochraceous, 3.0X as long as wide, basal area black, punctate, followed by a pale, rather indistinct transverse area at outer margin, veins to apical area slightly recurved, 1st apical cell 5.0X as long as wide, 1st discoidal cell petiolate, apical limb broad. Body beneath black. Legs with femora except their apices black, apices of femora and tibiae ferruginous, tarsi light brown.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.0 mm.; width across tips of suprahumeral horns 3.0 mm., at humeral angles 2.0 mm., at eyes 2.0 mm.

Male : Similar to female but distinctly smaller.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 2.4 mm.; width across tips of suprahumeral horns 2.5 mm., at humeral angles 2.0 mm., at eyes 1.8 mm.

Material examined : 2 females from Dehra Dun (Uttar Pradesh), 1 female from Mussorree, 1 male from Akeswar, all in FRI, Dehra Dun; lectotype female in British Museum; type locality Bombay.

Distribution : INDIA : Uttar Pradesh (Dehra Dun, Mussorree, Garhwal); Bombay; BANGLADESH; PAKISTAN.

T. bicolor is closely allied to *gibbosulus* (Walker) in the nature of the suprahumeral horns and posterior process, but differs by the obliquely projecting horns which in *gibbosulus* are directed outward and more horizontally, and by the presence of petiole for the 1st discoidal cell of tegmina.

31. *Tricentrus bifurcus* Distant

(Fig. 36)

1916. *Tricentrus bifurcus* Distant, *Fauna Br. India*, 6 : 165.

1979. *Tricentrus bifurcus* : Ahmad and Yasmeen, *Pacific Insects*, 20(2-3) : 260.

Female : General colour fuscous brown. Head 2.7X as wide across extremities of eyes as length of vertex, finely closely punctate, with short, sparse, golden pilosity, vertex 2.0X as wide as long, upper margin shallowly arcuate, lower margins obliquely rounded; eyes moderately large, brown with a dark hue; ocelli brown, slightly closer to eyes than to each other and situated above c-o line; frontoclypeus narrow at base, densely pilose, extending for half its length below lower margins of vertex, apex truncate. Pronotum fuscous brown, thickly punctate, centrally longitudinally percurrently carinate, metopidium vertical, convex, about 2.0X as wide as high, coarsely punctate; supraocular callosities black, undivided, impunctate; humeral angles

moderately large, their apices subacute; suprahumeral horns viewed from above as long as the space between their bases, obliquely erect, their apices subacute and strongly recurved; posterior process short, tricarinate, robust, apex acute, not reaching the posterior angle of the inner margin of the tegmina, median carina strongly percurrent through pronotum; tegmina pale bronzy, about 2.8X as long as wide, basal area fuscous brown, 1st apical cell wedge-shaped, 2.5X as long as wide, 1st discoidal cell with a short petiole, apical limb broad. Legs testaceous, bases of femora black.

Length from frontal margin to tips of tegmina 5.5 mm., to tip of posterior process 3.3 mm.; width across tips of suprahumeral horns 3.0 mm., at humeral angles 2.3 mm., at eyes 2.0 mm.

Male : General colour black; smaller than female. Suprahumeral horns present or absent, when present shorter than the space between their bases; tegmina smoky hyaline, without basal transverse fascia.

Length from frontal margin to tips of tegmina 4.5 mm., to tip of posterior process 2.75 mm.; width across tips of suprahumeral horns 2.2 mm., at humeral angles 2.0 mm., at eyes 1.75 mm.

Material examined : One female in FRI, Dehra Dun; 5 females and 3 males ex *Eupatorium odorum*, at Malampuzha Dam, Palghat, 8-12-1982. Type locality Darjeeling; Lectotype female in British Museum.

Distribution : INDIA : Uttar Pradesh (Darjeeling, Dehra Dun); Kerala State (Malampuzha Dam, Palghat); BANGLADESH; PAKISTAN.

T bifurcus is very closely allied to *projectus* Distant, but distinctly differs by the strongly recurved apices of the suprahumeral horns and the shorter posterior process which does not reach the posterior angle of the inner margin of tegmina.

32. *Tricentrus brevis* Funkhouser (Fig. 37)

1914. *Tricentrus brevis* Funkhouser, *Jt. N. Y. ent. Soc.*, 22 : 3.

1922. *Tricentrus brevis* : Funkhouser, *Rec. Indian Mus.*, XXIV : 323.

1929. *Tricentrus brevis* : Funkhouser, *Jour. Fed. Malay States Mus.*, 14 : 474.

Male : General colour black. Body robust; head finely sparsely pubescent, about 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, upper margin arcuate, lower margins rounded; eyes brown, subovate; ocelli white, closer to eyes than to each other and situated distinctly above c-o line; frontoclypeus densely pubescent, extending slightly below lower margins of vertex, apex broadly rounded. Pronotum black, finely punctate, sparsely pilose, metopidium 2.0X as wide as high, convex, obliquely sloping backward to disc; supraocular callosities inconspicuous; humeral angles subprominent, apices subacute; suprahumeral horns short, 0.3X as long as the space between their bases, slender, anterior margins rounded, tricarinate, above, apices acute; posterior process broad at base, tricarinate, median carina faint

on pronotum, apical area narrowing to an acuminate apex which passes distinctly well beyond the posterior angle of the inner margin of tegmina and slightly upturned; tegmina smoky hyaline, 3.0X as long as wide, basal sixth black, punctate, coriaceous, a narrow ferruginous fascia on outer margin near apex, 1st discoidal cell petiolate, narrower than the 2nd, apical limb broad. Body beneath black, punctate and pubescent. Legs ferruginous.

Length from frontal margin to tips of tegmina 4.5 mm., to tip of posterior process 3.2 mm.; width across tips of suprahumeral horns 2.25 mm., at humeral angles 1.9 mm., at eyes 1.7 mm.

Female : Unknown.

Material examined : One male, FRI, Dehra Dun, Coorg (Karnataka); Type locality Banguay Island.

Distribution : INDIA : Karnataka State (Coorg); INDONESIA : Banguay.

T. brevis is closely allied to *banguensis* Funkhouser in the nature of the suprahumeral horns and tegmina, but it is smaller and more robust; its colour and disposition of the posterior process are also different from those of *banguensis*.

33. *Tricentrus cinereus* Ananthasubramanian (Fig. 38)

1980. *Tricentrus cinereus* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Pap. No. 16* : 20.

Female : General colour fuscous brown. Head about 2.6X as wide across extremities of eyes as length of vertex, dark brown, thickly pilose, hairs silvery white, base of vertex shallowly arcuate, lower margins strongly obliquely continued to frontoclypeus; eyes fuscous brown, subglobose; ocelli succineous, closer to eyes than to each other and situated above c-o line; frontoclypeus light brown, thickly long pilose, extending for about three-fourths its length below lower margins of vertex, apex nearly truncate. Pronotum fuscous brown, broad, compressed dorsoventrally, thickly pilose; metopidium 2.0X as wide as high, convex, gently sloping behind to the disc; supraocular callosities prominent, black, oval, undivided; humeral angles prominent, sparsely pilose, apices blunt; suprahumeral horns short, strong, more than three-fourths as long as the space between their bases, directed upward, apices sharply recurved, lateral carinae prominent, black, viewed from front appearing much narrower, tricarinate; posterior process strong, tricarinate, median carina percurrent through pronotum, apical half attenuate, weakly arched, pale reddish brown, slightly raised above tegmina, apex black, passing beyond the posterior angle of the inner margin of tegmina; tegmina subhyaline, 3.0X as long as wide, basal sixth coriaceous, finely punctate, with a rounded pale white fascia, veins light yellowish, 1st apical cell nearly 8.0X as long as wide, 1st discoidal cell not petiolate, slightly longer than the 2nd. Legs dark brown. Abdomen beneath black.

Length from frontal margin to tips of tegmina 5.4 mm., to tip of posterior process 3.8 mm.; width across tips of suprahumeral horns 3.6 mm., at humeral angles 2.7 mm., at eyes 2.4 mm.

Male : Unknown.

Material examined : Holotype female, Z.S.I. Reg. No. 663/H15, one paratype female, Z.S.I. Reg. No. 664/H15, Lakshmikantapur (Calcutta, West Bengal), 15-10-1965.

T. cinereus is allied to *subangulatus* Distant and *mitrai* nom. nov. in the stout suprahumeral horns and their disposition, and in the presence of a rounded fascia near the basal part of tegmina, but differs from both by the colour of tegmina, very broad pronotum and rather attenuated posterior process.

34. *Tricentrus compressus* Ananthasubramanian (Fig. 39)

1980. *Tricentrus compressus* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Pap. No. 16* : 21.

Female : General colour black. Head 2.75X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, clothed with long silvery hairs, upper margin shallowly arcuate, lower margins obliquely rounded; eyes large, yellowish brown, subglobose; ocelli pale white, closer to eyes than to each other and situated on the c-o line; frontoclypeus densely pilose, extending for about half its length below lower margins of vertex, apex broadly rounded. Pronotum black, finely punctate, sprinkled with golden pilosity; metopidium convex, almost vertical, 2.5X as wide as high, supraocular callosities distinct, undivided; humeral angles black, subprominent, apices subacute; suprahumeral horns 0.33X as long as the space between their bases, obliquely directed upward and outward, tricarinate, apical area slightly inclined backward, apex subacute; posterior process stout at base, slender beyond middle, gradually tapering to apex, apex black, acute, reaching the posterior angle of the inner margin of tegmina, median carina percurrent through pronotum; tegmina 3.0X as long as wide, apical cells bounded by dark brown veins, 1st apical cell 6.0X as long as wide, 1st discoidal cell petiolate. Legs light brown except trochanters and femora which are black, hind trochanters toothed on the dilated internal surface. Abdomen dark brown.

Length from frontal margin to tips of tegmina 6.4 mm., to tip of posterior process 4.4 mm.; width across tips of suprahumeral horns 3.0 mm., at humeral angles 2.5 mm., at eyes 2.2 mm.

Male : Unknown.

Material examined : Holotype female in Z.S.I. Reg. No. 665/H15, Pander Keshwar, Garhwal Dist., U.P., 9,000 ft., 1-7-1958, coll. B.S. Lamba.

Distribution : INDIA : Uttar Pradesh (Garhwal).

T. compressus is allied to *kamaonensis* Distant in the general shape of the body and in the somewhat slender region of the posterior process, but distinctly differs from it in the absence of tomentosity on the lateral areas of the sternum and by the presence of transverse fascia on the tegmina.

35. *Tricentrus concolor* sp. nov.
(Fig. 40)

Female : General colour shining black. Head black, about 3.0X as wide across extremities of eyes as length of vertex, finely punctate, with sparse golden pilosity, vertex 1.5X as wide as long, upper margin strongly arcuate, lower margins broadly rounded; eyes large, subovate, dull white with a dark hue; ocelli vitreous, closer to eyes than to each other and situated above c-o line; frontoclypeus densely longly pilose with golden hairs, extending for one-half its length below lower margins of vertex, apex broadly rounded. Pronotum shining black, strongly punctate, with sparsely scattered pilosity; metopidium vertical to about two-third of its height and then gradually sloping behind to disc; humeral angles prominent; supraocular callosities inconspicuous; humeral angles prominent; suprahumeral horns absent; posterior process robust, shining black, tricarinate, gradually tapering, apex acute, just passing the posterior angle of the inner margin of tegmina, median carina strongly percurrent through pronotum; tegmina about 2.5X as long as wide, subhyaline, basal sixth black, punctate, coriaceous, sparsely pilose, proximal half pale white, a broad reddish brown transverse fascia on the apical cells, veins bordering discoidal cells smoky brown, a broad chitinised area partly absorbing R1 and extending considerably into the 1st apical cell, 1st discoidal cell shorter than the 2nd, without distinct petiole, apical limbus broad; abdomen beneath black, punctate, sparsely hairy. Legs with coxae, trochanters and femora (except apices) black, apices of femora, and tibiae dark brown, tarsi light brown, claws reddish brown, hind trochanters spinose.

Length from frontal margin to tips of tegmina 3.0 mm., to tip of posterior process 2.2 mm.; width across tips of humeral angles 1.5 mm., at eyes 1.3 mm.

Male : Unknown.

Material examined : Female holotype and one paratype female, ex *Cajanus cajan*, Panjim, Goa:2-2-1988.

Distribution : INDIA : Goa.

T. concolor n.sp. is closely allied to *decornis* Ananthasubramanian and Ananthakrishnan in the absence of suprahumeral horns, in the colour of the eyes, in the position of the ocelli and in the nature of the frontoclypeus, but differs in the general colour, in the presence of a large chitinous thickening of the costal margin of tegmina opposite to the 1st apical cell, and in the presence of a broad, transverse fascia in the subapical area of the tegmina; it is also much smaller than *decornis*.

36. *Tricentrus congestus* (Walker)
(Fig. 41)

1858. *Centrotus congestus* Walker, *Ins. Saund., Hom.* : 79.
1908. *Tricentrus congestus* : Distant, *Fauna Br. India*, 4 : 54.
1934. *Otaris congestus* : Goding, *Jt. N. Y. ent. Soc.*, 42 : 480.
1975. *Tricentrus congestus* : Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 231.

Female : General colour brown. Head about 3.0X as wide across extremities of eyes as length of vertex, thickly ochraceously pilose, vertex 2.0X as wide as long, upper margin very shallowly arcuate, lower margins obliquely continued to frontoclypeus; eyes moderately large, dull ochraceous; ocelli slightly closer to eyes than to each other and situated above c-o line; frontoclypeus densely pubescent, extending for half its length below lower margins of vertex, apex broadly rounded, frontoclypeal lobes almost completely fused with the main lobe. Pronotum dark brown, finely punctate, thickly clothed with short greyish hairs; metopidium convex, 1.6X as wide as high; supraocular callosities conspicuous, rounded, black, undivided; humeral angles prominent, sparsely pilose, apices blunt; suprahumeral horns robust, obliquely projecting forward, about three-fourths as long as the space between their bases, lateral carinae strong, reddish brown, viewed from above appearing broad, obliquely ascendant, apices subobliquely truncate; posterior process robust, tricarinate, basal half attenuate, slightly arched, apex acute, impinging on tegmina and just reaching the posterior angle of the inner margin of tegmina, median carina percurrent through metopidium; tegmina pale bronzy brown, about 3.0X as long as wide, 1st discoidal cell not petiolate, slightly longer than the 2nd, apical limb moderately broad. Legs black upto tibiae, tibiae reddish brown, tarsi light brown.

Length from frontal margin to tips of tegmina 5.5 mm., to tip of posterior process 3.7 mm.; width across tips of suprahumeral horns 4.3 mm., at humeral angles 2.8 mm., at eyes 2.4 mm.

Male : Similar to female, but general colour darker, humeral angles less prominent, posterior process straight.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.6 mm.; width across tips of suprahumeral horns 4.0 mm., at humeral angles 2.8 mm., at eyes 2.4 mm.

Fifth instar nymph : General colour greyish brown. Body robust, dorsoventrally flattened; head 3.0X as wide as long, cranial tubercles reduced, vertex with short tuberculate spines and chalazae scattered; eyes dull black; ocelli closer to eyes than to each other and situated above c-o line; pronotum with scattered tuberculate spines, metopidium convex, pronotal posterior process extending over three-fourths the length of mesonotum, suprahumeral buds small; mesonotal process much reduced, metanotum about one half as long as mesonotum with sparsely arranged tuberculate spines; dorsal tuberculate spines of abdomen inclined backward; lateral lamellae of abdominal segments III-VIII 2.0X as long as wide, each bordered with 14-18 slender tuberculate spines; anal tube about 0.2X as long as body; length of body 6.5 mm. length of anal tube 1.3 mm.

Material examined : 12 females, 4 males, numerous nymphs ex *Vernonia cinerea*, Madras, 10-5-1966; 2 females in FRI, Dehra Dun, coll. Kumaon. Lectotype male and female in British Museum.

Distribution : INDIA: Tamil Nadu (Madras); Uttar Pradesh (Dehra Dun); West Bengal (Calcutta); S.ASIA: Singapore; MALAYSIA: Penang; CHINA: Hainan, Kwantung, Fukien; BURMA: Tenasserim; SULA ISLANDS; PHILIPPINE ISLANDS.

This species is closely allied to *pronus* Distant in its general form and in the disposition of the horns, but differs by the suprahumeral horns being longer and broader.

37. *Tricentrus cornutus* Ananthasubramanian
(Fig. 42)

1980. *Tricentrus cornutus* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Pap. No. 16* : 27.

Female : General colour rusty brown. Head vertical, 3.0X as wide across extremities of eyes as length of vertex, thickly clothed with adpressed golden pilosity, vertex 2.0X as wide as long, upper margin strongly arcuate, lower margins gradually sloping to frontoclypeus; eyes subglobose, light reddish yellow; ocelli succineous, closer to eyes than to each other and situated above c-o line; frontoclypeus thickly pilose, extending for three-fourths its length below lower margins of vertex, frontoclypeal lobes small, distinct, apex of frontoclypeus truncate. Pronotum tawny brown, lateral aspects of thorax and scutellum white tomentose; metopidium convex, vertical, nearly 4.0X as wide as high, finely punctate with golden hairs; supraocular callosities somewhat obscured by pilosity; humeral angles black, short, apices subacute; suprahumeral horns as long as the space between their bases, tricarinate, carinae and apical half black, projecting upward and outward, apices gently recurved; posterior process tawny brown, slightly arched at middle, dorsal carina finely percurrent through metopidium, lateral carinae weak, apical half attenuate, apex passing a little beyond the clavus and reaching the posterior angle of the inner margin of tegmina; tegmina 3.5X as wide as long, semihyaline, with a large broad pale white fascia on the basal sixth, apical limb broad, apex narrowly rounded, costal margin opposite to 1st apical cell not thickened, 1st apical cell about 9.0X as long as wide, 1st discoidal cell petiolate, 0.5X as long as the 2nd. Body beneath and legs rusty brown.

Length from frontal margin to tips of tegmina 5.8 mm., to tip of posterior process 4.2 mm.; width across tips of suprahumeral horns 3.9 mm., at humeral angles 3.0 mm., at eyes 2.1 mm.

Male : Unknown.

Material examined : Holotype female Reg. No. Z.S.I. 676/H15 from Canning Garosthan Ghari, Calcutta, India, 18-10-1915.

Distribution : INDIA : Calcutta.

T. cornutus is very closely allied to *recurvicornis* Ananthasubramanian in the nature of the frontoclypeus which extends for 0.75X of its length below lower margins of the vertex, and the petiolate 1st discoidal cell of the tegmina, but differs by the very long, narrow 1st apical cell of the tegmina.

38. *Tricentrus decornis* Ananthasubramanian and Ananthakrishnan
(Fig. 43)

1975. *Tricentrus decornis* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 236.

Female : General colour reddish brown. Head 3.0X as wide across extremities of eyes as length of vertex, distinctly punctate with sparse short golden pilosity, vertex 2.0X as wide as long, upper margin shallowly arcuate, lower margins obliquely continued to frontoclypeus; eyes subglobose, dull white; ocelli succineous, slightly closer to eyes than to each other and situated

above c-o line; frontoclypeus reddish brown, extending for a little more than half of its length below lower margins of vertex, apex truncate. Pronotum reddish brown, lateral areas cretaceously sericeous; metopidium sloping backward to disc, wider than high; supraocular callosities prominent, impunctate, undivided; humeral angles dark brown, subprominent, apices blunt; suprahumeral horns absent. Posterior process robust, nearly straight, tricarinate, apex acute, just passing the posterior angles of the inner margin of tegmina, median carina percurrent through metopidium; tegmina hyaline, 3.0X as long as wide, basal sixth black, punctate, coriaceous, veins stout, dark brown, 1st discoidal cell not petiolate, as long as the 2nd, apex of tegmina narrowly rounded, apical limbus broad; scutellum light brown, punctate, 1.5X as wide as long; legs reddish brown except coxae and trochanters which are dark brown, hind trochanters with a group of 4 prominent teeth besides smaller teeth arranged on a disc on the inner surface, hind femora corrugated on inner surface.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.6 mm.; width across tips of humeral angles 2.1 mm., at eyes 2.0 mm.

Male : Similar to female but smaller, general colour dark brown. Length from frontal margin to tips of tegmina 4.25 mm., to tip of posterior process 3.2 mm.; width across tips of humeral angles 1.7 mm., at eyes 1.7 mm.

Fifth instar nymph : General colour dark brown. Head declivous, cranial tubercles persistent, very large; eyes reddish brown; vertex with a row of tuberculate spines turned forward; clypeal apex roundedly truncate, extending a little below lower margins of vertex; ocelli closer to eyes than to each other and situated above c-o line; pronotum with numerous scattered tuberculate spines, pronotal posterior process arched above, contiguous with mesonotum, median carina with closely set tuberculate spines, suprahumeral buds absent; lateral areas of thorax sparsely spinous, mesonotal process broadly triangular, fringed with short spines; wing pads conspicuous, their costal margins not quite demarcated. Abdomen nearly 2.0X as long as anal tube, dorsal tubercular spines of abdominal segments III-VIII adpressed to body, bases of tubercles black; lateral lamellae of segments III-VIII short, nearly semicircular, each lamella bearing only 5 tuberculate spines besides scattered chalazae. Length of nymph 4.1 mm., length of anal tube 0.9 mm.

Material examined : 19 females, 11 males, numerous nymphs ex *Eugenia caryophyllata*, *Lagerstroemia* sp. and *Cryptostegia* sp., Madras, 3-3-1967; 1 female, 1 male ex *Zizyphus* sp., Mysore, 10-3-1989. Types in National Pusa Collections, IARI, New Delhi.

Distribution : INDIA : Tamil Nadu (Madras); Karnataka (Mysore).

T. decornis is closely related to *concolor* n.sp. in the absence of suprahumeral horns in both sexes, but differs by general body colour, presence of white tomentosity in the lateral areas of the thorax and in tegminal characters.

39. *Tricentrus distinctus* Thirumalai and Ananthasubramanian (Fig. 44)

1985. *Tricentrus distinctus* Thirumalai and Ananthasubramanian, *Entomon*, 10(3) : 229.

Female : General colour reddish brown with shades of black. Head vertical, about 3.0X as wide across extremities of eyes as length of vertex, finely punctate with long, golden hairs, vertex 2.0X as wide as long, upper margin arcuate, lower margins obliquely curved to frontoclypeus; eyes subglobose, brown with shades of black; ocelli dark brown, closer to eyes than to each other and situated well above c-o line; frontoclypeus extending for half its length below lower margins of vertex, apex broadly rounded and covered with long golden hairs. Pronotum dark reddish brown with shades of black, finely punctate, with long, golden pilosity, median carina percurrent through metopidium; metopidium vertical, convex, 2.0X as wide as high; supraocular callosities pitch black, bare, divided; humeral angles prominent, their apices subacute; suprahumeral horns robust, broadbased, dark brown, slightly shorter than the distance between their bases, apices black, viewed from sides tricarinate, directed upward and moderately recurved, seen from front directed outward and then upward, viewed from above moderately broad, subobliquely curved backward, posterior process robust, emerging behind disc, contiguous with scutellum, basal part dark brown, apical area jet black, apex acuminate, reaching a little beyond claval suture, strongly tricarinate, covered with sparse, suberect hairs, median carina strongly percurrent through pronotum; tegmina shining bronzy brown, 3.0X as long as wide, basal fourth coriaceous, dark brown, sparsely pilose, 1st apical cell about 6.0X as long as wide, 1st discoidal cell not petiolate, as long as the 2nd, apical limb broad. Lateral areas of sternum white tomentose. Legs with femora jet black, rest dark brown, hind trochanters prominently toothed on the dilated inner surface. Abdomen black with white pubescence.

Length from frontal margins to tips of tegmina 5.71 mm., to tip of posterior process 4.21 mm.; width across tips of suprahumeral horns 3.1 mm., at humeral angles 2.47 mm., at eyes 2.38 mm.

Male : Similar to female, but smaller. General colour dark brown. Length from frontal margin to tips of tegmina 5.03 mm., to tip of posterior process 3.39 mm.; width across tips of suprahumeral horns 3.06 mm., at humeral angles 2.44 mm., at eyes 2.27 mm.

Material examined : Holotype female, allotype male, collected from South east of Pamba Travellers' Bungalow, Sabarigiri, Kerala, altitude 960 metres, coll. R.S. Pillai, 24-4-1981.

Distribution : INDIA : Kerala (Sabarigiri).

T. distinctus is nearest to *pilosus* Ananthasubramanian and Ananthakrishnan in the general colour and disposition of horns, but differs by the less pilose body and dimensions of the discoidal cells of tegmina.

40. *Tricentrus elegans* Ananthasubramanian (Fig. 45)

1980. *Tricentrus elegans* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Pap. No. 16* : 24.

Male : General colour black. Head black, clothed with long golden hairs, 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, upper margin arcuate, lower

margins oblique; eyes yellowish white with a black dot at centre, subglobose; ocelli translucent, closer to eyes than to each other and situated slightly above c-o line; frontoclypeus extending for half its length below lower margins of vertex, apex broadly rounded, frontoclypeal lobes inconspicuous. Pronotum black, metopidium convex, obliquely directed backward to the disc, 2.5X as wide as high, supraocular callosities subprominent; humeral angles prominent, their apices subacute; suprahumeral horns short, about half as long as the space between their bases, viewed from sides directed upward, viewed from front directed outward and upward, apices slightly recurved, tricarinate; posterior process stout, black, punctate, slightly sinuate, median carina percurrent through pronotum, lateral carinae weak, apex subacute, just reaching the posterior angle of the inner margin of tegmina; tegmina 3.0X as long as wide, hyaline, costal margin not thickened, 1st apical cell 6.0X as long as wide, 1st discoidal cell not petiolate, 2nd discoidal cell much wider than the 1st. Legs black upto femora, tibiae and tarsi greyish. Abdomen jet black.

Length from frontal margin to tips of tegmina 4.9 mm., to tip of posterior process 3.0 mm.; across tips of suprahumeral horns 2.1 mm., at humeral angles 2.0 mm., at eyes 1.8 mm.

Female : Unknown.

Material examined : Holotype male Reg. No. Z.S.I. 670/H15 from Tawang Camp, Kameng Division, NEFA, India, 12-12-1965.

Distribution : INDIA.

T. elegans is allied to *congestus* (Walker) in the general colour of the body, head and pronotum, in the obliquely ascendant stout suprahumeral horns and the short sinuate posterior process, but differs by the short suprahumeral horns which are only moderately curved.

41. *Tricentrus euschistus* Distant

1916. *Tricentrus euschistus* Distant, *Fauna Br. India*, 6 : 164.

1951. *Tricentrus euschistus* : Funkhouser, *Gen. Ins.* 208 : 210.

Distant's (1916) description of this species could not be supplemented in view of the nonavailability of the same, except for a single specimen in the collections of the Tamil Nadu Agricultural University College, Coimbatore, which is highly mutilated, with head and abdomen missing, and with no labels. However, the characteristic shape of the suprahumeral horns of the specimen leaves no doubt regarding the identity of the specimen with Distant's Burmese species. Funkhouser (1951) records its occurrence in India but does not mention the locality. Distant's description of the species is reproduced below:

Head and pronotum black, more or less finely pilose; eyes and legs bright ochraceous; tegmina subhyaline, moderately wrinkled, venation brownish, the basal angular area blackish; pronotum thickly punctate, centrally, longitudinally, percurrently carinate, the lateral angles transversely slightly upwardly produced, the apices acute, posterior process tricarinate, its apex

acute, a little upwardly produced and slightly passing the posterior angle of the inner tegminal margin; the darker basal area of the tegmina coarsely punctate. Length 5; breadth lateral pronotal process 3 millim.

Distribution : INDIA; BURMA (Tenasserim).

42. *Tricentrus fairmairei* (Stål)
(Fig. 46)

1859. *Centrotus fairmairei* Stål, *Preq. Euq. Resa. Ins.* : 284.
 1859. *Centrotus sobrinus* Stål, *Preq. Euq. Resa. Ins.* : 285.
 1866. *Terentius fairmairei* Stål, *Analect. Hemip.*, 10 : 387.
 1903. *Terentius fairmairei* : Buckton, *Monogr. Membrac* : 270.
 1905. *Tricentrus tinctoria* Buckton, *Trans. Linn. Soc. London*, 9(2) : 234.
 1908. *Tricentrus fairmairei* : Distant, *Fauna Br. India*, 4 : 58.
 1951. *Tricentrus sobrinus* : Funkhouser, *Gen. Ins.*, : 211.
 1965. *Tricentrus fairmairei* : Metcalf and Wade, *Gen. Cat. Homopt.* : 392.

Female : General colour black. Head vertical and finely punctate, 3.4X as wide across extremities of eyes as length of vertex, vertex 2.5X as wide as long, upper margin arcuate, sinuate, lower margins broadly rounded; eyes large, dull white; ocelli prominent, closer to eyes than to each other and situated just above c-o line; frontoclypeus black, densely pilose, extending for half its length below lower margins of vertex, its lateral lobes fused with main lobe, apex truncately rounded. Pronotum black, finely punctate, with short sparse hairs; metopidium thickly punctate, 2.0X as wide as high, gradually sloping behind to the disc; supraocular callosities prominent, impunctate, undivided; humeral angles prominent, their apices blunt; suprahumeral horns as viewed from above broadbased, short, less than half as long as the space between their bases, triquetrous, extending outward and slightly upward, apices recurved, anterior margins longitudinally carinate behind middle, as viewed in front slightly narrower and tricarinate; posterior process tricarinate, stout, almost straight out for a situation at about the middle, gradually tapering to apex which is subacute, just reaching the posterior angle of the inner margin of tegmina, lateral margins sinuate, median carina finely continued pronotum; tegmina smoky hyaline with a bronzy shade, 2.7X as long as wide, apex pointed, basal sixth black, a testaceous transverse area beyond the base, 1st apical cell about 5.0X as long as wide, 1st discoidal cell about half as wide as the 2nd, distinctly petiolate, apical limb broad. Body beneath black. Legs upto femora black, tibiae castaneous, tarsi yellowish brown.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 3.5 mm., at humeral angles 2.4 mm., at eyes 2.1 mm.

Male : Unknown.

Material examined : 3 females ex *Solanum verbascifolium*, 1 female ex *Solanum trilobatum* at Mercara, 12-12-1978; type locality Bangalore; holotype in Madrid.

Distribution : INDIA : Karnataka State (Bangalore, Mercara); EAST ASIA : Philippines; MALAYSIA : Malacca.

T. fairmairei is closely allied to *atrus* Ananthasubramanian in the general colour and size and disposition of the suprahumeral horns, but differs by the width to height ratio of the metopidium and the disposition of the posterior process.

43. *Tricentrus ferruginosus* Funkhouser
(Fig. 47)

1929. *Tricentrus ferruginosus* Funkhouser, *Philippine J. Sci.*, 40 : 123.

Female : General colour ferruginous. Head reddish brown, 3.0X as wide across extremities of eyes as length of vertex, densely pilose, vertex 2.0X as wide as long, upper margin arcuate, lower margins obliquely rounded; eyes large, reddish brown; ocelli small, ferruginous, equidistant from each other and from eyes and situated above c-o line; frontoclypeus longer than wide, extending for half its length below lower margins of vertex, apex longly pilose, truncate; pronotum ferruginous, finely punctate, with dense pilosity; metopidium 2.0X as wide as high, convex, sloping backward to disc; supraocular callosities subprominent, not divided; humeral angles prominent, triangular, apices blunt; suprahumeral horns about as long as the space between their bases, stout, extending upward, viewed from above flattened dorsoventrally, tricarinate, median carina strongly percurrent through metopidium, basal half broad, gradually narrowed to an acuminate apex which passes well beyond the posterior angle of the inner margin of tegmina, slightly upturned; tegmina hyaline with a hue of black, 3.0X as long as wide, base ferruginous, punctate, veins stout, brown, 1st discoidal cell petiolate, shorter than the 2nd, apical limbus broad. Body beneath dark ferruginous. Legs uniformly ferruginous.

Length from frontal margin to tips of tegmina 6.5 mm., to tip of posterior process 4.5 mm.; width across tips of suprahumeral horns 4.6 mm., at humeral angles 2.6 mm., at eyes 2.25 mm.

Male : Unknown.

Material examined : One female in FRI, Dehra Dun, collected at Dehra Dun; type locality Penang.

Distribution : INDIA : Dehra Dun; MALAYSIA : Penang; SUMATRA.

T. ferruginosus is closely allied to *minomorii* Ananthasubramanian in the nature of the posterior process, but differs in the much longer suprahumeral horns and presence of petiole for the 1st discoidal cell of tegmina.

44. *Tricentrus gibbosulus* (Walker)
(Fig. 48)

1858. *Centrotus gibbosulus* Walker, *Ins. Saun. Hom.* : 80.

1908. *Tricentrus gibbosulus* : Distant, *Fauna Br. India*, 4 : 53.

1979. *Tricentrus gibbosulus* : Ahmad and Yasmeen. *Oriental Insects*, 12(4) : 543.

Female : General colour piceous. Head piceous brown, 3.0X as wide across extremities of eyes as length of vertex, very finely pilose, vertex 2.2X as wide as long, upper margin strongly arcuate, lower margins obliquely rounded; eyes large, piceous brown; ocelli black, closer to eyes than to each other and situated above the c-o line; frontoclypeus piceous, densely pilose, extending for two-thirds its length below lower margins of vertex, apex broadly rounded, lateral lobes distinct. Pronotum piceous, finely punctate, with sparse pilosity; metopidium 3.0X as wide as high, vertical upto half its height, then obliquely continued backward to the disc; supraocular callosities subprominent; humeral angles prominent, triangular, apices blunt; suprahumeral horns as seen from above short, a little more than one half as long as the space between their bases, broadbased, coarsely punctate, anterior margin rounded, posterior margin obliquely straight, apex obtusely acute, slightly recurved, indistinctly tricarinate behind middle, as seen in front narrow, slender, with apices more acute; posterior process robust, tricarinate, median carina obscure on pronotum, finely punctate, apical area narrow, apex acuminate, reaching the posterior angle of the inner tegminal margin; tegmina pale brown, 2.7X as long as wide, basal area piceous black, veins stout, pilose, 1st apical cell narrow, about 5.0X as long as wide, 1st discoidal cell nonpetiolate, nearly as long as the 2nd, apical limbus broad. Body beneath piceous. Legs with femora testaceous.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.5 mm., width across tips of suprahumeral horns 3.6 mm., at humeral angles 2.7 mm., at eyes 2.1 mm.

Male : Smaller than female, general colour black; suprahumeral horns and posterior process shorter, the latter not reaching the posterior angle of inner tegminal margin.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 3.0 mm.; width across tips of suprahumeral horns 2.8 mm., at humeral angles 2.0 mm., at eyes 1.6 mm.

Material examined : One female in FRI, Dehra Dun, collected at Dehra Dun; one male in Z.S.I., Calcutta; 2 females and 1 male ex *Xanthium* sp., at Ahathethara, Palghat, 1-1-1989. Lectotype male and female in British Museum.

Distribution : INDIA : Uttar Pradesh (Dehra Dun), Kerala (Palghat), West Bengal (Calcutta); PAKISTAN : Lahore; BANGLADESH : Dacca, Ishurdi, Jessore, Khulna.

T. gibbosulus is closely related to *pronus* Distant and *bicolor* Distant in the general colour of the body and in the shape of the pronotal posterior process, but differs from both in the nature of suprahumeral horns which are directed upward and outward but not obliquely produced forward, and by the absence of a petiole for the 1st discoidal cell of tegmina.

45. *Tricentrus hameedi* n.sp.
(Fig. 49)

Female : General colour shining black. Head black, 3.0X as wide across extremities of eyes as length of vertex, finely punctate, with short, adpressed golden pilosity, vertex nearly 2.0X as wide as long, upper margin shallowly arcuate, lower margins obliquely continued to frontoclypeus;

eyes large, subovate, projecting outward, deep red; ocelli black, closer to eyes than to each other and situated on c-o line; frontoclypeus narrow at base, broad apically, extending for one-third its length below lower margins of vertex, densely longly pilose with golden hairs, apex truncate. Pronotum shining black, lateral areas tinged with greyish white, finely punctate, with short sparse pilosity; metopidium about 2.0X as wide as high, nearly vertical for half of its height, then gradually sloping behind to disc; supraocular callosities black, more or less circular, not divided; humeral angles subprominent, their apices subacute; suprahumeral horns black, very short, only one-seventh as long as space between their bases, obliquely directed outward, apices gently recurved, acute; posterior process black, finely punctate, gradually tapering, tricarinate, median carina strongly percurrent through pronotum, apex extending well beyond the posterior angle of the inner margin of tegmina, slightly raised up, not impinging on tegminal margin, acuminate; tegmina nearly 3.0X as long as wide, dull yellowish brown, basal fifth coriaceous, punctate, veins black, costal margin facing 1st apical cell thickened, 1st discoidal cell petiolate, about as long as the 2nd, apical limbus broad. Legs black upto tibiae, tarsi light black.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 3.25 mm., at humeral angles 2.75 mm., at eyes 2.75 mm.

Male : Remarkably similar to female in colour and measurements; apex of posterior process not raised up.

Material examined : Holotype female, allotype male, collected at Kuala Lumpur, 5-7-1981 by Mr. M. Hameed, from the prop roots of *Ficus bengalensis*; one female collected by the author at Bombay on 30-12-1981 from prop roots of *F. bengalensis*.

Distribution : INDIA : Bombay; MALAYSIA : Kuala Lumpur.

T. hameedi n. sp. is closely allied to *recurvicornis* Ananthasubramanian in the very short suprahumeral horns which are apically gently recurved and in the presence of a distinct petiole for the 1st discoidal cell of the tegmina, but distinctly differs in the nature of the posterior process which extends well beyond the posterior angle of the inner margin of tegmina and in the characteristic markings on the tegmina.

46. *Tricentrus horizontalis* Distant (Fig. 50)

1916. *Tricentrus horizontalis* Distant, *Fauna Br. India*, 6 : 164.
 1929. *Tricentrus horizontalis* : Funkhouser, *Fed. Malay States Mus.*, 14 : 474.
 1933. *Tricentrus horizontalis* : Funkhouser, *Indian Forest Records*, 17(10) : 5.
 1934. *Otaris horizontalis* : Goding, *Jt. N. Y. ent. soc.*, 42 : 479.

Female : General colour dark bronzy brown. Head vertical, dark brown, thickly longly pilose, 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, upper margin strongly arcuate, lower margins obliquely continued to frontoclypeus; eyes large, hemispherical, light yellowish brown; ocelli vitreous, closer to eyes than to each other and situated above c-o line; frontoclypeus light brown with shades of black, extending for half its length below lower margins of vertex, apex rounded, longly sparsely pilose, pronotum dark bronzy brown, coarsely punctate, with short, sparse, depressed pilosity; metopidium 2.0X as wide as high, supraocular callosities subprominent; humeral angles prominently projecting, apices subacute; suprahumeral horns robust, broadbased, as long as space between their bases, extending upward and horizontally outward, centrally percurrently longitudinally carinate, apices oblique and gently recurved; posterior process robust, nearly straight, gradually tapering, coarsely punctate, tricarinate, median carina strongly percurrent through pronotum, apex subacute, slightly recurved, just passing the posterior angle of the inner margin of tegmina; tegmina bronzy brown, 3.0X as long as wide, wrinkled, basal angular area bronzy brown, followed by a large white costal spot, 1st apical cell 6.0X as long as wide, 1st discoidal cell petiolate, much shorter than the 2nd, apical limb broad. Lateral areas of sternum white tomentose, scutellum triangular with a small, white spot at each basal angle of the scutellum. Legs with tibiae densely pilose, femora black, tibiae castaneous brown.

Length from frontal margin to tips of tegmina 5.5 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 4.0 mm., at humeral angles 2.25 mm., at eyes 2.1 mm.

Male : Almost black with shades of brown. Smaller than female; suprahumeral horns shorter. Length from frontal margin to tips of tegmina 4.5 mm., to tip of posterior process 3.5 mm.; width across tips of suprahumeral horns 3.0 mm., at humeral angles 2.0 mm., at eyes 1.8 mm.

Materials examined : 8 females and 2 males in FRI, Dehra Dun, collected from Frazerpet, Coorg; type locality Moulmein, Burma; holotype female in British Museum.

Distribution : INDIA : Karnataka (Coorg); BURMA (Moulmein).

T. horizontalis is closely allied to *banguensis* Funkhouser in the shape and disposition of the suprahumeral horns which are robust, as long as the space between their bases and directed outward and upward, but differs by the general colour, the more robust posterior process and the presence of white tomentosity on the lateral areas of sternum and basal angles of the scutellum.

47. *Tricentrus indicus* nom. nov.
(Fig. 51)

1942. *Tricentrus purpureus* Funkhouser, *Jt. N. Y. ent. soc.*, 50 : 62.

1975. *Tricentrus purpureus* : Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 230 (Junior homonym).

Tricentrus indicus nom. nov. (Present work).

Female : General colour purplish brown. Head greyish, with scattered black dots, 2.5X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, densely pubescent with long golden hairs, upper margin shallowly arcuate, lower margins obliquely continued to frontoclypeus; eyes dark brown; ocelli black, slightly closer to eyes than to each other and situated above c-o line; frontoclypeus densely pilose with golden hairs, extending for half its length below lower margins of vertex, apex broadly rounded, frontoclypeal lobes distinct, pronotum dark brown, lateral areas cretaceously sericeous; metopidium vertical, greyish brown, 2.0X as wide as high; supraocular callosities prominent, their margins shaded with black; humeral angles subprominent, apices blunt; suprahumeral horns stout, about 0.75X as long as the space between their bases, finely punctate, longly sparsely pilose, pilosity dense at bases, tricarinate, apically broadly rounded and recurved, apices subacute; posterior process robust, short, tricarinate, apical half straight, apex acute, dark brown, median carina percurrent through pronotum; tegmina purplish brown, fringed with long hairs, basal area dark brown and punctate, followed by a yellow rounded fascia, 1st apical cell about 5.0X as long as wide, 1st discoidal cell with a very short petiole, nearly as long as 2nd. Legs densely pilose, distal end of femora and the whole of tibiae purplish brown tarsi light brown.

Length from frontal margin to tips of tegmina 5.3 mm., to tip of posterior process 3.5 mm.; width across tips of suprahumeral horns 2.7 mm., at humeral angles 2.0 mm., at eyes 1.9 mm.

Male : General colour similar to that of female, slightly smaller, differing from female mainly in the nature of suprahumeral horns which are smaller, slightly projecting forward, more divergent, turned outward and slightly upward, apices acutely turned backward; abdomen slender, dark brown.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.5 mm.; width across tips of suprahumeral horns 3.0 mm., at humeral angles 2.0 mm., at eyes 1.8 mm.

Fifth instar nymph : General colour brown. Body dorsoventrally compressed; head 2.0X as wide as long, cranial tubercles prominent, broadly conical; eyes subglobose, dark brown; ocelli equidistant from each other and from eyes and situated on c-o line; rostral tip reaching hind coxae. Thorax with numerous tuberculate spines; metopidium gradually sloping; pronotal posterior process dark brown, densely spinose, apically acute; suprahumeral buds indistinct; mesonotal process densely spinose, apex blunt; abdominal segments III-VIII with a row of spines on the distal half of each segment dorsally; lateral lamellae of abdominal segments IV-VIII nearly identical, about 2.0X as long as wide, directed obliquely backward, each bordered with 17-22 long, slender spines mounted on tubercles; anal tube about one-fifth as long as body. Length of body 6.2 mm., length of anal tube 1.2 mm.

Materials examined : 15 females, 6 males and numerous nymphs collected at Kodaikanal ex *Polygonum* sp., 30-9-1968.

Distribution : INDIA : Tamil Nadu (Kodai Kanal).

T. indicus is closely related to *congestus* (Walker) in the nature of posterior process and suprahumeral horns, but differs by the general colour and by the cretaceously sericeous lateral areas of pronotum.

48. *Tricentrus kamaonensis* Distant
(Fig. 52)

1916. *Tricentrus kamaonensis* Distant, *Fauna Br. India*, 6 : 163.

1934. *Otaris kamaonensis* Goding, *Jt. N. Y. ent. Soc.*, 42 : 479.

Female : General colour pale brown. Head reddish brown, finely punctate, with sparse, short, golden pilosity, 2.5X as wide across extremities of eyes as the length of vertex, vertex 1.7X as wide as long, upper margin strongly arcuate, lower margins rounded; eyes moderately large, light brown; ocelli vitreous, closer to eyes than to each other and situated well above c-o line; frontoclypeus extending for two-thirds its length below lower margins of vertex, densely longly pilose, apex truncate. Pronotum greyish brown with a hue of red, finely punctate, sparsely pilose; metopidium 2.0X as wide as high, convex, very gently sloping backward to disc; supraocular callosities subprominent, inconspicuously divided; humeral angles subprominently produced laterad, their apices subacute; suprahumeral horns robust, darker and more blackish than pronotum, as long as the space between their bases, viewed from above rugose and finely punctate, transversely and a little upwardly extended, their apices oblique, slightly curved; posterior process broad at base, somewhat attenuated, tricarinate, median carina strongly percurrent through pronotum, posterior half darker, apex acute, just reaching or slightly passing the posterior angle of the inner margin of tegmina; tegmina 2.6X as long as wide, subhyaline, wrinkled, veins dark brown, 1st apical cell 3.5X as long as wide, 1st discoidal cell nonpetiolate apical limb broad. Legs ochraceous, densely pilose.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 4.0 mm., at humeral angles 2.4 mm., at eyes 2.0 mm.

Male : Unknown.

Material examined : 1 female from Peora (4,500 ft.), Naini Tal and 3 females from Ramgarh (7,000 ft.) in FRI, Dehra Dun; type locality Kumaon, Bhimtal; holotype female in British Museum.

Distribution : INDIA : Uttar Pradesh (Naini Tal, Kumaon); Rajasthan (Ramgarh).

T. kamaonensis is closely related to *cinereus* Ananthasubramanian in the disposition of the horns and in the subhyaline tegmina, but differs by the attenuated posterior half of the posterior process and the obliquely directed suprahumeral horns; the tegmina are also broader.

49. *Tricentrus longiceps* Ananthasubramanian
(Fig. 53)

1980. *Tricentrus longiceps* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Pap. No. 16* : 29.

Female : General colour rusty brown. Head vertical, brownish with black dots, 2.75X as wide across extremities of eyes as length of vertex, densely pilose, upper margin slightly arcuate, lower margins strongly sloping to frontoclypeus; eyes subglobose, pinkish, with shades of black; ocelli hyaline, slightly closer to each other than to eyes and situated well above c-o line; frontoclypeus densely pilose, extending for 0.75X its length below lower margins of vertex, apex slightly broader and truncate. Pronotum rusty brown above and at sides, punctate, metopidium vertical, 3.0X as wide as high, densely pilose, punctate, especially along median area; supraocular callosities black, oval, bare; humeral angles darker than base of horns, apices blunt; suprahumeral horns tawny brown, thickly hairy at basal half, shaded with black at apical one-third, broadbased, tricarinate, nearly as long as the space between their bases, viewed from sides directed upward, seen in front appearing narrower, directed outward and forward, apices acute; posterior process strongly tricarinate, dorsal carina strong, percurrent through metopidium apex black, acute, reaching the posterior angle of the inner margin of tegmina; tegmina rusty brown, 3.0X as long as wide, basal sixth darker, coriaceous, punctate, a pale round spot following the basal area, 1st apical cell very narrow, about 10.0X as long as wide, 1st discoidal cell not petiolate, longer than the 2nd. Abdomen dark reddish brown. Legs tawny brown.

Length from frontal margin to tips of tegmina 5.7 mm., to tip of posterior process 4.1 mm.; width across tips of suprahumeral horns 3.4 mm., at humeral angles 3.0 mm., at eyes 2.8 mm.

Male : Unknown.

Material examined : Holotype female, Z.S.I. Reg. No. 61/H15, collected Collem, Goa, 3-4-1966.

Distribution : INDIA : Goa.

T. longiceps is closely allied to *pilosus* Ananthasubramanian and Ananthakrishnan and *cornutus* Ananthasubramanian in the general colour and size of the body and in the presence of a pale fascia on the basal area of tegmina, but differs from both by the very narrow 1st apical cell of tegmina which is 10.0X as long as wide; from *pilosus* it differs by the nature of the frontoclypeus which extends to more than three-fourths its length below lower margins of vertex and by the 1st discoidal cell distinctly longer than the 2nd; from *cornutus* it differs by the nature of the suprahumeral horns.

50. *Tricentrus longicornis* Ananthasubramanian

1980. *Tricentrus longicornis* Ananthasubramanian, *Rec. zool. Surv. India, Occa. Pap. No. 16* : 19.

Female : General colour greyish brown. Head 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, finely punctate, densely pubescent, hairs golden yellow, upper margin of vertex shallowly arcuate, lower margins strongly obliquely continued to frontoclypeus; eyes golden yellow; ocelli succineous, closer to eyes than to each other and situated above c-o line; frontoclypeus extending for half its length below lower margins of vertex, basal lobes distinct, apex truncate. Pronotum greyish brown, finely punctate, with golden pilosity;

metopidium almost vertical, 2.0X as wide as high; supraocular callosities small but distinct; humeral angles prominent, their apices blunt; suprahumeral horns greyish marooned with black patches, densely pilose, strongly tricarinate, carinae black, as viewed from lateral aspects slightly projecting forward and upward, apical areas strongly recurved, viewed from above much broader, apices acute, viewed in front about half as long as the space between their bases; posterior process greyish brown at basal fourth, golden yellowish at middle, apical area shaded with black, apex acute, passing well beyond the posterior angle of the inner margin of tegmina, median carina percurrent through pronotum; tegmina 2.5X as long as wide, smoky hyaline, costal margin bordering 1st apical cell much thickened, 1st apical cell narrow, 7.0X as long as wide, 1st discoidal cell petiolate, as long as the 2nd. Legs black upto femora, tibiae greyish brown, tarsi pale brown.

Length from frontal margin to tips of tegmina 4.1 mm., to tip of posterior process 3.2 mm.; width across tips of suprahumeral horns 2.65 mm., at humeral angles 2.4 mm., at eyes 2.3 mm.

Male : Similar to female.

Material examined : Holotype female Z.S.I. 660/H15, allotype male Z.S.I. Reg. No. 661/H15, and one female paratype Z.S.I. Reg. No. 662/H15, from Manoharpur, Bihar, India, 30-12-1967.

Distribution : INDIA : Bihar.

T. longicornis is closely allied to *allabens* Distant and *minomorii* Ananthasubramanian in the elevated terminal part of the posterior process which passes well beyond the posterior angle of the inner tegminal margin, but differs from both by the shorter strongly recurved suprahumeral horns and also in the tegminal characters.

51. *Tricentrus minomorii* Ananthasubramanian (Fig. 55)

1980. *Tricentrus minomorii* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Pap. No. 16* : 18.

Female : General colour greyish brown. Head greyish black, with numerous black dots, about 2.75X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, sparsely hairy, hairs silvery white, base of vertex shallowly arcuate, lower margins strongly obliquely continued to frontoclypeus; eyes yellowish brown; ocelli black, closer to eyes than to each other and situated slightly above c-o line; frontoclypeus extending for half its length below lower margins of vertex, longly sparsely pilose, apex broadly rounded, basal lobes short. Pronotum greyish brown, metopidium slightly convex, nearly vertical, greyish brown, densely pubescent, 1.5X as wide as high; supraocular callosities conspicuous with black margins; humeral angles prominent, triangular, apices blunt; suprahumeral horns moderately stout, about half as long as the space between their bases, longly pilose, pilosity denser at basal half, seen in lateral aspects projecting slightly forward and then outward, apices gently recurved, subacute; posterior process greyish brown, slender, tricarinate, apical half distinctly inclined upward, apex acute, dark brown, passing well beyond posterior angle of the inner margin of tegmina, median carina very

strong, bronzy brown, percurrent through metopidium; tegmina hyaline, 3.0X as long as wide, veins yellowish, costal margin adjacent to 2nd apical cell and apical limb smoky brown, basal sixth black, punctate, 1st apical cell nearly 4.0X as long as wide, 1st discoidal cell non-petiolate, 2nd discoidal cell nearly as long as the 1st. Abdomen black. Legs black upto femora, tibiae and tarsi grey.

Length from frontal margin to tips of tegmina 5.5 mm., to tip of posterior process 4.25 mm.; width across tips of suprahumeral horns 3.8 mm., at humeral angles 2.8 mm., at eyes 2.5 mm.

Male : Unknown.

Material examined : Holotype female Z.S.I. Reg. No. 659/H15 from Sonai Rupai Forest, Minomori, NEFA, India, 30-11-1965.

Distribution : INDIA.

T. minomorii is closely allied to *longicornis* Ananthasubramanian in the general colour of the body and in the upturned apex of the posterior process which passes well beyond the posterior angle of the inner tegminal margin, but differs by the longer suprahumeral horns and the nonpetiolate 1st discoidal cell of tegmina.

52. *Tricentrus minusculus* Ananthasubramanian (Fig. 56)

1980. *Tricentrus minusculus* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Pap. No. 16* : 23.

Male : General colour black. Head 2.9X as wide across extremities of eyes as length of vertex, finely punctate, densely pubescent, vertex 2.0X as wide as long, upper margin arcuate, lower margins strongly obliquely continued to frontoclypeus; eyes reddish brown, subovate, very prominent; ocelli black, distinctly closer to eyes than to each other and situated slightly above c-o line; frontoclypeus clothed with short silvery hairs, extending for half its length below lower margins of vertex, its apex nearly truncate, basal lobes inconspicuous. Pronotum dark reddish brown, finely punctate at basal area of horns, sparsely pilose; metopidium 2.0X as wide as high, obliquely sloping backward to the disc; supraocular callosities conspicuous, somewhat divided; humeral angles light brown, their apices blunt; suprahumeral horns about 0.33X as long as the space between their bases, directed upward and outward, apical areas obliquely directed backward, apices subacute; posterior process reddish brown at basal half, black at terminal one-fifth, median carina percurrent through metopidium, lateral carinae fine, apex acute, slightly elevated, just reaching the posterior angle of the inner margin of tegmina; tegmina smoky brown, 2.75X as long as wide, basal sixth dark brown, finely punctate, veins reddish brown, 1st apical cell about 7.0X as long as wide, 1st discoidal cell petiolate, equal in length to the 2nd, apical limb broad. Legs with trochanters and femora dark brown, tibiae pale brown, tarsi reddish brown. Abdomen beneath black.

Length from frontal margin to tips of tegmina 4.6 mm., to tip of posterior process 3.1 mm.; width across tips of suprahumeral horns 2.8 mm., at humeral angles 2.3 mm., at eyes 2.2 mm.

Female : Unknown.

Material examined : Holotype male Z.S.I. Reg. No. 669/H15 from Gundgardrum (Poona, Maharashtra), 8-2-1972.

Distribution : INDIA : Maharashtra (Pune).

T. minusculus is nearest to *recurvicornis* Ananthasubramanian in the short, recurved suprahumeral horns and petiolate 1st discoidal cell as also other tegminal characters, but differs by the shape of the frontoclypeus and by the relative size of the discoidal cells.

53. *Tricentrus mitrai* nom. nov.

(Fig. 57)

1960. *Tricentrus dubius* Kato, *Bernice P. Bishop Mus.*, 6(5) : 345.

1980. *Tricentrus dubius*: Ananthasubramanian, *Rec. zool. Surv. India, Occ. Pap. No. 16* : 25.
(Junior homonym).

Tricentrus mitrai nom. nov. (Present work)

Female : General colour black. Head vertical, pitch black, 2.5X as wide across extremities of eyes as length of vertex, finely punctate, with adpressed golden pilosity, vertex nearly 2.0X as wide as long, upper margin strongly arcuate, lower margins carinate, oblique; eyes dark brown, subglobose; ocelli succineous, to eyes than to each other and situated above c-o line; frontoclypeus about 1.5X as long as wide, extending for nearly half its length below lower margins of vertex, densely clothed with golden pilosity, pilosity at the apex longer, lobes inconspicuous, apex truncate. Pronotum black, punctate, with short golden hairs, lateral and ventral areas cretaceously sericeous; metopidium convex, nearly vertical, about 2.0X as wide high, supraocular callosities somewhat obscure; humeral angles subprominent, apices blunt, posterior angles rounded into transverse posterior margin; suprahumeral horns viewed from sides stout, broad, gently recurved, apex subacute, slightly shorter than the space between their bases; posterior process robust, slightly raised behind the level of thorax, gradually narrowing to apex, apical area jet black, apex acute, reaching the posterior angle of the inner margin of tegmina, median carina percurrent through metopidium; tegmina pale brown, nearly 3.0X as long as wide, basal sixth coriaceous, black, punctate, with a distinct rounded pale fascia on outer margin, apical limbus broad, a distinct black patch opposite to 2nd apical cell, veins reddish brown, costal margin thickened, 1st discoidal cell not petiolate, narrower than the 2nd; legs black. Abdomen black, thickly punctate.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.4 mm.; width across tips of suprahumeral horns 3.5 mm., at humeral angles 2.4 mm., at eyes 2.0 mm.

Male : General colour similar to female. Frontoclypeus extending for nearly two-thirds its length below lower margins of vertex; metopidium slightly obliquely directed backward; suprahumeral horns shorter than those of female, about 0.66X as long as the space between their bases.

Length from frontal margin to tips of tegmina 4.6 mm., to tip of posterior process 3.1 mm.; width across tips of suprahumeral horns 2.7 mm., at humeral angles 2.15 mm., at eyes 2.0 mm.

Material examined : Female holotype, Reg. No. 671/H15, male allotype Reg. No. 672/H15, 6 female paratypes and one male paratype, Z.S.I., from 24-Parganas, West Bengal, Calcutta, 17-12-1965; one female from Tarakeswar, West Bengal, 15-10-1965.

Distribution : INDIA : West Bengal (Calcutta).

T. mitrai is nearest to *subangulatus* Distant and *pilosus* Ananthasubramanian and Ananthakrishnan in the general colour, disposition of the suprahumeral horns and posterior process and in having a rounded pale fascia on the basal part of tegmina, but differs by the presence of the black patch on the apical area of tegmina, in the length of horns and in the nature of the frontoclypeus.

54. *Tricentrus nobilis* Ananthasubramanian (Fig. 58)

1980. *Tricentrus nobilis* Ananthasubramanian, *Entomon*, 5(2) : 123.

Female : General colour black. Head thickly pilose, nearly 3.0X as wide across extremities of eyes as length of vertex, upper margin of vertex strongly arcuate, lower margins obliquely continued to frontoclypeus; eyes subglobose, greyish black; ocelli black, closer to eyes than to each other and situated on the c-o line; frontoclypeus extending for half its length below lower margins of vertex, thickly clothed with golden pilosity, its lobes fused apex truncately rounded. Pronotum black, finely punctate, covered with dense golden hairs; metopidium vertical, 2.25X as wide as high, supraocular callosities divided, black, almost bare; humeral angles prominent, their apices blunt; suprahumeral horns fuscous in front, robust, nearly 1.5X as long as the space between their bases, viewed from sides projecting obliquely forward with the apices subobliquely subacute; posterior process robust, contiguous with scutellum, distal half slightly arcuate, apex just reaching the posterior angle of the inner margin of the tegmina, dorsal carina percurrent through metopidium; tegmina amber-coloured, veins light brown, 1st apical cell 4.0X as long as wide, costal margin bordering the 1st apical cell very thick, 1st discoidal cell not petiolate, as long as the 2nd. Scutellum white tomentose laterally. Legs black upto tibiae, tibiae dark brown, tarsi light brown, hind trochanters prominently toothed on the dilated internal surfaces. Abdomen black.

Length from frontal margin to tips of tegmina 4.7 mm., to tip of posterior process 3.4 mm.; width across tips of suprahumeral horns 3.9 mm., at humeral angles 2.5 mm., at eyes 2.3 mm.

Male : General colour as in female. Suprahumeral horns much shorter than those of female, less than 0.5X as long as the space between their bases, seen from sides directed upward and then backward, apices acute; posterior process robust, a little elevated above the level of disc, apex not reaching the posterior angle of inner margin of tegmina.

Length from frontal margin to tips of tegmina 4.55 mm., to tip of posterior process 2.8 mm.; width across tips of suprahumeral horns 2.6 mm., at humeral angles 2.2 mm., at eyes 2.1 mm.

Fifth instar nymph : General colour grey, with scattered black dots. Body robust, laterally compressed and subcylindrical; head 2.0X as wide as long, vertex with dense tuberculate spines, eyes greyish white, ocelli closer to eyes than to each other and situated above c-o line; rostral tip extending backward upto the bases of hind coxae; thorax greyish, densely tuberculate, the tubercles tipped with spines; metopidium 2.0X as wide as high, suprahumeral buds short, pronotal posterior process extending over three-fourths of the length of mesonotum; wing pads broad, extending to the abdominal segment V, veins obscurely visible, costal angles well demarcated, fringed with a row of chalazae; abdominal dorsal tubercles inclined backward or adpressed to dorsum; lateral lamellae of segments V-VIII about 2.0X as long as wide, each bearing 11-14 tuberculate spines besides many scattered chalazae; anal tube 0.2X as long as body. Length of nymph 4.2 mm.

Material examined : 7 females, 1 male and 2 fifth instar nymphs ex *Boerhaavia diffusa*, Mysore, 21-2-1979.

Distribution : INDIA : Karnataka (Mysore).

T. nobilis is closely related to *congestus* (Walker) in the nature of the horns and in the position of the ocelli, but differs by its smaller size and presence of a chitinised thickening on the costal margin of tegmina opposite to the 1st apical cell.

55. *Tricentrus pilosus* Ananthasubramanian and Ananthakrishnan (Fig. 59)

1975. *Tricentrus pilosus* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 225.

Female : General colour brown. Head about 3.0X as wide across extremities of eyes as length of vertex, longly pilose with silvery hairs, vertex about 2.0X as wide as long, upper margin slightly arcuate, lower margins strongly obliquely continued to frontoclypeus; eyes dark brown, subglobose, projecting outward; ocelli black, slightly closer to eyes than to each other and situated slightly above c-o line; frontoclypeus longly sparsely pilose, extending to about one-third its length below lower margins of vertex, apex rounded. Pronotum light brown laterally, darker medially, finely punctate and densely pilose; metopidium almost vertical, 1.5-2.0X as wide as high, less punctate and pilose than pronotal dorsum; supraocular callosities black, prominent, punctate; humeral angles light brown, posterior margins rounded, apices subacute; suprahumeral horns highly variable with regard to the degree of development; when fully developed about one-third as long as space between their bases, obliquely directed outward and upward, apices directed backward, subacute; posterior process robust, tricarinate, median carina percurrent through pronotum, finely punctate, sparsely pilose, apex black, acute, slightly raised, not impinging on tegmina, just reaching the posterior angle of the inner margin of tegmina; tegmina about 3.0X as long as wide, hyaline, basal sixth coriaceous, punctate, dark brown, veins reddish brown, 1st apical cell about 5.0X as long as wide, 1st discoidal cell not petiolate, apical limb broad. Legs

with trochanters and basal three-fourths of femora black, rest light reddish brown, hind trochanters prominently toothed on the dilated inner surface, inner margin of mid and hind femora corrugated. Abdomen dark brown, pubescent ventrally.

Male : Similar to female, but slightly smaller and darker, suprahumeral horns shorter. Genitalia with sternal plate black, apical notch extending to about one-fourth the length of the plate, lower surface pubescent, lateral valves broadly triangular, their processes short, covered with long bristles, parameres with tips recurved, bearing a small subapical process visible from caudal aspect, connecting plate quadrangular, aedeagus finely serrate on inner margin.

The species is noted for its polymorphism (Fig. 60). Females include 4 different groups: 1. With normal horns as described above; 2. With short horns; 3. With aborted horns; 4. With no horns. Males include 3 groups; 1. Those with short horns comparable to females to group 2; 2. Those with aborted horns; 3. Those with no horns (Table : 5). But for the presence of intergrading forms the extremes might be regarded as different species.

Fifth instar nymph : General colour light reddish brown. Body dorsoventrally flattened, densely setose. Head 2.5X as wide across extremities of eyes as length of vertex, cranial tubercles small, conical, tipped with spines; eyes large, pale white; ocelli conspicuous, closer to eyes than to each other and situated on c-o line; frontoclypeus extending slightly below lower margins of vertex, rostral tip reaching hind coxae. Thorax slightly longer than abdomen excluding anal tube; metopidium sparingly setose, sloping behind to disc; lateral angles of pronotum broadly rounded, posterior process gradually narrowing to an acute apex extending over three-fourths the length of mesonotum, median carina of posterior process beset with tuberculate spines; mesonotum about 0.6X as long as pronotum, its process short, apex acute; metanotum shorter than mesonotum, sparingly spinose; tegminal pads prominent, extending behind upto abdominal segment II, costal angles distinctly differentiated; legs pinkish brown, hind trochanters simple, unarmed; abdominal dorsal tubercles inconspicuous; lateral lamellae of abdominal segment III dark brown, shorter than succeeding ones, bearing six or seven tuberculate spines, lateral lamellae of segments IV-VIII large, 2.0X as long as wide inclined backward, each lamella beset with fourteen to twenty long, slender, tuberculate spines, many chalazae scattered all over the lamellae; anal tube about one-sixth as long as body, width at base nearly equalling its length. Length of the nymph 6.6 mm., length of anal tube 1.2 mm.

Material examined : 260 females, 170 males and numerous nymphs ex *Thespesia populnea* and prop root of *Ficus bengalensis*; Madras, Bangalore, Trivandrum and Hyderabad; July 1966; 10 females from Cobin's Cove, Andamans, January-February, 1985 ex *Thespesia populnea*. It is noteworthy that specimens from Andamans are found to be monomorphic, with suprahumeral horns comparable to the normal morph described. Types in National Pussa collection, IARI New Delhi. Type locality, Madras.

Distribution : INDIA : Tamil Nadu (Madras); Karnataka (Bangalore); Kerala (Trivandrum); Andhra Pradesh (Hyderabad); Andamans.

The species is nearest to *subangulatus* Distant in the robust slightly upturned posterior process, but differs by the colour of the body and tegminal characters.

TABLE : 5

Morphometric analysis of different morphs in the polymorphic species, *Tricentrus prilosus*

	Females				Males		
	I With normal horns	II With short horn	III With aborted horns	IV With no horns	I With short horns	II With aborted horns	III With no horns
Length from frontal margin to tips of tegmina in mm.	6.0	6.1	5.6	5.75	5.1	5.2	5.0
Length from frontal margin to tip of posterior process in mm.	4.2	4.4	3.9	3.75	3.1	3.5	3.6
Width across tips of suprahumeral horns in mm.	3.25	2.75	2.2	–	2.3	2.0	–
Width of disc across bases of suprahumeral horn & in mm.	1.75	1.75	1.7	–	1.5	1.5	–
Width at humeral angles in mm.	3.0	2.8	2.7	2.65	2.3	2.4	2.6
Width across eyes in mm.	2.9	2.75	2.6	2.7	2.3	2.35	2.65
Length of suprahumeral horn in mm.	.75	.50	.20	–	.50	.20	–

56. *Tricentrus platycornis* Ananthasubramanian
(Fig. 61)

1980. *Tricentrus platycornis* Ananthasubramanian, *Rec. zool. Surv. India, Occa. Pap. No. 16* : 21.

Female : General colour pale reddish brown. Head vertical, 3.0X as wide across extremities of eyes as length of vertex, vertex dark ochraceous, finely punctate, with adpressed hairs, about 2.0X as wide as long, upper margin shallowly arcuate, lower margins obliquely rounded; eyes pale reddish brown; ocelli pale succineous, closer to eyes than to each other and situated on the c-o line; frontoclypeus 2.0X as long as wide, extending to three-fourths of its length below lower margins of vertex, apex broader, truncate, longly pilose, basal lobes distinct, pronotum greyish brown, finely punctate with recumbent hairs, lateral areas of sternum cretaceously sericeous; metopidium vertical, 3.0X as wide as high; supraocular callosities subprominent, black, divided; humeral angles prominent, their apices blunt; suprahumeral horns robust, slightly shorter than the space between their bases, projecting forward and upward, viewed from above broad, projecting outward, viewed in front appearing narrower and directed outward and forward; posterior process short, robust, tricarinate, lateral carinae weak, median carina finely continued on pronotum, apex acute, just reaching the posterior angle of the inner margin of tegmina; tegmina amber-hyaline, 3.0X as long as wide, basal sixth coriaceous and punctate, 1st apical cell long, narrow, 1st discoidal cell with a short petiole, equal in length to 2nd discoidal cell. Legs dark brown.

Length from frontal margin to tips of tegmina 5.5 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 4.4 mm., at humeral angles 3.4 mm., at eyes 2.5 mm.

Male : Unknown.

Materials examined : Female holotype Reg. No. Z.S.I. 677/H15, and paratype females Reg. No. Z.S.I. 678-680/H15 from Kunihar, Solan (H.P.), 29-4-1970.

Distribution : INDIA.

This species is nearest to *cinereus* Ananthasubramanian in the robust, upturned suprahumeral horns and in the nature of the tegmina, but differs by the stout broader posterior process which is not strongly carinate.

57. *Tricentrus projectus* Distant
(Fig. 62)

1908. *Tricentrus projectus* Distant, *Fauna Br. India*, 4 : 55.

1979. *Tricentrus projectus* : Ahmad and Yasmeen, *Pacific Insects*, 20(2-3) : 266.

Female : General colour black, with shades of brown. Head vertical, 3.0X as wide across extremities of eyes as length of vertex, covered with golden pilosity, vertex 2.0X as wide as long, upper margin strongly arcuate, lower margins obliquely rounded; eyes large, pale white, hemispherical; ocelli small, black, closer to eyes than to each other and situated above c-o line;

frontoclypeus distinctly wider than long, densely pilose, extending for half its length below lower margins of vertex, apex truncate, pronotum thickly finely punctate, disc ochraceously pilose, metopidium 2.0X as wide as high, convex, vertical, finely punctate, with sparse golden hairs; supraocular callosities conspicuously black, impunctate, bare; humeral angles subprominent, their apices subacute; suprahumeral horns 2.0X as long as the space between their bases, as seen from above obliquely porrect, tricarinate, central carina strongly ridged, depressed on each side of the carina, apically narrowing, apices subacute, seen from sides directed outward and upward; posterior process robust, strongly centrally raised, tricarinate, median carina obscurely continued through pronotum, apical area black, closely impinging on tegmina, apex acute, just reaching the posterior angle of the inner margin of tegmina; tegmina 3.0X as long as wide, subhyaline with a hue of black, strongly wrinkled, base black, punctate apical margins slightly paler and ochraceous brown, 1st apical cell long, narrow, 6.0X as long as wide, 1st discoidal cell with a very short petiole, about as long as the 2nd, apical limb broad. Scutellum wider than long, narrowly exposed, punctate, pubescent, with a pale sericeous spot on each basal angle. Abdomen beneath black. Legs with femora excepting their apices black, tibiae castaneous, tarsi ochraceous.

Length from frontal margin to tips of tegmina 4.5 mm., to tip of posterior process 2.8 mm.; width across tips of suprahumeral horns 3.0 mm., at humeral angles 2.0 mm., at eyes 1.8 mm.

Male : Unknown.

Materials examined : 2 females in FRI, Dehra Dun, one from Anamalai Hills (Tamil Nadu), 2,400 ft., the other from Dehra Dun; one female at Z.S.I. collected by F.H. Gravely at Tollyganj, Calcutta, 11-11-1916. Type locality Tenasserim Myitta; Holotype female in British Museum.

Distribution : INDIA : Uttar Pradesh (Dehra Dun); Tamil Nadu (Anamalai Hills); West Bengal (Calcutta); BURMA : Tenasserim; PHILIPPINE ISLANDS; BANGLADESH.

T. projectus is closely related to *bifurcus* Funkhouser in the length of the suprahumeral horns, but differs from it by the relatively straighter suprahumeral horns and a little longer posterior process and by the general colour and tegminal characters.

58. *Tricentrus pronus* Distant
(Fig. 63)

1916. *Tricentrus pronus* Distant, *Fauna Br. India*, 6 : 166.

1927. *Tricentrus pronus* : Funkhouser, *Gen. Cat. Hem.*, 1 : 502.

Female : General colour black. Head black, 3.2X as wide across extremities of eyes as length of vertex, sparsely covered with pale white hairs, vertex 2.2X as wide as long, upper margin arcuate, lower margins obliquely rounded; eyes large, piceous; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus only slightly extending below lower margins of vertex, longly pilose, apex broadly rounded. Pronotum black, finely punctate with short hairs; metopidium convex, 3.0X as wide as high, upper two-thirds gradually sloping behind to disc; supraocular callosities subprominent; humeral angles prominent, triangular, projecting beyond

eyes, apices blunt; suprahumeral horns shorter than the space between their bases, viewed from above broadbased, compressed, horizontally produced, apical area moderately angularly recurved, tricarinate, apices acute; posterior process robust, tricarinate, the median carina strongly percurrent through pronotum, posterior half narrowing to an acute apex which just reaches the posterior angle of the inner margin of tegmina; tegmina dark ochraceous, 3.0X as long as wide, basal sixth black punctate, 1st apical cell 5.0X as long as wide, 1st discoidal cell petiolate, about as long as the 2nd, apical limb broad. Abdomen beneath ochraceous brown. Legs with femora black, tibiae and tarsi ochraceous.

Length from frontal margin to tips of tegmina 4.5 mm., to tip of posterior process 3.2 mm.; width across tips of suprahumeral horns 3.0 mm., at humeral angles 1.9 mm., at eyes 1.7 mm.

Male : Similar to female, but shining black, slightly smaller.

Materials examined : One female (label carrying Reg. No. missing) in Z.S.I., Calcutta, collected from Tara, Garo Hills, Assam, 1,400 ft., October, 1917; one male ex *Acalypha wilkesiana* Emakulam, 12-12-1989. Type locality Kavalai, Cochin State; lectotype male in British Museum.

Distribution : INDIA : Cochin State (Emakulam), Assam; MALAYSIA : Penang.

P. pronus is closely related to *gibbosulus* (Walker) and *congestus* (Walker) in the robust body and in the disposition of the posterior process, but differs by the nature of the suprahumeral horns being more upwardly turned and acute than in *gibbosulus*, and much shorter than in *congestus*.

59. *Tricentrus pubescens* Funkhouser (Fig. 64)

1929. *Tricentrus pubescens* Funkhouser, *Philippine J. Sci.*, 40 :127.

Female : General colour brown. Head subquadrangular, densely pilose, finely punctate, about 2.75X as wide across extremities of eyes as length of vertex, vertex about 1.6X as wide as long, upper margin arcuate, lower margins obliquely continued to frontoclypeus; eyes subglobose, brown; ocelli vitreous, equidistant from each other and from eyes and situated on c-o line; frontoclypeus extending for half its length below lower margins of vertex, densely pubescent, apex broadly truncately rounded. Pronotum brown, coarsely punctate, with sparse, adpressed pilosity; metopidium 1.6X as wide as high, convex, slightly sloping backward to the disc; supraocular callosities undivided, black; humeral angles very prominent, extending well beyond the level of eyes, apices blunt; suprahumeral horns about as long as the space between their bases, viewed in front slender, extending outward, upward and very moderately curved backward, very weakly carinate, gradually narrowed, apex acuminate, passing well beyond the posterior angle of the inner margin of tegmina, median carina percurrent through pronotum; tegmina hyaline, slightly wrinkled, 3.0X as long as wide, basal area opaque, 1st apical cell 5.0X as long as wide, 1st discoidal cell petiolate, as long as the 2nd; body beneath brown, punctate, sparsely pilose. Legs dark brown with a reddish hue.

Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 5.0 mm.; width across tips of suprahumeral horns 4.25 mm., at humeral angles 3.0 mm., at eyes 2.4 mm.

Male : Not known.

Material examined : 1 female in FRI, Dehra Dun, collected from Mussorie, Dehra Dun. Type locality Catbalogan, Samar, Philippine Islands. Type in Funkhouser's Collections.

Distribution : INDIA : Uttar Pradesh (Mussorie, Dehra Dun); PHILIPPINE ISLANDS (Samar).

T. pubescens is closely allied to *ferruginosus* Funkhouser in the size of the body, in the position of the ocelli and in the nature of the metopidium; the 1st discoidal cell of tegmina in both the species are petiolate, and the length to width ratio of the 1st apical cell is similar; *pubescens* differs from *ferruginosus* by the more slender, sharp suprahumeral horns, the almost straight posterior process the apex of which is not upturned and in the colour of body and tegmina.

60. *Tricentrus recurvicornis* Ananthasubramanian
(Fig. 65)

1980. *Tricentrus recurvicornis* Ananthasubramanian, *Rec. zool. Surv. India, Occa. Pap. No.* 16:26.

Male : General colour reddish brown. Head thickly pilose, 3.5X as wide across extremities of eyes as length of vertex, vertex 2.25X as wide as long, upper margin slightly arcuate, lower margins obliquely continued to frontoclypeus; eyes subglobose, pale white; ocelli translucent, closer to eyes than to each other and situated on the c-o line; frontoclypeus ochraceous, densely pilose, extending for three-fourths its length below lower margins of vertex, apex broadly rounded, frontoclypeal lobes distinct. Pronotum dark brown, coarsely punctate, longly pilose; metopidium vertical; supraocular callosities black, divided, impunctate, bare; humeral angles prominent, their apices subacute; suprahumeral horns short, black, about one-sixth as long as space between their bases, viewed from sides obliquely raised and then directed backward, viewed from front somewhat narrow and turned outward with their apices acute; posterior process black, tricarinate, robust, apical area slender, attenuated, apex acuminate, reaching the posterior angle of the inner margin of tegmina, dorsal carina percurrent through metopidium; tegmina 2.5X as long as wide, 1st discoidal cell petiolate, much smaller than the 2nd. Abdomen and terminalia black. Legs with trochanters black, rest light brown.

Length from frontal margin to tips of tegmina 4.6 mm., to tip of posterior process 3.5 mm. width across tips of suprahumeral horns 3.15 mm., at humeral angles 3.0 mm., at eyes 2.4 mm.

Female : Unknown.

Material examined : Holotype male, Reg. No. Z.S.I. 675/H15, Solan (H.P.), Kunihar, 19-4-1970.

Distribution : INDIA.

T. recurvicornis is related to *minusculus* Ananthasubramanian in the short, recurved suprahumeral horns, petiolate 1st discoidal cell of tegmina and posterior process with median carina percurrent, but differs in the shape of the frontoclypeus and length to width ratio of the tegmina.

61. *Tricentrus repandus* Distant
(Fig. 66)

1916. *Tricentrus repandus* Distant, *Fauna Br. India*, 6 : 163.

Female : General colour dark reddish brown. Head castaneous brown, 3.0X as wide across extremities of eyes as length of vertex, vertex 2.2X as wide as long, upper margin strongly acute, lower margins obliquely rounded; eyes small, light brown; ocelli somewhat inconspicuous, a little closer to eyes than to each other and situated above c-o line; frontoclypeus densely pubescent, extending for half its length below lower margins of vertex, apex broadly rounded. Pronotum castaneous brown, coarsely punctate, sparsely ochraceously pilose; metopidium dark brown, convex, 2.5X as wide as high; supraocular callosities prominent, undivided; humeral angles prominent, their apices blunt; suprahumeral horns as long as the space between their bases, tricarinate, gradually tapering, distinctly upwardly and obliquely directed, apical area gradually narrowing and strongly recurved, apex subacute; posterior process straight, laterally subcarinate, apically attenuated, dorsal carina strongly percurrent through pronotum, apex just reaching the posterior angle of the inner margin of tegmina; tegmina 3.0X as long as wide, moderately wrinkled, outwardly margined by an indistinct pale transverse fascia, veins stout, brown, 1st apical cell 6.0X as long as wide, 1st discoidal cell nonpetiolate, shorter than the 2nd, apical limb broad. Legs piceous upto distal ends of femora, tibiae paler, shortly, densely, greyish pilose.

Length from frontal margin to tips of tegmina 7.00 mm., to tip of posterior process 4.5 mm.; width across tips of suprahumeral horns 3.5 mm., at humeral angles 2.7 mm., at eyes 2.3 mm.

Male : Not known.

Material examined : One female in FRI, Dehra Dun, collected from Jawalgiri, North Salem, Tamil Nadu; type locality Assam; holotype female in British Museum.

Distribution : INDIA : Tamil Nadu (Salem); Assam; BORNEO; SUMATRA; MALAYSIA (Penang).

T. repandus is closely allied to *projectus* Distant in the disposition of the suprahumeral horns and the posterior process, but differs by the slender attenuate posterior process and by the thickly pilose tibiae.

62. *Tricentrus sissoo* Sharma and Badan
(Fig. 67)

1986. *Tricentrus sissoo* Sharma and Badan, *Reinchenbachia Mus. Tierk. Dresden*, 23 : nr. 30 : 167.

Female : General colour ferruginous. Head about 3.0X as wide across extremities of eyes as length of vertex, with dense, short, golden pilosity, vertex 2.0X as wide as long, arcuate and sinuate at base, lower margins obliquely continued to frontoclypeus; eyes dark brown; ocelli vitreous, closer to eyes than to each other and situated above c-o line; frontoclypeus extending for half its length below lower margins of vertex, densely longly pilose; apex broadly rounded. Pronotum ferruginous, thickly finely punctate, with short, silvery hairs; metopidium vertical, convex, 2.0X as wide as high; supraocular callosities prominent, impunctate, undivided; humeral angles subprominent, apices subacute; suprahumeral horns about half as long as the space between their bases, viewed in front narrow, tricarinate, directed upward and outward, apices subacute, viewed from above, dorsoventrally compressed, flat; directed upward and outward and moderately backward; posterior process stout, straight, tricarinate median carina strongly percurrent through metopidium, apical area black, apex acute, passing well beyond the posterior angle of the inner margin of tegmina, not impinging on tegmina; tegmina 3.0X as long as wide, subhyaline, basal area black, coriaceous and punctate, veins stout, 1st apical cell long, narrow, 1st discoidal cell not petiolate, as long as the 2nd, apical limb broad, shaded with black. Legs with femora dark brown, tibiae ferruginous, tarsi yellowish brown.

Length from frontal margin to tips of tegmina 4.6 mm., to tip of posterior process 3.5 mm.; width across tips of suprahumeral horns 3.6 mm., at humeral angles 2.4 mm., at eyes 2.2 mm.

Male : Similar to female, but slightly smaller and darker.

Material examined : 5 females, 1 male ex *Pterocarpus marsupium*, 29-6-1983; 4 females ex *Dalbergia latifolia*, 1-7-1983, Mannarkad, Kerala; type locality Jammu; types in Badan collections.

Distribution : INDIA : Jammu : Kerala (Mannarkad).

This species is closely allied to *pilosus* Ananthasubramanian and Ananthakrishnan in the nature of the posterior process, but differs by the general colour and suprahumeral horns which are directed obliquely upward and outward, and in tegminal characters.

63. *Tricentrus spathodei* Ananthasubramanian
(Fig. 68)

1982. *Tricentrus spathodei* Ananthasubramanian, *Entomon*, 7(4) : 475.

Female : General colour greyish brown. Head 3.0X as wide across extremities of eyes as length of vertex, densely pilose, vertex about 2.0X as wide as long, upper margin slightly arcuate and sinuate, lower margins obliquely continued to frontoclypeus; eyes light brown, shaded with black, subglobose; ocelli hyaline, closer to eyes than to each other and situated above c-o line;

frontoclypeus longly sparsely pilose, extending half its length below lower margins of vertex, frontoclypeal lobes fused. Pronotum light brown, clothed with dense silvery hairs, finely punctate; metopidium vertical, about 1.75X as wide as high; supraocular callosities indistinct; humeral angles prominent, apices subacute; suprahumeral horns dark brown, coarsely punctate at basal area, clothed with silvery hairs, viewed from above, much flattened, nearly as long as the space between their bases, obliquely directed forward and outward, their apices broadly obliquely truncate and recurved, anterior carina weak, dorsoposterior carina strongly ridged; posterior process stout, tapering beyond middle, dark brown with a very light area in the antero-mid-dorsal region, posterior one-third jet black, central carina finely continued through metopidium, apex slightly curved upward and reaching the posterior angle of the inner margin of tegmina; tegmina hyaline, 3.0X as long as wide, basal area coriaceous, dark brown, punctate, veins light yellow, R 1, rs and part of the veins bordering the apical cells 4 and 5 jet black, costal margin thickened, absorbing the R1 partially and extending well into the 1st apical cell, 1st discoidal cell slightly longer than the 2nd, nonpetiolate. Legs uniformly greyish brown, claws dark brown.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 3.8 mm., at humeral angles 2.5 mm., at eyes 2.35 mm.

Male : Similar to female but smaller. Abdominal terminalia typical for the genus. Subgenital plate short, stubbed; base slightly broadened, outer margins gradually narrowing to apex; lateral valves broadly triangular with very short processes; aedeagus U-shaped with the posterior arm gradually tapering to an acute apex.

Length from frontal margin to tips of tegmina 4.9 mm., to tip of posterior process 3.3 mm.; width across tips of suprahumeral horns 3.0 mm., at humeral angles 2.2 mm., at eyes 2.2 mm.

Fifth instar nymph : Length 6.4 mm. including anal tube. Body much compressed dorsoventrally; general colour greyish brown with black dots scattered along dorso-lateral areas. Head about 2.5X as wide across extremities of eyes as length of vertex, cranial tubercles long, their bases bearing tuberculate spines; vertex shallowly arcuate at base, eyes large, dull white; ocelli closer to eyes than to each other and situated above c-o line; rostrum reaching the hind coxae. Thorax shorter than abdomen excluding the anal tube; metopidium obliquely sloping backward and bearing a double row of tuberculate spines, lateral angles of pronotum broadly rounded, pronotal posterior process beset with dense tuberculate spines, gradually tapering to an acute apex over mesonotum; suprahumeral buds prominent, black, produced backward; mesonotum about 0.75X as long as pronotum, mesonotal process tapering to an acute apex over metanotum; metanotum shorter than mesonotum; tegminal wing pads extending to abdominal segment II, hind wing pads extending to segment III, costal angles of wing pads broadly rounded and fringed with fine setae; abdominal segments III-VIII uniform, laterally extended and bearing long, flat lateral lamellae, each lamella beset with 14-16 tuberculate spines inclined backward, short chalazae scattered over lamellae; lateral lamellae of segment III of abdomen shorter, dorsal tubercles on segments III-VIII uniform, large, broadbased, black, bearing tuberculate spines; anal tube about 0.25X as long as body.

Material examined : 41 females, 6 males and numerous nymphs of all stages ex *Spathodea campanulata* Bexuv at Trivandrum (Kerala), 29-12-1981.

Distribution : INDIA : Kerala State (Trivandrum). Type locality Trivandrum. Types in the National Pusa Collections, IARI, New Delhi.

T. spathodei is closely related to *gibbosulus* Walker, in the disposition of the suprahumeral horns, but differs by the jet black colour of the apical area of the posterior process and by a very thick chitinous formation on the costal margin opposite to the 1st apical cell of tegmina, and also by the characteristic pitch black colour of R1, rs and part of the veins bordering the 4th and 5th apical cells of tegmina.

64. *Tricentrus speciosus* Thirumalai and Ananthasubramanian
(Fig. 69)

1985. *Tricentrus speciosus* Thirumalai and Ananthasubramanian, *Entomon*, 10(1) : 229.

Female : General colour brown with shades of black. Head black, 2.5X as wide across extremities of eyes as length of vertex, punctate, with long adpressed golden hairs, vertex 1.75X as wide as long, upper margin strongly arcuate, lower margins obliquely continued to frontoclypeus; eyes large, subglobose, brown; ocelli black, closer to eyes than to each other and situated slightly above c-o line; frontoclypeus thickly pubescent, extending half of its length below lower margins of vertex, apex rounded. Pronotum brown, finely punctate, with long suberect golden pilosity; metopidium convex, vertical, 2.75X as wide as high; supraocular callosities divided black; humeral angles prominent, their apices subacute; suprahumeral horns robust, broadbased, basal areas brown, rest black, viewed from above longer than the distance between their bases, strongly tricarinate, directed outward, apical part curving backward, apices acute; posterior process robust, straight, emerging behind the disc, contiguous with scutellum, basal two-thirds dark brown, apex black, acuminate, passing well beyond the posterior angle of the inner margin of tegmina, strongly tricarinate, median carina strongly percurrent through metopidium; tegmina bronzy, 3.0X as long as wide, basal one-fourth coriaceous, black, veins dark brown, 1st apical cell about 6.0X as long as wide, 1st discoidal cell not petiolate, nearly as long as the 2nd. Lateral areas of thorax white tomentose. Legs with femora black, tibiae and tarsi dark brown. Abdomen dark brown, ovipositor jet black.

Length from frontal margin to tips of tegmina 5.56 mm., to tip of posterior process 3.94 mm.; width across tips of suprahumeral horns 3.21 mm., at humeral angles 2.24 mm., at eyes 2.18 mm.

Male : Differing from female in being smaller and darker, suprahumeral horns shorter, apex of posterior process inclined upward above claval suture.

Length from frontal margin to tips of tegmina 4.59 mm., to tip of posterior process 3.01 mm. width across tips of suprahumeral horns 2.56 mm., at humeral angles 2.18 mm., at eyes 2.0 mm.

Material examined : Holotype female and allotype male collected from Papparai, Sabarigiri, Kerala, 11-5-1981, and deposited into Z.S.I., Calcutta. Type locality Papparai, Sabarigiri, Kerala.

Distribution : INDIA : Kerala State (Sabarigiri).

T. speciosus is closely allied to *syrandriksae* Thirumalai and Ananthasubramanian in the general size of the body and to *fairmairei* Stål in the general colour, but differs from both by the disposition of the suprahumeral horns which extend outward and moderately straight, the longer posterior process in the female and the marked sexual dimorphism.

65. *Tricentrus subangulatus* Distant
(Fig. 70)

1908. *Tricentrus subangulatus* Distant, *Fauna Br. India*, 4 : 55.

1934. *Otaris subangulatus* : Goding, *Jt. N. Y. ent. Soc.*, 42 : 479.

1979. *Tricentrus subangulatus* : Ahmad and Yasmeen, *Oriental Insects*, 12(4) : 551.

Female : General colour black. Head about 3.3X as wide across extremities of eyes as length of vertex, finely punctate, covered with dense, short, golden hairs; vertex 2.3X as wide as long, upper margin strongly arcuate and sinuate, lower margins horizontally continued to frontoclypeus; eyes large, reddish brown; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus extending for half its length below lower margins of vertex, densely longly pilose, apex truncate. Pronotum black, thickly punctate, with short adpressed golden pilosity; metopidium 3.4X as wide as high, convex, slightly sloping backward to disc; supraocular callosities inconspicuous; humeral angles prominent, coarsely punctate at base, apices subacute; suprahumeral horns short, as seen from above broad, recurved, 0.75X as long as the space between their bases, anterior margin rounded, posterior margin substraight, apices subacute; posterior process robust, tectiform, coarsely punctate, sparsely pilose, tricarinate, lateral carinae fine, median carina percurrent through pronotum, apical area gradually tapering, apex acute, gently elevated, not impinging on tegmina, not reaching the posterior angle of the inner margin of tegmina; tegmina 3.0X as long as wide, pale bronzy hyaline, veins piceous, base black, punctate, a distinct transverse fascia on outer margin, 1st apical cell 5.0X as long as wide, 1st discoidal cell petiolate, shorter than the 2nd, apical limb broad. Body beneath and legs black.

Length from frontal margin to tips of tegmina 5.5 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 3.0 mm., at humeral angles 2.4 mm., at eyes 2.2 mm.

Male : Smaller than female; general colour dark brown; suprahumeral horns shorter than those of female.

Length from frontal margin to tips of tegmina 4.5 mm., to tip of posterior process 3.25 mm.; width across tips of suprahumeral horns 2.5 mm., at humeral angles 2.2 mm., at eyes 2.0 mm.

Material examined : One female collected at Rangirum, Darjeeling (6,000 ft.), one female at Ramgarh, Naini Tal (7,000 ft.) in FRI, Dehra Dun; 2 females collected at Mudmalai ex *Acacia nilotica*, 2-2-1985. Type locality Nilgiri Hills (Tamil Nadu); lectotype male in British Museum.

Distribution : INDIA : Tamil Nadu (Nilgiri Hills, Mudumalai); Uttar Pradesh (Dehra Dun, Naini Tal); West Bengal (Darjeeling); PAKISTAN; BANGLADESH; BURMA (moulmein).

T. subangulatus is closely related to *pilosus* Ananthasubramanian and Ananthakrishnan and *albomaculatus* Distant, but it can be easily separated from *pilosus* by the distinctly elevated apex of the posterior process and the presence of a long petiole for the 1st discoidal cell of tegmina; it can be separated from *albomaculatus* by the absence of white tomentosity on the lateral areas of pronotum and sternum.

66. *Tricentrus syrandroidikae* Thirumalai and Ananthasubramanian
(Fig. 71)

1981. *Tricentrus syrandroidikae* Thirumalai and Ananthasubramanian, *Bull. zool. Surv. India*, 4(1) : 32.

Female : General colour black with shades of brown. Head vertical, 2.5X as wide across extremities of eyes as length of vertex; vertex about 1.6X as wide as long, finely punctate with short, adpressed silvery hairs, upper margin strongly arcuate, lower margins obliquely curved to frontoclypeus; eyes subglobose, light brown; ocelli black, a little closer to eyes than to each other and situated well above c-o line; frontoclypeus extending for half its length below lower margins of vertex, thickly pubescent, apex truncately rounded. Pronotum black, finely punctate, with short suberect silvery pilosity; metopidium convex, vertical, 2.0X as wide as high; humeral angles prominent, their apices blunt; suprahumeral horns robust, broadly based, jet black, as long as the space between their bases, lateral carinae inconspicuous, apices sharply acute, viewed from lateral aspects directed upward and strongly recurved, viewed in front directed obliquely upward and outward, pilosity at bases denser, posterior process emerging behind disc, basal area reddish brown, apical area jet black, apex acuminate, reaching a little beyond claval suture, strongly tricarinate, median carina percurrent through metopidium; tegmina pale brown, 3.0X as long as wide, basal fourth coriaceous, black, a pale white fascia beyond the basal coriaceous area, veins brown, 1st apical cell about 7.0X as long as wide, 1st discoidal cell not petiolate, nearly as long as the second, apical limb broad. Lateral areas of sternum white tomentose. Legs dark brown upto tibiae, tibiae and tarsi yellowish brown, hind trochanters prominently toothed on the dilated inner surface; abdomen dark brown with white pubescence. Ovipositor jet black.

Length from frontal margin to tips of tegmina 5.7 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 3.0 mm., at humeral angles 2.4 mm., at eyes 2.4 mm.

Male : Similar to female in general colour and pubescence as also in measurements, but the suprahumeral horns are less curved and shorter than the space between their bases; 1st discoidal cell of tegmina petiolate, much smaller than the 2nd.

Material examined : One female and one male collected at Valiyaparathodu, Silent Valley, Kerala, 3-5-1980; Reg. No. zsi/srs/I/H; types in Z.S.I., Calcutta.

Distribution : INDIA.

T. syrandrikan is closely related to *fairmairei* Stål in its general colour and size and in the disposition of the horns and the posterior process, but differs by the distinctly shorter suprahumeral horns, and the marked differences in the dimensions of discoidal cells.

67. *Tricentrus transversus* (Distant)
(Fig. 72)

1908. *Centrotus transversus* Distant, *Fauna Br. India*, 4 : 48.

1933. *Tricentrus transversus* : Funkhouser, *Indian For. Rec.*, 17(10) : 4.

Female : General colour black. Head black, about 2.0X as wide across extremities of eyes as length of vertex, vertex about 1.25X as wide as long, upper margin arcuate and sinuate, lower margins strongly obliquely continued to frontoclypeus; eyes large, dull black; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus with about half of its length extending below lower margins of vertex, apex truncate, wider than base, its lobes fused almost to their whole length. Pronotum black, coarsely punctate, metopidium about 2.0X as wide as high, coarsely granulose, sparsely pilose, somewhat obliquely sloping backward to disc; supraocular callosities prominent, undivided; humeral angles extending beyond the level of eyes, their apices subacute; suprahumeral horns as seen from above broad, horizontally truncate, as viewed in front shorter than the intervening space between their bases, appearing much narrower; posterior process stout, tricarinate, the central carina strongly percurrent through metopidium, inferior margin of posterior process distinctly separated from scutellum, medially ampliate and then gradually narrowed to apex, apex acute, distinctly passing beyond the posterior angle of the inner margin of tegmina; tegmina dark castaneous brown, about 3.0X as long as wide, darker at base and on costal area, R₁ oblique to subcosta, 1st apical cell based on R₁ and rs, about 4.0X as long as wide, wedged-shaped, veins to apical area straight; scutellum as long as wide, basal angles cretaceously sericeous; lateral areas of sternum castaneously sericeous. Legs ochraceous, sparingly pilose.

Length from frontal margin to tips of tegmina 10.0 mm., to tip of posterior process 7.5 mm.; width across tips of suprahumeral horns 6.0 mm., at humeral angles 3.4 mm., at eyes 3.0 mm.

Male : Similar to female in the nature of the horns; smaller; general colour shining black; tegmina darker.

Length from frontal margins to tips of tegmina 9.0 mm., to tip of posterior process 6.8 mm.; width across tips of suprahumeral horns 5.5 mm., at humeral angles 3.4 mm., at eyes 3.0 mm.

Material examined : 4 females and 2 males in FRI, Dehra Dun; type locality Assam (Margherita); holotype female in British Museum.

Distribution : INDIA : Assam (Margherita); Tamil Nadu (Jawalagiri).

T. transversus, one of the large species of the genus, was placed in the genus *Centrotus* Fabricius by Distant (1908) in view of its large size, horizontally truncate suprahumeral horns, medially ampliate posterior process gradually narrowing to apex, and the inferior margin of the

posterior process distinctly separated from scutellum; Funkhouser (1933) allocated it to the genus *Tricentrus* due to the presence of spines on the inner margin of hind trochanters, the absolute diagnosis for the genus.

68. *Tricentrus unicolor* Ananthasubramanian
(Fig. 73)

1980. *Tricentrus unicolor* Ananthasubramanian, *Rec. zool. Surv. India, Occa. Pap. No. 16* : 22.

Male : General colour greyish yellow. Head vertical, greyish yellow, sparingly clothed with golden pilosity, 2.0X as wide across extremities of eyes as length of vertex, vertex 1.6X as wide as long, upper margin shallowly arcuate, lower margins strongly obliquely continued to frontoclypeus; eyes hemispherical, yellowish brown; ocelli succineous, equidistant from each other and from eyes and situated distinctly above c-o line; frontoclypeus densely pubescent, extending for half its length below lower margins of vertex, apex truncate, basal lobes inconspicuous. Pronotum greyish yellow, finely punctate, with sparse silvery pilosity; metopidium 2.0X as wide as high, obliquely sloping to disc; supraocular callosities prominent, jet black, impunctate, undivided; humeral angles subprominent, their posterior angles rounded and slightly arched over base of scutellum; suprahumeral horns short, 0.5X as long as the space between their bases, tricarinate directed outward and backward, apices black, subacute; posterior process greyish, emerging from behind disc, moderately stout, dorsally pilose, median carina strong, percurrent through pronotum, apex acute, reaching the posterior angle of the inner margin of the tegmina; tegmina light brown, 3.0X as long as wide, 1st apical cell about 6.0X as long as wide, 1st discoidal cell petiolate, about one-third as long as the 2nd, apical limbus moderately broad. Lateral areas of sternum white tomentose. Legs entirely greyish yellow. Subgenital plate jet black.

Length from frontal margins to tips of tegmina 4.4 mm., to tip of posterior process 3.1 mm.; width across tips of suprahumeral horns 2.7 mm., at humeral angles 2.2 mm., at eyes 2.0 mm.

Female : Unknown.

Material examined : Holotype male, Z.S.I. Reg. No. 617/H15, and one paratype male, from Kunihar, Solan (H.P.), 19-4-1970.

Distribution : INDIA.

T. unicolor is closely allied to *gibbosulus* (Walker) and *mitrai* nom. nov. in the short, robust suprahumeral horns and in the nature of the posterior process; it differs from both by the small first discoidal cell which is only one-third as large as the 2nd.

69. *Tricentrus varicornis* Ananthasubramanian
(Fig. 74)

1980. *Tricentrus varicornis* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Pap. No. 16* : 30.

Female : General colour purplish brown. Head greyish, 3.0X as wide across extremities of eyes as length of vertex, sparsely pilose, finely punctate, vertex 2.0X as wide as long, upper margin shallowly arcuate, lower margins obliquely continued to frontoclypeus; eyes large, pale yellow; ocelli pale white, closer to eyes than to each other and situated on c-o line; frontoclypeus densely pilose, extending for half its length below lower margins of vertex, apex truncately rounded. Pronotum reddish brown, finely punctate, thickly pubescent; metopidium vertical, sparsely hairy, 2.0X as wide as high; supraocular callosities prominent, circular, jet black; humeral angles prominent darker than pronotum, apices blunt; suprahumeral horns robust, about 1.5X as long as the space between their bases, highly variable in length, longly pilose, projecting obliquely forward and upward, apical area recurved, apices subacute; posterior process short, tricarinate, lateral carinae weak, median carina percurrent through metopidium, apex acute, black, not reaching the posterior angle of the inner margin of tegmina; tegmina purplish brown, sparsely hairy, nearly 2.5X as long as wide, 1st apical cell 5.0X as long as wide, 1st discoidal cell petiolate, shorter than the 2nd. Legs densely pilose, distal end of femora, the whole of tibiae and tarsi pale white. Abdomen black.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.1 mm.; width across tips of suprahumeral horns 2.75 mm., at humeral angles 2.0 mm., at eyes 1.35 mm.

Male : Unknown.

Material examined : Holotype female Reg. No. Z.S.I. 682/H15 from Tenga River bed, 18-12-1965; two other females Reg. Nos. Z.S.I. 683/H15, 684/H15, from Wokro, NEFA, 1,700 m., 2-12-1970.

Distribution : INDIA.

T. varicornis is allied to *indicus* nom. nov. in the general colour of the body and in the disposition of suprahumeral horns, but differs by the smaller body size, longer and stouter suprahumeral horns and the nature of frontoclypeus.

Genus 4. *Tricentroides* Distant

1916. *Tricentroides* Distant, *Fauna Br. India*, 6 : 169.

Allied to *Tricentrus* Stål, from which it differs by the more slender and longer posterior process which is apically elevated, and the strongly curved veins to the apical cells of the tegmina.

Head subquadrate, wider than long, eyes large, subglobose, frontoclypeus extending for half its length below lower margins of vertex, frontoclypeal lobes indistinctly fused with the main lobe. Pronotum convex, metopidium vertical; humeral angles prominent; suprahumeral horns long,

slender, tricarinate, posterior process long, slender, triquerate, tectiform, elevated apically, apex acuminate, passing the posterior angle of the inner margin of tegmina; scutellum exposed laterally; tegmina hyaline, 5 apical and 2 discoidal cells, veins to apical cells strongly curved; hind wings with 3 apical cells; legs simple, hind trochanters spinulose, hind tarsi longest.

Type species : *Tricentroides proprius* Distant.

70. *Tricentroides propria* Distant
(Fig. 75)

1916. *Tricentroides proprius* Distant, *Fauna Br. India*, 6 : 169.

1965. *Tricentroides propria* : Metcalf and Wade, *Gen. Cat. Hom.*, 1 : 427.

Female : General colour castaneous brown. Head 3.2X as wide across extremities of eyes as length of vertex, black, punctate, with silvery pilosity, vertex 2.0X as wide as long, upper margin arcuate, lower margins strongly oblique; eyes large, subglobose, brown; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus longer than wide, extending for half its length below lower margins of vertex, densely pubescent, apex truncately rounded; frontoclypeal lobes indistinctly fused with the main lobe. Pronotum castaneous, coarsely punctate, with sparse silvery pilosity; metopidium 2.0X as wide as high, supraocular callosities rather inconspicuous; humeral angles black, triangular, apices subacute; suprahumeral horns tricarinate, 1.3X as long as space between their bases, viewed in front directed outward and obliquely upward, their spines black, slightly recurved and subacute, inner margins black; posterior process long, slender, straight, contiguous with tegminal inner margin, apical area black, elevated, not impinging on the inner margin of tegmina, apex acuminate, passing well beyond the posterior angle of the inner margin of tegmina; tegmina 3.0X as long as wide, subhyaline, reflecting the castaneous body beneath, basal area black, coriaceous, coarsely punctate, veins black. R1 oblique to subcosta, 1st apical cell long, somewhat parallel sided, about 5.0X as long as wide, 1st discoidal cell petiolate, petiole as long as the cell, 2nd discoidal much longer than the 1st, apical limb narrow. Legs pale ochraceous, hind trochanters spinulose, hind tarsi longest.

Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 5.6 mm.; width across tips of suprahumeral horns 4.8 mm., at humeral angles 2.7 mm., at eyes 2.8 mm.

Male : Unknown.

Material examined : One female in Tamil Nadu Agricultural University, Coimbatore, collected from Assam, 4,200 ft. Type locality Assam, Cherrapunji, 4,200 ft. Holotype female in British Museum.

Distribution : INDIA.

Tricentroides propria differs from *orcus* (Buckton), the only other known species of the genus, by the general colour of the body, the longer suprahumeral horns and the apically elevated posterior process which in *orcus* is straight.

Tribe HYPSAUCHENIINI Distant

1908. *Hypsaucheniaria* Distant, *Fauna Br. India*, 4 : 10.
 1926. *Hypsaucheniini* : Schmidt, *Soc. Ent.*, 41 : 21.
 1930. *Hypsauchenini* : Goding, *Amer. Mus. Novitates*, 421 : 26.

This tribe is diagnosed by the following characters : Head almost triangular, disc of pronotum elevated in an erect, recurved, forwardly inclined or porrect process, its apex bilobed, bispined, bituberculate or compressed; posterior process impinging upon or somewhat distant from scutellum, with or without a subapical dorsal node; sides of pro and mesosterna armed with a small lobe or tooth; tegmina with 2 or 3 discoidal cells and 4 or 5 apical cells, in some the tegminal venation irregular, with the apical area multicellular. Legs simple, tibiae somewhat dilated.

Key to genera of Indian Hypsaucheniini

- 1(4) Posterior process with a dorsal subapical node.
- 2(3) Anterior pronotal process recurved; venation of tegmina normal. *Hypsauchenia* Germar
- 3(2) Anterior pronotal process straight; venation of tegmina irregular. *Hypsolyrium* Schmidt
- 4(1) Posterior process without a dorsal subapical node; anterior pronotal process recurved; venation in the apical area of tegmina irregular and reticulate. *Hybanda* Distant

Genus 5. *Hypsauchenia* Germar

1835. *Hypsauchenia* Germar, *Silb. Rev. Ent.*, 3 : 230.

Head subquadrate, almost triangular, about as wide as long, finely granulose, upper margin of vertex highly arcuate and strongly bituberculate, lower margins strongly oblique; eyes globular, ocelli prominent, protruding, closer to eyes than to each other and situated well above c-o line; frontoclypeus very long, extending for three-fourths its length below lower margins of vertex. Pronotum shorter than tegmina, without lateral processes, but produced upward in a curved backwardly directed compressed process with its apex bilobed; metopidium conical, vertical tricarinate, higher than wide; median strongly percurrent; humeral angles large, triangular, their apices blunt; mesonotum extended into teeth or lobes; posterior process narrow at base, exposing the scutellum, with a dorsal subapical node, slender, apex acuminate, reaching the posterior angle

of inner tegminal margin; scutellum as wide as long; tegmina with apical margins obliquely truncate, their apical angles longly produced; sides of pro- and mesoterna armed with a small lobe or tooth.

Type species : *Centrotus hardwickii* Kirby.

Key to species of Indian *Hypsauchenia* Germar

- 1(4) Dorsal subapical node of posterior process broad and subacute; apical lobes to the discal pronotal process broad, basally broadly separated by a circular space.
- 2(3) Apical lobes of pronotal discal process with their tips almost reaching the level of tegminal apices; distal half of posterior process inclined upwards, its apex not impinging on inner tegminal margin. *hardwickii* (Kirby)
- 3(2) Apical lobes of pronotal discal process with their tips almost reaching the apex of posterior process; distal half of posterior process not inclined upward, but contiguous with inner tegminal margin. *anantkrishnani* n.sp.
- 4(1) Dorsal subapical node of posterior process narrower and more acute; apical lobes of discal pronotal process narrow and basally separated by a narrow oval space. *subfusca* Buckton

71. *Hypsauchenia anantkrishnani* n.sp.

(Fig. 76)

Female : General colour dark reddish brown. Head dark brown, finely punctate, about 2.25X as wide across extremities of eyes as length of vertex, upper margin of vertex truncate, lower margins obliquely continued to frontoclypeus; eyes large, black, hemispherical; ocelli concolorous with vertex, closer to eyes than to each other and situated slightly above c-o line; frontoclypeus 1.5X as long as wide, with one-half of its length extending below lower margins of vertex, apex almost truncate, clothed with short hairs, frontoclypeal lobes almost fused, with the main lobe. Pronotum dark reddish brown, coarsely punctate; metopidium about 2.5X as wide as high, vertical, gradually sloping backward to discal pronotal process; humeral angles large, about as wide as eyes and projecting laterad well beyond eyes, finely granulate, apices subacute; pronotal discal process smoothly curved backward, then continued horizontally at a distance of 3.1 mm. from the upper surface, apical lobes broad, about 1.7 mm. long 0.3 mm. wide, basally separated

by a space which is more or less circular, apices of lobes acuminate, just reaching the level of the apex of posterior process; posterior process slightly arched at base above scutellum, slender, almost straight behind scutellum, contiguous with inner tegminal margin, dorsal subapical node broadly rounded above, about as long as the apical part of posterior process just behind the dorsal node, apex acute, reaching the posterior angle of the inner margin of tegmina; tegmina a little more than 3.0X as long as wide, dark reddish brown, coriaceous, coarsely punctate except at apical area, R1 oblique to subcosta, rs much shortened, veins to apical area straight, venation regular except for a few spurious cross veins, apical limb fairly broad. Legs dark brown. Abdomen beneath concolorous with pronotum. Scutellum slightly longer than wide, with a cretaceously sericeous spot at basal angles.

Length from frontal margin to tips of tegmina 8.5 mm., to tip of posterior process 5.5 mm.; length of discal pronotal process 6.25 mm., length of apical node of posterior process 1.4 mm., width across humeral angles 3.3 mm., at eyes 2.3 mm.

Male : Unknown.

Material examined : One female in Tamil Nadu Agricultural University, Coimbatore, collected from western Himalayas, Kurseong, April-May, 1917, coll. L.V. Newton. Holotype female in T.N. Agri. University, Coimbatore.

Distribution : INDIA.

H. ananthkrishnani n.sp. is closely allied to *hardwickii* (Kirby) in the general disposition of the discal pronotal process, its apical lobes and posterior process, but differs by the general colour of the body, shorter discal pronotal process and the posterior process contiguous with the inner tegminal margin. The species is named after Prof. Dr. T.N. Ananthkrishnan from whom the author has received sustained help, advice and inspiration.

72. *Hypsauchenia hardwickii* (Kirby)

1829. *Centrotus hardwickii* Kirby, *Ann. Mag. nat. Hist.*, 2 : 21.
 1835. *Hypsauchenia ballista* Germar, *Silb. Rev. Ent.*, 3 : 231.
 1846. *Hypsauchenia hardwickii* : Fairmaire, *Ann. Soc. Ent. de France*, 4 : 520.
 1903. *Hypsauchenia hardwickii* var. *floralis* Buckton, *Mon. Membrac.*, 210.
 1903. *Hypsauchenia hardwickii* var. *pygmaea* Buckton, *Ibid.*, : 211.
 1908. *Hypsauchenia hardwickii* : Distant, *Fauna Br. India*, 4 : 10.

Female : General colour piceous. Head vertical, about 2.0X as wide across extremities of eyes as length of vertex, almost triangular, finely granulose, vertex about 1.3X as wide as long, its upper margin shallowly arcuate, sinuate, lower margins strongly obliquely continued to frontoclypeus; eyes large, subglobose, black; ocelli small, distinct, a little elevated, closer to eyes than to each other and situated well above c-o line; frontoclypeus narrow at base, broadly truncate at apex longer than wide, with about one half of its length extending below lower margins of vertex, frontoclypeal lobes distinct. Pronotum dark brown, finely punctate and granulose;

metopidium almost vertical above base of vertex, gradually sloping back to discal process, about 2.0X as wide as high, finely granulose; humeral angles prominent, projecting outward well beyond eyes, their apices subacute; pronotal discal process curved backward and continued well above posterior process horizontally, apically bilobed, the lobes broad, basally broadly separated by a circular space, their apices with a slight slender projection, nearly but not reaching the level of the apices of the tegmina; posterior process slender, narrow at base, exposing the scutellum; tegmina 3.0X as long as wide, extending considerably beyond abdominal apex, piceous brown, basal two-thirds of corium punctate, R1 oblique to subcosta, 1st apical cell wedge-shaped, based on rs, about 3.0X as long as wide, venation mostly regular, apical limbus moderately broad; hind wings with 4 apical cells. Legs piceous brown, tibiae and tarsi a little paler than femora, abdomen beneath dark brown.

Length from frontal margin to tips of tegmina 8.0 mm., to tip of posterior process 6.7 mm.; length of apical lobes 2.25 mm., width across extremities of humeral angles 3.2 mm., at eyes 2.75 mm.

Male : Similar to female.

Material examined : One female and one male in Tamil Nadu Agricultural University, Coimbatore, collected from Darjeeling, 22-2-1915.

Distribution : INDIA : Darjeeling, Eastern Himalayas, Naga Hills, Khasi Hills, Sikkim, Assam; NEPAL; LOWER BURMA; CELEBES.

H. hardwickii is very closely related to *ananthakrishnani* n.sp. in the disposition of the discal pronotal process and the posterior process, but differs in the general colour of the body and shorter discal pronotal process.

73. *Hypsauchenia subfusca* Buckton
(Fig. 78, 79)

1846. *Hypsauchenia hardwickii* Fairmaire, *Ann. Soc. Entomol. France* 3 : 520.

1903. *Hypsauchenia subfusca* Buckton, *Mon. Membrac.* : 211.

1908. *Hypsauchenia subfusca* : Distant, *Fauna Br. India*, 4 : 11.

Female : General colour dark reddish brown. Head dark brown, triangular, finely granular, about 1.5X as wide across extremities of eyes as length of vertex, vertex about as wide as long, upper margin shallowly arcuate, lower margins strongly obliquely continued to frontoclypeus; eyes large, subglobose, black; ocelli prominent, closer to eyes than to each other and situated above c-o line; frontoclypeus narrow at base, broadly truncate at apex, extending for about half its length below lower margins of vertex, frontoclypeal lobes distinct. Pronotum finely punctate, piceous brown, metopidium dark brown, punctate, almost vertical, continued above to discal pronotal process, humeral angles prominent, about as wide as eyes and projecting laterad beyond eyes, apices subacute; pronotal discal process gradually curved backward, then continued horizontally as far backward as the apex of posterior process, apical lobes 3.0X as long as wide,

basally wider separated by a small oval space; posterior process slender, narrow at base exposing the scutellum, the dorsal subapical node narrow, its posterior face nearly vertical, apex of posterior process acuminate, just reaching the posterior angle of the inner margin of tegmina; tegmina brownish piceous, coriaceous, punctate at basal two-thirds, about 3.5X as long as wide, veins to apical area tending towards reticulation, apex obliquely narrow, apical limbus moderately wide. Scutellum slightly longer than wide. Legs uniformly dark brown.

Length from frontal margin to tips of tegmina 7.5 mm., to tip of posterior process 3.5 mm.; length of discal pronotal process 5.0 mm., length of apical lobes 1.8 mm., width 0.6 mm.; width across extremities of humeral angles 2.4 mm., at eyes 1.8 mm.

Male : Similar to female in general colour, but smaller.

Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 3.75 mm.; length of discal process of pronotum 4.6 mm., length of apical lobes 1.6 mm., width 0.5 mm.; width across extremities of humeral angles 2.25 mm., at eyes 1.6 mm.

Fifth instar nymph : General colour dark reddish brown above, light brown beneath. Body very much flattened dorsoventrally and devoid of prominent tuberosities and spines. Head about 2.0X as wide across extremities of eyes as length of vertex, rostral tip reaching the mesosternite, cranial tubercles persistent, broadly conical; eyes prominent, dark brown; ocelli faintly visible, closer to eyes than to each other and situated above c-o line; antennae nearly 0.3X as long as head width. Thorax as long as abdomen excluding anal tube, free from prominent tuberculated spines; pronotal posterior process triangular, its apex subacute, extending over the basal half of mesonotum; mesonotum 2.0X as long as metanotum; wing pads prominent, 2.0X as long as wide, finely setose, costal angles not demarcated. Abdomen excluding anal tube about 0.66X as long as wide; segments V-VIII identical, their lateral margins fringed with short hairs, lateral lamellae absent; anal tube about 0.16X as long as body, cerci long, tapering to an acute apex, about 0.7X as long as body. Length of body 3.0 mm., length of cerci 2.2 mm.

Material examined : 3 females, FRI, Dehra Dun, collected from Darjeeling, Nambong, 3,000'; 1 female, ZSI, Calcutta, collected from Sikkim, Gantex, 1682 m., 19-8-1959, Reg. Nos. 8376/H7; 12 females, 2 males, many nymphs from Nongklaw, Meghalaya, 1-10-1988, ex *Salix elegans*. Lectotype female in British Museum.

Distribution : INDIA; PAKISTAN.

H. subfusca is very closely related to *H. hardwickii* (Kirby) in the general colour, size and many other characters, but differs from the latter in the narrower and more acute subapical node of the posterior process, and the narrower apical lobes of discal pronotal process which are basally separated by a small, oval space. The nymphs of this species are of interest. Unlike the nymphs of many species of membracids, they are devoid of prominent tuberosities, spines, scoli and lamellae; they are characterised by the presence of a pair of long unjointed cerci arising from the ventrolateral parts of the anal tube; these structures and the dorsoventrally flattened body make them appear like small cockroaches as reported by Lefory and Howlett (1909) who also

state that the young of this membracid show no sign of any pronotal prominence; while this is true with regard to the pronotal structure of the first and second immatures of this species, the later nymphs present pronotal posterior processes; in the fifth nymph of the pronotal posterior process extends over the basal half of the mesonotum.

Genus 6. *Hypsolyrium* Schmidt

1926. *Hypsolyrium* Schmidt, *Soc. Ent.* : 22.

1951. *Hypsolyrium* : Funkhouser, *Gen. Ins.*, 208 : 214.

The genus *Hypsolyrium* is closely related to *Hypsauchenia* Germar from which it differs in the anterior discal pronotal process being straight, and the venation of tegmina irregular and reticulate.

Head nearly triangular, about 2.0X as wide across extremities of eyes as length of vertex; frontoclypeus longer than wide, extending to a considerable extent below lower margins of vertex, eyes large, subglobose; ocelli closer to eyes than to each other. Pronotum shorter than tegmina, without lateral processes, but produced upward in a straight upturned process with its apex subglobose, acuminate and recurved; posterior process narrow at base, exposing the scutellum, slender with a subapical node, the apex just reaching the posterior angle of inner tegminal margin; scutellum as wide as long; tegmina with moderately dense reticulation behind the middle; hind wings with 4 apical cells.

Type species : *Hypsauchenia uncinata* Stål.

Key to species of Indian *Hypsolyrium* Schmidt

- | | | |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| 1(4) | Pronotal anterior process shorter than posterior process. | |
| 2(3) | Pronotal anterior process a little forwardly inclined, its apex slender, acuminate and much recurved. | <i>uncinatum</i> (Stål) |
| 3(2) | Pronotal anterior process somewhat perpendicularly elevated, its apex oblique and more outwardly curved. | <i>manni</i> (Distant) |
| 4(1) | Pronotal anterior process longer than the posterior process, almost perpendicularly elevated; tibiae pale dull sanguineous, a small white spot on tegminal margin near apex of posterior process; black species. | <i>kempi</i> (Distant) |

74. *Hypsolyrium kempi* (Distant)
(Fig. 80)

1916. *Hypsauchenia kempi* Distant, *Fauna Br. India*, 6 : 148.

1951. *Hypsolyrium kempi* : Goding, *Jt. N. Y. ent. Soc.*, 58 : 256.

Female : General colour dark brown. Head finely punctate, about 2.0X as wide across extremities of eyes as length of vertex, vertex nearly 1.3X as wide as long, upper margin strongly arcuate, lower margins strongly obliquely continued to frontoclypeus; eyes moderately large, black; ocelli distinct, much closer to eyes than to each other and situated distinctly above c-o line; frontoclypeus sparsely hairy, longer than wide, extending half its length below lower margins of vertex, apex obtusely rounded; antennae reddish brown. Pronotum finely punctate, metopidium at first vertical, then gradually sloping backward to disc, finely punctate; supraocular callosities faintly visible, circular, smooth; humeral angles prominent, extending outward beyond eyes, apices obtusely subacute; pronotal anterior (dorsal) process almost vertical, longer than posterior process, its apex subacute directed obliquely backward; posterior process narrow at base, slender, contiguous with inner tegminal margin, its subapical lobe abruptly raised, apex acuminate, just reaching the posterior angle of the inner margin of tegmina, basal area pale dull sanguineous; tegmina nearly 4.0X as long as wide, dark brown, a central anterior marginal space of tegmina dull reddish brown, basal half somewhat punctate, distal half nonpunctate, with veins irregularly reticulate, legs simple, dark brown upto femora, tibiae and tarsi pale reddish brown.

Length from frontal margins to tips of tegmina 9.5 mm., to tip of posterior process 5.5 mm.; height of pronotal anterior (dorsal) process 4.0 mm.; width across tips of humeral angles 3.0 mm., at eyes 2.2 mm.

Male : Similar to female in the disposition of pronotal anterior process and posterior process, tegminal venation and general colour, but slightly smaller.

Length from frontal margin to tips of tegmina 8.0 mm., to tip of posterior process 5.0 mm.; height of pronotal (dorsal) process 3.7 mm.; width across tips of humeral angles 2.8 mm., at eyes 2.0 mm.

Material examined : 2 females and 1 male in the collections of ZSI, Calcutta (collected by Mann from Assam in 1917); holotype male in British Museum.

Distribution : INDIA : Assam; UPPER BURMA.

Hypsolyrium kempi is closely related to *H. uncinatum* (Stål) and *manni* (Distant) in the general disposition of pronotal dorsal and posterior process and tegminal venation, but differs from *uncinatum* in the much more perpendicularly elevated anterior pronotal process and general colour, and from *manni* in the shorter anterior pronotal process which is somewhat broader, more outwardly curved apically and in the colour of tibiae.

75. *Hypsolyrium manni* (Distant)

1916. *Hypsauchenia manni* Distant, *Fauna Br. India*, 6 : 149.
 1951. *Hypsolyrium manni* : Goding, *Jt. N. Y. ent. Soc.*, 58 : 256.

This species was not available for examination and it is not represented in the collections, of the various institutions in India. As such, Distant's (1916) comments on the species are quoted: "Allied to *H. kempi*, but differing in the following characters : The anterior pronotal process is shorter, broader, more outwardly curved apically, its apex oblique not acute; tibiae ochraceous; other characters as in *H. kempi*. Length 7 millim. Hab. Darjeeling: Pussumbling (H.H. Mann)" Holotype male in British Museum.

76. *Hypsolyrium uncinatum* (Stål)
(Fig. 81)

1869. *Hypsauchenia uncinata* Stål, *Ofv. Vet.-Ak. Forh.* : 283.
 1908. *Hypsauchenia uncinata* : Distant, *Fauna Br. India*, 4 : 12.
 1951. *Hypsolyrium uncinata* : Goding, *Jt. N. Y. ent. Soc.*, 58 : 256.
 1951. *Hypsolyrium uncinata* : Funkhouser, *Gen. Ins.*, 208 : 217.
 1965. *Hypsolyrium uncinatum* : Metcalf and Wade, *General Catalogue of Homoptera : Membracidae*, fas. 1 and 2 : 280.

Female : General colour ferruginous ochraceous. Head vertical, 2.0X as wide across extremities of eyes as length of vertex, densely hairy, upper margin of vertex strongly arcuate, lower margins obliquely continued to frontoclypeus; eyes large, subglobose, dark brown; ocelli prominent, somewhat elevated, closer to eyes than to each other and situated well above c-o line; frontoclypeus pubescent, extending for about half of its length below lower margins of vertex, apex obtusely rounded, frontoclypeal lobes indistinct. Pronotum punctate, densely pubescent, metopidium convex, vertical to about one-third of its height, then gradually sloping backward to disc; pronotal anterior (dorsal) process shorter than posterior process, bending a little forward, posteriorly rounded, amplified a little above the middle, subglobose, acuminate and strongly recurved at apex; humeral angles very prominent, extending beyond eyes, their apices obtusely subacute; posterior process slender at base, exposing the scutellum, somewhat elevated behind the middle, subapical lobe gradually tapering behind, apex acuminate, just reaching the inner tegminal angle; scutellum as wide as long, apex emarginate; tegmina dark brown, about 3.3X as long as wide, punctate at proximal half, pellucid behind middle, moderately reticulated at apical area.

Length from frontal margin to tips of tegmina 8.0 mm., to tip of posterior process 5.0 mm.; length of anterior pronotal (dorsal) process 1.75 mm., length of posterior process 3.2 mm., length of tegmina 7.0 mm., width 2.1 mm.; width across tips of humeral angles 2.5 mm., at eyes 2.2 mm.

Male : Similar to female. General colour dark reddish brown. Abdomen narrower; basal part of dorsal process black, tegmina about 3.75X as long as wide, darker and more prominently punctate at proximal half, apical area more markedly reticulate than in female.

Material examined : 2 females, 1 male, in FRI, Dehra Dun, collected from Darjeeling, Kurseong, 5,000 ft. Cotype in Stockholm Museum.

Host plants : *Cyphomandra* and *Artemisia* (*vide* H.H. Mann).

Distribution : INDIA : Darjeeling, Kurseong; NEPAL.

H. uncinatum is closely related to *kempi* (Distant) in the tegminal venation and disposition of pronotal anterior and posterior processes, but differs in the general colour and the less perpendicularly elevated anterior pronotal process.

Genus 7. *Hybanda* Distant

1908. *Hybanda* Distant, *Fauna Br. India*, 4 : 13.

The genus *Hybanda* is closely related to *Hypsauchenia* Germar and *Hypsolyrium* Schmidt in the presence of a pronotal dorsal process which is long, upwardly inclined and apically bilobate or bifurcate. It differs from both *Hypsauchenia* and *Hypsolyrium* in the nature of the posterior process which is long, uniformly slender and without a subapical erection or node.

Head 2.0X as wide across extremities of eyes as length of vertex, upper margin of vertex arcuate, lower margins strongly obliquely continued to frontoclypeus; eyes moderately large, hemispherical; ocelli about as far apart from eyes as from each other and situated above c-o line; frontoclypeus broader basally and narrow at apex, frontoclypeal lobes indistinct; humeral angles prominent. Pronotal dorsal process long, upwardly inclined and curved backward, apically bilobed or bifurcate; posterior process slender from base exposing the scutellum, centrally and laterally carinate, gradually tapering to apex which passes well beyond the posterior angles of the inner margin of tegmina, devoid of a dorsal subapical node; tegmina more than 3.0X as long as wide, 5 apical and 2 discoidal cells which are often crossed by spurious veins; hind wings with 4 apical cells.

Type species : *Hypsauchenia anodonta* Buckton

77. *Hybanda anodonta* (Buckton) (Fig. 82)

1903. *Hypsauchenia anodonta* Buckton, *Mon. Membrac.* : 212.

1908. *Hybanda anodonta* : Distant, *Fauna Br. India*, 4 : 13.

Female : General colour dark brown. Head finely punctate, about 2.0X as wide across extremities of eyes as length of vertex, vertex 1.5X as wide as long; upper margin arcuate, planate, lower margins strongly obliquely continued to frontoclypeus; eyes large, hemispherical, piceous; ocelli equidistant from each other and from eyes and situated above c-o line; frontoclypeus as long as wide, basal area broad, gradually narrowing to apex, apex broadly obtusely rounded, frontoclypeal lobes indistinct. Pronotum punctate, subrugulose, piceous brown,

metopidium vertical, continued upwardly to pronotal dorsal process, supraocular callosities inconspicuous, humeral angles prominent, projecting laterad beyond eyes, apices blunt; pronotal dorsal process long, extending obliquely backward at an angle of about 50° to the posterior process, its apex bilobed, passing beyond the tips of tegmina, the lobes elongate and somewhat narrowly divided at base, about 3.0X as long as wide; posterior process impinging on tegminal inner margin, slender, long, finely dentate above, gradually tapering behind to an acuminate apex which passes well beyond the posterior angle of the inner margin of tegmina, reaching the apex of 5th apical cell of tegmina, dorsal carina percurrent through metopidium; scutellum long as wide, piceous at basal angles; tegmina 3.8X as long as wide, basal black, coarsely punctate to a little beyond middle, apical area brownish ochraceous, inner apical margin wrinkled, veins tending towards reticulation. Body beneath and legs dark testaceous.

Length from frontal margin to tips of tegmina 8.5 mm., to tip of posterior process 7.0 mm.; length of anterior pronotal dorsal process 10.5 mm., length of apical lobes 1.7 mm., width across tips of humeral angles 2.75 mm., at eyes 2.5 mm.

Male : General colour black. Tegmina extending far beyond apex of abdomen; body beneath dark reddish brown; tegmina reddish brown at apical area, much darker at basal area, coarsely punctate except at the apical area.

Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 6.0 mm.; length of anterior pronotal dorsal process 9.25 mm., length of apical lobes 1.5 mm., width across tips of humeral angles 2.25 mm., at eyes 2.2 mm.

Material examined : 4 females and 2 males collected from Assam on unidentified wild shrub (3,000 ft.), Mr. Hameed, November, 1984. Lectotype male in British Museum.

Distribution : INDIA.

Tribe MICREUNINI Distant

Disc of pronotum elevated in a high, nearly erect process, its summit bilobed, or with a spine on each side; scutellum longer than wide, its apex acute or acuminate; sides of pro- and mesosterna unarmed; hind wings with 4 apical cells; tibiae rarely dilated. The name of this tribe, according to Distant (1908), is derived from *Micreune* Walker, a Malaysian genus. The genus *Leptobelus* Stål finds its place in this tribe.

Genus 8. *Leptobelus* Stål

1866. *Leptobelus* Stål, *Hem. Afr.*, 4 : 86.

Head 2.2-3.0X as wide across extremities of eyes as length of vertex, upper margin of vertex shallowly arcuate, sinuate, lower margins somewhat rounded; ocelli nearer to eyes than to each other and situated above c-o line; frontoclypeus extending below lower margins of vertex, its lobes indistinct. Pronotum with the disc elevated in a more or less erect process, its summit

armed on each side with a transverse spinous process; posterior process arising from near the apex of pronotal dorsal process, long, slender, extending backward parallel with but high above the body, exposing the scutellum; scutellum longer than wide, strongly narrowed toward the apex which is slightly, narrowly obtusely or subsinuately lobed; tegmina about 3.0X as long as wide, with 5 apical and 2 discoidal cells, the 1st discoidal cell much smaller than the 2nd and petiolate, apical limb moderately wide, R1 distinctly oblique to subcosta, veins to apical area straight; hind wings with 4 apical cells; tibiae slightly dilated.

Type species : *Centrotus dama* Germar.

78. *Leptobelus dama* (Germar)

(Fig. 83)

1835. *Centrotus dama* Germar, *Silb. Rev. Ent.*, 3 : 258.

1846. *Centrotus dama* : Fairmaire, *Ann. Soc. ent. France*, 4 : 510.

1866. *Leptobelus dama* : Stål, *Berl. ent. Z.*, 10 : 386.

1908. *Leptobelus dama* : Distant, *Fauna Br. India*, 4 : 15.

Female : General colour black. Head black, about 3.0X as wide across extremities of eyes as length of vertex, vertex 2.5X as wide as long, upper margin shallowly arcuate, lower margins somewhat obliquely continued to frontoclypeus; eyes moderately large, black; ocelli black, as wide apart from each other as from eyes and situated well above c-o line; frontoclypeus extending for one-third its length below lower margins of vertex, apex obtuse, frontoclypeal lobes indistinct. Pronotum black at anterior and lateral areas, cretaceously sericeous at posterior area, thickly coarsely punctate, metopidium convex, coarsely punctate, about 2.0X as wide as high; pronotal discal process nearly vertical, about 0.37X as high as metopidium, supraocular callosities subprominent; humeral angles broadbased, their apices obtuse; discal transverse processes about as long as the width of metopidium, seen from sides strongly recurved, apices acuminate, seen from front directed laterad; posterior process slender, well elevated above scutellum, slightly curved and undulate, strongly tricarinate, the dorsal carina obsolete on metopidium, apical area acuminate, apex passing the posterior angle of the inner margin of tegmina; scutellum longer than wide, gradually narrowed toward apex which is obtusely truncate, basal area cretaceously sericeous, rest finely thickly punctate; tegmina about 3.0X as long as wide, pale bronzy, the basal sixth black, coriaceous, followed by a large transverse dull ochraceous fascia, R1 oblique to subcosta, 1st apical cell wedge-shaped, based on rs, about 5.0X as long as wide, 1st discoidal cell petiolate, shorter than 2nd, veins to apical area straight, apical limb moderately wide; abdomen black beneath; legs more or less greyish pilose.

Length from frontal margin to tips of tegmina 9.0 mm., to tip of posterior process 7.25 mm.; width across tips of humeral angles 3.0 mm., across tips of discal lateral processes 5.0 mm., at eyes 2.5 mm.

Male : Not known.

Material examined : One female in Z.S.I., Calcutta, Reg. No. 483/H15, collected from Shillong, 25-10-1978.

Distribution : INDIA; JAVA; BORNEO; SUMATRA; PHILIPPINES.

79. *Leptobelus gazella* (Fairmaire)
(Fig. 84)

1846. *Centrotus gazella* Fairmaire, *Ann. Soc. ent. France*, 4 : 510.
1866. *Leptobelus gazella* : Stål, *Berl. ent. Z.* 10 : 386.
1903. *Leptocentrus gazella* : Buckton, *Monogr. Membrac.* : 235.
1903. *Micreune gazella* Buckton, *Monogr. Membrac.* : 268.
1908. *Leptobelus gazella* : Distant, *Fauna Br. India*, 4 : 16.

Female : General colour indigo black. Head dark brown, about 2.0X as wide across extremities of eyes as length of vertex, vertex slightly wider than long, upper margin arcuate, sinuate, lower margins obliquely continued to frontoclypeus; eyes large, dark brown, subglobose; ocelli black, closer to eyes than to each other and situated well above c-o line; frontoclypeus nearly rectangular, extending three-fourths its length below lower margins of vertex, densely longly pilose, apex truncate, frontoclypeal lobes indistinct. Pronotum indigo black, thickly coarsely punctate, sprinkled with short pale white adpressed hairs; metopidium about 2.0X as wide as high, finely punctate, vertical; supraocular callosities black, entire; humeral angles moderately developed, their apices subacute; pronotal discal process somewhat obliquely directed, robust, thickly covered with short white hairs, discal processes broad, as viewed from sides strongly recurved, as viewed in front broadbased, tricarinate, directed laterad, apices acute, longer than the width of metopidium, posterior process slender, almost straight, running backward high above scutellum and tegmina, its apex acuminate, passing well beyond the posterior angle of the inner tegminal margin, centrally and laterally carinate, the central carination strongly percurrent through metopidium; scutellum longer than wide, basal area cretaceously sericeous, beyond the base thickly punctate; tegmina 2.3X as long as wide, brownish ochraceous, basal sixth dark reddish brown, punctate, apical area wrinkled, 1st apical cell 5.0X as long as wide, 1st discoidal cell petiolate; hind wings about 3.5X as long as wide, apical area light brown, with 4 apical cells; abdomen beneath reddish brown.

Length from frontal margin to tips of tegmina 10.0 mm., to tip of posterior process 7.5 mm.; width across tips of discal transverse processes 6.7 mm., at humeral angles 3.2 mm., at eyes 2.8 mm.

Male : General colour castaneous with shades of brown. Smaller. Similar to female in all respects except in the much narrower abdomen and disposition of the posterior process which is somewhat curved at base and obliquely directed backward with a slight undulation.

Length from frontal margin to tips of tegmina 7.5 mm., to tip of posterior process 6.0 mm.; width across tips of discal transverse processes 6.0 mm., at humeral angles 3.0 mm., at eyes 2.5 mm.

Material examined : One female in ZSI., Calcutta, Reg. No. 483/H15, collected from ICAR Res. camp. Shillong, 25-10-1978; 1 female and 2 males in FRI., Dehra Dun, collected from Shillong, 6,000 ft.

Distribution : INDIA : Shillong; BURMA; NORTH CHINA; EAST INDIES.

Leptobelus gazella is closely related to *L. dama* (Germar), but it can be easily distinguished from the latter by the pronotal discal process stouter and obliquely directed upward and forward, the central carination of the posterior process very strongly percurrent through metopidium, and in the markings on tegmina.

Tribe LEPTOCENTRINI Distant

This tribe is diagnosed by the presence of prominent frontoclypeal lobes, well developed scutellum, the absence of pterostigma in the tegmina, and the hind wings with 4 apical cells.

Key to the genera of Indian Leptocentrini

- 1(30) Suprahumeral horns present.
- 2(13) Base of posterior process distant from scutellum.
- 3(4) Scutellum much longer than wide. *Telingana* Distant
- 4(3) Scutellum as long as wide.
- 5(12) Posterior process not united with the apex of scutellum by a distinct perpendicular prolongation.
- 6(11) Posterior process long, convexly curved or straight, its apex just passing the posterior angle of the inner tegminal margin, or extending beyond apex of clavus.
- 7(8) Posterior process with an elongate median ampliation. *Deitzius* gen. nov.
- 8(7) Posterior process without an elongate medial ampliation.,
- 9(10) R₁ of tegmina oblique to subcosta, 1st apical cell of tegmina short and based on radial sector (rs). *Lanceonotus* Capener

- 10(9) R_1 of tegmina not oblique to subcosta, 1st apical cell of tegmina long and based on R_1 . *Leptocentrus* Stål
- 11(6) Posterior process short, straight from base, obliquely elevated posteriorly, apex not extending beyond apex of clavus. *Nilautama* Distant
- 12(5) Posterior process united with the apex of scutellum by a distinct perpendicular prolongation. *Dograna* Distant
- 13(2) Base of posterior process touching or very near to scutellum.
- 14(21) Posterior process slightly but distinctly separated from scutellum; scutellum as wide as long.
- 15(16) Pronotum strongly centrally ridged; tips of suprahumeral obtuse; posterior process strongly sinuately waved, not elevated above tegmina. *Imporcitor* Distant
- 16(15) Pronotum not centrally ridged; tips of suprahumeral acute.
- 17(18) Posterior process strongly sinuate, well elevated above tegmina; veins to apical areas of tegmina strongly curved inwardly. *Pogonotus* Thirumalai and Ananthasubramanian
- 18(17) Posterior process weakly sinuate, not elevated above tegmina; veins to apical areas of tegmina straight.
- 19(20) Posterior process parallel-sided from base to apex. *Convecton* Distant
- 20(19) Posterior process gradually tapering from base to apex. *Otinotus* Buckton
- 21(14) Posterior process impinging on scutellum, usually entirely covering it.

- 22(25) Pronotum gibbous before base of posterior process.
- 23(24) Suprahumeral horns horizontally directed in a continuous line with the crescentic anterior margin of pronotum. *Emphusis* Buckton
- 24(23) Suprahumeral horns directed outwardly and upwardly just behind the vertical anterior margin of pronotum. *Centrotypus* Stål
- 25(22) Pronotum not gibbous before base of posterior process.
- 26(27) Median carina of pronotum elevated just beyond base of suprahumeral in a spine or angle, rarely a second elevation near middle of posterior process; suprahumeral shorter than space between their bases; sometimes 1 or 2 veins to apical areas of tegmina slightly sinuate. *Acanthuchus* Stål
- 27(26) Median carina of pronotum not elevated just beyond the base of suprahumeral in a spine or angle.
- 28(29) Suprahumeral horns as long as or longer than the space between their bases and obliquely directed upwards; scutellum longer than wide. *Periaman* Distant
- 29(28) Suprahumeral horns shorter than the space between their bases and more or less horizontally directed; scutellum wider than long. *Centruchus* Stål
- 30(1) Suprahumeral horns absent. *Neocentrus* Thirumalai and Ananthasubramanian

Genus 9. *Telingana* Distant

1869. *Leptobelus* Stål, *Ofv. Vet. -Ak. Forh* : 284.

1908. *Telingana* Distant, *Fauna Br. India*, 4 : 7.

Distant (1908) diagnoses the genus *Telingana* as follows :-

"Principally differing from *Leptobelus* Stål by the non- or little elevated disc of the pronotum and the distinctly curved posterior process. Pronotum with a transverse, curved lateral process on each side, the posterior process very distinctly tricarinate; scutellum elongate, triangular"

Head vertical, about 2.5X as wide across extremities of eyes as length of vertex, upper margin of vertex slightly arcuate, eyes subglobose, ocelli distinct, normally closer to eyes than to each other and situated above c-o line; frontoclypeus extending for two-thirds or three-fourths its length below lower margins of vertex, its apex broadly rounded, frontoclypeal lobes either free or fused; disc of pronotum normal or slightly elevated, metopidium wider than high; supraocular callosities either distinct or inconspicuous; humeral angles prominent, their apices blunt; suprahumeral horns normally strongly tricarinate, their apices recurved, but variations occur, posterior process slender, tricarinate, emerging from posterior half of disc, normally curved at base, remote from scutellum, its apex either impinging on inner tegminal margins or well raised from them; scutellum, normally much longer than wide, well exposed, its apex often elevated, deeply excavated, acute; tegmina 3.0X as long as wide, lacking a pterostigma, with 5 apical and 2 discoidal cells, R₁ oblique to subcosta, 1st apical cell based on R1 and rs; hind wings with 4 apical cells; male genitalia almost similar to that of *Leptocentrus* Stål, but the process of lateral valves very long and unchitinised.

Type species : *Leptobelus recurvispinus* Stål.

Key to Indian species of *Telingana* Distant

- 1(20) Suprahumeral horns strongly or moderately recurved.
- 2(11) Suprahumeral horns longer than the space between their bases.
- 3(6) Posterior process strongly curved from base to near apex, slender, apically attenuated, well raised from scutellum and inner tegminal margins; ocelli equidistant from each other and from eyes or closer to eyes than to each other.
- 4(5) Tegmina bronzy, inner apical margin beyond clavus and costal area beyond middle piceous black; lateral margins of pronotum and a central longitudinal discal fascia to same divided by a dark carinate line; ocelli equidistant from each other and from eyes; lateral areas of sternum ochraceous.

capistrata Distant

- 5(4) Tegmina amber hyaline, costal area black; a pair of white tomentose lines extending from the base of metopidium to the base of the posterior process, and another pair of lines of a similar nature bordering the bases of humeral angles anteriorly and dorsally; ocelli closer to eyes than to each other; lateral areas of sternum cretaceously sericeous.
- subarigiriensis* Thirumalai and Ananthasubramanian
- 6(3) Posterior process substraight from base, then horizontal and sinuate, narrowly separated from scutellum and inner tegminal margins; tegmina black with large inner area stramineous; ocelli closer to eyes than to each other and situated well above c-o line.
- balteata* Distant
- 7(8) Posterior process strongly curved near base and then oblique to apex, passing moderately beyond the posterior angle of the inner tegminal margins and impinging on them; tegmina pale ochraceous, base and costal areas black; lateral areas of sternum greyishly sericeous.
- flavipes* (Kirby)
- 8(7) Posterior process moderately curved near base, apex considerably passing the posterior angle of the inner tegminal margins and contiguous with them.
- 9(10) Tegmina bronzy ochraceous, costal and subcostal areas, and apical margin black; ocelli closer to eyes than to each other and situated on c-o line.
- orlando* Distant
- 10(9) Tegmina ochraceous, base, more than upper half and apical margin dark brown; ocelli equidistant from each other and from eyes and situated above c-o line.
- travancorensis* Distant
- 11(2) Suprahumeral horns as long as the space between their base.

- 12(13) Posterior process basally curved and then almost straight to apex, well raised above scutellum and remote from inner tegminal margins.
majuscula Thirumalai and Ananthasubramanian
- 13(12) Posterior process curved downward from near base, the apex passing well beyond the posterior angle of the inner margin of tegmina; lateral margins of pronotum ochraceously sericeous.
- 14(15) Apex of posterior process almost reaching the apex of tegmina; tegmina bronzy yellow, anterior area and base of claval area black, veins to apical area straight.
canescens (Buckton)
- 15(14) Apex of posterior process reaching the tip of the 5th apical cell of tegmina; tegmina dark shining stramineous, the whole of costal area, radial area beyond middle and base of claval area black, veins to apical area somewhat curved.
curvispina (Stål)
- 16(19) Posterior process well remote from scutellum at base, its apex impinging on the posterior angle of the inner tegminal margin; tegmina nonhyaline.
- 17(18) Tegmina pale ochraceous and subhyaline; ocelli equidistant from each other and from eyes and situated slightly above c-o line; reddish brown species.
paria (Fairmaire)
- 18(17) Tegmina with apical area shining ochraceous, subapical area somewhat stramineous, the whole of costal margin, subcostal and radial areas, claval area and half of 2nd discoidal cell black; ocelli closer to eyes than to each other and situated above c-o line; shining black species.
nigroalata Ananthasubramanian & Ananthakrishnan
- 19(16) Posterior process obliquely elevated from the hind end of disc, directed backward horizontally, well remote from scutellum and inner margin of tegmina; tegmina hyaline.
pulniensis Ananthasubramanian

- 20(1) Suprahumeral horns almost obliquely straight or subhorizontal.
- 21(26) Posterior process short, its apex just reaching or just passing the posterior angle of the inner tegminal margin.
- 22(25) Suprahumeral horns as long as the space between their bases.
- 23(24) Tegmina stramineous, basal half of costal area black; ocelli closer to eyes than to each other and situated above c-o line; lateral areas of sternum cretaceously sericeous; indigo black species. *imitator* (Kirby)
- 24(23) Tegmina sordidly vinaceous, base of clavus, entire costal area, radial area at base and outwardly beyond middle black; ocelli closer to each other than to eyes and situated on c-o line; lateral areas of sternum ochraceously sericeous; black species. *subsimilis* (Walker)
- 25(22) Suprahumeral horns longer than the space between their bases; tegmina bronzy ochraceous, basal angle black, immediately followed by a whitish fascia; lateral areas of sternum cretaceously sericeous; bright bluish black species. *campbelli* Distant
- 26(21) Posterior process long, its apex passing well beyond the posterior angle of the inner margin of tegmina in female; tegmina shining ochraceous, basal fourth, the whole of costal margin, subcostal, basal and claval areas, basal three-fourths of 1st apical cell and veins bordering 1st discoidal cell black; ocelli closer to eyes than to each other and situated above the c-o line; sexual dimorphism marked. *consobrina* Distant

80. *Telingana balteata* Distant
(Fig. 85)

1916. *Telingana balteata* Distant, *Fauna Br. India*, 6 : 151.

Female : General colour black with shades of bronzy brown. Head greyish black, 3.25X as wide across extremities of eyes as length of vertex, densely longly pilose with golden hairs, upper margin of vertex arcuate, lower margins horizontally continued to frontoclypeus; eyes large, subglobose, dull black; ocelli slightly elevated, closer to eyes than to each other and situated above c-o line; frontoclypeus extending for three-fourths its length below lower margins of vertex, its apex broadly rounded, densely pubescent with long brown hairs, frontoclypeal lobes indistinct. Pronotum bronzy-black, finely punctate with dense brown pilosity, metopidium 2.5X as wide as high, somewhat convex and gradually sloping behind to the disc, densely ochraceously pilose, supraocular callosities distinct, undivided, bare; humeral angles prominent, their apices subacute; suprahumeral horns robust, broadbased, longer than the space between their bases, seen from sides directed forward and obliquely upward, apices strongly recurved, tricarinate; posterior process slender, tricarinate, basally strongly curved, then horizontal with a little undulation, extending beyond the posterior angle of the inner margin of tegmina, apex finely acuminate, not quite reaching the tip of 5th apical cell, dorsal carina strongly percurrent through metopidium; tegmina black, 3.0X as wide, basal area strongly punctate and densely pilose, the whole of subcostal, basal and 1st apical cells, distal area of discal cell, parts of 1st and 2nd discoidal cells and 4th apical and almost the entire 5th apical cells black, rest of apical area stramineous, large inner area subhyaline, 1st apical cell based on R1, about 7.0X as long as wide; scutellum bronzy black, with an ochraceous spot at each basal angle. Legs with femora black, their apices, tibiae and tarsi pale ochraceous, apices of tarsi black.

Length from frontal margin to tips of tegmina 8.0 mm., to tip of posterior process 6.5 mm.; width across tips of suprahumeral horns 4.0 mm., at humeral angles 2.3 mm., at eyes 2.1 mm.

Male : General colour jet black. Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 6.2 mm.; width across tips of suprahumeral horns 3.6 mm., at humeral angles 2.1 mm., at eyes 2.0 mm. Genitalia as figured.

Material examined : 1 female and 2 males in the Tamil Nadu Agricultural University, Coimbatore; coll. T V Campbell, 1915; Kodaikanal Hills (6,000 ft.); lectotype female in British Museum.

Distribution : INDIA : Kodaikanal.

T. balteata is closely allied to *T. majuscula* Thirumalai and Ananthasubramanian in the nature of the suprahumeral and posterior process, but differs distinctly in the markings of the tegmina.

81. *Telingana campbelli* Distant
(Fig. 86)

1916. *Telingana campbelli* Distant, *Fauna Br. India*, 6: 150.

Female: General colour black with shades of blue. Head black, punctate, 3.0X as wide across extremities of eyes as length of vertex, upper margin of vertex strongly arcuate, lower margins obliquely continued to frontoclypeus; eyes large, subglobose, castaneous; ocelli a little closer to eyes than to each other and situated clearly above c-o line; frontoclypeus longer than wide, extending to two-thirds its length below lower margins of vertex, frontoclypeal lobes distinct. Pronotum very coarsely punctate, with sparse, adpressed pilosity, metopidium coarsely punctate, about 1.6X as wide as high, obliquely continued behind to disc; supraocular callosities very distinct, jet black, bare, undivided; humeral angles prominently projecting outward, their apices subacute; suprahumeral horns longer than the space between their bases, viewed from sides robust, broad-based, strongly horizontally produced, only slightly apically upwardly produced, viewed from front somewhat narrow, strongly tricarinate, apices obtusely acute; posterior process broad at base, well separated from scutellum, directed obliquely straight to the apex which is acute and passes the posterior angle of the inner margins of tegmina, reaching upto middle of 5th apical cell of tegmina, tricarinate, the dorsal carina very strongly percurrent through metopidium, strongly ridged; tegmina 3.0X as long as wide, bronzy-ochraceous reflecting the abdomen beneath, basal sixth black, punctate, coriaceous, immediately followed by a transverse fascia, 1st apical cell based on rs, about 4.0X as long as wide, veins to apical area straight; scutellum bright bluish black at basal corners, anterior margin whitish tomentose, lateral areas of sternum cretaceously sericeous. Legs black.

Length from frontal margin to tips of tegmina 7.0-7.9 mm., to tip of posterior process 5.25-5.5 mm.; width across tips of suprahumeral horns 4.0-5.0 mm., at humeral angles 3.0 mm., at eyes 2.8mm.

Male: unknown

Material examined: 1 female in the collections of the Tamil Nadu Agricultural University, Coimbatore; coll. T.V Campbell, 1915, Kodaikanal; lectotype female in British Museum.

Distribution: INDIA: Kodaikanal.

T. campbelli is closely related to *T. subsimilis* (Walker) in the general colour and disposition of suprahumeral horns and posterior process, but distinctly differs in the relatively longer suprahumeral horns and posterior process and in the presence of a distinct fascia on the tegmina immediately following the basal area.

82. *Telingana canescens* (Buckton)
(Fig.87)

1903. *Leptocentrus canescens* Buckton, *Monogr. Membrac.* : 234.

1908. *Telingana canescens* : Distant, *Fauna Br. India*, 4 : 19.

Female : Head about 2.6X as wide across extremities of eyes as length of vertex, finely granulose, sparsely pilose, vertex about 1.5X as wide as long, upper margin arcuate, lower margins obliquely continued to frontoclypeus; eyes large, hemispherical, dark brown; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus extending for about three-fourths its length below lower margins of vertex, its apex narrowly rounded, frontoclypeal lobes indistinct. Pronotum finely punctate, black above, lateral margins ochraceously sericeous, metopidium about 1.75X as wide as high, convex, concolorous with disc; supraocular callosities conspicuous, more or less rounded, undivided; humeral angles short, blunt; supra humeral horns robust, as long as the space between their bases, seen from front directed upward and outward, seen from above directed laterad and then backward, seen from sides strongly recurved apically, apices subacute; posterior process slightly curved from near base, slender, somewhat arched, gradually tapering to an acute apex which reaches the tip of tegmina, the dorsal carina strongly percurrent through metopidium; tegmina bronzy yellow, basal fifth and to about middle of anterior area black, a dark patch near anal angle extending into the 5th apical cell, 1st apical cell about 5.0X as long as wide, veins to apical area straight. Scutellum much longer than wide, densely ochraceously sericeous. Sternum and abdomen beneath ochraceous with white tomentosity.

Length from frontal margin to tips of tegmina 8.0mm., to tip of posterior process 7.9 mm.; width across tips of suprahumeral horns 4.75 mm., at humeral angles 2.7 mm., at eyes 2.5 mm.

Male : General colour shining black. Suprahumeral horns more strongly apically recurved than in female; posterior process slightly shorter, not reaching the apex of tegmina; tegmina as in female but lacking the dark patch near the anal angle extending into the 5th apical cell.

Length from frontal margin to tips of tegmina 7.7 mm., to tip of posterior process 7.3 mm.; width across tips of suprahumeral horns 4.0 mm., at humeral angles 2.5 mm., at eyes 2.3 mm.

Material examined : 9 females and 2 males in F.R.I., Dehra Dun; holotype female in highly mutilated condition in British Museum.

Distribution : INDIA : Madhya Pradesh (Hoshangabad, Rahatgaon); Punjab (Hoshiarpur, Hamirpur); Uttar Pradesh (Dehra Dun); Sikkim; BURMA (Tenasserim).

T. canescens is closely allied to *T. curvispina* (Stål) in many of its characters, but differs in the longer posterior process which reaches the apex of the tegmina and also in the markings on the tegmina.

83. *Telingana capistrata* Distant (Fig.88)

1908. *Telingana capistrata* Distant, *Fauna Br. India*, 4 : 19.

Female : General colour black. Head vertical, about 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.1X as wide as long, coarsely granulate, upper margin arcuate,

lower margins obliquely continued to frontoclypeus; eyes subglobose, piceous; ocelli black, closer to each other than to eyes and situated well above c-o line; frontoclypeus greyish black, extending for two-thirds its length below lower margins of vertex, apex narrowly rounded, longly hairy, frontoclypeal lobes indistinct. Pronotum coarsely granulate, sparsely pilose with silvery hairs, lateral margins and central area with longitudinal white fascia divided by a dark carinate line, metopidium about 2.25X as wide as high, black, coarsely granulate; supraocular callosities prominently irregularly semicircular, undivided; humeral angles prominent, their apices subacute; suprahumeral horns about 2.0X as long as the space between their bases, coarsely granulate at basal areas, seen from front conspicuously divergent with a central carination, gradually tapering to apex which is acute, seen from above directed upward and then strongly recurved; posterior process coarsely granulate at base, strongly curved at base, then directed backward more or less horizontally, slender, apically attenuated, strongly tricarinate, the dorsal carina strongly percurrent through metopidium, apex well remote from inner margins of tegmina and passing well beyond the anal angles; tegmina about 3.3X as long as wide, bronzy, inner apical margin beyond clavus and costal area beyond middle piceous black, veins dark reddish brown. Scutellum longer than wide, ochraceously pilose, apex acute, emarginate.

Length from frontal margin to tips of tegmina 10.5 mm., to tip of posterior process 9.3 mm.; width across tips of suprahumeral horns 6.0 mm., at humeral angles 4.0 mm., at eyes 3.0 mm.

Male : Similar to female in colour and in the disposition of horns, but smaller.

Length from frontal margin to tips of tegmina 9.0 mm., to tip of posterior process 8.0 mm.; width across tips of suprahumeral horns 5.5 mm., at humeral angles 3.75 mm., at eyes 2.8 mm.

Material examined : 2 females and 1 male, coll. Muzaffarpur, Orissa, 2-5-1981, deposited in the Government Museum, Madras; lectotype female in British Museum.

Distribution: INDIA; BURMA.

This species is very closely allied to *sabarigiriensis* Thirumalai and Ananthasubramanian in the general colour and nature of suprahumeral and posterior process, but differs in the position of the ocelli and tegminal colour and markings.

84. *Telingana consobrina* Distant (Fig. 89)

1916. *Telingana consobrina* Distant, *Fauna Br. India*, 6 : 152.

1975. *Telingana consobrina* : Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 211.

Female : General colour black. Head 2.5X as wide across extremities of eyes as length of vertex, finely punctate with short, silvery hairs, base of vertex sinuate, lower margins slightly rounded; eyes dark brown; ocelli black, closer to eyes than to each other and situated slightly above c-o line; frontoclypeus wider than long, extending for half of its length below lower margins of vertex, apex obtusely rounded, fringed with short, white hairs. Pronotum black, densely hairy

finely punctate; metopidium nearly vertical, wider than high; supraocular callosities distinct; humeral angles short, not extending beyond eyes laterally, their apices subacute; suprahumeral horns seen from above slender, shorter than the space between their bases, directed outward and backward, apices acute; posterior process emerging from the hind end of disc, slightly sinuate beyond middle, passing well beyond the posterior angle of the inner tegminal margin and reaching the tip of 5th apical cell of tegmina; tegmina a little more than 3.0X as long as wide, basal fourth jet black, finely punctate, 1st discoidal cell petiolate, 1st apical cell about 3.5X as long as wide; scutellum much longer than wide; basal area of scutellum, lateral areas of pronotum and sternum cretaceously sericeous. Legs fuscous upto base of tibiae, rest ochraceous, hind tibiae light brown.

Length from frontal margin to tips of tegmina 6.4 mm., to tip of posterior process 5.3 mm.; width across tips of suprahumeral horns 2.9 mm., at humeral angles; 2.5 mm., at eyes 1.8 mm.

Male : General colour black. Head nearly vertical, about 3.0X as wide across extremities of eyes as length of vertex, finely punctate, with short silvery white hairs, upper margin of vertex sinuate, lower margins obliquely continued to frontoclypeus; eyes dark brown; ocelli shining white, situated closer to eyes than to each other and situated above the c-o line; frontoclypeus parallel-sided, extending for two-thirds its length below lower margins of vertex, frontoclypeal lobes inconspicuous. Pronotum black, often shaded with dark brown, coarsely punctate, with short, adpressed white hairs, metopidium wider than high, strongly convex; supraocular callosities rather inconspicuous; humeral angles broadly based, short, blunt, not projecting outward beyond extremities of eyes; suprahumeral horns shorter than the space between their bases, viewed from front much narrow, apices acute, directed outward, viewed from above narrowbased, projecting outward horizontally, tricarinate; posterior process obliquely raised from disc, slender, tricarinate, tip acuminate, impinging on inner tegminal margins, just reaching the posterior angle of the inner margin of tegmina, median carina strongly percurrent through metopidium; tegmina hyaline, reflecting the abdomen beneath, about 3.0X as long as wide, basal sixth coriaceous, ochraceously black, veins reddish brown, apical veins darker, 5 apical cells and 1 discoidal cell, 1st apical cell 3.0X as long as wide; scutellum 1.75X as long as wide, coarsely punctate; lateral areas of pronotum, sternum, and basal lateral areas of scutellum white tomentose; abdomen black beneath, dark ochraceously brown above.

Length from frontal margin to tips of tegmina 4.8 mm., to tip of posterior process 3.6 mm.; width across tips of suprahumeral horns 2.0 mm., at humeral angles 1.7 mm., at eyes 1.8 mm.

Material examined : 10 females and 3 males, Kodaikanal (Tamil Nadu), 16-6-1967; 9 females and 2 males from Courtalam (Tamil Nadu), 1-1-1979 ex *Agapanthus umbellatus* and *Aspidium* sp. Lectotype male in British Museum.

Distribution : INDIA : Tamil Nadu.

T. cosobrina is very near to *pulniensis* Ananthasubramanian in the general colour and size, slender suprahumeral horns which are not longer than the space between their bases and the hyaline tegmina, but differs in the disposition of the posterior process which is distant from the inner tegminal margins in *pulniensis*, while in *consobrina* it impinges on the inner tegminal margins.

85. *Telingana curvispina* (Stål)
(Fig.90)

1869. *Leptobelus curvispina* Stål, *Ofv. Vet. -Ak. Forh.* : 289
 1903. *Leptobelus curvispina* : Melichar, *Hom. Faun. Ceylon* : 115
 1891. *Centrotus decipiens* : Kirby, *J. Linn. Soc.*, 24 : 165.
 1903. *Leptocentrus decipiens* : Melichar, *Hom. Faun. Ceylon* : 117
 1908. *Telingana decipiens* : Distant, *Fauna Br. India*, 4 : 20.
 1916. *Telingana curvispina* : Distant, *Fauna Br. India*, 6 : 152.

Female : General colour black. Head black, 3.25X as wide across extremities of eyes as length of vertex, vertex shallowly arcuate, 2.0X as wide as long, with short, sparse brown hairs, lower margins obliquely continued to frontoclypeus; eyes large, subglobose, projecting lateral; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus densely pilose, with three-fourths its length extending below lower margins of vertex, frontoclypeal lobes partially fused. Pronotum thickly punctate, centrally longitudinally carinate, lateral margins cretaceously sericeous, metopidium convex, faintly obliquely continued behind to disc, punctate with short, adpressed brown hairs; supraocular callosities conspicuous, nearly rounded, undivided; humeral angles prominent, their apices blunt; suprahumeral horns as long as the space between their bases, broadbased, tricarinate, seen from sides directed outward with apices strongly recurved and subacute, seen from front almost obliquely straight, seen from above rather flat, basal one-third almost horizontal, apices recurved; posterior process curved near base and directed downward, tricarinate, dorsal carina strongly percurrent through metopidium, apical area tapering to an acute point passing well beyond the posterior angle of the inner margin of tegmina and impinging on them; tegmina about 3.3X as long as wide, dark bronzy, basal and costal areas black, thickly coarsely punctate, apical area dark ochraceous, veins to the apical area straight; scutellum longer than wide, basal area white tomentose, beyond basal area thickly finely punctate. Legs testaceous.

Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 6.5 mm.; width across tips of suprahumeral horns 4.5 mm., at humeral angles 2.2 mm., at eyes 2.0 mm.

Male : Unknown.

Material examined : 2 females from Kodaikanal, 2-9-1981 ex *Aspidium* sp. Type in British Museum.

Distribution : INDIA : Tamil Nadu (Kodaikanal); SRI LANKA.

T. curvispina is closely related to *canescens* (Stål) in the general disposition of the suprahumeral horns and posterior process but differs in the less prominently recurved apices of suprahumeral horns, shorter posterior process not reaching the tips of tegmina and the different colour of tegmina.

86. *Telingana flavipes* (Kirby)
(Fig.91)

1891. *Centrotus flavipes* Kirby, *J. Linn. Soc. Zool.*, **24** : 165.
1903. *Centruchus atricoxis* Melichar, *Hom. Faun. Ceylon* : 113.
1908. *Telingana flavipes* : Distant, *Fauna Br. India*, **4** : 20.

Female : General colour black. Head 3.5X as wide across extremities of eyes as length of vertex, finely punctate, with dense silvery hairs, vertex 2.5X as wide as long, upper margin strongly arcuate, lower margins more or less horizontally continued to frontoclypeus; eyes hemispherical, greyish white; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus extending for about three-fourths its length below lower margins of vertex, densely longly pilose with silvery hairs, frontoclypeal lobes distinct. Pronotum black, coarsely punctate, thickly greyish pilose, lateral margins greyish sericeous, metopidium nearly 2.0X as wide as high, punctate with short, adpressed white hairs; supraocular callosities distinct, undivided; humeral angles prominent, broadbased, their apices obtusely subacute; suprahumeral horns longer than the space between their bases, seen from sides directed obliquely upward and forward, strongly recurved, seen from front less prominently recurved, strongly tricarinate, apices acute; posterior process strongly recurved from near base, then obliquely straight, apex acuminate, passing well beyond the inner tegminal margins, reaching about the middle of 5th apical cell of tegmina and impinging on it, strongly tricarinate, the dorsal carina continued through metopidium; tegmina about 3.0X as long as wide, pale castaneous, basal sixth and costal area black, coarsely punctate, sparsely pilose, veins to apical area somewhat curved, 1st apical cell about 4.75X as long as wide; scutellum much longer than wide, greyish sericeous; legs ochraceous, extreme apices of tibiae and tarsi piceous; abdomen beneath greyish sericeous.

Length from frontal margin to tips of tegmina 6.5 mm., to tip of posterior process 4.5 mm.; width across tips of suprahumeral horns 5.0 mm., at humeral angles 2.3 mm., at eyes 2.1 mm.

Male : Not known.

Material examined : 5 females from Kodaikanal, 17-6-1981, ex *Agapanthus umbellatus*. Holotype female in British Museum.

Distribution : INDIA : Tamil Nadu (Kodaikanal), Assam (Margherita); SRI LANKA (Kandy, Peradeniya).

T. flavipes is closely allied to *T. curvispina* (Stål) in the nature of the suprahumeral horns and posterior process, but differs in the colour and markings of tegmina.

87. *Telingana imitator* (Kirby)
(Fig. 92)

1863. *Centrotus imitator* de Motschulsky, *Bull. Mosc. Nat.* **36** : 96. (*Nom. nud.*)
1891. *Centrotus imitator* : Kirby, *J. Linn. Soc. Zool.*, **24** : 167.

1903. *Leptocentrus imitator* Melichar, *Hom. Faun. Ceylon* : 118.

1908. *Telingana imitator* Distant, *Fauna Br. India*, 4 : 21.

Female : Colour indigo black. Head black, 3.0X as wide across extremities of eyes as length of vertex, finely punctate, upper margin of vertex shallowly sinuate, lower margins slightly obliquely continued to frontoclypeus; eyes large, piceous black; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus slightly longer than wide, sparsely pilose, frontoclypeal lobes prominent. Pronotum thickly finely punctate, indigo-black above, metopidium obliquely continued backward to disc, finely punctate, centrally carinate; supraocular callosities conspicuous, nearly rounded, undivided, nonpunctate; humeral angles subprominent, their apices subacute; suprahumeral horns almost obliquely straight, viewed from sides apices acute and slightly recurved, viewed from front rather narrow and directed laterad, viewed from above distinctly tricarinate, as long as the space between their bases; posterior process sharply curved near base, slender, subhorizontal, apex acute, just reaching the posterior angle of the inner margins of tegmina, tricarinate, lateral carinae weak, median carina strongly percurrent through metopidium; tegmina stramineous, basal area and about half of the costal area black, coarsely punctate, proximal half of basal cell black, coarsely punctate, R₁ based on rs, 1st apical cell about 6.0X as long as wide, veins yellowish, those to apical area straight, discoidal cells one or two, the 1st being shorter than the 2nd; scutellum much longer than wide, basal area cretaceously sericeous. Legs pale ochraceous. Lateral areas of sternum white tomentose.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.5 mm.; width across tips of suprahumeral horns 2.5 mm, at humeral angles 1.3 mm., at eyes 1.25 mm.

Male : Similar to female in genral colour and size.

Material examined : 2 females and 1 male from Ootacamund (6,000 ft.) ex *Sytissus scoparius*, 30-1-1985. Lectotype female in British Museum.

Distribution : INDIA; Tamil Nadu (Ootacamund); SRI LANKA.

T. imitator is closely related to *T. subsimilis* (Walker) in the general colour and size, length and disposition of the posterior process which is short and just reaches sthe anal angles of tegmina, and in the almost obliquely straight suprahumeral horns which are as long as the space between their bases, but ldiffers in the markings on the tegmina, position of ocelli and number of discoidal cells, which in some specimens is single.

88. *Telingana majuscula* Thirumalai and Ananthasubramanian
(Fig. 93)

1981. *Telingana majuscula* Thirumalai and ananthasubramanian. *Bull. zool. Surv. India*, 4(1) : 29.

Male : General colour piceous black. Head 3.4X as wide across extremities of eyes as length of vertex, dark brown, densely pilose with long golden hairs, vertex 2.0X as wide as long, upper margin somewhat planate, lower margins obliquely continued to frontoclypeus; eyes large, subglobose, dull black; ocelli shining black, closer to eyes than to each other and situated well above c-o line; frontoclypeus dark brown, extending for three-fourths its length below lower margins of vertex, densely pilose, apex broadly rounded, frontoclypeal lobes distinct. Pronotum piceous black, finely granulose, densely pubescent, pilosity denser at bases of suprahumeral horns; metopidium vertical, convex, about 1.3X as wide as high; supraocular callosities black, entire humeral angles prominent, black, their apices subacute; suprahumeral horns black, robust, densely pilose, 2.75X as long as space between their bases, viewed from sides directed forward and strongly recurved, viewed from front directed obliquely upward and outward. Lateral and posterior surfaces planate; posterior process slender, emerging obliquely behind disc, and vertically from its posterior margins, basally curved and directed almost horizontally caudad high above scutellum and tegmina, apex acute, reaching the 4th apical cell of tegmina; tegmina nearly 3.5X as long as wide, brownish amber hyaline, basal fifth and costal area coriaceous, punctate, black, the costal, radial, median, 1st and 2nd apical cells and three-fourths of discoidal cells dark brown, punctate, apical limb narrow, R_1 oblique to subcosta, 1st apical cell based on radial sector, about 6.0X as long as wide, 2nd discoidal cell about 2.0X as long as 1st. Scutellum triangular, as long as wide, basal area densely white tomentose, apical area punctate, sparsely pilose. Legs black in femora, light brown with a hue of black in tibiae and tarsi.

Length from frontal margin to tips of tegmina 7.1 mm., to tip of posterior process 5.7 mm.; width across tips of suprahumeral horns 5.0 mm., at humeral angles 3.0 mm., at eyes 2.4 mm.

Female : Unknown.

Material examined : Holotype male from Silent Valley, Kerala (920 metres), 23-4-1980, Reg. No zsi/srs I/H.

Distribution : INDIA : Kerala (Silent Valley).

T. majuscula is closely allied to *capistrata* Distant in the general colour of body and tegmina and disposition of the posterior process, but differs in the shape of the frontoclypeus, non-arched horizontal posterior process and the scutellum which is as wide as long.

89. *Telingana nigroalata* Ananthasubramanian and Ananthakrishnan
(Fig. 94)

1975. *Telingana nigroalata* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 209.

Female : General colour pitch black. Head vertical, black, lightly shaded with dark brown on genae, about 2.8X as wide across extremities of eyes as length of vertex, finely punctate, with very short adpressed silvery white hairs, upper margin of vertex sinuate, weakly concave. Lower

margins broadly rounded at lateral angles; eyes black, subglobose; ocelli black, somewhat elevated, closer to eyes than to each other and situated well above c-o line; frontoclypeus nearly rhomboidal, extending for two-thirds its length below lower margins of vertex, frontoclypeal lobes entirely fused, apex obtusely rounded, fringed with long pale white hairs. Pronotum shining black with shades of dark brown, thickly coarsely punctate, with short, adpressed silvery white hairs; metopidium almost vertical, 2.0X as wide as high, supraocular callosities conspicuous, jet black, bare; humeral angles concolorous with disc, apices blunt; disc convex at middle, distinctly punctate and sparingly hairy; suprahumeral horns shorter than space between their bases, as seen from above slender, long, gently recurved with strong carinae, seen from sides slightly directed upward, then outward with apices acute curved backward; posterior process slender, curved and slightly elevated at base, remote from scutellum, declivous, slightly sinuate at middle, apex nearly acute, almost touching the tegmina near the posterior angle of inner tegminal margin but not touching on them, tricarinate, dorsal carina strongly percurrent through metopidium; tegmina 3.0X as long as wide, apical area shining ochraceous, subapical area somewhat stramineous, basal sixth black, coriaceous, costal, subcostal, and basal areas, half of 2nd discoidal cell and claval area black, punctate, veins pale brown with the exception of R_1 , R_{2+3} , R_{4+5} , rs and 3rd anal vein which are black and finely punctate. Scutellum black, longer than wide, lateral areas coarsely punctate, basal area white tomentose. Lateral areas of sternum cretaceously sericeous. Legs with coxae, trochanters and femora jet black, tibiae of 1st and 2nd pairs of legs more or less dark ochraceous, posterior tibiae very light brown, tarsi light brown. Abdomen black, ovipositor dark reddish brown.

Length from frontal margin to tips of tegmina 6.75 mm., to tip of posterior process 5.50 mm., width across tips of suprahumeral horns 3.9 mm., at humeral angles 2.5 mm., at eyes 2.0 mm.

Male : Similar to female in general colour, but smaller, suprahumeral horns shorter, directed more prominently upward, their apices slightly recurved; metopidium 1.5X as wide as high; posterior process not sinuate in the middle, obliquely directed backward, its tip reaching the middle of 5th apical cell of tegmina. Genitalia as in the figure.

Length from frontal margin to tips of tegmina 5.9 mm., to tip of posterior process 4.9 mm.; width across tips of suprahumeral horns 2.7 mm., at humeral angles 2.3 mm., at eyes 1.75 mm.

Material examined : 207 females and 26 males from Kodaikanal, 16-6-1968, ex *Agapanthus umbellatus*; types in National Pusa Collections, I.A.R.I., New Delhi.

Distribution : This species is very closely related to *curvispina* (Stål), differing from it in the colour of tegmina and the black punctate nature of R_1 , R_{2+3} , R_{4+5} and 2nd discoidal cell.

90. *Telingana orlanda* Distant
(Fig. 95)

1916. *Telingana orlanda* Distant, *Fauna Br. India*, 6 : 150.

Female : General colour black with shades of blue. Head shining black, about 3.3X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, upper margin strongly arcuate, sinuate, lower margins somewhat obliquely continued to frontoclypeus; eyes subglobose, black; ocelli small, very close to eyes than to each other and situated on the c-o line; frontoclypeus extending for three-fourths its length below lower margins of vertex, frontoclypeal lobes distinct. Pronotum black, lateral margins with a longitudinal white tomentose fascia, thickly coarsely punctate, with very short, adpressed pilosity, metopidium obliquely convex, coarsely punctate, distinctly wider than high; supraocular callosities obsolete; humeral angles prominent, their apices subacute; suprahumeral horns slightly longer than the space between their bases, seen from the sides strongly recurved and acute, seen from above directed laterad and strongly recurved, seen from front almost horizontally produced, their apices recurved and acute, basal areas coarsely punctate; posterior process strongly curved near base, then directed backward subhorizontally, obliquely, its apex considerably passing the posterior angle of the inner margin of tegmina, strongly tricarinate, the median carina strongly percurrent through metopidium; tegmina bronzy-ochraceous, basal sixth, costal and subcostal areas and very narrow apical margin black, finely punctate, 1st apical cell based on rs, about 4.5X as long as its maximum width; scutellum longer than wide, base and apex white tomentose. Lateral areas of sternum cretaceously sericeous. Legs dark reddish brown upto distal area of femora, tibiae brown, apices of tarsi black.

Length from frontal margin to tips of tegmina 5.5 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 3.0 mm., at humeral angles 1.8 mm., at eyes 1.8 mm.

Male : General colour black with shades of brown. Posterior process shorter than in female, its apex just passing the posterior angle of the inner margin of tegmina; suprahumeral horns less strongly recurved than in female; tegmina bronzy, subcostal cell not black and punctate, only one discoidal cell.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.7 mm.; width across tips of suprahumeral horns 2.85 mm., at humeral angles 1.7 mm., at eyes 1.6 mm.

Material examined : 1 female and 1 male in Tamil Nadu Agricultural University, Coimbatore, collected by T.V Campbell, 1915, Kodaikanal. Holotype female in British Museum.

Distribution : INDIA : Tamil Nadu (Kodaikanal).

This distinctly dimorphic species is closely related to *curvispina* (Stål) in the general nature of the suprahumeral horns and posterior process, but differs in the much more strongly recurved suprahumeral horns in the female and in the smaller size.

91. *Telingana paria* (Fairmaire)
(Fig. 96)

1846. *Centrotus paria* Fairmaire, *Ann. Soc. ent. France*, 4 : 513.

1908. *Telingana paria* : Distant, *Fauna Br. India*, 4 : 18.

Female : General colour reddish brown. Head dull black, about 3.0X as wide across extremities of eyes as length of vertex, finely punctate, sparsely pilose, vertex with upper margin arcuate, lower margins nearly horizontally continued to frontoclypeus; eyes subglobose, black; ocelli equidistant from each other and from eyes and situated slightly above c-o line; frontoclypeus as long as wide, extending for about three-fourths its length below lower margins of vertex, apex nearly truncate, longly pilose, frontoclypeal lobes indistinct. Pronotum thickly and coarsely punctate, with short, sparse, adpressed hairs; metopidium dark brown, nearly vertical to about two-thirds its height, then obliquely continued backward to disc, 2.0X as wide as high; supraocular callosities oval, undivided, humeral angles black, prominent, their apices subacute; suprahumeral horns as long as the space between their bases, as seen from sides directed upward, strongly recurved, as seen from above somewhat short, recurved, tricarinate, apices obtusely acute, anterior margins slightly ridged, as seen from front less strongly curved, carinate near middle; posterior process well separated from scutellum at base, rather slender, tricarinate, dorsal carina finely percurrent through metopidium, apex acuminate, almost touching the tegmina near the posterior angle of their inner margin, reaching the tip of 5th apical cell of tegmina; tegmina very pale ochraceous, subhyaline, basal sixth opaque, punctate, veins to apical area straight, R₁, nearly parallel-sided, about 9.0X as long as wide, basal half white tomentose, apex slightly raised. Lateral areas of sternum cretaceously sericeous. Legs brownish ochraceous.

Length from frontal margin to tips of tegmina 5.5 mm., to tip of posterior process 4.7 mm.; width across tips of suprahumeral horns 3.0 mm., at humeral angles 2.4 mm., at eyes 2.2 mm.

Material examined : One female collected by beating wild shrubs, Chedia tope, Andamans, 10-1-1985.

Distribution : INDIA.

This species is to be identified by the tegmina which are very pale, subhyaline, ochraceous, reflecting the abdomen beneath, the unique shape of the discoidal cells of tegmina different from those of other species of the genus, and the very long 1st apical cell of tegmina based on R₁ which is straight to subcosta.

92. *Telingana pulniensis* Ananthasubramanian
(Fig. 97)

1980. *Telingana pulniensis* Ananthasubramanian, *Entomon.* 5(2) : 121.

Female : General colour black. Head vertical, about 3.0X as wide across extremities of eyes as length of vertex, finely punctate with short, silvery hairs, vertex about 2.0X as wide as long,

upper margin slightly sinuate, lower margin obliquely continued to frontoclypeus; eyes shining black; ocelli silvery white, closer to eyes than to each other and situated above c-o line; frontoclypeus parallel-sided, extending for two-third its length below lower margins of vertex, its lobes more or less fused, apex broadly rounded, longly pilose. Pronotum black with shades of dark brown, coarsely punctate, with scattered silvery white hairs, metopidium nearly 2.0X as wide as high, black, strongly convex, obliquely directed backward to disc; humeral angles short, blunt, not projecting beyond eyes; suprahumeral horns much shorter than the space between their bases, viewed from above directed outward and backward, viewed from front directed horizontally laterad, apices acute, viewed from sides directed upward with apices directed backward; posterior process obliquely elevated from the hind end of disc, slender, tricarinate, horizontal, well remote from scutellum, apex acuminate, not impinging on the inner angles of tegmina, reaching about the middle of 5th apical cell of tegmina; scutellum longer than wide, coarsely punctate, its antero-lateral areas cretaceously sericeous; tegmina hyaline, 3.0X as long as wide, basal sixth coriaceous, black, veins, light brown, 1st apical cell wedge-shaped, 2.0X as long as wide, only one discoidal cell, an inconspicuous cross vein at basal third of 2nd apical cell, apical limb narrow. Lateral areas of pronotum white tomentose. Abdomen beneath black and dorsally dark brown.

Length from frontal margin to tips of tegmina 4.2 mm., to tip of posterior process 3.4 mm.; width across tips of suprahumeral horns 2.2 mm., at humeral angles 1.9 mm., at eyes 2.0 mm.

Male : Similar to female in general colour, but smaller; genitalia as figured.

Length from frontal margin to tips of tegmina 4.1 mm., to tip of posterior process 3.35 mm.; width across tips of suprahumeral horns 2.1 mm., at humeral angles 1.7 mm., at eyes 1.8 mm.

Material examined : INDIA : Tamil Nadu (Pulney).

T. pulniensis is closely related to *T. consobrina* Distant in the general colour and disposition of horns, but differs in the presence of a cross vein at the basal one-third of 2nd apical cell in the female and in the presence of a single discoidal cell.

93. *Telingana sabarigiriensis* Thirumalai and Ananthasubramanian
(Fig. 98)

1985. *Telingana sabarigiriensis* Thirumalai and Ananthasubramanian, *Entomon*, 10(3) : 223.

Female : General colour black. Head shining black, 2.75X as wide across extremities of eyes as length of vertex, vertex wider than long, upper margin slightly arcuate, lower margins somewhat obliquely continued to frontoclypeus; eyes large, subglobose, brown; ocelli shining white, closer to eyes than to each other and situated well above c-o line; frontoclypeus black, extending for three-fourths its length below lower margins of vertex, thickly pilose, apex broadly rounded, frontoclypeal lobes fused. Pronotum piceous, strongly punctate with short, sparse golden pilosity; metopidium vertical, convex, about 1.5X as wide as high, a pair of white tomentose lines extending from base of metopidium to base of posterior process, and another pair of similar lines

bordering the base of humeral angles anteriorly and dorsally; supraocular callosities black, almost bare; humeral angles prominent, extending beyond eyes, their apices subacute; suprahumeral horns black, robust, sparsely pilose, 1.5X as long as the space between their bases, viewed from sides directed forward and outward, viewed from above prominently carinate and directed laterad and caudad, viewed from front directed obliquely upward and outward, lateral and posterior surfaces strongly punctate; posterior process slender, moderately stout at base, directed almost horizontally caudad, slightly arched, highest above scutellum, emerging obliquely behind disc, not impinging on tegmina, apex acute, reaching the tip of 5th apical cell of tegmina; lateral areas of pronotum and scutellum cretaceously sericeous; scutellum, 2.0X as long as wide; tegmina 3.0X as long as wide, brownish amber hyaline, costal area black, coriaceous, costal, radial, median and cubital veins, 1st discoidal, three-fourths of 2nd discoidal cell, 1st apical and basal half of 2nd apical cells dark brown, sparsely pilose, apical limb narrow, R_1 oblique to subcosta, 1st apical cell based on rs, 2nd discoidal cell about 1.5X as long as the 1st. Legs with femora black, tibiae dark brown, claws dark brown.

Length from frontal margin to tips of tegmina 6.58 mm., to tip of posterior process 5.9 mm.; width across tips of suprahumeral horns 4.6 mm., at humeral angles 2.5 mm., at eyes 2.3 mm.

Male : Slightly smaller than female. General colour as in female. Posterior process just reaching the basal third of 5th apical cell of tegmina.

Length from frontal margin to tips of tegmina 6.4 mm., to tip of posterior process 4.8 mm.; width across tips of suprahumeral horns 4.4 mm., at humeral angles 2.6 mm., at eyes 2.2 mm.

Material examined : Holotype female from Sabarigiri (Kerala). 420 metres, 11-5-1981; paratype male from Sabarigiri, 520 metres, 9-5-1981. Type in ZSI, Calcutta.

Distribution : INDIA : Kerala State (Sabarigiri).

This species is closely related to *T. majuscula* Thirumali and Ananthasubramanian in the general colour and to *travancorensis* Distant in the presence of longitudinal fascia on the median and lateral margins of pronotum, but differs from both in the strongly recurved suprahumeral horns, in the less arched posterior process and in the colour of tegmina.

94. *Telingana subsimilis* (Walker) (Fig. 99)

1859. *Centrotus subsimilis* Walker, *Cat. Homopt. Ins.* : 385.

1869. *Leptobelus pallipes* Stål, *Ofv. Vet.- Ak. Forh.* : 284.

1908. *Telingana pallipes* Distant, *Fauna Br. India*, 4 : 22.

1916a. *Telingana subsimilis* Distant, *Ann. Mag. nat. Hist.*, 49 : 298.

Female : General colour metallic black with a hue of brown. Head dull ochraceously black, finely punctate, with dense silvery pilosity, about 3.2X as wide across extremities of eyes as length of vertex, vertex about 1.75X as wide as long, upper margin strongly arcuate, sinuate,

lower margins somewhat obliquely continued to frontoclypeus; eyes prominent, subspherical, black; ocelli closer to each other than to eyes and situated on c-o line; frontoclypeus about as long as wide, extending for three-fourths its length below lower margins of vertex, frontoclypeal lobes indistinct. Pronotum shining black, finely punctate, densely pilose with white hairs, metopidium coarsely punctate, sparsely pilose, strongly obliquely continued to disc, as wide as high; supraocular callosities subprominent, divided, bare; humeral angles prominently projecting laterad, their apices subacute; suprahumeral horns slender, weakly tricarinate, almost straight, directed outward, as long as space between their bases, apices acute and very weakly curved backward; posterior process slightly curved at base, then subhorizontal, distant from scutellum, apex acute, just reaching the posterior angle of the inner margins of tegmina, tricarinate, lateral carinae weak, median carina percurrent through metopidium; tegmina 3.0X as long as wide, sordidly vinaceous, base of clavus, entire costal area, radial area at base and outwardly beyond middle black, punctate, a black spot near posterior angle of inner tegminal margin, 1st apical cell based on the oblique rs, about 4.0X as long as wide, veins to apical area slightly curved, apical limbus narrow. Scutellum much longer than wide, base white tomentose. Lateral areas of pronotum and sternum densely ochraceously sericeous. Legs yellow with shades of reddish brown and black.

Length from frontal margin to tips of tegmina 5.5 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 2.1 mm., at humeral angles 1.7 mm., at eyes 1.6 mm.

Male : unknown.

Material examined : 2 females ex *Santalum album*, Kodaikanal, 12-12-1980.

Distribution : INDIA : Tamil Nadu (Kodaikanal); BORNEO.

T. subsimilis is closely allied to *curvispina* (Stål) in the general colour, markings on tegmina and disposition of posterior process, but differs in the smaller size, shorter, more slender and almost obliquely straight suprahumeral horns which are only as long as the space between their bases and very little upwardly directed, and also in the shorter posterior process which just reaches the posterior angle of the inner margins of tegmina.

95. *Telingana travancorensis* Distant
(Fig. 100)

1916. *Telingana travancorensis* Distant, *Fauna Br. India*, 6 : 151.

Female : General colour black. Head black, 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, lateral margins with longitudinal fascia covered with white tomentose hairs, a similar fascia at the centre of vertex ochraceously tomentose, upper margin of vertex moderately arcuate, lower margins obliquely continued to frontoclypeus; eyes large, somewhat projecting laterad; ocelli succineous, closer to eyes than to each other and situated above c-o line; frontoclypeus extending for two-thirds its length below lower margins of vertex, frontoclypeal lobes fused along their entire length to the frontoclypeus. Pronotum black,

very coarsely punctate, lateral margins ochraceously tomentose, metopidium obliquely sloping backward to disc, 1.75X as wide as high, with a pair of longitudinal fascia extending backward upto base of posterior process; humeral angles prominent, broadbased, apices blunt; supraocular callosities large, jet black, undivided; suprahumeral horns nearly 1.2X as long as space between their bases, coarsely punctate at basal area, viewed from sides directed upward and strongly recurved, tricarinate, viewed from above strongly curved and obliquely upwardly produced, viewed from front directed outward and obliquely upward, apices subacute; posterior process strongly curved near base, well remote from scutellum, tricarinate, directed convexly oblique, its apex acute, passing considerably the posterior angle of the inner tegminal margin and impinging on tegmina; tegmina 2.8X as long as wide, ochraceous, basal sixth, the whole of subcostal, basal and 1st apical cells, basal areas of clavus and costal margin black, rest ochraceous; veins to apical area slightly curved. Scutellum much longer than wide, basal area ochraceous. Legs black upto tibiae, tarsi reddish brown. Lateral areas of sternum ochraceous.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 5.25 mm.; width across tips of suprahumeral horns 3.5 mm., at humeral angles 2.3 mm., at eyes 2.0 mm.

Male : Unknown.

Material examined : One female collected from Palayam (Kerala State) ex *Spathodea campanulata*, 12-12-1979. Holotype female in British Museum.

Distribution : INDIA : Kerala State (Trivandrum).

T. travancorensis is very closely related to *T. sabarigiriensis* Thirumalai and Ananthasubramanian in the presence of the lateral longitudinal fascia on pronotum and metopidium, but differs in the disposition of the posterior process which impinges on the inner margins of the tegmina.

Genus 10. *Deitzius* gen. nov.

1980. *Paranotus* Ananthasubramanian, *Entomon*, 5(2) : 119.

This genus is close to *Leptocentrus* Stål, but differs in the non-declivous posterior process which shows an elongate medial ampliation.

Head vertical about 2.5X as wide across extremities of eyes as length of vertex, upper margin of vertex arcuate, lower margins obliquely continued to frontoclypeus; eyes subglobose; ocelli closer to eyes than to each other and situated on c-o line; frontoclypeus slightly declivous, longer than wide, extending for half its length below lower margins of vertex, frontoclypeal lobes distinct. Pronotum moderately high, metopidium vertical, 2.0X as wide as high, humeral angles prominent, with a short, oblique anterior carina, posterior angles rounded, apices subacute; suprahumeral horns moderately developed, tricarinate, directed obliquely forward; posterior process tricarinate, emerging from behind bases of horns, a little convexly elevated at base, distant from scutellum and tegmina, elongately ampliate in middle, then gradually tapering, apex acute, extending just behind the posterior angle of the inner margins of tegmina; scutellum as long as wide; tegmina 2.5X as long as wide, with 5 apical and 2 discoidal cells, apical veins straight, 1st apical cell narrow, parallel-sided, based on R_1 which is straight to subcosta; hind wings with 4 apical cells.

Type species : *Paranotus tomentosus* Ananthasubramanian

96. *Deitzius tomentosus* (Ananthasubramanian) comb. nov.
(Fig. 101)

1980. *Paranotus tomentosus* Ananthasubramanian, *Entomon* 5(2) : 120.

Female : As in generic description with the following additional characters :

General colour greyish black. Head dull black, finely pilose, vertex about 1.75X as wide as long, frontoclypeus laterally carinate with long pilosity, antennae greyish white, eyes pale white with a brownish hue, genae tomentose. Pronotum greyish black with a hue of yellow, finely punctate with short, adpressed golden hairs, an irregular golden yellow area behind suprahumeral horns extending to basal one-fourth of posterior process with denser pilosity; metopidium yellow, sparsely pilose, supraocular callosities black, small, undivided; suprahumeral horns black, broadbased with denser golden pilosity, a little longer than space between their bases, strongly tricarinate, carinae black, viewed from sides directed obliquely forward, apex acute and strongly recurved, viewed from front more or less flat, directed outward and forward, viewed from above directed outward and then backward; posterior process shining yellow at basal one-fourth, rest black, sprinkled with golden pilosity, apex reaching about three-fourths of the length of 5th apical cell of tegmina, not touching the inner tegminal margins, scutellum white tomentose at basal angles, finely punctate, tip acute, emarginate; lateral areas of sternum greyish black, tegmina amber-hyaline with a brown area near claval margin between 1st and 2nd anal veins, apical limbus broad, tinted with dark brown, costal margin in the area of 1st apical cell thickened, 1st apical cell about 7.0X as long as wide, 2nd discoidal cell slightly longer than 1st; abdomen black, legs uniformly yellow.

Length from frontal margin to tips of tegmina 6.3 mm., to tip of posterior process 5.2mm.; width across tips of suprahumeral horns 3.6mm., at humeral angles 2.9 mm., at eyes 2.4 mm.

Male : Unknown.

Material examined : 2 females, ex *Artocarpus integrifolia* at Bangalore, 20-1-1079. Holotype female in National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Karnataka State (Bangalore).

Genus. 11 *Lanceonotus* Capener

1968. *Lanceonotus* Capener, *Ent. Mem. Dep. agric. tech. Serc. Repub. S. Afr.*, 17 : 31.

Closely related to *Leptocentrus* Stål, differing in the oblique R_1 and the short 1st apical cell based on radial sector. Head vertical, upper margin of vertex weakly curved or weakly sinuate,

lower margins oblique to frontoclypeus; ocelli equidistant or closer to eyes than to each other and situated above c-o line; frontoclypeus weakly declivous, longer than wide across lobes, frontoclypeal lobes moderately prominent with sutures indistinct; pronotum moderately high, convex, metopidium wider than high, almost vertical and curving backward to disc, humeral angles prominent, blunt, with a short oblique anterior carina; suprahumeral horns moderately developed, tricarinate, extending outward beyond humeral angles; posterior process emerging behind disc well above scutellum, strongly tricarinate, reaching or passing the posterior angle of the inner margin of tegmina, apex sharp; scutellum triangular, as long as or longer than wide, weakly convex, apex emarginate; tegmina with 5 apical and 2 discoidal cells, R_1 oblique to subcosta, 1st apical cell short, wedged-shaped, based on radial sector (rs), apical limb moderately broad; hind wings with 4 apical cells.

Type species : *Leptocentrus opacus* Capener

Key to the Indian species of *Lanceonotus* Capener

- 1(6) Scutellum longer than wide.
- 2(3) Suprahumeral horns much shorter than space between their bases; tegmina 2.5X as long as wide; apex of posterior process not impinging on inner tegminal margin; shining black species. *indicus* Ananthasubramanian
- 3(2) Suprahumeral horns longer than space between their bases; tegmina 3.0X as long as wide; apex of posterior process impinging on inner tegminal margin.
- 4(5) Suprahumeral horns 1.4X as long as space between their bases; tegminal veins brownish; apical limb moderately broad; shining brown species. *malabaricus* Thirumalai and Ananthasubramanian
- 5(4) Suprahumeral horns 2.0X as long as space between their bases; tegminal veins outlined with flat yellow; apical limb narrow; black species. *luteinervis* (Funkhouser) comb. nov.
- 6(1) Scutellum as long as wide; suprahumeral horns as long as space between their base; tegmina 3.5X as long as wide; black species. *cinnamomi* Ananthasubramanian

97. *Lanceonotus cinnamomi* Ananthasubramanian
(Fig. 102)

1980. *Lanceonotus cinnamomi* Ananthasubramanian, *Entomon* 5(2) : 117.

Female : General colour black. Head nearly 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, upper margin shallowly arcuate, lower margins gradually roundedly curving to frontoclypeus; frontoclypeus greyish brown, extending for two-thirds its length below lower margins of vertex, sparsely pilose, apex broadly rounded; eyes deep reddish brown; ocelli shining white, closer to eyes than to each other and situated above c-o line. Pronotum shining black, strongly punctate with long golden pilosity, metopidium vertical, 1.8X as wide as high; supraocular callosities black, divided; humeral angles reddish brown, apices subacute; suprahumeral horns jet black, slender, broad at base, long as distance between their bases, sparsely pilose, viewed above directed laterad, apices acute; posterior process emerging from the posterior margin of disc, raised well above scutellum, a little arched about its middle and tapering gradually, apex acute, not touching the tegmina. Scutellum triangular, as long as wide, basal third densely pilose, with an oval white patch on either side, tip emarginate, black. sparingly pilose, lateral aspects of thorax white tomentose; tegmina amber hyaline, 3.5X as long as wide, basal sixth coriaceous, apical veins yellowish, rest of the veins black, 1st apical cell based on rs, about 5.0X as long as wide, 2nd discoidal cell longer than the 1st, apical limb narrow, apex rounded. Abdomen black; legs dark brown except tarsi which are yellowish brown.

Length from frontal margin to tips of tegmina 7.0mm., to tip of posterior process 5.8 mm., width across tips of suprahumeral horns 4.7mm., at humeral angles 3.0 mm., at eyes 2.8 mm.

Male : General colour similar to female. Metopidium 2.6X as wide as high; suprahumeral horns 2.0X as long as space between their bases; posterior process well arched at about middle, its apex impinging on inner tegminal margin.

Length from frontal margin to tips of tegmina 6.8mm. to tip of posterior process 5.7 mm.; width across tips suprahumeral horns 5.5mm., at humeral angles 2.8 mm., at eyes 2.5 mm.

Material examined : One female and 2 males ex *Cinnamomum* sp. in Mercara (Karnataka State), 21-2-1979. Types in National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Karnataka State (Mercara).

The species is closely related to *indicus* Ananthasubramanian from which it differs in the longer suprahumeral horns which are longer than the space between their bases, scutellum as long as wide, very narrow, apical limb of tegmina and the posterior process conspicuously arched about its middle, but elevated slightly above tegminal inner margins, not impinging on inner margins of tegmina.

98. *Lanceonotus indicus* Ananthasubramanian
(Fig. 103)

1980. *Lanceonotus indicus* Ananthasubramanian, *Entomon* 5(2) : 110.

Male: General colour shining black. Vertex black, nearly 3.0X as wide across extremities of eyes as length of vertex, finely punctate, sparsely pilose, upper margin shallowly arcuate, lower margins obliquely continued to frontoclypeus; frontoclypeus extending for two-thirds its length below lower margins of vertex, densely pilose, apex broadly rounded; eyes large, subglobose, pale white, ocelli succineous, closer to eyes than to each other and situated above c-o line; frontoclypeal lobes subprominent with sutures indistinct. Pronotum black, strongly punctate with long hairs, metopidium vertical, 2.2X as wide as high; supraocular collosities entire; humeral angles prominent, their apices subacute; suprahumeral horns shorter than space between their bases, viewed from sides directed upward, then backward, slightly punctate at base, weakly tricarinate, viewed from front directed laterad, apices acute, viewed from above directed obliquely backward; posterior process emerging from behind disc and vertically from posterior margin of pronotum, raised well above scutellum and directed almost horizontally caudad, slender, tricarinate, apex acute, extending to about the middle of the 5th apical cell of tegmina. Scutellum triangular, longer than wide, basally somewhat convex and pilose, apex slightly raised, strongly bifid with dense pilosity. Tegmina 2.5X as long as wide, amber hyaline, basal fourth coriaceous and punctate, veins light brown, apical limbus moderately broad, apex acutely rounded, R₁ oblique to subcosta, 1st apical cell 2.0X as long as wide, based on radial sector, 2nd discoidal cell 1.3X as long as 1st, costal margin and apical limbus shaded black; sides of sternum cretaceously sericeous.

Length from frontal margin to tips of tegmina 6.8mm., to tip of posterior process 5.3mm.; width across tips of suprahumeral horns 4.1 mm., at humeral angles 3.0 mm., at eyes 2.8 mm.

Female: Unknown.

Material examined : One male from Courtalam, 4-4-1978; holotype male deposited in National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Tamilnadu (Courtalam).

L. indicus is closely related to *L. cinnamomi* Ananthasubramanian, as remarked earlier.

99. *Lanceonotus luteinervis* (Funkhouser) comb. nov.
(Fig. 104)

1936. *Leptocentrus luteinervis* Funkhouser, *Ann. ent. Soc. Am.*, 21(2) : 245.

Female: General colour black. Head subquadrate, about 3.5X as wide across extremities of eyes as length of vertex, finely punctate, densely pubescent, vertex 2.5X as wide as long, upper margin strongly arcuate, lower margins broadly rounded; eyes large, vitreous, ocelli dull white,

closer to eyes than to each other and situated above c-o line; frontoclypeus parallel-sided, extending for more than two-thirds its length below lower margins of vertex, densely hairy, apex truncately rounded. Pronotum black, coarsely punctate, densely pubescent; metopidium broader than high, strongly oblique, inferior margin extending over head; humeral angles prominent, their apices acute; supraocular callosities conspicuous, coarsely punctate, bare, irregularly shaped, undivided, suprahumeral horns long, slender, extending upward and backward, more than 2.0X, as long as space between their bases, quadricarinate, coarsely punctate, apices acuminate; posterior process arising high above scutellum, slender, quadricarinate, strongly curved, its sides more or less parallel for most of its length, then abruptly acuminate, almost impinging on inner tegminal margin, dorsal carina strongly percurrent through metopidium; tegmina 3.0X as long as wide, opaque and brown, veins stout, outlined in flat yellow, basal area black, punctate, coriaceous, apical limbus very narrow, 1st apical cell wedgeshaped, based on radial sector (rs), R₁ oblique to subcosta, 1st discoidal cell narrower and shorter than the 2nd, veins to apical area almost straight; hind wings with 4 apical cells; scutellum well exposed, longer than wide, basal area cretaceously sericeous, apex weakly bifid; legs with femora black, tibiae yellowish, tarsi light yellow; abdomen beneath black.

Length from frontal margin to tips of tegmina 6.5 mm., to tip of posterior process 4.8 mm.; width across tips of suprahumeral horns 5.0 mm., at humeral angles 2.4 mm., at eyes 2.2 mm.

Male : Unknown.

Material examined : One female in FRI., Dehra Dun, ex *Michelia champaka*, in Assam, April, 1918. Holotype female in British Museum.

Distribution : INDIA : Assam.

Funkhouser (1936) included this species in the genus *Leptocentrus* Stål, but the generic characters of the species conform to *Lanceonotus* Capener (1968). The wedgeshaped 1st apical cell of tegmina based on rs and the oblique disposition of R₁ in relation to subcosta justify the inclusion of the species in *Lanceonotus*. The tegminal veins which are stout and outlined in flat yellow, distinguish this species from other known species of the genus.

100. *Lanceonotus malabaricus* Thirumalai and Ananthasubramanian.
(Fig. 105)

1981. *Lanceonotus malabaricus* Thirumalai and Ananthasubramanian, *Bull. zool. Surv. India*, 4(1) : 27.

Female : General colour shining brown. Head vertical, with short, adpressed silvery white hairs, 3.0X as wide across extremities of eyes as length of vertex. Vertex 2.0X as wide as long, upper margin slightly arcuate, lower margins obliquely rounded and continued to frontoclypeus, frontoclypeus dark brown, extending for three-fourths its length below lower margins of vertex, apex hairy, broadly rounded; eyes pinkish brown; ocelli silvery white, closer to eyes than to each other and situated slightly above c-o line. Pronotum shining black, strongly punctate, with short sparse silvery hairs; metopidium slightly oblique from its base, about 1.7X as wide as high;

supraocular callosities black, not divided, nearly rounded; humeral angles dark brown, sparsely pilose with silvery white hairs, their apices subacute; suprahumeral horns jet black, broadly based tricarinate, about 1.4X as long as the space between their bases, densely pilose at base, viewed from sides strongly obliquely curved backward, viewed from above directed laterad upto three-fourths of their length and then turned backward, viewed from front directed obliquely outward and upward, apices acute, posterior process emerging from the posterior margin of disc, well remote from scutellum, subhorizontal, impinging on the inner margin of tegmina, apex acute, passing the posterior angle of the inner margin of tegmina, slightly upturned, dorsal carina black, strongly percurrent through metopidium. Scutellum 1.5X as long as wide, basal half white tomentose, lateral areas of thorax cretaceously sericeous. Tegmina 3.0X as long as wide, basal fifth black, coriaceous, apical limbus moderately wide, inner margin opposite to 4th and 5th apical cells black, 1st apical cell wedge-shaped, nearly 3.5X as long as wide, 2nd discoidal cell longer than 1st. Abdomen black; Legs light brown.

Length from frontal margin to tips of tegmina 7.4mm., to tip of posterior process 5.7 mm.; width across tips of suprahumeral horns 3.5mm., at humeral angles 2.75 mm., at eyes 2.5 mm.

Male : Similar to female in general colour and size, but the suprahumeral horns are shorter and more slender.

Length from frontal margin to tips of tegmina 7.4mm., to tip of posterior process 5.7 mm., width across tips of suprahumeral horns 3.5 mm., at humeral angles 2.75 mm., at eyes 2.5.

Material examined : One female and 2 males, Silent Valley (Kerala State), 22-4-1980. Types in ZSI., Calcutta.

Distribution : INDIA : Kerala State (Silent Valley).

This species is closely related to *cinnamomi* Ananthasubramanian with which it resembles in the general colour of body and eyes and in the position of ocelli, but differs in the shorter posterior process which impinges on the tegminal inner margin, longer suprahumeral horns, scutellum longer than wide and in the broader apical limbus.

Genus 12. *Leptocentrus* Stål

1866. *Leptocentrus* Stål, *Hem. Afr.* 4 : 87, 90.

1903. *Rabduchus* Buckton, *Mon. Memb.* : 2709.

1968. *Leptocentrus*: Capener, Ent. Mem. Dep. agric. tech. Serc. Repub. S. Afr., 17 : 33.

1975. *Leptocentrus*: Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 184.

Head vertical, about 3.0X as wide across extremities of eyes as length of vertex, upper margin of vertex arcuate and sinuate, 2.0X as wide as long, lower margins slightly oblique, straight, or weakly oblique to frontoclypeus; eyes hemispherical, prominent; ocelli closer to eyes than to each other and situated on or above the centro-ocular line; frontoclypeus weakly declivous, about 2.0X as long as wide, apex rounded or obtusely truncate, frontoclypeal lobes prominently developed,

extending about to its apical third. Pronotum moderately elevated, metopidium wider than high, oblique or vertical and convex, frontal margin obumbrant or not, humeral angles prominent, their apices blunt; supraocular collasities conspicuous; suprahumeral horns usually well developed, occasionally short, directed outwards, horizontal or slightly elevated, usually strongly tricarinate, or not; posterior process stout or slender, tricarinate, median carina percurrent through metopidium, emerging from posterior half of pronotum, more or less constant in girth to acuminate apical third, distant from scutellum and tegmina, usually impinging or not on tegmina at tip and reaching anal angles of tegmina or extending beyond tegminal anal angle; scutellum triangular, as wide as long, apically narrowly emarginate; tegmina 2.5-3.0X as long as wide, lacking pterostigma, with 5 apical and 2 discoidal cells, 1st apical cell parallel-sided or wedgelike, 2.5-8X as long as wide; hind wings with 4 apical cells.

Type species *Centrotus altifrons* Walker

Key to Indian species of *Leptocentrus* Stål

- 1(8) Posterior process remote from scutellum and tegmina from base to apex.
- 2(5) Apex of posterior process just passing the posterior angle of the inner margin of tegmina; suprahumeral horns equal to or slightly longer than the space between their bases, strongly recurved.
- 3(4) Suprahumeral horns as long as space between their bases; ocelli succineous and situated above c-o line; tegmina pale bronzy; small species. *bajulans* Distant
- 4(3) Suprahumeral horns slightly longer than the space between their bases; ocelli black, situated on c-o line; tegmina hyaline, marooned with black on costal margin; large species. *major* Ananthasubramaniam and Ananthakrishnan
- 5(2) Apex of posterior process passing distinctly the posterior angle of the inner margin of tegmina; suprahumeral horns about 1.5X as long as space between their bases; gently or strongly recurved.
- 6(7) Head more than 3.0X as wide as long; frontoclypeus extending for half its length below lower margins of vertex; suprahumeral horns strongly recurved *rubrinigris* Ananthasubramanian

- 7(6) Head nearly 3.0X as wide as long, frontoclypeus extending for three-fourths its length below lower margins of vertex; suprahumeral horns gently recurved. *carinatus* Ananthasubramanian
- 8(1) Apex of posterior process impinging on or just touching the tegmina.
- 9(40) Apex of posterior process passing distinctly the posterior angle of the inner margin of tegmina.
- 10(19) Suprahumeral horns shorter than the space between their bases.
- 11(14) Suprahumeral horns nearly straight, their tips acute.
- 12(13) Metopidium convex; tegmina hyaline with apical margins black, ocelli situated above c-o line; greyish brown species. *moringae* Ananthasubramanian and Ananthakrishnan
- 13(12) Metopidium obliquely directed to disc; tegmina pale bronzy; ocelli situated on c-o line; purplish brown species. *scutellatus* Distant
- 14(11) Suprahumeral horns strongly or gently recurved; ocelli situated on c-o line.
- 15(16) Head 3.0X as wide as long; posterior process slender and sub-straight; metopidium vertical; suprahumeral horns gently curved; ocelli equidistant from each other and from eyes. *rufescens* Ananthasubramanian.
- 16(15) Head 2.5X as wide as long; posterior process stout; strongly arched behind scutellum; metopidium convex; suprahumeral horns strongly recurved; ocelli closer to eyes than to each other. *acuticornis* Ananthasubramanian
- 17(18) Head about 3.0X as wide as long; ocelli closer to eyes than to each other and situated above c-o line; metopidium obliquely directed backward to disc; tegmina light yellow, 1st apical cell wedge-shaped. Large yellowish species. *luteus* Ananthasubramanian

- 18(17) Head about 2.5X as wide as long; ocelli closer to each other than to eyes and situated on c-o line; metopidium vertical; tegmina bronzy, base and costal margin black, 1st apical cell long and narrow; black species. *insignis* Distant
- 19(10) Suprahumerals horns as long as or longer than the space between their bases.
- 20(35) Metopidium vertical; posterior process well remote from scutellum at base and obliquely straight.
- 21(22) Suprahumerals horns strongly recurved, their apices acute; head 3.0X as wide as long; tegmina pale bronzy ochraceous; posterior process prominently arched at base. *taurus* (Fabricius)
- 22(21) Suprahumerals horns weakly recurved, their apices less acute; head 2.5X as wide as long; tegmina subhyaline; posterior process less arched at base. *substitutus* (Walker)
- 23(24) Suprahumerals horns slender, centrally carinate above; ocelli closer to eyes than to each other and situated above c-o line; tegmina shining ochraceous, black; large species. *leucaspis* (Walker)
- 24(23) Suprahumerals horns much broader above and foliaceously convex, their tips abruptly acute; ocelli closer to each other than to eyes and situated on c-o line; tegmina bronzy. *reponens* (Walker)
- 25(26) Suprahumerals horns obliquely recurved near apices; posterior process slender and nearly straight; tegmina pale bronzy; ocelli closer to each other than to eyes and situated on c-o line; black species. *obortus* Buckton
- 26(25) Suprahumerals horns not obliquely recurved near apices; posterior process robust and slightly arched; tegmina vitreous; ocelli closer to eyes than to each other and situated above c-o line; greyish brown species. *obliquus* (Walker)

- 27(32) Posterior process slender, slightly arched above scutellum, almost straight upto half of its length, then sinuate and acuminate to tip, not impinging on the posterior angle of the inner margin of tegmina.
- 28(29) Frontoclypeus extending for about two-thirds its length below lower margins of vertex; metopidium as wide as high; tegmina hyaline; light brown species. *mangiferae* Ananthasubramanian and Ananthakrishnan.
- 29(28) Frontoclypeus extending for about three-fourths its length below lower margins of vertex; metopidium wider than high; tegmina semihyaline; dark brown species. *beluri* Ananthasubramanian
- 30(31) Frontoclypeus extending for two-thirds its length below lower margins of vertex; ocelli equidistant from each other and from eyes and situated on c-o line; tegmina lustrous, about 3.0X as long as wide; 1st apical cell about 8.0X as long as wide. Small black species. *ustus* Buckton
- 32(37) Posterior process robust, well elevated from scutellum, strongly recurved and obliquely straight.
- 33(34) Metopidium as wide as high; tegmina 3.5X as long as wide, 1st apical cell about 8.0X as long as wide. Large black species. *nigra* Ananthasubramanian and Ananthakrishnan.
- 34(33) Metopidium wider than high; tegmina 3.0X as long as wide, 1st apical cell about 6.0X as long as wide. Dark brown species. *bauhiniae* Ananthasubramanian and Ananthakrishnan.
- 35(20) Metopidium obliquely directed backward to disc; posterior process moderately elevated above scutellum; suprahumeral horns very long and slender.

- 36(37) Suprahumeral horns 1.5-1.8X as long as space between their bases; metopidium 1.5X as wide as high; tegmina sub-hyaline; ocelli closer to eyes than to each other and situated above c-o line; greyish brown species. *varicornis* Ananthasubramanian and Ananthakrishnan
- 37(36) Suprahumeral horns 2.5X as long as space between their bases; metopidium as wide as high; tegmina pale ochraceous brown; ocelli closer to each other than to eyes and situated on c-o line. Black species. *longispinus* Distant.
- 38(39) Head 2.75X as wide as long; frontoclypeus extending for one half its length below lower margins of vertex; tegmina dark brown; ocelli slightly closer to eyes than to each other and situated above c-o line; black species. *splendens* Ananthasubramanian
- 39(38) Head 3.0X as wide as long; frontoclypeus extending for three-fourths its length below lower margins of vertex; tegmina hyaline; ocelli closer to each other and situated on c-o line; dark brown species. *rhizophagus* Ananthasubramanian and Ananthakrishnan
- 40(9) Apex of posterior process just passing the posterior angles of the inner margin of tegmina; base and margins of tegmina black with a large subbasal white spot. *albonotatus* Distant

101. *Leptocentrus acuticornis* Ananthasubramanian
(Fig. 106)

1980. *Leptocentrus acuticornis* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Paper*, **16** : 13.

Female : General colour greyish brown. Head yellowish brown, 3.0X as wide across extremities of eye as length of vertex, coarsely punctate with short adpressed white hairs, upper margin of vertex planate, lower margins obliquely sloping to frontoclypeus; eyes subglobose, brownish marooned with shades of black, ocelli succineous, closer to eyes than to each other and situated on the c-o line, frontoclypeus about 2.0X as wide as long, extending for half its length below lower margins of vertex, densely pubescent, tip broadly rounded, basal lobes about one-third as long as main lobe, densely pilose and distinct. Pronotum greyish brown, finely punctate.

cretaceously sericeous laterally; metopidium convex, obumbrant, with short sparse hairs, 2.0X as wide as high; supraocular callosities divided; humeral angles prominent, apices subacute, suprahumeral horns robust, broadbased, about 0.65X as long as space between their bases, direct, outward and then backward, strongly tricarinate, apices sharply acute and black, rising above disc; posterior process emerging from posterior half of disc, moderately arched and remote from scutellum and tegmina, reaching 4th apical cell of tegmina, tegmina subhyaline, 3.25X as long as wide, apical limb wide, apex narrowly rounded, basal sixth coriaceous, piceous brown, punctate, 1st apical cell about 9.0X as long as wide, 1st discoidal cell nearly as long as 2nd. Scutellum triangular, as long as wide, white tomentose at basal half, distal half dark brown, slightly upturned, tip emarginate. Legs uniformly greyish brown. Abdomen beneath greyish brown.

Length from frontal margin to tips of tegmina 7.9mm., to tip of posterior process 6.4mm.; width across tips of suprahumeral horns 4.5 mm., at humeral angles 3.0 mm., at eyes 2.7 mm.

Male : Unknown.

Fifth instar nymph : General colour greyish with shades of brown. Head 2.0X as wide as long, vertex convex, covered with short, sparsely scattered bristles, tubercular bases black, rostral tip reaching abdominal segment II, base of vertex weakly arcuate, sinuate, cranial tubercles inconspicuous; eyes brown, subovate; ocelli closer to eyes than to each other and situated on c-o line; margin of frontoclypeus on a line with lower margins of vertex. Pronotum covered with dense tuberculate spines; metopidium vertical, anterior pronotal process obliquely raised upward, its apex sharp, acute, pronotal posterior process about 0.35X as long as anterior process, extending backward over mesonotum, tip acuminate; suprahumeral buds short, black; wing pads greyish brown with scattered black dots, costal angles distinct, fringed with tuberculate spines; metanotum about 0.5X as long as mesonotum, bearing short tuberculate spines above. Abdominal segments slightly telescoped, apex raised upward, dorsal tubercles of abdominal segments short, their spines turned caudad, more or less adpressed to the body; lateral lamellae of segments III to VIII short, each lamella bearing 7 long tuberculate spines; anal tube long, bearing rows of tuberculate bristles; genital rudiments dark brown.

Material examined : Holotype female in ZSI, Calcutta, Reg.No. 639/H15, collected from Rajasthan, Siker District, 9-11-1960; one fifth instar neponotype, Reg.No.640/H15.

Distribution : INDIA : Rajasthan.

L. acuticornis is closely related to *L. rhizophagus* Ananthasubramanian and Ananthakrishnan in the nature of the posterior process, relative size of the discoidal cells of tegmina and tegminal colour patterns, but differs in the curvature of suprahumeral horns, planate upper margin of vertex and in the nature of frontoclypeus and its lobes.

102. *Leptocentrus albonotatus* Distant
(Fig. 107)

1916. *Leptocentrus albonotatus* Distant, *Ann. Mag. nat. Hist.*, 8(18) : 289.

1939. *Leptocentrus albonotatus* : Goding, *Jl. N.Y. ent. Soc.*, 47 : 340.

Female : General colour black. Head black, about 3.5X as wide across extremities of eyes as length of vertex, finely punctate with short, white hairs, vertex about 2.5X as wide as long, upper margin arcuate, lateral margins greyish black, lower margins slightly obliquely continued to frontoclypeus; eyes testaceous; ocelli vitreous, closer to eyes than to each other and situated above c-o line; frontoclypeus slightly longer than wide, extending for half its length below lower margins of vertex, epex broadly rounded, frontoclypeal lobes distinct. Pronotum black, thickly punctate, with short, adpressed, white hairs; metopidium about 1.5X as wide as high, obliquely continued backward to disc, coarsely punctate; humeral angles subprominent; supraocular callosities somewhat inconspicuous, divided; suprahumeral horns shorter than the space between their bases, seen in front straightly directed outward, seen from above centrally longitudinally carinate, gradually narrowing to apices which are acute; posterior process somewhat coarsely punctate at base, slender, tricarinate, well separated from scutellum, almost obliquely straight, its apex acute, dorsal carina strongly percurrent through metopidium, apex just passing the posterior angles of the inner margin of tegmina; scutellum as long as wide, basal margin greyish white, apex emarginate; tegmina about 3.0X as long as wide, subhyaline, reflecting the black abdomen beneath, palely aeneous, veins light brownish, margins narrowly black, basal one-sixth black, punctate, coriaceous, immediately followed by a large greyish-white spot, 1st apical cell about 8.0X as long as wide; lateral aspects of sternum greyish white.

Length from frontal margin to tips of tegmina 6.5mm., to tip of posterior process 5.25 mm.; width across tips of suprahumeral horns 3.5 mm., at humeral angles 2.8mm, at eyes 2.6 mm.

Male : Unknown.

Material examined : 2 females ex *Coffea arabica* in Nilgris, 2-10-1985. Holotype female in National Pusa Collections, IARI, New Delhi.

Distribution : INDIA : Tamil Nadu (Nilgiris).

L. albonotatus is nearest to *L. moringae* Ananthasubramanian and Ananthkrishnan in the short suprahumeral horns and general colour and size, but distinctly differs in the position of the ocelli, in the short posterior process which just passes the anal angle of tegmina and the tegminal colour patterns, particularly in the presence of a large subbasal white spot.

103. *Leptocentrus bajulans* Distant

1916. *Leptocentrus bajulans* Distant, *Fauna Br. India*, 6 : 155.

1975. *Leptocentrus bajulans* : Ananthasubramanian and Ananthkrishnan, *Rec. zool. Surv. India*, 68 : 192.

Female : General colour black. Head 3.0X as wide across extremities of eyes as length of vertex, longly pilose with pale hairs, vertex about 2.75X as wide as long, upper margin arcuate, lower margin somewhat obliquely sloping in frontoclypeus; eyes pinkish, subglobose; ocelli succineous, closer to eyes than to each other and situated slightly above c-o line, frontoclypeus extending for 0.75X its length below lower margins of vertex. apex truncate, longly pilose, lateral lobes small but distinct. Pronotum thickly and coarsely punctate, with long, white hairs emerging from punctures, metopidium vertical, wider than high, sparsely hairy; supraocular collosities entire, oval, bare, humeral angles brown, densely pilose, broadly conical, apices blunt; suprahumeral horns strongly tricarinate, viewed from sides broad, directed obliquely outward and upward, their apices strongly recurved and acute, anterior carina prominent; posterior process slender, arising from the posterior half of disc, curved at base, remote from scutellum and tegmina, strongly tricarinate, median carina percurrent through metopidium, lateral carinae reddish brown, apex acute, passing the posterior angle of the inner margin of tegmina; scutellum reddish brown, wider than long tomentose, apex emarginate, narrow; tegmina 3.0X as long as wide, pale bronzy, wrinkled, 1st apical cell about 8.0X as long as wide, basal sixth slightly dark brown, coriaceous, veins light reddish brown. Legs black upto distal fourth of femora, tibiae yellowish, tarsi pale white with black spots.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 4.8 mm., width across tips of suprahumeral horns 4.0 mm., at humeral angles 2.0 mm., at eyes 2.2 mm.

Male : Similar to female but darker, with denser pilosity; posterior process longer, its apex passing beyond 5th apical cell of tegmina.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 5.3 mm.; width across tips of suprahumeral horns 3.8 mm., at humeral angles 1.8 mm., at eyes 2.0 mm.

Fifth instar nymph : General colour leafy green. Head densely setose, about 2.5X as wide as long, inclined backward, vertex planate, eyes dark brown, ocelli succineous, closer to eyes than to each other and situated slightly above c-o line; thorax with pronotum highly developed, dorsal tubercles with backwardly inclined spines, small chazlazeae scattered over pronotum, metopidium somewhat convex, suprahumeral buds conspicuously large, directed backward, pronotal anterior process obliquely extended backward and upward, tip blunt, pronotal posterior process about 0.5X as long as anterior process, extending over the metanotum, wing pads large, their apices reaching the middle of abdominal segment III, costal angles distinct. Abdominal dorsal tuberculated spines much reduced, inclined backward, adpressed to body, lateral lamellae of segments III-VIII semicircular, each with 7-9 slender spines on tubercles; anal tube black at distal third, nearly as long as rest of abdomen, highly eversible.

Material examined : 6 females, 4 males, numerous nymphs ex *Casuarina equisetifolia*, Madras, 1-9.1967. Male lectotype in British Museum.

Distribution : INDIA; BURMA; MALAYSIA.

L. bajulans is closely related to *L. major* Ananthasubramanian and Ananthakrishnan in the length and disposition of the posterior process which is remote from scutellum and tegmina from base to apex, but differs in the shorter suprahumeral horns, position of ocelli, colour of tegmina and size of the body.

104. *Leptocentrus bauhiniae* Ananthasubramanian and Ananthakrishnan.

1975. *Leptocentrus bauhiniae* Ananthasubramanian and Ananthakrishnan. *Rec. zool. Surv. India*, **68** : 203.

Female : General colour dark brown. Head nearly 3.0X as wide across extremities of eyes as length of vertex, finely pilose, vertex about 2.0X as wide as long, upper margin arcuate, declivous, lower margins slightly oblique to frontoclypeus, eyes reddish brown with shades of black at centre; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus declivous, densely pilose with golden yellow hairs, extending for nearly 0.65X its length below lower margins of vertex, apex broadly rounded, frontoclypeal lobes inconspicuous. Pronotum black, finely punctate, with more or less recumbent yellowish pilosity; metopidium vertical, wider than high, finely punctate, sparsely pilose, supraocular callosities bare, distinct; humeral angles prominent, tips acute; suprahumeral horns black, sparsely pilose, strongly quadricarinate, carinae jet black, as viewed from sides slightly projecting forward, as viewed in front extending outward and gently curved backward, as viewed from above much broader with acute tips; posterior process punctate at base, remote from scutellum, rising well above disc, obliquely directed backward in a subhorizontal manner, the apical fourth tapering, apex reaching the extremity of 4th apical cell of tegmina, not impinging on inner margins of tegmina, median carina finely percurrent through metopidium; tegmina 3.0X as long as wide, shining pale bronzy ochraceous, apex of costal margin smoky black, basal sixth black, oriaceous, punctate, 1st apical cell about 6.5X as long as wide, scutellum as long as wide, white tomentose at basal half. Legs with whole of coxae to basal three-fourths of femora black, rest of femora and tibiae castaneous, tarsi yellowish brown. Abdomen black, sparsely hairy.

Length from frontal margin to tips of tegmina 6.2 mm., to tip of posterior process 5.75 mm., width across tips of suprahumeral horns 5.0 mm., at humeral angles 2.6 mm., at eyes 2.4 mm.

Male : Similar to female, but slightly smaller. Genitalia with sternal plate broadened at base, the split extending to more than one half of the length of the plate, terminal lobes not conspicuous, tips divergent; lateral plate narrowly rounded at base, widest at one-third distance from main body, its process short, not distinctly demarcated from the main body, fringed with long hairs, aedeagus and parameres typical of the genus.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 5.5 mm., width across tips of suprahumeral horns 4.5 mm., at humeral angles 2.4 mm., at eyes 2.2 mm.

Fifth instar nymph (female): General colour green. Head sparsely pilose with short tuberculated bristles inclined forward, vertex slightly sinuate at base, eyes prominently reddish brown, ocelli closer to eyes than to each other and situated on c-o line. Pronotum with metopidium obliquely extending forward and produced as an anterior crest which is nearly

horizontal and slightly inclined downward; pronotal posterior process less than half as long as anterior process; suprahumeral buds very small, inconspicuous, dorsal tuberculate spines of abdomen prominent, suberect, inclined backward; lateral lamellae of abdominal segments III-VIII semicircular, each bearing 8 or 9 tuberculate spines; anal tube as long as rest of abdomen; genitalic rudiments prominent, sternal plate black.

Fifth instar nymph (male): Similar to the same stage of female with the following differences: Anterior pronotal process obliquely directed upward and forward; the suprahumeral buds indistinct; tip of abdomen upwardly raised; genital rudiments different from those of female.

Material examined : Holotype male, allotype female, 75 female and 35 male paratypes and numerous nymphs ex *Bauhinia tomentosa*, in Madras, August, November, 1968; types in author's collections, paratypes in National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Tamil Nadu (Madras).

L. bauhiniae is very closely related to *L. taurus* (Fabricius) in its general colour and appearance, but differs distinctly by the nature of the posterior process the distal fourth of which is straight and acuminate, its apex not impinging on the inner margins of tegmina.

105. *Leptocentrus beluri* Ananthasubramanian
(Fig.110)

1980. *Leptocentrus beluri* Ananthasubramanian, *Rec.zool. Surv. India, Occ. Paper* No. 16 : 15.

Female : General colour piceous brown. Head vertical, about 3.2X as wide across extremities of eyes as length of vertex, light brown with long, sparse adpressed silvery hairs, vertex 1.9X as wide as long, upper margin arcuate, lower margins gently sloping to frontoclypeus; frontoclypeus extending for 0.75X its length below lower margins of vertex, densely longly pilose, apex nearly truncate, frontoclypeal lobes small, but distinct; eyes subglobose, pale red; ocelli succineous, closer to eyes than to each other and situated well above c-o line, pronotum piceous brown, finely punctate, longly pilose, metopidium vertical, wider than high; supraocular callosities subprominent, divided; humeral angles prominent, their anterior carina prominent, apices blunt; suprahumeral horns robust, longer than space between their bases, moderately wide at base, directed upward well above disc and outward and very weakly recurved, tapering with acute apices, strongly tricarinate with an additional posterodorsal carina, posterior process piceous brown, emerging from the posterior half of disc, raised above scutellum and tegmina, tricarinate, longly pilose, almost horizontal upto half of its length, slightly ampliate near apex, apex sharply acute, not impinging on inner tegminal margins, extending upto 4th apical cell of tegmina, median carina strongly percurrent; tegmina about 3.25X as long as wide, semihyaline, apical limbus broad, apex narrowly rounded, veins light brown, basal sixth reddish brown, 1st apical cell about 8.0X as long as wide, with a dark patch about its middle, 1st discoidal cell shorter than 2nd. Scutellum white tomentose at basal lateral third, rest rusty brown, tip emarginate. Legs and abdomen uniformly rusty brown.

Length from frontal margin to tips of tegmina 7.4 mm., to tip of posterior process 6.2 mm.; width across tips of suprahumeral horns 5.1 mm., at humeral angles 2.8 mm., at eyes 2.6 mm.

Male: Similar to female in general colour, but smaller. Suprahumeral horns shorter; posterior process slightly arched behind scutellum; abdomen dark brown beneath.

Length from frontal margin to tips of tegmina 6.8 mm., to tip of posterior process 5.6 mm.; width across tips of suprahumeral horns 4.9 mm., at humeral angles 2.6 mm., at eyes 2.4 mm.

Material examined: Holotype female, Z.S.I., Calcutta, Reg.No. 643/H15; allotype male, Reg.No. 644/H15, and one paratype male Reg.No. 645/H15, from Belur, Howrah Dist., West Bengal, 14-1-1966.

Distribution : INDIA : West Bengal.

L. beluri is closely allied to *L. mangiferae* Ananthasubramanian and Ananthakrishnan in the nature of the posterior process which is slender, slightly arched above scutellum, almost straight upto half of its length and not impinging on inner tegminal margins, but distinctly differs in the downward extension of frontoclypeus, metopidium wider than high and in the colour and markings of tegmina.

106. *Leptocentrus carinatus* Ananthasubramanian
(Fig. 111)

1980. *Leptocentrus carinatus* Ananthasubramanian, *Rec. zool. Surv. India, Misc. Pub. Occ. Paper* No. 16 : 11.

Female : General colour greyish black with shades of red. Head vertical, nearly 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, finely granulate, longly pilose with adpressed silvery hairs, upper margin of vertex nearly planate, lower margins broadly sloping to frontoclypeus; eyes subglobose, pinkish; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus densely hairy, extending for three fourths its length below lower margins of vertex, tip truncate, frontoclypeal lobes fused. Pronotum black, finely granulate, longly pilose with suberect silvery hairs; metopidium wider than high, vertical, convex; humeral angles short, blunt; supraocular collosities small, undivided; suprahumeral horns stout, 1.5X as long as space between their bases, broadbased, strongly tricarinate, carinae heavy, jet black, viewed from sides directed upward and outward, gently backward, tips jet black, acute, basal area longly sparsely pilose; posterior process horizontal, emerging from posterior half of disc, raised well above and remote from scutellum and tegmina, sparsely pilose, finely punctate, median and lateral carinae strong, jet black, apex acute, reaching the middle of 4th apical cell of tegmina; scutellum triangular, nearly as wide as long, greyish black, convex at base, finely punctate with long erect hairs, tip slightly raised, emarginate; tegmina subhyaline, more than 3.0X as long as wide, basal sixth coriaceous, veins greyish, apical limb fairly broad, tip narrowly rounded, 1st apical cell narrow, more than 10X as long as wide 1st and 2nd discoidal cells of equal length. Legs light brown with a red hue. Abdomen black.

Length from frontal margin to tips of tegmina 7.2 mm., to tip of posterior process 6.2 mm., width across tips if suprahumeral horns stouter and longer, nearly 1.75X as long as distance between their bases, apices strongly recurved.

Male : Similar to female with the following differences:

Metopidium more convex, prominently projecting forward; suprahumeral horns stouter and longer, nearly 1.75X as long as distance between their bases, apices strongly recurved.

Material examined : Holotype female in Z.S.I. Reg.No. 617/H15, and one male paratype Reg.No. 619/H15, collected from Barasat, 24 Parganas, West Bengal, 17-12-1965.

Distribution : INDIA : West Bengal.

This species is nearest to *bajulans* Distant and *rubrinigris* Ananthasubramanian in the horizontal posterior process remote from scutellum and tegmina, but differs from both the species by the longer suprahumeral horns, subhyaline tegmina which is more than 3.5X as long as wide, and by the uniformly light brown legs.

107. *Leptocentrus insignis* Distant
(Fig. 112)

1951. *Centrotus vicarius* Walker, *List Hom.*, **2** : 605.

1903. *Centrotus impunctus* Buckton, *Trans. Linn. Soc. Zool.*, **9** : 334.

1908. *Leptocentrus insignis* Distant, *Fauna Br. India*, **4** : 32.

Female : General colour black., Head vertical, about 3.2X as wide across extremities of eyes as length of vertex, with sparse golden yellow pilosity, vertex about 2.0X as wide as long, upper margin strongly arcuate, lower margins gently sloping to frontoclypeus; eyes greyish black, ocelli closer to eyes than to each other and situated on the c-o line; frontoclypeus densely hairy, longer than wide, extending for 0.75X its length below lower margins of vertex, frontoclypeal lobes distinct. Pronotum greyish black, with a broad white band laterally clothed with white tomentosity, coarsely punctate with long, sparse golden yellow hairs, metopidium obliquely directed backward to disc, about as wide as high; supraocular callosities large, undivided, bare; humeral angles prominent, about 0.25X as long as suprahumeral horns, apices subacute; suprahumeral horns shorter than space between their bases, roundly recurved, tricarinate, seen from above slightly inclined backward with apices subacute; posterior process slender, obliquely recurved from base, extending more or less horizontally, the apex impinging on tegmina and reaching the 4th apical cell of tegmina, strongly tricarinate and punctate with long yellowish hairs, the dorsal carina percurrent through metopidium; scutellum about as long as wide, densely clothed with white tomentosity; tegmina pale bronzy, about 3.5X as long as wide, costal margin and apex black, apical limb broad, 1st apical cell narrow, about 9.0X as long as wide, 1st discoidal cell as long as the 2nd, but broader. Legs black, apices of femora, the whole of tibiae and the basal half of tarsi reddish brown with a black hue. Abdomen beneath black, cretaceously sericeous on lateral areas.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 5.5 mm., width across tips of suprahumeral horns 3.25 mm., at humeral angles 2.2 mm., at eyes 2.0 mm.

Male : General colour dark brown, shaded with black, more densely pilose than in female; pronotum finely punctate with dense, golden pilosity; lateral margins and the entire scutellum white tomentose; suprahumeral horns shorter and more strongly recurved; tegmina subhyaline, shaded with black at basal area, costal margin and at the apex.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 5.4 mm.; width across tips of suprahumeral horns 5.5 mm., at humeral angles 2.3 mm., at eyes 2.0 mm.

Material examined : 2 females and 1 male, collected by beating wild shrubs, Coorg, 1-10-1979.

Distribution : INDIA : Karnataka State (Coorg).

The species is closely related to *luteus* Ananthasubramanian in the disposition of the suprahumeral horns and ocelli, but differs in the length to width ratio of head, markings on tegmina and in the nature of the 1st apical cell of tegmina which is long and narrow while it is short and wedge-shaped in *luteus*.

108. *Leptocentrus leucaspis* (Walker)

(Fig. 113)

1851. *Centrotus taurus* Walker, *List Hom.*, 2 : 602.
 1858. *Centrotus leucaspis* Walker, *List Hom. Suppl.* : 235.
 1903. *Leptocentrus leucaspis* : Buckton, *Monogr. Membrac.* : 235.
 1908. *Leptocentrus leucaspis* : Distant, *Fauna Br. India*, 4 : 30.
 1975. *Leptocentrus leucaspis* : Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 194.

Female : General colour black. Head about 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, upper margin arcuate and sinuate, lower margins weakly obliquely continued to frontoclypeus; eyes subglobose, black marooned; ocelli slightly closer to eyes than to each other and situated just above c-o line; frontoclypeus extending for three-fourths its length below lower margins of vertex, frontoclypeal lobes distinct, longly pilose. Pronotum black, finely punctate with sparse adpressed hairs, metopidium slightly convex, vertical, wider than high disc convex; supraocular callosities large, irregularly rounded; humeral angles dark brown, their apices acute; suprahumeral horns slender, more than 2.0X as long as space between their bases, viewed from front obliquely raised and much divergent, apices acute, viewed from above strongly arinate, flattened, obliquely directed backward, viewed from sides raised upward, then outward, apices turned backward, posterior process tricarinate, dorsal carina percurrent through metopidium, strongly convexly curved from base, achieving its maximum height above scutellum, then moderately arched, apical fourth impinging on tegminal inner margins, apex acute, touching the posterior end of 5th apical cell of tegmina, tegmina shining ochraceous, costal margin and apical limb black, basal sixth black, punctate, coriaceous, 1st apical cell about 7.0X

as long as wide, veins reddish brown. Scutellum black, as wide as long, tip broadly emarginate; basal two-thirds of scutellum and lateral areas of sternum cretaceously sericeous. Legs with femora dark brown, tibiae yellowish, tarsi pale yellow.

Length from frontal margin to tips of tegmina 8.0-8.6 mm., to tip of posterior process 6.5-7.0 mm.; width across tips of suprahumeral horns 5.25-6.5 mm., at humeral angles 2.8-3.0 mm., at eyes 2.2-2.4 mm.

Male : General colour dark brown. Smaller than female. Suprahumeral horns much more divergent; posterior process strongly arched, tip impinging on tegminal inner margins; terminalia, with lateral valve oblong, 2.5X as long as wide, its process chitinised, fringed with short setae; aedeagus and parameres typical to genus.

Length from frontal margin to tips of tegmina 7.0-7.5 mm., to tip of posterior process 5.5-6.0 mm.; width across tips of suprahumeral horns 6.4-7.0mm., at humeral angles 2.5-2.7 mm., at eyes 2.0-2.2 mm.

Fifth instar nymph : General colour light green, in some specimens greyish, mottled with black dots. Head 2.0X as wide as long, base of vertex strongly arcuate and sinuate, longly pilose, eyes pale white, ocelli transparent, closer to eyes than to each other and situated above c-o line, frontoclypeus greyish white, longly pilose, extending slightly below lower margins of vertex, rostral tip reaching hind coxae. Pronotum enlarged, nearly as long as pterothorax, crest with closely arranged short tuberculate spines, pronotal anterior process directed obliquely forward and upward with broadly rounded tip, nearly 2.5X as long as pronotal posterior process, posterior process extending over basal half of mesonotum, tip acute, tuberculate spines on mid-dorsal area of pterothorax short and stout, suprahumeral buds small, with blunt apices; mesonotal process short; tegminal wing pads greyish brown, large, costal angles inconspicuous and sparingly hairy. Abdomen laterally compressed with 9 visible segments, the 1st segment very narrow, segment IX forming the anal tube, dorsal tubercles of abdominal segments suberect, inclined backward, lateral lamellae of segments III-VIII large, crescentic, bordered by 8 or 9 long, slender, spines, some of which showing a tendency to fork; anal tube highly eversible, subterminally fringed with a circllet of fine *setae*.

Material examined : Long series of females, males and nymphs ex *Terminalia catappa* and *Pongamia glabra*, at Madras, July to October, 1966; ex *Bauhinia tomentosa*, Bangalore, January 1979.

Distribution : INDIA : Tamil Nadu (Madras), Karnataka (Bangalore), Andhra (Vijayawada, Guntur); SRI LANKA; PHILIPPINES; BORNEO; MALAYSIA.

L. leucaspis is very closely related to *L. mephistopheles* Buckton in the presence of long and slender suprahumeral horns, but differs by the relatively stouter suprahumeral horns, longer and less curved posterior process, shining ochraceous tegmina and in the presence of white tomentous patches on the lateral areas of sternum.

109. *Leptocentrus longispinus* Distant
(Fig. 114)

1908. *Leptocentrus longispinus* Distant, *Fauna Br. India*, 4 : 31.

Female : General colour black. Head black, 2.8X as wide across extremities of eyes as length of vertex, sparsely, pilose vertex, 2.0X as wide as long, upper margin arcuate, lower margins gradually sloping to frontoclypeus; eyes subglobose, piceous; ocelli equidistant from each other and from eyes and situated on c-o line; frontoclypeus 1.5X as long as wide, extending for three-fourths its length below lower margins of vertex, longly pilose, apex broadly rounded, frontoclypeal lobes distinct. Pronotum black, coarsely punctate, densely pilose with long hairs, metopidium vertical, wider than high; supraocular callosities inconspicuous; humeral angles very short, their apices obtuse; suprahumeral horns very long, about 2.0X as long as space between their bases, width between their tips nearly equalling the length of posterior process, as seen from above gradually curving backward, prominently carinate near extreme hind margin, apex acute, as seen in front moderately stout, slightly diverging outward and upward, as seen from lateral aspects directed obliquely upward and backward; posterior process tricarinate, moderately arched to apex which passes as far back as the 4th apical cell of tegmina, apex impinging on tegmina, median carina of posterior process finely continued through metopidium; tegmina 3.2X as long as wide, pale, ochraceous, subhyaline, basal sixth coriaceous, punctate, basal and costal area to apex black, 1st apical cell narrow, about 8.0X as long as wide. Scutellum as long as wide, emarginate at apex; legs black upto distal half of femora, rest of femora and tibiae light brown, tarsi pale yellow.

Length from frontal margin to tips of tegmina 9.0mm., to tip of posterior process 8.4 mm.; width across tips of suprahumeral horns 7.8 mm., at humeral angles 3.2 mm., at eyes 2.9 mm.

Male : Similar to female in general colour and size; suprahumeral horns somewhat shorter and slightly more recurved, their length slightly less than the distance between the bases of horns; abdomen narrow.

Material examined : 2 females, 1 male ex *Michelia champaka* in Malampuzha Dam, Palghat, Kerala, 10-10-1969. Holotype female in British Museum.

Distribution : INDIA : Kerala State (Palghat); BURMA; SINGAPORE; BORNEO; SUMATRA.

This species is closely allied to *leucaspis* (Walker) and *mephistopheles* Distant in the very long, slender divergent suprahumeral horns and the posterior process which is slender, long and passes the posterior angles of the inner tegminal margins, but differs in several aspects, particularly in the nature of the frontoclypeus, position of ocelli and tegminal characters.

110. *Leptocentrus luteus* Ananthasubramanian
(Fig. 115)

1980. *Leptocentrus luteus* Ananthasubramanian, *Rec. zool. Surv. India, Misc. Pub. Occ. Paper* No. 16 : 16.

Female : General colour yellowish brown. Head vertical, 2.75X as wide across extremities of eyes as length of vertex, vertex 1.75X as wide as long, upper margin arcuate, lower margins obliquely sloping to frontoclypeus; eyes subglobose, reddish brown; ocelli succineous, equidistant from each other and from eyes and situated above c-o line; frontoclypeus greyish yellow, extending for three-fourths its length below lower margins of vertex, densely pilose with long silvery white hairs, lateral margins parallel and carinate, apex truncate. Pronotum yellowish brown, darkly granulate with sparsely arranged silvery white hairs, metopidium slightly slanting backward, coarsely punctate, 2.0X as wide as high; supraocular callosities prominent, black, divided; humeral angles concolorous with metopidium, subprominent, apices subacute; suprahumeral horns dark brown, shorter than space between their bases, tricarinate, viewed from sides raised upward and strongly backwardly recurved, viewed from above turned outward and backward, tips acute, seen in front narrow, directed outward, posterior process slender, slightly sinuate, arising from the posterior end of disc, recurved from base, well raised from disc and widely separated from scutellum, extending as far back as the posterior angle of the inner margin of tegmina, apex acuminate, impinging on tegmina, dorsal carina finely percurrent through metopidium; tegmina straw yellow, 3.0X as long as wide, basal sixth dark brown, coriaceous, veins yellowish brown and stout, 1st apical cell 5.0X as long as wide, 2 discoidal cells (in the type the 1st discoidal cell of right tegmen absent); hind wings with 4 apical cells. Legs light brown except tarsi which are shaded with black. Abdomen yellowish below; ovipositor dark reddish brown.

Length from frontal margin to tips of tegmina 9.3mm., to tip of posterior process 7.5 mm., width across tips of suprahumeral horns 4.8 mm., at humeral angles 3.4 mm., at eyes 3.2 mm.

Male : Unknown.

Material examined : Female holotype in Z.S.I., Calcutta, Reg.No. 646/H15, Harjeana Forest, Hoshiarpur District, 24-12-1962.

Distribution : INDIA.

This species is related to *scutellatus* Distant in the moderately long suprahumeral horns and the slender sinuate posterior process the apex of which slightly passes the posterior angles of the inner margin of tegmina, but differs in the shorter frontoclypeus, the strongly recurved suprahumeral horns and the general colour of body and tegmina.

111. *Leptocentrus majesticus* Ananthasubramanian
(Fig. 116)

1980. *Leptocentrus majesticus* Ananthasubramanian, *Entomon*, 5(2) : 115.

Female : General colour shining yellow. Head about 2.75X as wide as long, sprinkled with greyish dots, densely pilose with long silvery white hairs, vertex nearly planate at upper margin, lower margins downwardly convexly sloping to frontoclypeus; eyes large, globate, chocolate brown; ocelli silvery white, closer to eyes than to each other and situated above c-o line; frontoclypeus concolorous with vertex, extending for half its length below lower margins of vertex, frontoclypeal lobes prominent, longly pilose. Pronotum luteous, coarsely punctate with long subsrect hairs, metopidium slightly wider than high, convex, nearly vertical; supraocular callosities conspicuous, brown, entire, almost bare; humeral angles subprominent, their apices blunt; suprahumeral horns yellowish brown, nearly as long as the space between their bases, seen from front moderately broad, seen in lateral aspect a little projecting forward upto middle, then obliquely curved backward, seen from above somewhat flat, apical one-third gently curved backward, apices sharp, posterior process rather slender, yellowish, emerging from about the middle of disc, well remote from scutellum, substraight, apical part slightly sinuate, not impinging on inner tegminal margins, reaching the middle of 4th apical cell of tegmina, distinctly tricarinate, lateral carinae fuscous, extending upto middle of disc, median carina strongly percurrent through metopidium; scutellum as wide as long, basal half punctate with silvery hairs, apex narrowly emarginate, slightly raised; lateral areas sternum brownish, lacking white tomentosity; tegmina a little more than 3.0X as long as wide, straw yellow, basal sixth coriaceous, a smoky area on costal margin opposite to 1st apical cell, apical limb moderately broad, 1st apical cell nearly wedge-shaped, about 5.0X as long as wide, 2nd discoidal cell about 1.5X as long as 1st Legs uniformly yellow; abdominal undersurface light brown.

Length from frontal margin to tips of tegmina 8.3 mm., to tip of posterior process 7.2 mm.; width across tips of suprahumeral horns 5.0 mm., at humeral angles 3.2 mm., at eyes 2.6 mm.

Male : Unknown

Material examined : One female, Yercaud Hill (4,800 ft.), 1-3-1979. Type in author's collections.

Distribution : INDIA : Tamil Nadu.

This species is nearest to *major* Ananthasubramanian and Ananthakrishnan in the nature of the suprahumeral horns and posterior process, but differs from it in the longer posterior process and the general colour besides differences in the nature of apical and discoidal cells of tegmina.

112. *Leptocentrus major* Ananthasubramanian and Ananthakrishnan
(Fig. 117)

1975. *Leptocentrus major* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 190.

Female : General colour shining black. Head 3.0X as wide across extremities of eyes as length of vertex, densely pilose with silvery hairs, vertex 2.0X as wide as long, upper margin sinuate, arcuate, lower margins gently curved to frontoclypeus; eyes large, chestnut brown; ocelli white, closer to eyes than to each other and situated on c-o line; frontoclypeus densely pilose, extending

for two-thirds its length below lower margins of vertex, tip broadly rounded. Pronotum black, coarsely punctate, with long silvery hairs, metopidium wider than high, convex, nearly vertical; supraocular collasities irregular in outline, large, black, humeral angles prominent, their apices subacute; suprahumeral horns slightly longer than space between their bases, viewed from sides obliquely directed forward, then upward, strongly recurved backward beyond middle, apices acute, viewed in front much narrower, widely divergent, dorsal carinae shining black, nearer to posterior margin; posterior process robust, obliquely curved immediately after its origin from disc, raised well above scutellum, then extending horizontally backward, sinuate beyond middle, strongly tricarinate, the central carination finely percurrent through metopidium, apex black, acuminate, remote from tegmina, scutellum clothed with silvery white hairs, as wide as long, apex narrowly emarginate; tegmina about 3.0X as long as wide, basal fifth coriaceous, costal margin, apical limb and basal fifth dark marooned, rest shaded black, veins stout, reddish brown; legs basally black, tibiae brown, tarsi yellow; abdominal sternites uniformly black; lateral areas of thorax cretaceously sericeous; ovipositor prominent, shining black.

Length from frontal margin to tips of tegmina 9.0 mm., to tip of posterior process 7.0 mm.; width across tips of suprahumeral horns 5.9 mm., at humeral angles 3.2 mm., at eyes 3.0 mm.

Male : Smaller than female; posterior process slender, not sinuate, genitalia as figured.

Length from frontal margin to tips of tegmina 7.7 mm., to tip of posterior process 6.0 mm.; width across tips of suprahumeral horns 5.4 mm., at humeral angles 2.4 mm., at eyes 2.3 mm.

Fifth instar nymph : General colour pale brown. Head obliquely turned backward, rostral tip reaching midcoxae, vertex emarginate at base, cranial tubercles obsolete; eyes pale white, subglobose; ocelli black, closer to eyes than to each other and situated on c-o line; thorax with pronotum greatly developed, arrangement of tuberculate spines on thoracic tergites mostly as in *L. rhizophagus*; metopidium receding in front and curving forward into pronotal crest, pronotal posterior process shorter than anterior process, contiguous with mesonotum, extending to about half its length, suprahumeral buds large, their apices blunt; wing pads darker than rest of thorax, extending only slightly backward, costal angles broadly rounded; dorsal tuberculate spines of abdominal segments more or less erect, each tubercle bearing 4 or 5 spines of varying length; lateral lamellae of abdominal segments III-VIII large, crescentic, each bearing 7-10 long, slender tuberculate spines; anal tube as long as the combined length of abdominal segments I-VIII, highly eversible.

Material examined : 10 females, 9 males, 6 fifth instar nymphs, Malampuzha Dam, Palghat, Kerala, ex *Michelia champaka* 8-8-1968; type in the National Pusa Collections, IARI, New Delhi.

Distribution : INDIA : Kerala State (Palghat).

L. major is nearest to *L. bajulans* Distant in the strongly tricarinate posterior process which is well remote from tegmina, but differs by its larger size, the tegmina shaded black and the posterior process sinuous beyond middle.

113. *Leptocentrus mangiferae* Ananthasubramanian and Ananthakrishnan.
(Fig. 118)

1975. *Leptocentrus mangiferae* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, **68** : 188.

Female : General colour greyish brown. Head more than 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, brown, shaded with black, clothed by short, closely adpressed silvery white hairs, upper margin arcuate, lower margins obliquely sloping to frontoclypeus; eyes pale white; ocelli shining white, situated closer to eyes than to each other and a little above c-o line; frontoclypeus longly pilose, speckled with black spots, longer than wide, extending for two-thirds its length below lower margins of vertex, apex rounded. Pronotum greyish brown, finely punctate, with short pale white hairs; metopidium as wide as high, nearly vertical; supraocular callosities inconspicuous, undivided, bare; humeral angles prominent, their apices subacute; suprahumeral horns as long as space between their bases, seen from above stout at base, more or less foliate, directed upward, then gradually turned backward upto the level of humeral angles, apices subacute; posterior process basally raised above scutellum, tricarinate, almost straight upto half of its length, then sinuate and acuminate to tip which is contiguous with the inner tegminal margins, extending upto middle of 4th apical cell of tegmina, median carina strongly percurrent through metopidium; tegmina about 3.5X as long as wide, vitreous, basal sixth brown, punctate, coriaceous, 1st apical cell long, narrow, about 9.0X as long as wide., Scutellum white tomentose at basal lateral third, rest rusty brown, tip narrowly emarginate; lateral areas of sternum rusty brown; abdomen light brown; ovipositor concolorous with abdominal sternites.

Length from frontal margin to tips of tegmina 6.9 mm., to tip of posterior process 6.0 mm.; width across tips of suprahumeral horns 4.8 mm., at humeral angles 2.8 mm., at eyes 2.5 mm.

Male : Similar to female. General colour dark brown. Genitalia as figured.

Fifth instar nymph : General colour pinkish brown. Head 2.0X as wide as long, vertex planate at base, cranial tubercles obsolete, tuberculate spines slender and closely arranged; eyes reddish brown; ocelli fuscous brown, equidistant from each other and from eyes and situated on c-o line. thorax light brown, pronotal crest as long as or longer than posterior process which is contiguous with mesonotum and extending over two-thirds its length; suprahumeral buds black, moderately developed, with backwardly directed acute tips; tegminal wing pads reddish brown, extending over abdominal segment III, costal angles distinctly demarcated; legs yellowish on tibiae, rest brown; abdomen dark brown; dorsal tubercles of abdominal segments II-VIII short, their spines suberect; lateral lamellae of segments III-VIII large, crescentic, each provided with 7 to 9 slender spines inclined backward; anal tube black at distal half, as long as rest of abdomen.

Material examined : 9 females, 9 males 12 fifth instar nymphs ex *Mangifera indica*, in Madras, 1-10-1965; types deposited in the National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Tamil Nadu (Madras).

L. mangiferae is closely related to *rhizophagus* Ananthasubramanian and Ananthakrishnan in the disposition of the horns and the posterior process, but differs by the general colour, in the position of ocelli, and tegminal characters.

114. *Leptocentrus moringae* Ananthasubramanian and Ananthakrishnan
(Fig. 119)

1975. *Leptocentrus moringae* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, **68** : 205.

Female : General colour greyish brown. Head declivous, nearly 3.0X as wide across extremities of eyes as length of vertex, vertex 1.8X as wide as long, upper margin strongly arcuate, lower margins gently sloping to frontoclypeus; eyes scarlet brown, projecting; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus densely pilose, extending for two-thirds its length below lower margins of vertex, frontoclypeal lobes small, white tomentose, free end of frontoclypeus broadly rounded. Pronotum greyish brown dorsally, lateral areas cretaceously sericeous, metopidium slightly wider than high, greyish with sparsely distributed hairs, convex, obumbrant; supraocular callosities very small, entire; humeral angles moderately developed, their apices subacute; suprahumeral horns shorter than space between their bases, seen in front horizontal, slender, directed outward, gradually tapering, apices acute, carinae chestnut brown, seen from sides distal one-third directed backward, lateral carinae fine; posterior process slender, tricarinate, slightly raised from disc, obliquely arched, apex acute, impinging on inner tegminal margins, reaching upto 4th apical cell of tegmina; tegmina nearly 3.0X as long as wide, hyaline except at apical fourth of costal margin which is fuscous, basal area somewhat darker and coriaceous, 1st apical cell about 6.0X as long as wide, parallel-sided, discoidal cells nearly subequal; scutellum as wide as long, basal area white tomentose, apex narrowly emarginate; abdomen greyish above, lower surface sparingly white tomentose. Legs black upto femora, tibiae reddish brown, tarsi light yellow; ovipositor dark brown.

Length from frontal margin to tips of tegmina 6.5 mm., to tip of posterior process 5.6 mm.; width across tips of suprahumeral horns 4.5 mm., at humeral angles 2.4 mm., at eyes 2.2 mm.

Male : Similar to female. Genitalia as figured.

Length from frontal margin to tips of tegmina 6.2mm., to tip of posterior process 5.3 mm.; width across tips of suprahumeral horns 4.5 mm., at humeral angles 2.4 mm., at eyes 2.2 mm.

Fifth instar nymph : General colour deep brown. Head obliquely directed caudad, the rostral tip reaching the level of 1st pair of coxae, upper margin of vertex strongly arcuate and sinuate, cranial tubercles much reduced, bases of tuberculate spines dark brown, setae on upper margin of vertex dense; eyes reddish brown, ocelli dull white, inconspicuous, equidistant from each other and from eyes and situated on c-o line; frontoclypeus extending for a short distance below lower margins of vertex. Pronotum brown, metopidium as wide as high, slightly receding in front and curving forward and upward to form the anterior extension of pronotal crest, ending in a broadly rounded tip covered with dense setae; posterior process half as long as anterior process, extending for over three-fourths its length on mesonotum; suprahumeral buds moderately developed, dark

brown at base; mesonotal process half as long as anterior process, extending backward over the entire length of metanotum; wing pads green with scattered brown dots, costal angles not distinctly demarcated; abdominal segments I-VIII somewhat telescoped, slightly exceeding two-thirds of the length of anal tube; dorsal tubercles dark brown, longer spines on tubercles suberect, smaller ones adpressed to body; lateral lamellae of segments III-VIII conspicuous, semicircular, each with 7 or 8 tuberculate spines; anal tube very long, much longer than rest of abdomen.

Material examined : 32 females, 19 males and 20 fifth instar nymphs, ex *Moringa oleifera*, in Madras, 20-10-1967.

Distribution : INDIA : Tamil Nadu (Madras).

L. moringae is closely allied to *L. obortus* Distant in the nature of the suprahumeral horns which are horizontal, obliquely narrowed with apices acute and carinate, the black costal area and white temontosity on lateral areas of sternum, but differs by the colour of the body and disposition of posterior process.

115. *Leptocentrus nigra* Ananthasubramanian and Ananthakrishnan
(Fig. 120)

1975. *Leptocentrus nigra* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, **68** : 201.

Female: General colour black. Head declivous, about 3.0X as wide across extremities of eyes as length of vertex, somewhat densely pilose, hairs golden yellow, vertex 2.0X as wide as long, upper margin shallowly arcuate, lower margins downwardly sloping; eyes large, subglobose, reddish brown, moderately projecting latered; ocelli jet black, a little raised, located closer to eyes than to each other and above c-o line; frontoclypeus concolorous with vertex, densely pilose, extending for two-thirds its length below lower margins of vertex, frontoclypeal lobes prominent, fringed with golden yellow hairs, apex, truncate. Pronotum jet black, finely punctate with long, suberect, golden yellow hairs, lateral and ventral areas of sternum cretaceously sericeous; metopidium slightly higher than wide, vertical, slightly convex; supraocular callosities conspicuous, jet black, bare, somewhat oval, undivided; humeral angles prominent, their apices blunt; suprahumeral horns black, about 1.5X as long as space between their bases, seen from front broad, subparallel, seen from sides a little projecting forward just beyond middle, then obliquely curved backward, apices acuminate; posterior process robust, black, rising obliquely from disc, achieving its greatest height above middle of scutellum, then extending backward in an almost declivous manner, apical fourth acuminate, impinging on inner margins of tegmina, reaching the extremity of 5th apical cell of tegmina, distinctly tricarinate, lateral carinae extending upto middle of disc, posterior face of pronotum vertically raised up, then curving caudad into base of posterior process, median carina strongly percurrent; scutellum as wide as long, basal half cretaceously sericeous, apex narrowly emarginate; tegmina 3.5X as long as wide, shining bronzy ochraceous, extreme base smoky hyaline, distal half of costal margin, tip of 1st apical cell and the adjacent area of apical limb shaded with black. Legs black upto distal ends of tibiae, tarsi brown.

Length from frontal margin to tips of tegmina 7.7 mm., to tip of posterior process 6.4 mm.; width across tips of suprahumeral horns 6.0 mm., at humeral angles 2.7 mm., at eyes 2.5 mm.

Male : Similar to female but smaller.

Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 5.9mm., width across tips of suprahumeral horns 5.2 mm., at humeral angles 2.5 mm., at eyes 2.3 mm.

Fifth instar nymph : General colour green. Head inclined backward, rostral tip reaching abdominal segment II; head densely pilose, base of vertex nearly truncate; eyes reddish brown; ocelli closer to eyes than to each other and situated on c-o line; pronotum with metopidium vertical, sprinkled with small tuberculate spines; anterior process of pronotum gradually tapering to an acute tip, directed forward and upward; posterior process extending over entire length of mesonotum, tip acute; suprahumeral buds small, concolorous with metopidium; abdominal lateral lamellae crescentic, each lamella bearing 7 to 9 slender, tuberculate spines; anal tube shorter than the combined length of abdominal segments I-VIII.

Material examined : 16, females, 7 males and 5 fifth instar nymphs ex *Phyllanthus* sp., in Amerthi Hill, 10-5-1968. Types in National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Tamil Nadu.

L. nigra is related to *L. taurus* in the nature of the suprahumeral horns and tegminal characters, but differs by the metopidium which is higher than wide, the strongly abruptly elevated base of posterior process which does not extend beyond the 5th apical cell to tegmina.

116. *Leptocentrus obliquus* (Walker)
(Fig. 121)

1858. *Centrotus obliquus* Walker, *Ins. Saund., Hom.* : 79.

1927. *Leptocentrus obliquus* : Funkhouser, *Gen. Cat. Memb.*, 1 : 427.

1965. *Leptocentrus obliquus* : Metcalf and Wade, *Gen. Cat. Homop.*, 119.

Female : General colour dark brown, with shades of black. Head about 2.75X as wide across extremities of eyes as length of vertex, vertex about 1.8X as wide as long, upper margin strongly arcuate, lower margins gradually obliquely extending to frontoclypeus; eyes reddish brown; ocelli closer to each other than to eyes and situated on c-o line; frontoclypeus densely pilose, extending for half of its length below lower margins of vertex, frontoclypeal lobes distinct, tip broadly rounded. Pronotum dark brown, finely punctate with short adpressed white hairs; metopidium vertical, slightly convex, about 1.5X as wide as high; supraocular callosities rather inconspicuous, undivided, bare; humeral angles broadly conical, apices subacute; suprahumeral horns stout, finely punctate with short silvery white hairs, slightly longer than space between their bases, moderately recurved, viewed from front subhorizontal, viewed from sides raised upward and outward and moderately recurved, apices acute; posterior process moderately arched at base and remote from scutellum, obliquely straight, slightly arched at middle, distinctly passing posterior angle of inner margin of tegmina, impinging on tegminal inner margins, strongly tricarinate, apex acute; tegmina pale bronzy hyaline reflecting the abdomen beneath, 3.5X as long as wide, apex narrowly rounded, apical limbus moderately broad, 1st apical cell somewhat wide, 4.0X as

long as wide, 1st and 2nd discoidal cells subequal; scutellum as long as wide, white tomentose at basal half; lateral areas of sternum cretaceously sericeous; abdomen dark brown beneath.

Length from frontal margin to tips of tegmina 6.5 mm., to tip of posterior process 5.0 mm.; width across tips of suprahumeral horns 4.75 mm., at humeral angles 3.0 mm., at eyes 2.75 mm.

Male : Slightly smaller than female. Tegmina vitreous, posterior process almost obliquely straight, not arched at middle. Genitalia with subgenital plate cleft very narrowly to about one-third the distance from free end; lobes of subgenital plate inconspicuous; parameres with cuneiform apices; aedeagus typical of the genus; lateral valves oblong, about 2.0X as long as wide, the process of lateral valve very short, fringed with long setae.

Material examined: 10 males and 10 females ex *Terminalia arjuna*, Trivandrum, 15-1-1981; 1 male in FRI., Dehra Dun, collected from Uttar Pradesh. Lectotype male in British Museum.

L. obliquus (Walker) is very closely allied to *L. substitutus* (Walker) in many of their characters, and Distant (1908) considered the former species as synonymous to the latter. The two species, however, are distinct. In *obliquus* the pilosity is short and the ocelli are closer to each other than to eyes and situated on c-o line, while in *substitutus* the pilosity is long and the ocelli are closer to eyes than to each other and situated above c-o line. The tegmina of *obliquus* are 3.5X as long as wide, mostly vitreous and the 1st apical cell is somewhat wider, while in *substitutus* the tegmina are 3.0X as long as wide, smoky hyaline and the 1st apical cell is long and narrow. The posterior process in *obliquus* is distinctly arched at about its middle, while in *substitutus* it is obliquely straight and subhorizontal.

117. *Leptocentrus obortus* Distant
(Fig. 122)

1916. *Leptocentrus obortus* Distant, *Fauna Br. India*, 6 : 154.

Female : General colour black. Head 2.9X as wide across extremities of eyes as length of vertex, upper margin of vertex strongly arcuate, lower margins gently sloping to frontoclypeus; eyes light black; ocelli closer to each other than to eyes and situated on the c-o line; frontoclypeus densely pubescent, extending for two-thirds its length below lower margins of vertex, frontoclypeal lobes fused with the main lobe, apex broadly truncate, longly hairy. Pronotum black, coarsely punctate, with long dull-white hairs; metopidium about 1.25X as wide as high, vertical, coarsely punctate with long white hairs; supraocular callosities large, undivided, bare; humeral angles black, prominent, apices subacute; suprahumeral horns robust, 1.5X as long as space between their bases, coarsely punctate with long hairs, seen in front directed obliquely upward and outward, strongly tricarinate, apices strongly recurved and narrowed to acute points, seen from above subhorizontal, apically directed backward; posterior process moderately slender, tricarinate, dorsal carina percurrent through metopidium, raised at base well above scutellum, then subhorizontally directed backward, apex acuminate distinctly passing the posterior angle of the inner margin of tegmina, reaching the 4th apical cell of tegmina, slightly impinging on them; tegmina 3.0X as long as wide, pale bronzy hyaline, basal sixth punctate, coriaceous and

ochraceous, costal and apical areas black, 1st apical cell about 6.0X as long as wide, 2nd discoidal cell clearly longer than the 1st; basal half of scutellum and lateral areas of sternum thickly tomentose with white hairs, distal half of scutellum black, apex slightly raised and narrowly emarginate. Legs brown with shades of black, moderately pilose.

Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 6.25 mm.; width across tips of suprahumeral horns 5.5 mm., at humeral angles 3.0 mm., at eyes 2.7mm.

Male : Similar to female in general colour and size, but the frontoclypeus is shaded with black, bearing a white tomentose patch; tegmina with basal fifth ochraceous, costal, subcostal and apical areas darker than in female.

Material examined : 2 females and 1 male, Madras Govt. Museum, bearing the label: coll. Trivandrum, Kerala, 21-7-1923.

Distribution : INDIA : Kerala State (Trivandrum); BURMA : MALAYSIA : BORNEO; SUMATRA.

L. obortus is closely related to *L. taurus* (Fabricius) in the general colour of the body and tegmina, disposition of posterior process and tomentosity of the lateral areas of sternum, but differs in the rather slender posterior process which is well raised at base above the scutellum, and the more upwardly directed suprahumeral horns with their apices abruptly directed backward and narrowed to end in acute tips.

118. *Leptocentrus reponens* (Walker)
(Fig. 123)

1851. *Centrotus reponens* Walker, *List Hom.*, 2 : 604
 1859. *Centrotus antilope* Stål, *Freg. Eug. Resa Ins.* : 284.
 1870. *Leptocentrus antilope* : Stål, *Ofv. Vet.-Ak. Forh.* : 727.
 1885. *Leptocentrus reponens* : Atkinson, *J. Asiat. Soc. Bengal*, 54 : 86.
 1908. *Leptocentrus reponens* : Distant, *Fauna Br. India*, 4 : 30.

Female : General colour black. Head nearly 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, upper margin arcuate, lower margins somewhat parallel and gently sloping to frontoclypeus; eyes large, reddish brown, ocelli black, closer to each other than to eyes and situated on c-o line; frontoclypeus pinkish brown, longly pilose, parallel-sided, extending for about three-fourths its length below lower margins of vertex, apex broadly rounded, frontoclypeal lobes distinct. Pronotum black, finely punctate with short adpressed hairs, metopidium vertical, about 1.5X as wide as high, finely punctate, densely pubescent; supraocular callosities prominent, undivided, bare; humeral angles prominent, basal one-third black, apices subacute; suprahumeral horns robust, about 1.5X as long as space between their bases, finely punctate, tricarinate, seen in front slightly divergent and flat, tips, acute, seen from sides somewhat recurved and directed backward, seen from above foliaceously convex and much broader at their anterior margins; posterior process broad behind disc, moderately remote from

scutellum and directed backward in an obliquely straight manner, the apical area just impinging on the inner tegminal margins, lateral carinae fine, dorsal carina strongly percurrent through metopidium, apex of posterior process acuminate, reaching the 5th apical of tegmina, tegmina pale bronzy, 3.5X as long as wide, base and costal margin black, basal sixth coriaceous and punctate, apical limb narrow, veins pale yellow, 1st apical cell narrow, long, about 8.0X as long as wide; scutellum nearly as long as wide, basal two-thirds cretaceously sericeous. Abdomen beneath black, lateral areas white tomentose.

Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 5.7 mm.; width across tips of suprahumeral horns 5.25 mm., at humeral angles 2.5 mm., at eyes 2.2 mm.

Material examined : 3 females, 2 males ex *Butea monosperma*, in Chediatope, Andamans, 15-1-1985. Lectotype male in British Museum.

Distribution : INDIA : Andamans; BURMA; PHILIPPINES; SUMATRA.

This species is closely allied to *taurus* (Fabricius) and *substitutus* (Walker) in the general colour, disposition of posterior process and colour of tegmina, but differs from both in the nature of the suprahumeral horns which are much broader above and foliaceously convex at their margins.

119. *Leptocentrus rhizophagus* Ananthasubramanian and Ananthakrishnan.
(Fig. 124)

1975. *Leptocentrus rhizophagus* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, **68** : 185.

Female : General colour dark brown. Head vertical, 3.0X as wide across extremities of eyes as length of vertex, vertex strongly arcuate at upper margin, lower margins broadly rounded, greyish white with scattered silvery pilosity; eyes reddish brown; ocelli closer to eyes than to each other and situated on c-o line; frontoclypeus greyish white, bordered by black streaks with long sparse pilosity, 2.5X as long as wide, extending for two thirds its length below lower margins of vertex, frontoclypeal lobes prominent, tip of frontoclypeus truncately rounded. Pronotum brown, shaded with black, densely pilose, lateral areas of sternum cretaceously sericeous; metopidium wider than high, vertical upto half of its height, then gradually sloping backward to disc; supraocular callosities conspicuous, irregularly shaped, black; humeral angles subprominent, light yellowish brown, apices subacute; suprahumeral horns reddish brown, densely pilose at base, longer than space between their bases, seen from sides broadbased, obliquely curved forward, then upward, distal one-fifth directed backward, apices acute, seen in front much narrower, carinae weak; posterior process reddish brown, a little raised from disc and obliquely backwardly directed, more or less arcuate, tip acuminate, passing well beyond the posterior angle of the inner tegminal margin and reaching three-fourths of the length of the 5th apical cell of tegmina, median carina strongly percurrent through metopidium; tegmina 3.0X as long as wide, hyaline, distal third of costal margin fuscous, base somewhat coriaceous, veins light brown, pilose, 1st apical cell about 7.0X as long as wide. Scutellum white tomentose at lateral basal areas, wider than long, narrowly emarginate. Abdomen beneath dark brown. Legs with apical two-thirds of tibiae and tarsi light yellow, rest dark brown.

Length from frontal margin to tips of tegmina 6.3 mm., to tip of posterior process 5.3 mm.; width across tips of suprahumeral horns 4.9 mm., at humeral angles 2.5 mm., at eyes 2.3 mm.

Male : Smaller, dark brown, frontoclypeus jet black; humeral angles conspicuous, tips blunt. Genitalia with aedeagus finely serrate on inner margin, tip subacute; parameres rectangularly truncate in lateral aspect, sparsely setose on inner margin; lateral valves broadly triangular, their processes well chitinised and fringed with short setae; sternal plate split to two-third its length from free end, its apical lobes inconspicuous, basal area highly chitinised.

Length from frontal margin to tips of tegmina 5.9 mm., to tip of posterior process 5.0 mm.; width across tips of suprahumeral horns 4.4 mm., at humeral angles 2.1 mm., at eyes 2.0 mm.

Fifth instar nymph : General colour pinkish brown. Head densely pilose, directed backward, rostral tip reaching mid-coxae, base of vertex strongly arcuate, eyes prominent, pink or reddish brown, surrounded by numerous setae, ocelli closer to eyes than to each other and situated on c-o line; pronotal anterior process broadly rounded, distinctly shorter than posterior process, extending over three-fourths length of mesonotum, suprahumeral buds conspicuously large, dark brown; wing pads dark brown, extending upto abdominal segment III, costal angles fringed with long setae and distinctly demarcated; tibiae of legs with light transverse bands; dorsal tubercles of abdominal segments short, their spines suberect, lateral lamellae of abdominal segments III-VIII semicircular, each bearing 7 or 9 long, slender slightly curved spines inclined caudad; anal tube black at distal half, as long as the combined length of abdominal segments I-VIII, highly eversible.

Material examined : 50 females, 21 males, 38 fifth instar nymphs ex *Ficus bengalensis* on free-hanging prop roots, in Madras, 1-1-1966; paratypes in National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : In all southern states.

L. rhizophagus is nearest to *obliquus* (Walker) in the general colour and size, obliquely straight posterior process which impinges on the inner tegminal margins and the hyaline tegmina, but differs by the much longer and less oblique suprahumeral horns and also by the position of the ocelli.

120. *Leptocentrus rubrinigris* Ananthasubramanian
(Fig. 125)

1980. *Leptocentrus rubrinigris* Ananthasubramanian, *Rec.zool. Surv. India, Misc. Pub. Occa. Paper* No.16 : 10.

Male : General colour black. Head vertical, nearly 3,0X as wide across extremities of eyes as length of vertex, thickly pilose, hairs silvery white, upper margin of vertex arcuate, lower margins carinate, sloping obliquely to frontoclypeus; eyes reddish brown, subglobose; ocelli succineous, closer to eyes than to each other and situated above c-o line; frontoclypeus extending for half its length below lower margins of vertex, its apex truncate, basal lobes more or less fused.

Pronotum black, granulate and punctate with dull white hairs; metopidium convex in front, greyish black with suberect silvery white hairs, 2.0X as wide as high; humeral angles dark reddish brown, subprominent, apices subacute; supraocular callosities very small, undivided; suprahumeral horns about 1.3X as long as space between their bases, broadbased, jet black, viewed from sides turned obliquely upward and strongly backwardly curved, seen in front narrow and projecting outward, strongly quadricarinate, anterior carina prominent; posterior process stout, horizontal, arising from posterior half of disc and slightly raised from disc, curved at base and remote from scutellum and tegmina, strongly tricarinate, median carina pitch black, percurrent through metopidium, lateral carinae obscure on disc, apex of posterior process acute, passing over the posterior angle of the inner margin of tegmina and reaching the tip of abdomen; scutellum jet black, as wide as long, tip slightly raised and narrowly emarginate; tegmina bronzy brown, subopaque, more than 3.0X as long as wide, inner tegminal and costal margins marooned with black, apical limb moderately broad, tip rounded, veins dark brown. Abdomen black.

Length from frontal margin to tips of tegmina 7.7 mm., to tip of posterior process 6.7 mm.; width across tips of suprahumeral horns 4.9 mm., at humeral angles 3.0 mm., at eyes 2.4 mm.

Female : Unknown.

Material examined : Holotype male in ZSI., from Uttar Pradesh, 2-8-1958.

Distribution : INDIA : Uttar Pradesh.

L. rubrinigris is closely allied to *L. bajulans* Distant in the disposition of the posterior process which is horizontal, well remote from scutellum and tegmina, but differs in the nature of frontoclypeus, relative size of discoidal cells of tegmina and tegminal colour.

121. *Leptocentrus rufescens* Ananthasubramanian
(Fig. 126)

1980. *Leptocentrus rufescens* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Paper* No. 16 : 12.

Male : General colour greyish black. Head about 2.75X as wide across extremities of eyes as length of vertex, greyish black, vertex finely punctate with long, adpressed silvery white hairs, upper margin of vertex arcuate and sinuate, lower margins gently sloping to frontoclypeus; eyes subglobose, greyish black; ocelli succineous, equidistant from each other and from eyes and situated on c-o line; frontoclypeus longer than wide, extending for nearly half its length below lower margins of vertex, tip broadly rounded, longly pilose. Pronotum greyish black, finely punctate, with long silvery hairs; metopidium vertical, 2.0X as wide as high, supraocular callosities large, rounded, greyish impunctate; humeral angles short, apices blunt. suprahumeral horns dark brown, broadbased, directed outward, rising obliquely well above the level of disc, apex weakly recurved, slightly longer than the space between their bases, extending well beyond humeral angles, apices acute; posterior process dark brown, emerging horizontally from disc and obliquely from its posterior half, distant from scutellum and impinging on the posterior angles of tegmina, apex acuminate, extending as far back as the tip of 5th apical cell of; tegmina,

tricarinate, with a longitudinal depression between median and lateral carinae; scutellum triangular, as wide as long, basal half white tomentose, distal half black and punctate, apex concavely emarginate, tegmina slightly more than 3.0X as long as wide, subhyaline, apex shaded with black, basal sixth coriaceous and punctate, apex acutely rounded, apical limb broad, veins pale brown, 1st apical cell 10.0X as long as wide, 1st discoidal cell shorter than 2nd. Legs greyish black. Abdomen beneath light brown.

Length from frontal margin to tips of tegmina 6.1 mm., to tip of posterior process 4.9 mm.; width across tips of suprahumeral horns 4.0 mm., at humeral angles 2.3 mm., at eyes 2.5 mm.

Female : Unknown.

Material examined : Holotype male in Z.S.I., Calcutta, reg. No : 638/H15, from Manoharpur, Bihar, India, 29-12-1967.

Distribution : INDIA; Bihar (Manoharpur).

L. rufescens is nearest to the African species *nubianus* Capener in the disposition of the posterior process which emerges horizontally from the disc and in the form of the tegmina, but differs by the general colour, more obliquely forwardly projecting horns, short humeral angles and the scutellum which is as long as wide.

122. *Leptocentrus scutellatus* Distant (Fig. 127)

1916a. *Leptocentrus scutellatus* Distant, *Fauna Br. India*. 6 : 155.

Female : General colour purplish brown. Head thickly pilose with silvery white hairs, about 2.5X as wide across extremities of eyes as length of vertex, upper margin of vertex nearly planate, lower margins obliquely passing to frontoclypeus; eyes pinkish brown; ocelli succineous, closer to eyes than to each other and situated on c-o line; frontoclypeus densely hairy extending for three-fourths its length below lower margins of vertex, apex broadly rounded, frontoclypeal lobes distinct. Pronotum coarsely punctate, purplish brown above and at sides, metopidium slightly wider than high, nearly vertical upto two-thirds of its height, then gradually obliquely continued to disc, densely pilose; supraocular callosities subprominent; humeral angles prominent, about 0.25X as long as suprahumeral, apices subacute; suprahumeral horns shorter than space between their bases, subhorizontal, only slightly curved, weakly tricarinate, apices acute, seen from sides slightly recurved and directed upward and backward; posterior process slender, strongly tricarinate, base narrow, median carina percurrent through metopidium, slightly sinuate, its apex acute, slightly depressed and just passing the posterior angle of the inner margin of tegmina; tegmina very pale bronzy brown reflecting the dark abdomen beneath, about 3.0X as long as wide, apical limb fairly wide, 1st apical cell about 7.0X as long as wide, 2nd discoidal cell distinctly wider than 1st; scutellum pale virescent, its base purplish brown, densely hairy, a purplish spot on each of its basal angle; legs moderately hairy, basal half of femora black, tibiae pinkish brown, tarsi pale white. Abdomen beneath reddish brown.

Length from frontal margin to tips of tegmina 8.6-9.5 mm., to tip of posterior process 5.8-6.0 mm.; width across tips of suprahumeral horns 4.5 mm., at humeral angles 3.2 mm., at eyes 2.6 mm.

Male : Unknown.

Material examined : 3 females ex *Cytissus scoparius*, in Bryan's Park, Kodaikanal, 1-10-1979; 1 female ex *Tectona grandis*, in Mudumalai Hills, 20-3-1989, Lectotype female in British Museum.

Distribution : INDIA : Tamil Nadu (Kodaikanal, Mudumalai)

This species is closely related to *L. moringae* Ananthasubramanian and Ananthakrishnan in the nature of the posterior process which passes distinctly the posterior angles of the inner margins of tegmina, and in the disposition of the suprahumeral horns which are shorter than the space between their bases and nearly straight with acute tips, but differs in the nature of metopidium, tegminal colour, position of ocelli and also in the general colour.

123. *Leptocentrus splendens* Ananthasubramanian
(Fig. 128)

1980. *Leptocentrus splendens* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Paper No. 16* : 14.

Female : General colour black. Head vertical, about 2.75X as wide across extremities of eyes as length of vertex, finely punctate with long, white hairs, upper margin of vertex strongly arcuate, lower margins weakly oblique to frontoclypeus; eyes subglobose, dark brown; ocelli succineous, somewhat closer to eyes than to each other and situated above c-o line; frontoclypeus longer than wide, extending for half its length below lower margins of vertex, densely longly pilose, hairs white; antennae stramineous. Pronotum black, finely punctate, with long, suberect, silvery hairs; metopidium convex, vertical, 1.5X as wide as high, sparsely hairy; supraocular callosities conspicuous, black, undivided, bare; humeral angles well developed, posterior angles rounded, apices subacute; suprahumeral horns robust, broadbased, directed upward, then outward and backward, about 1.5X as long as space between their bases, strongly tricarinate, tips acute, jet black; posterior process slender, black, pilose, emerging from the posterior one-third of disc, remote from scutellum and gently arched, tip acuminate, passing as far caudad as the 4th apical cell of tegmina, tricarinate, median carina strongly percurrent through metopidium; tegmina about 3.0X as long as wide, dark brown, subopaque, basal sixth coriaceous, punctate, apical limb moderately broad, tip rounded, 1st apical cell about 6.0X as long as wide, 1st discoidal cell nearly rectangular, smaller than the 2nd; legs dark brown; abdomen beneath black.

Length from frontal margin to tips of tegmina 8.0 mm., to tip of posterior process 6.4 mm.; width across tips of suprahumeral horns 6.1 mm., at humeral angles 3.0 mm., at eyes 2.6mm.

Male : Unkonwn.

Material examined : Female holotype in Z.S.I. Calcutta, Reg. No : 642/H15, from Murdhari, Poona, 4-9-1952.

Distribution : INDIA : Maharashtra (Pune).

This species is closely related to *L. bauhiniae* Ananthasubramanian and Ananthakrishnan in the general colour and disposition of the posterior process, but differs in the dark, subopaque nature of tegmina and the relatively less recurved suprahumeral horns.

124. *Leptocentrus substitutus* (Walker)
(Fig. 129)

1851. *Centrotus substitutus* Walker, *List Hom.* : 78.
1985. *Centrotus substitutus* : Atkinson, *J. Asiat. Soc. Bengal.* : 67.
1858. *Centrotus flexicorne* Walker, *Ins. Saund. Hom.* : 78.
1858. *Centrotus obliquus* Walker, *Ins. Saund. Hom.* : 79.
1908. *Leptocentrus substitutus* : Distant, *Fauna Br. India*, 4 : 29.

Female : General colour dark brown shaded with black. Head 3.0X as wide as long, greyish black, upper margin of vertex arcuate, lower margins obliquely sinuately rounded to frontoclypeus; eyes reddish brown, subglobose; ocelli black, slightly projecting, closer to eyes than to each other and situated above c-o line; frontoclypeus parallel-sided, extending for about half its length below lower margins of vertex. Pronotum dark brown, finely punctate with long silvery white hairs; metopidium vertical, wider than high, coarsely punctate; supraocular callosities, inconspicuous, bare; humeral angles short, apices subacute; suprahumeral horns robust, finely punctate with long white hairs, longer than the space between their bases, less prominently recurved, strongly tricarinate, apices less acute, viewed from sides somewhat projecting upward and outward with the apices abruptly turned backward; posterior process moderately arched at base, fairly remote from scutellum, obliquely straight, extending backward as far as the 4th apical cell of tegmina, apex impinging on tegmina, dorsal carina strongly percurrent through metopidium; tegmina pale bronzy ochraceous, 3.0X as long as wide, narrowly opaque, apical area black, basal one-sixth dark brown, coriaceous and punctate, veins light brown, stout, apical limbus moderately broad, 1st apical cell long and narrow, about 8.0X as long as wide. Scutellum slightly longer than wide, anterior half densely pilose and cretaceously sericeous. Abdomen dark brown beneath.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 5.7 mm.; width across tips of suprahumeral horns 4.5 mm., at humeral angles 2.6 mm., at eyes 2.9 mm.

Male : General colour black. Head densely pubescent, 2.8X as wide across extremities of eyes as length of vertex, vertex strongly arcuate at upper margin, obliquely rounded at lower margins, longly and densely pilose; pronotum black, finely punctate with sparse silvery white pilosity, suprahumeral horns as long as space between their bases, strongly recurved and strongly tricarinate; posterior process strongly arched at base, then obliquely straight, its apex reaching the 5th apical cell; tegmina ochraceous with shades of black, venation as in female.

Length from frontal margin to tips of tegmina 5.8 mm., to tip of posterior process 5.3 mm.; width across tips of suprahumeral horns 4.1 mm., at humeral angles 2.5 mm., at eyes 2.75 mm.

Material examined : 25 females 6 males ex *Ficus bengalensis*, in Madras, 1-1-1979; 19 females, 5 males on *Cestrum diurnum*, Bangalore, 3-2-1981; 5 females on *Cajanus cajan*s, Trivandrum, 12-11-1981. Holotype female in British Museum.

Distribution : INDIA : All over; SRI LANKA; CENTRAL CHINA.

L. substitutus is very closely allied to *L. obliquus* in many of the taxonomic characters, but they are distinctive and differ in important characters as mentioned under *L. obliquus*.

125. *Leptocentrus taurus* (Fabricius)

(Fig. 130)

1775. *Membracis taurus* Fabricius, *Syst. Ent.* : 676.
 1778. *Cicada taurus* Goeze, *Hemiptera*, 2 : 147.
 1792. *Membracis taurus* : Olivier, *Enc. Meth.* 7 : 665.
 1798. *Membracis rupricapra* Fabricius, *Ent. Syst. Suppl.* : 514.
 1803. *Centrotus rupricapra* Fabricius, *Syst. Rhynq.* : 18.
 1803. *Centrotus scutellaris* Fabricius, *Syst. Rhynq.* : 19.
 1803. *Centrotus taurus* Fabricius, *Syst. Rhynq.* : 20.
 1829. *Membracis tricornis* Hardwicke, *Zool. Jour.*, 4 : 114.
 1851. *Centrotus terminalis* Walker, *List Hom.*, 2 : 604.
 1851. *Centrotus vicarius* Walker, *List Hom.*, 2 : 605.
 1869. *Leptocentrus taurus* Stål, *Hem. Fabr.*, 2 : 50.
 1885. *Leptobelus scutellaris* Atkinson, *J. Asiat. Soc. Bengal*, 54 : 83.
 1903. *Leptocentrus gazella* Buckton, *Monogr. Membrac* : 235.
 1908. *Leptocentrus taurus* : Distant, *Fauna Br. India*, 4 : 28.

Female : General colour black. Head 3.0X as wide across extremities of eyes as length of vertex, greyish black, coarsely punctate, sparsely pilose, vertex 2.0X as wide as long, upper margin of vertex arcuate, lower margins obliquely sloping to frontoclypeus, eyes reddish brown, subglobose; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus slightly darker than vertex, longer than wide, extending for three-fourths its length below lower margins of vertex, apex broadly rounded and longly pilose. Pronotum black, thickly coarsely punctate with closely adpressed pale white hairs; metopidium dark reddish brown, vertical, nearly 2.0X as wide as high; supraocular callosities subprominent; humeral angles greyish brown, longer than wide, sparsely pilose, apices subacute; suprahumeral horns robust, longer than space between their bases, as seen in front strongly tricarinate, subhorizontal, much narrower and less recurved, as seen from above, broader with the three carinae jet black, the dorsal carina closer to posterior margin, as seen from sides turned slightly upward, then strongly recurved, apices acute; posterior process strongly tricarinate, abruptly convexly elevated from near base, then substraight, passing behind 5th apical cell of tegmina, apex black, impinging on the inner margins of tegmina, central carina strongly percurrent through metopidium; tegmina pale bronzy ochraceous, 3.5X as long as wide, distal half of costal margin black, basal sixth opaque,

coriaceous and punctate, 1st apical cell about 8.0X as long as wide. Scutellum as wide as long, its basal half white tomentose, tip narrowly emarginate; lateral areas of sternum cretaceously sericeous. Legs with femora dark brown, tibiae light brown with shades of red. Abdomen beneath black.

Length from frontal margin to tips of tegmina 7-8 mm., to tip of posterior process 5.8-6.6 mm.; width across tips of suprahumeral horns 5.0-5.2 mm., at humeral angles 2.4-2.7 mm., at eyes 2.2-2.4 mm.

Male : General colour black. Smaller than female; suprahumeral horns more strongly recurved. Genitalia with aedeagus 'U' shaped, connective plate of parameres rectangular lateral valves nearly oblong, 2.0X as long as wide, dark brown, process of lateral valve short, nodular, fringed with short setae; apical third of subgenital plate split, lateral areas punctate with long sparse hairs, apical lobes of subgenital plate inconspicuous.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 5.0-5.4 mm.; width across tips of suprahumeral horns 4.6-4.8 mm., at humeral angles 2.2-2.4 mm., at eyes 2.0-2.2 mm.

Fifth instar nymph : Colour leafy green in life, but fading to ochraceous in cabinet specimens. Vertex convex, covered with sparse bristles, bases of tuberculate spines black, rostrum extending backward upto abdominal segment II, cranial tubercles absent; eyes large and pale white; ocelli somewhat projecting, closer to eyes than to each other and situated above c-o line; lower margin of frontoclypeus on a line with lower margins of vertex; frontoclypeal lobes distinct. Pronotum with metopidium vertical, anterior process obliquely raised forward and upward, tip narrowly rounded, fringed with closely arranged short tuberculate spines, posterior process about 0.35X as long as anterior process, extending backward over mesonotum, apex acuminate; suprahumeral buds black at base, moderately large; wing pads pale green, with scattered brown and black dots; abdominal segments slightly telescoped, dorsal tubercles of abdominal segments short, their spines adpressed to the dorsum; lateral lamellae of segments III-VIII large, crescentic, each with 7-10 tuberculate spines inclined backward; anal tube about 1.25X as long as rest of abdomen; genital rudiments black or dark brown.

Material examined : Long series of females, males and nymphs ex *Prosopis spicigera*, *Solanum melongena* and *Morinda tinctoria*, in Madras, in September-December, 1965.

The host plants of this polyphagous species found commonly in the southern States of India are tabulated (Table : 6)

Distribution : INDIA : All over; BURMA; SRI LANKA; MALAYSIA; EAST INDIES; BORNEO; PHILIPPINES.

Table : 6
Host plants of *Leptocentrus taurus* recorded from India

Name of host plant	Natural Order
<i>Abrus precatorius</i>	<i>Fabaceae</i>
<i>Arachis hypogaea</i>	"
<i>Butea frondosa</i>	"
<i>Canavalia ensiformis</i>	"
<i>Clitoria ternatea</i>	"
<i>Crotalaria juncea</i>	"
<i>Crotalaria verrucosa</i>	"
<i>Cyamopsis tetragonoloba</i>	"
<i>Dolichos biflorus</i>	"
<i>Erythrina indica</i>	"
<i>Lablab purpureus</i>	"
<i>Lathyrus aphaca</i>	"
<i>Lathyrus odoratus</i>	"
<i>Phaseolus mungo</i>	"
<i>Sesbania aegyptiaca</i>	"
<i>Cassia auriculata</i>	<i>Caesalpinaceae</i>
<i>Cassia fistula</i>	"
<i>Caesalpinia coriaria</i>	"
<i>Caesalpinia pulcherrima</i>	"
<i>Parkinsonia aculeata</i>	"
<i>Poinciana regia</i>	"
<i>Tamarindus indicus</i>	"
<i>Acacia arabica</i>	<i>Mimoseae</i>
<i>Albizia lebbek</i>	"
<i>Mimosa rubicaulia</i>	"
<i>Parkia biglandulosa</i>	"
<i>Prosopis juliflora</i>	"
<i>Prosopis spicigera</i>	"
<i>Psidium guajava</i>	<i>Myrtaceae</i>
<i>Cinnamomum zeylanicum</i>	<i>Lauraceae</i>
<i>Capparis sepiaria</i>	<i>Capparidaceae</i>
<i>Crataeva religiosa</i>	"
<i>Zizyphus jujuba</i>	<i>Rhamnaceae</i>
<i>Zizyphus oenoplia</i>	"
<i>Ipomea biloba</i>	<i>Convolvulaceae</i>
<i>Hibiscus rosasinensis</i>	<i>Malvaceae</i>
<i>Gossypium herbaceum</i>	"
<i>Sida cordifolia</i>	"

<i>Casuarina equisetifolia</i>	Casuarinaceae
<i>Datura fastuosa</i>	Solanaceae
<i>Eranthimum sp</i>	"
<i>Lycopersicum esculentum</i>	"
<i>Solanum melongena</i>	"
<i>Solanum nigrum</i>	"
<i>Solanum torvum</i>	"
<i>Solanum trilobatum</i>	"
<i>Feronia elephantum</i>	Rutaceae
<i>Murraya koenigii</i>	"
<i>Cissus quadrangularis</i>	Vitaceae
<i>Anacardium occidentale</i>	Anacardiaceae
<i>Mangifera indica</i>	"
<i>Morinda tinctoria</i>	Rubiaceae
<i>Artabotrys odoratissimus</i>	Anonaceae
<i>Polyalthia longifolia</i>	"

L. taurus is very closely related to *L. substitutus* in its general appearance, but the latter species is smaller, its posterior process less arched at base and more obliquely straight, the suprahumeral horns less prominently recurved and their apices less acute than in *taurus*.

126. *Leptocentrus ustus* Buckton
(Fig. 131)

1903. *Leptocentrus ustus* Buckton, *Monogr. Membrac.* : 236.

1908. *Leptocentrus ustus* : Distant, *Fauna Br. India*, 4 : 32.

Buckton's (1903) description of this species agrees with 3 female specimens collected by the author on *Casuarina equisetifolia* in Madras, based on which the following redescription is given.

Female : General colour greyish black. Head 2.7X as wide across extremities of eyes as length of vertex, greyish black, with sparse pilosity, upper margin of vertex arcuate, sinuate, lower margins gently sloping to frontoclypeus; eyes pale white, subglobose; ocelli succineous, a little closer to eyes than to each other and situated slightly above c-o line; frontoclypeus nearly 2.0X as long as wide, parallel-sided, longly densely pilose, extending for 2/3 its length below lower margins of vertex, apex obtusely truncate, frontoclypeal lobes indistinct. Pronotum black with shades of grey on the disc, finely punctate with short, adpressed silvery hairs; metopidium wider than high, vertical almost upto its upper margin and then sloping gradually to disc; supraocular callosities distinct, undivided, bare; humeral angles appearing closer to suprahumeral horns, their apices subacute; suprahumeral horns shorter than space between their bases, tricarinate, viewed from above obliquely directed backward, viewed from front directed subhorizontally and the apices directed backward, apices acute, viewed from sides directed upward, weakly recurved; posterior process slender at base, remote from scutellum and obliquely directed backward

somewhat subhorizontally, apex tapering to an acute point which passes distinctly beyond the posterior angle of inner margin of tegmina, reaching the middle of the 5th apical cell of tegmina and impinging on them; tegmina lustrous, reflecting the abdomen beneath, 3.0X as long as wide, veins slender and brown, apex narrowly rounded, fuscous, apical limb broad, 1st apical cell about 6.0X as long as wide. Scutellum slightly longer than wide, proximal half white tomentose; lateral areas of sternum white tomentose. Abdomen black beneath, reaching the tip of 1st apical cell of tegmina. Legs brown, tibiae slightly flat.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 2.5 mm., at humeral angles 2.1 mm., at eyes 1.8 mm.

Material examined : 3 females ex *Casuarina equisetifolia*, in Madras, 12-3-1969.

Distribution : INDIA: Tamil Nadu (Madras) : SRI LANKA.

L. ustus is nearest to *L. moringae* Ananthasubramanian and Ananthakrishnan in the nature of the posterior process which passes well beyond the posterior angle of the inner margins of tegmina and impinging on inner tegminal margin, and the short suprahumeral horns which are shorter than the space between their bases, as also in the position of the ocelli and in the colour of tegmina, but it distinctly differs from *moringae* by the general colour, nature of metopidium and also by the slightly dilated nature of the tibiae.

127. *Leptocentrus varicornis* Ananthasubramanian and Ananthakrishnan
(Fig.132)

1975. *Leptocentrus varicornis* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, **68** : 196.

Female : General colour greyish brown. Head yellowish brown, about 3.2X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, upper margin arcuate, coarsely punctate, lower margins obliquely continued to frontoclypeus; eyes light reddish brown; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus greyish with black dots, longly pilose, extending for one-third its length below lower margins of vertex. Pronotum greyish black, finely punctate with long suberect hairs; metopidium vertical, closely punctate, 1.5X as wide as high; supraocular callosities inconspicuous; humeral angles short, their apices subacute; suprahumeral horns very long, rather slender, widely divergent, not abruptly curved from base, obliquely directed upward, apex acute and moderately curved backward, seen from above much flattened, seen in front much narrow, finely tricarinate, carinae black; posterior process slender, reddish brown, tricarinate, median carina finely percurrent, lateral carinae weak, posterior process recurved from near base, widely remote from scutellum, extending as far back as the 4th apical cell of tegmina, apex acuminate, impinging on tegmina; tegmina subhyaline, basal area punctate, dark brown, veins stout, yellowish brown, 1st apical cell very narrow, about 9.0X as long as wide. Scutellum as long as wide, tip narrowly emarginate. Legs reddish brown except tarsi which are yellowish. Abdomen beneath black.

Length from frontal margin to tips of tegmina 6.1 mm., to tip of posterior process 5.44 mm.; width across tips of suprahumeral horns 4.5-6.0 mm., at humeral angles 2.4 mm., at eyes 2.5 mm.

Male : Slightly smaller than female. Body uniformly yellowish brown except abdominal undersurface which is black; eyes greyish black; metopidum less punctate, more densely pilose; abdomen narrow; genitalia as figured.

Length from frontal margin to tips of tegmina 5.75 mm., to tip of posterior process 5.25 mm.; width across tips of suprahumeral horns 4.27-5.75 mm., at humeral angles 2.2 mm., at eyes 2.4 mm.

The species exhibits variations with regard to the length and angle of inclination of the suprahumeral horns to a great extent, the length of the horns ranging between 2.1 and 2.6 mm., and the degree of inclination varying from nearly horizontal to strongly obliquely upturned conditions.

Fifth instar nymph : General colour light reddish brown. Head highly pilose, vertex somewhat convex with basal margin nearly planate, cranial tubercles obsolete, ocelli slightly closer to eyes than to each other and situated on c-o line. Pronotum with prominent tuberculate spines, metopidium vertical, suprahumeral buds conspicuous; pronotal anterior process very long, slightly curved at middle and ending in an acute apex, spines on pronotal process densely arranged; pronotal posterior process short, about one-sixth as long as the anterior process, extending over the basal half of mesonotum; costal angles of wing pads broadly rounded; dorsal tuberculate spines on thorax and abdomen long, erect or suberect; abdominal lateral lamellae of segments III-VIII semicircular, each bearing 6 to 9 long, slender, slightly curved spines besides smaller spines scattered on the lamella; anal tube dark brown as long as the combined length of segments I-VIII.

Material examined : 20 females and 12 males and nymphs of all stages ex *Zizyphus jujuba*, in Madras, January, 1966; types in the National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Tamil Nadu (Madras).

L. varicornis is closely related to *L. leucaspis* (Walker) and *longispinus* Distant in the presence of very long, slender, divergent suprahumeral horns, but it differs from both these species by its smaller size, colour, highly variable linear growth with regard to suprahumeral horns, and less oblique posterior process. The fifth instar nymph of *L. varicornis* is characterised by the presence of a very long pronotal anterior process.

Genus 13. *Nilautama* Distant

1908. *Nilautama* Distant, *Fauna Br. India*, 4 : 32.

This genus is diagnosed by the pronotum slightly elevated at base and by the obliquely elevated posterior process which is rather short, slender, its apex just reaching the anal angles of tegmina. It is closely related to *Leptocentrus* Stål except in the disposition of the posterior process.

Head vertical, upper margin of vertex arcuate and sinuate, lower margins a little oblique; frontoclypeus weakly declivous, its lobes not distinct; ocelli a little closer to eyes than to each other and situated above c-o line; eyes sublobate. Pronotum slightly elevated at base, metopidium wider than high; humeral angles prominent, their apices blunt; supraocular callosities inconspicuous; suprahumeral horns broad, stout, tricarinate, longer than space between their bases; posterior process short, slender, emerging from a little above base of pronotum, well elevated above scutellum and obliquely directed upward, its apex just reaching the anal angles of tegmina; scutellum wider than long, its apex emarginate; tegmina amplified towards middle and obtusely angularly narrowed at apex, with 5 apical and 2 discoidal cells, the 1st apical cell based on R1 and not curving inwards at its base, hind wings with 4 apical cells.

Type species : *Nilautama typica* Distant.

128. *Nilautama typica* Distant
(Fig. 133)

1908. *Nilautama typica* Distant, *Fauna Br. India*, 4 : 32.

Female : General colour shining black. Head vertical, 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, sparsely covered with silvery hairs, upper margin of vertex arcuate, lower margins slightly obliquely continued to frontoclypeus; frontoclypeus about as long as wide, longly pilose, extending for three-fourths its length below lower margins of vertex, its apex rounded narrowly; eyes pale white; ocelli black, slightly closer to eyes than to each other and situated just above c-o line. Pronotum slightly elevated at base, black, coarsely punctate, with short adpressed silvery hairs; metopidium wider than high, basal two-thirds vertical, apical one-third sloping behind to disc; supraocular callosities inconspicuous; humeral angles prominent, apices blunt; suprahumeral horns robust, broadbased, about 1.25X as long as space between their bases, strongly tricarinate, basal areas coarsely punctate, sparsely pilose, seen from above broad, carinate behind middle, directed outward, seen in front narrow, obliquely upwardly divergent, seen from sides, apices strongly recurved with acute tips; posterior process slender, emerging slightly above base of pronotum, well remote from scutellum, gradually tapering and continued characteristically obliquely upward, tricarinate, median carina percurrent through metopidium, apex acuminate, just reaching the posterior angles of the inner margin of tegmina; tegmina bronzy ochraceous, 3.5X as long as wide, costal area somewhat black, basal area coriaceous, punctate, apical limb moderately broad, 1st apical cell long, narrow, parallel-sided, about 8.0X as long as wide, 1st discoidal cell shorter than 2nd. Scutellum shorter than wide, triangular, apex narrowly emarginate, basal area white tomentose. Lateral areas of sternum cretaceously sericeous.

Length from frontal margin to tips of tegmina 6.7 mm., to tip of posterior process 4.25 mm.; width across tips of suprahumeral horns 4.25 mm., at humeral angles 2.2 mm., at eyes 2.0 mm.

Male : Similar to female in general colour and size, but suprahumeral horns less obliquely upwardly divergent, their apical areas less strongly recurved; posterior process less oblique in its position; abdomen narrow, black, lateral areas of sternum more conspicuously white tomentose.

Material examined : 2 females ex *Bauhinia tomentosa*, in Bangalore, 20-1-1979; 1 male in ZSI., Calcutta, collected from Garo Hills, Assam, 1917. Lectotype female in British Museum.

Distribution : INDIA : Karnataka (Bangalore), Assam; BURMA.

Genus 14. *Dograna* Distant

1908. *Dograna* Distant, *Fauna Br. India*, 4 : 24.

This genus is very closely related to *Lobocentrus* Stål (1870) and *Centrolobus* Capener (1952) in the tegminal venation and in the nature of the lobe of the posterior process.

Head slightly obliquely backwardly directed, about 3.0X as wide across extremities of eyes as length of vertex, vertex moderately globose between eyes; ocelli equidistant from each other and from eyes; frontoclypeal lobes indistant. Pronotum moderately high, convex, metopidium backwardly curving to disc; supraocular callosities indistinct; humeral angles prominent; suprahumeral horns moderately stout, produced transversely; posterior process curved at base, well arched upto about middle of its length where its characteristic ventral lobe contacts the tip of scutellum after which the posterior process is more slender, slightly sinuous, gradually tapering to apex which is elevated from tegmina and passes the posterior angle of the inner tegminal margin; scutellum longer than wide, apex with a 'V' shaped notch, tip touching the ventral lobe of the posterior process; tegmina 3.0X as long as wide, lacking a pterostigma, 1st apical cell based on rs, apical veins straight, 1st discoidal cell shorter than the 2nd; apical limb very narrow; hind wings with 4 apical cells.

Type species : *Dograna suffulta* Distant.

129. *Dograna suffulta* Distant (Fig. 134)

1908. *Dograna suffulta* Distant, *Fauna Br. India*, 4 : 24.

1916. *Lobocentrus suffultus* Distant, *Ann. Mag. nat. Hist.*, (8)18 : 293.

1952. *Lobocentrus suffulta* : Distant, *J. ent. Soc. sth. Afr.*, 15 : 77.

1968. *Dograna suffulta* : Capener, *Repub. Afr. Dept. Agr. Tech. Ser. Ent. Mem.* 17 : 39.

Female : General colour black. Head a little more than 3.0X as wide across extremities of eyes as length of vertex, slightly obliquely directed backward, finely punctate with short, sparse, golden hairs, vertex 2.0X as wide as long, upper margin shallowly arcuate, lower margins downwardly sloping and broadly rounded to frontoclypeus; eyes subglobose, projecting laterad, black with shades of red; ocelli equidistant from each other and from eyes and situated a little above c-o line; frontoclypeus broad at base, 2.0X as long as wide, extending for three-fourths its length below lower margins of vertex, tip narrowly rounded, longly pilose, frontoclypeal lobes inconspicuous. Pronotum with disc moderately high and convex, shining black, coarsely punctate with short, sparse, yellow hairs; metopidium about 1.5X as wide as high, backwardly sloping to disc, covered with sparsely arranged yellow pilosity; supraocular callosities indistinct; humeral

angles prominent, blunt, posterior angles rounded; suprahumeral horns black, densely pilose at base, as long as space between their bases, viewed in front transversely produced, tricarinate, apices acute, very weakly recurved, viewed from above conspicuously grooved; posterior process reddish brown, tricarinate, emerging from behind suprahumeral horns high above scutellum, grooved on either side of median carina, strongly curved from base, produced ventrally with a stout, nearly reniform lobe directed obliquely downward and backward, its apex united with the apex of scutellum, after which it is continued backward as a slender, yellow, tapering, slightly sinuous process, its apex passing the posterior angle of the inner margin of tegmina, situated well above tegmina, lateral carinae of posterior process behind the ventral lobe very fine, median carina strong and percurrent through metopidium; tegmina 3.0X as long as wide, pale bronzy, veins dark brown, basal sixth black, coarsely punctate, coriaceous, with a pale transverse fascia following the black basal area, apical limb very narrow, R_1 oblique to subcosta, 1st apical cell based on rs , wedge-shaped, about 4.0X as long as wide, 2nd discoidal cell about 1.5X as long as the 1st. Scutellum longer than wide, its apex acute, narrowly emarginate, united with the ventral lobe of posterior process, basal lateral areas white tomentose. Lateral areas of thorax cretaceously sericeous, abdominal sternites dull white, ovipositor black, Legs uniformly light brown.

Length from frontal margin to tips of tegmina 5.75 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 4.1 mm., at humeral angles 2.8 mm., at eyes 2.5 mm.

Male : Similar to female in size, but darker; suprahumeral horns shorter than those of female; genitalia as figured.

Material examined : 2 females ex *Butea frondosa*, Coorg, 1-12-1979; 1 male ex *Capparis sepiaria*, in Malampuzha Dam, Palghat, 20-9-1968. Holotype female in British Museum.

Distribution : INDIA: Karnataka State (Coorg), Kerala State (Palghat), Maharashtra (Bombay).

Genus 15. *Imporcitor* Distant

1916. *Imporcitor* distant, *Fauna Br. India*, 6 : 157.

Head vertical, vertex rather broad with lower margins obliquely continued to frontoclypeus; ocelli about equidistant from each other and from eyes and situated on the c-o line; frontoclypeus as wide as long, slightly broader at base, apex broadly rounded, frontoclypeal lobes indistinct. Pronotum strongly centrally ridged, metopidium almost vertical to two-thirds its height and then sloping backward to disc, wider than high; supraocular callosities not very conspicuous, divided; humeral angles subprominent; suprahumeral horns stout, broadbased, weakly tricarinate, strongly recurved; posterior process moderately arched at base, elevated from scutellum, then strongly sinuately waved following the contour of tegminal inner margin, its apex slender, reaching the posterior angle of the inner margin of tegmina, dorsal carina percurrent, lateral carinae weak; tegmina 3.0X as long as wide, apical limb narrow, 1st apical cell based on R_1 , R_1 straight to subcosta, 2nd discoidal cell longer than the 1st, veins to apical area straight; hind wings with 4 apical cells; scutellum as wide as long, tip narrowly emarginate; legs simple.

Type species : *Imporcitor typicus* Distant.

130. *Imporcitor typicus* Distant
(Fig. 135)

1916. *Imporcitor typicus* Distant, *Fauna Br. India*, **6** : 157.

Female : General colour black with shades of red and brown. Head brownish ochraceous, punctate with short, greyish hairs, about 2.5X as wide across extremities of eyes as length of vertex, vertex about 1.7X as wide as long, upper margin arcuate and sinuate, lower margins obliquely continued to frontoclypeus; frontoclypeus about as wide as long, extending for two-thirds its length below lower margins of vertex, basal lobes indistinct; eyes large, hemispherical, dull black; ocelli black, slightly projecting, equidistant from each other and from eyes and situated slightly above or almost on c-o line. Pronotum ochraceously brown, coarsely punctate with short, adpressed pilosity, strongly ridged centrally; metopidium wider than high, basal two-thirds nearly vertical, upper one-third gradually sloping back to disc, brownish ochraceous with a pair of large obliquely triangular spots, one on either side of the median carina; supraocular callosities inconspicuous, divided; humeral angles broad at base, punctate, apices blunt; suprahumeral horns black, punctate, with short hairs, a little longer than the space between their bases, broad, weakly carinate, viewed from sides directed upward and forward with apices strongly recurved; posterior process strongly sinuate, moderately arched at base and remote from scutellum and then concavely strongly sinuate following the contour of inner tegminal margin, gradually tapering to an acute apex which impinges on and reaching the posterior angle of the inner margin of tegmina, dorsal carina dark ochraceous, percurrent through metopidium; tegmina 3.0X as long as wide, dark brown with shades of black, basal area, two transverse fasciae and apical area black, anal angle and apical area with black markings, apical limbus very narrow, 1st apical cell about 4.0X as long as wide, other tegminal characters as in generic diagnosis. Scutellum as wide as long, basal half white tomentose, distal half black, apex narrowly emarginate; sternum reddish brown; legs simple, black.

Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 4.25 mm.; width across suprahumeral horns 3.3 mm., at humeral angles 2.3 mm., at eyes 2.0 mm.

Male : Not known.

Material examined : One female in Govt. Agricultural College, Coimbatore (coll. T.V. Campbell, January, 1915, Nilgiri Hills).

Distribution : INDIA : Tamil Nadu (Nilgiris)

Genus 16. *Pogonotus* Thirumalai and Ananthasubramanian

1985. *Pogonotus* Thirumalai and Ananthasubramanian, *Entomon*, **10**(3): 225.

This genus is close to *Pogon* Buckton (1903) in the strongly curved apical veins of tegmina, but differs in the nature of the pronotal posterior process which is long, quite remote from scutellum and not impinging on the inner tegminal margin; the posterior process is robust and wavy.

Head vertical, about 3.0X as wide across extremities of eyes as length of vertex, upper margin arcuate and weakly sinuate, lower margins oblique to frontoclypeus; eyes subglobose; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus declivous, longer than wide, extending for about half its length below lower margins of vertex, tip broadly rounded, frontoclypeal lobes distinct, extending for half the length of frontoclypeus and slightly below the lower margins of vertex. Pronotum convex, slightly gibbous behind disc, metopidium 1.5X as wide as high; humeral angles prominent, their apices subacute; suprahumeral horns well developed, robust, tricarinate, directed obliquely upward and outward, apices acute; posterior process emerging well behind horns, tricarinate, well remote from scutellum, moderately stout, wavy, narrow at middle, wider subterminally, apex acute, reaching the tip of abdomen; scutellum longer than wide; tegmina 3.0X as long as wide, with 5 apical and 2 discoidal cells, apical veins strongly curved, 1st apical cell about 5.0X as long as wide, 1st discoidal cell not parallel-sided, R_1 oblique to radial sector (rs), apical limb narrow. Legs simple.

Type species : *Pogonotus indicus* Thirumalai and Ananthasubramanian.

131. *Pogonotus indicus* Thirumalai and Ananthasubramanian
(Fig. 136)

1985. *Pogonotus indicus* Thirumalai and Ananthasubramanian, *Entomon*, **10**(3) : 226.

Female : As in the generic description with the following additional characters:

General colour rusty brown. Vertex shining brown, punctate with short, golden pilosity; eyes buffy brown; ocelli succineous; frontoclypeal margin black, sparsely longly pilose; metopidium shining brown; supraocular callosities bare, undivided; suprahumeral horns dark brown, broadbased, sprinkled with short, silvery hairs, seen in front a little longer than space between their bases, directed obliquely upward and outward, apices strongly recurved, acute; posterior process brown, apical area black, with sparse golden hairs; scutellum about 2.0X as long as wide, longly densely pilose, apex narrowly emarginate; tegmina bronzy brown, R_{2+3} , R_{4+5} , M_1 and M_2 strongly curved inwardly, 1st discoidal cell 0.5X as long as the 2nd, basal one-sixth of tegmina coriaceous, black, the costal, radial and medial areas densely darkly granulose; legs with femora brown, rest pale yellow; abdomen brown with long white hairs.

Length from frontal margin to tips of tegmina 5.19 mm., to tip of posterior process 4.67 mm.; width across tips of suprahumeral horns 3.9 mm., at humeral angles 2.67 mm., at eyes 2.37 mm.

Male: Unknown.

Material examined : 1 female collected from Pepparai, Sabarigiri, Kerala (420 mtrs.), 11-5-1981; holotype female in ZSI., Calcutta.

Distribution : INDIA : Kerala State (Sabarigiri).

Genus 17. *Convectator* Distant

1916. *Convectator* Distant, *Fauna Br. India*, 6 : 153.

This genus is very closely related to *Otinotus* Buckton in many of its characters, but the posterior process is strongly curved near base and raised above scutellum, impinging on it near its apex; the lateral carinae of the posterior process are parallel to each other and hence the process is parallel-sided till the apex which is acute.

Head vertical, wider than long, upper margin of vertex arcuate, lower margins somewhat obliquely rounded to frontoclypeus; ocelli closer to eyes than to each other; frontoclypeus longer than wide, frontoclypeal lobes short and indistinct, Pronotum not gibbous, metopidium slightly convex; humeral angles prominent; suprahumeral horns moderately developed, slender, tricarinate, apices acute; posterior process emerging dorsally horizontally from behind disc and ventrally from posterior margin of pronotum, curved and raised above scutellum, but impinging on it near its apex, then following the contour of the inner tegminal margin, tricarinate, the lateral carinae parallel, about equally broad till the apex, apex acute, reaching the posterior angle of the inner margin of tegmina; scutellum about as wide as long, well exposed, apices acute, emarginate; tegmina a little more than 3.0X as long as wide, veins in the apical area a little curved, 1st apical cell short, wedge-shaped, R_1 slightly oblique to subcosta, 2nd discoidal cell about 2.0X as long as the 1st, apical limb narrow; hind wings with 4 apical cells.

Type species: *Convectator cavendus* Distant

132. *Convectator cavendus* Distant
(Fig. 137)

1916a. *Convectator cavendus* Distant, *Fauna Br. India*, 6:153.

Female : General colour black. Head black with shades of grey, vertical, 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, shallowly arcuate and sinuate at upper margin, lower margins obliquely rounded and continued to frontoclypeus, fringed with long, greyish hairs; eyes hemispherical, pale white; ocelli vitreous, situated closer to eyes than to each other and above c-0 line; frontoclypeus slightly longer than wide, extending for two-thirds its length below lower margins of vertex, apex rounded, frontoclypeal lobes indistinct. Pronotum black, finely punctate, with short, adpressed greyish white hairs; metopidium wider than high, gently sloping backward to disc, sparsely pilose; disc not elevated; supraocular callosities conspicuous, jet black, undivided, bare; humeral angles prominent, their apices blunt; suprahumeral horns shorter than the space between their bases, broadbased, slender, tricarinate, produced subhorizontally, viewed from sides slightly projecting forward, moderately recurved, apices subacute, viewed from above almost subhorizontal and strongly carinate; posterior process slender, emerging from posterior margin of disc, base raised distinctly above scutellum but impinging on it near its apex, then following the contour of the inner tegminal margin, coarsely

punctate with short adpressed greyish hairs, about equally broad till the apex, apex acute, slightly passing the posterior angle of the inner margin of tegmina, median carina percurrent through metopidium; scutellum as long as wide, well exposed, apices acute, emarginate; tegmina more than 3.0X as long as wide, veins in the apical area a little curved, 1st apical cell short, wedge-shaped, R_1 slightly oblique to subcosta, 2nd discoidal cell about 2.0X as long as the 1st, apical limb narrow; hind wings with 4 apical cells. Legs brownish, apices of the tarsi black. Lateral areas of sternum and basal angles of scutellum conspicuously white tomentose.

Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 5.5 mm.; width across tips of suprahumeral horns 3.0 mm., at humeral angles 2.2 mm., at eyes 2.0 mm.

Male : Unknown.

Material examined : 4 females in Tamil Nadu Agricultural University, Coimbatore, collected from Nilgiri Hills, 1-10-1930; 2 females ex *Cinchona officinalis*, Nilgiris, 23-3-1989.

Distribution : INDIA : Tamil Nadu (Nilgiris); Punjab.

Genus 18. *Otinotus* Buckton

1903. *Otinotus* Buckton, *Monogr. Membrac.* : 232.

1927. *Convecton* Funkhouser, *Cat. Hom. Fasc.* 1 : 348.

This well delimited genus is distinguished particularly by the sloping and nongibbous pronotum and the undulate posterior process which lies close to the scutellum.

Head vertical, subquadrate, wider than long, upper margin of vertex shallowly arcuate and sinuate, lower margins obliquely extending to frontoclypeus and weakly rounded or sinuate; eyes large, globular and protruding; ocelli nearly equidistant from each other and from eyes or somewhat closer to eyes, and situated on or above the centro-ocular line; frontoclypeus about 2.0X as long as wide, extending for three-fourths its length below lower margins of vertex, its apex rounded. Pronotum nongibbous or moderately high; metopidium vertical or convex, sloping backward to the disc; humeral angles prominent, blunt; supraocular callosities conspicuous; suprahumeral horns short or long, narrow or broad, spatulate or triangular, apices acute, obtuse or obliquely truncate, tricarinate or quadricarinate; posterior process emerging dorsally and horizontally from behind disc and ventrally from posterior margin, tricarinate, weakly undulate and contiguous with or very close to scutellum and tegmina; scutellum triangular, wider than long, tip concavely emarginate; tegmina long, narrow, 3.0-3.5X as long as wide, hyaline, basal fifth coriaceous and punctate, veins stout, apical limb narrow, 5 apical and 2 discoidal cells, R_1 either straight or oblique to subcosta, 1st apical cell either based on radial sector (rs) and wedge-shaped or based on R_1 and long and narrow, parallel-sided; hind wings with 4 apical cells. Legs simple.

Type species : *Otinotus ammon* Buckton.

Key to the Indian species of *Otinotus* Buckton

- 1(10) Posterior process short, its apex about reaching the posterior angle of the inner margin of tegmina.
- 2(7) R_1 of tegmina oblique to subcosta, 1st apical cell short, wedged shaped, based on rs.
- 3(4) Suprahumeral horns substraight, narrow, slightly recurved, longer than space between their bases; large black species. *ammon* Buckton
- 4(3) Suprahumeral horns directed a little upwardly and anteriorly, shorter than space between their bases.
- 5(6) Ocelli closer to eyes than to each other, scutellum slightly longer than wide; tegmina hyaline, 2.5X as long as wide; large yellow species. *aureus* Ananthasubramanian
- 6(5) Ocelli closer to each other than to eyes; scutellum as wide as long; tegmina subhyaline, more than 3.0X as long as wide; small dark brown species. *badius* Distant
- 7(2) R_1 of tegmina straight to subcosta, 1st apical cell long, narrow, not based on rs; suprahumeral horns shorter than space between their bases.
- 8(9) Scutellum black with a prominent white spot in each basal angle; tegmina shining ochraceous with a large, sub-basal, rounded, white spot; legs pale brown; small, black species. *albomaculatus* Distant
- 9(8) Scutellum greyish white without a prominent white spot in each basal angle; tegmina dull bronzy ochraceous with 2 ochraceous spots on basal area; large fuscous brown species. *campbelli* Distant
- 10(1) Posterior process long, passing distinctly the posterior angle of the inner margin of tegmina.

- 11(16) R_1 of tegmina straight to subcosta, 1st apical cell long, narrow, not based on rs; suprahumeral horns longer than space between their bases.
- 12(13) Apices of suprahumeral horns acute; piceous brown species. *oneratus* (Walker)
- 13(12) Apices of suprahumeral horns obtuse; pale tawny species. *pallescens* Distant
- 14(15) Body elongate and compressed; tegmina 4.0X as long as wide; suprahumeral horns upwardly directed and strongly recurved; lateral carinae of posterior process dark brown; piceous brown species. *elongatus* Distant
- 15(14) Body not compressed; tegmina 3.0X as long as wide; suprahumeral horns subhorizontal; lateral carinae of posterior process black; small fuscous brown species. *transversus* Distant
- 16(11) R_1 of tegmina oblique to subcosta, 1st apical cell short, wedge-shaped and based on rs.
- 17(20) 1st discoidal cell of tegmina as long as or longer than the 2nd; suprahumeral horns shorter than space between their bases.
- 18(19) Veins to apical area of tegmina long; ocelli closer to each other than to eyes and situated above c-o line; dark reddish brown species. *mysorensis* Ananthasubramanian
- 19(18) Veins to apical areas of tegmina short; ocelli closer to eyes than to each other and situated on c-o line; black species. *brevicornis* Distant
- 20(17) 1st discoidal cell of tegmina much shorter than the 2nd.
- 21(22) Suprahumeral horns shorter than the space between their bases, their apices moderately recurved and acute. *mimicus* Distant

- 22(21) Suprahumeral horns as long as or slightly longer than the space between their bases, their apices strongly recurved and obliquely truncate.
- 23(24) Suprahumeral horns subhorizontal, as long as the space between their bases. *indicatus* (Melichar)
- 24(23) Suprahumeral horns directed obliquely forward, slightly longer than the space between their bases. *obliquus* Ananthasubramanian and Ananthkrishnan

133. *Otinotus albomaculatus* Distant
(Fig. 138)

1916. *Otinotus albomaculatus* Distant, *Fauna Br. India*, 6 : 159.

Female : General colour black. Head black, about 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, upper margin strongly arcuate, lower margins more or less obliquely continued to frontoclypeus; frontoclypeus greyish black, longly pilose, extending for three-fourths its length below lower margins of vertex, frontoclypeal lobes inconspicuous, fused with the main lobe; eyes hemispherical, pale red with shades of black; ocelli vitreous, slightly closer to each other than to eyes and situated above c-o line. Pronotum black, coarsely punctate, with a prominent median ridge continued behind into the posterior process and in front into the metopidium; metopidium convex, nearly vertical; supraocular callosities small and inconspicuous; humeral angles short, blunt; suprahumeral horns shorter than space between their bases, directed slightly upwardly and their apices directed backward, apices subacute; posterior process slender, tricarinate, the dorsal carina strongly percurrent, sinuate, a little elevated from scutellum, but not elevated from tegmina, its apex acute, not passing the posterior angle of the inner tegminal margins; tegmina 3.0X as long as wide, shining ochraceous, basal area black followed by a large rounded white spot, costal margin narrowly black, 1st apical cell long, narrow, parallel-sided, 6.0X as long as wide, 1st discoidal cell shorter than the 2nd. Scutellum black with a prominent white spot in each basal angle, tip concave, emarginate; sternum black above and beneath, lateral areas white tomentose. Legs dark brown upto half the length of tibiae, apices of tibiae and tarsi dull black.

Length from frontal margin to tips of tegmina 5.5 mm., to tip of posterior process 3.7 mm.; width across tips of suprahumeral horns 3.25 mm., at humeral angles 2.8 mm., at eyes 2.75 mm.

Male : Similar to female in colour and size. Genitalia with the sternal plate broad at base, gradually converging to the apex, cleft extending to the middle of the plate, apical lobes not demarcated; lateral valves wedge-shaped, coarsely punctate with long setae, process of lateral valve prominent, slightly longer than the valve weakly chitinised and densely setose; parameres with apices cuneiform; aedeagus robust, only slightly bent at base, inner margin finely serrate.

Material examined : 3 females ex *Cinchona* sp., Nilgiris, 10-10-1969; 3 males in Tamil Nadu Agricultural University, Coimbatore (coll. T.V. Campbell, 1916); lectotype male in British Museum.

Distribution : INDIA : Tamil Nadu (Nilgiris)

O. albomaculatus is very near to *O. nimicus* Distant in the tegmina having a large rounded white spot near the base and the disposition of the suprahumeral horns, but differs in its smaller size, shorter suprahumeral horns which are only gently curved, and the shorter posterior process which does not pass the posterior angle of the inner tegminal margin.

134. *Otinotus ammon* Buckton
(Fig. 139)

1903. *Otinotus ammon* Buckton, *Monogr. Membrac.* : 233.

Female : General colour dark piceous. Head vertical, about 2.5X as wide across extremities of eyes as length of vertex, ochraceously pilose, vertex 2.0X as wide as long, upper margin arcuate and sinuate, lower margins obliquely rounded to frontoclypeus; frontoclypeus dark brown, about 2.0X as long as wide, its lobes short and marginally rounded; eyes subglobose, pale white marooned with black; ocelli a little closer to eyes than to each other and situated on the c-o line. Pronotum coarsely punctate, with short brown, adpressed hairs, moderately high, metopidium convex, punctate with short, brown hairs, about 2.0X as wide as high; humeral angles prominent and blunt; suprahumeral horns broadbased, longer than space between their bases, rather narrow, substraight, slightly curved backward, viewed from above strongly centrally carinate, apices subacute, viewed from front obliquely directed outward and slightly outward; posterior process slender, distinctly separated at base from scutellum, sinuate, narrowed at apex which about reaches the posterior angle of the inner margin of tegmina; tegmina pale bronzy, basal one-fifth black and punctate, 2.8X as long as wide, R1 oblique to subcosta, 1st apical cell short, wedgeshaped, based on rs, about 5.0X as long as wide; scutellum as wide as long, tip narrow, emarginate, basal area white tomentose; lateral areas of sternum white tomentose.

Length from frontal margin to tips of tegmina 7.0-8.0 mm., to tip of posterior process 5.5-5.75 mm.; width across tips of suprahumeral horns 4.0-4.5 mm., at humeral angles 3.0-3.25 mm., at eyes 2.5-2.75 mm.

Male : Similar to female. Genitalia with subgenital plate parallel-sided upto half its length from base, apical notch V-shaped, extending to about two-thirds the length of the plate from apices, apices subacute, apical lobes inconspicuous, not demarcated; parameres with apodeme very short, shank broadest at middle, apices cuneiform, connective pear-shaped; lateral valves with short process, nearly triangular; aedeagus with anterior arm much shorter than the posterior arm, dorsal surface much reduced, posterior arm nearly parallel-sided, its apex subacute, finely serrate on dorsal surface.

Material examined : 1 female, 2 males ex *Santalum album*, Nilgiris, 20-1-1980.

Distribution : INDIA : Tamil Nadu (Nilgiris).

O. ammon is closely related to *O. aureus* Ananthasubramanian in the disposition of posterior process which is short, just reaching the anal angles of the tegmina, in the position of the ocelli closer to eyes and in the wedge-shaped 1st apical cell of tegmina based on *rs*, but differs in the nature of the suprahumeral horns which are substraight and longer than the space between their bases, and also in the general colour.

135. *Otinotus aureus* Ananthasubramanian
(Fig. 140)

1980. *Otinotus aureus* Ananthasubramanian, *Entomon*, 5(2) : 118.

Female : General colour yellow. Head 2.5X as wide across extremities of eyes as length of vertex, finely punctate with adpressed golden pilosity, vertex about 1.75X as wide as long, upper margin arcuate, lower margins obliquely sloping to frontoclypeus; eyes dark brown, subglobose, projecting laterad beyond humeral angles; ocelli pale white, closer to eyes than to each other and situated above c-o line; frontoclypeus about as long as wide, extending for half its length below lower margins of vertex, apex broadly rounded with long hairs. Pronotum yellow, coarsely punctate with adpressed golden hairs; metopidium vertical, about 1.5X as wide as high; supraocular callosities dark brown, undivided; humeral angles short, their apices subacute; suprahumeral horns robust, shorter than space between their bases, densely pilose, viewed from sides obliquely projecting forward and upward, apices acute, slightly recurved, viewed from above broadbased, viewed from front directed outward and upward; posterior process tricarinate, emerging from behind disc, slightly raised behind scutellum contiguous with scutellum and tegmina, apex acute, reaching about the posterior angle of the inner tegminal margin; scutellum triangular, slightly longer than wide, punctate, densely pilose; tegmina 2.5X as long as wide, hyaline, basal sixth coriaceous, punctate, veins translucent, *R*₁ oblique to subcosta, 1st apical cell stemming from *R*₁ and *rs*, about 5.0X as long as wide, 2nd discoidal cell 0.3X as long as the 1st. Legs yellowish brown.

Length from frontal margin to tips of tegmina 6.4 mm., to tip of posterior process 4.6 mm.; width across tips of suprahumeral horns 3.2 mm., humeral angles 2.2 mm., at eyes 2.4 mm.

Male : Unknown.

Material examined : 4 females ex *Cytissus scoparius*, Botanical Gardens, Ootacamund, 1-6-1978; type in National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Tamil Nadu (Ootacamund).

As stated earlier, *O. ammon* and *O. aureus* are closely related in many respects, but they differ in the nature of the disposition of the suprahumeral horns. They also differ in the relative dimensions of the discoidal cells and in the general colour.

136. *Otinotus badius* Distant
(Fig. 141)

1916. *Otinotus badius* Distant, *Fauna Br. India*, 6 : 158.

Female : General colour dark brown. Head nearly vertical, thickly pilose, about 2.5X as wide across extremities of eyes as length of vertex, vertex about 1.5X as wide as long, upper margin strongly arcuate, lower margin broadly rounded and sloping down to frontoclypeus; frontoclypeus reddish brown, highly pilose, about 1.5X as long as wide, extending for half its length below lower margins of vertex, tip broadly rounded, frontoclypeal lobes indistinct, eyes subglobose, succineous; ocelli black, closer to each other than to eyes and situated above c-o line. Pronotum reddish brown, coarsely punctate, with short, adpressed, brown hairs; metopidium slightly wider than high, vertical, slightly convex; supraocular callosities irregularly rounded, bare; humeral angles prominent, their apices subacute; suprahumeral horns shorter than space between their bases, seen from sides a little upwardly and forwardly directed, their apices very slightly recurved and obtusely acute, seen from above narrow, subhorizontal and weakly recurved; posterior process moderately sinuate, slender, tricarinate, median carina percurrent through metopidium, finely punctate, distinctly separated from scutellum, not raised from tegmina, its apex tapering, acute, just reaching the posterior angle of the inner margin of tegmina; tegmina subhyaline reflecting the dark abdomen beneath, base, costal and apical areas black, the veins reddish brown, R_1 oblique to subcosta, 1st apical cell short, 1st discoidal cell shorter than the 2nd. Scutellum as wide as long, basal area black, apical area reddish brown. Lateral areas of sternum with long, pale white hairs. Legs reddish brown.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.5 mm.; width across tips of suprahumeral horns 2.7 mm., at humeral angles 2.4 mm., at eyes 2.0 mm.

Male : Not known.

Material examined : 2 females ex *Eucalyptus globulus*, in Bryan's Park, Kodaikanal, 2-3-1981; 1 female in Tamil Nadu Agricultural University College, Coimbatore (coll. T.V. Campbell, 1916).

Distribution : INDIA : Tamil Nadu (Kodaikanal, Coimbatore).

O. badius is closely related to *ammon* Buckton in the short posterior process and tegminal venation, but differs in the shorter suprahumeral horns which are slightly recurved with subacute apices and also in its smaller size.

137. *Otinotus brevicornis* Distant
(Fig. 142)

1916. *Otinotus brevicornis* Distant, *Fauna Br. India*, 6 : 160.

Male : General colour black. Head black, about 3.5X as wide across extremities of eyes as length of vertex, about 2.5X as wide as long, upper margin of vertex nearly planate, lower

margins obliquely continued to frontoclypeus; frontoclypeus longer than wide, highly pilose, its tip truncate, frontoclypeal lobes entirely fused; eyes large, ochraceous; ocelli closer to eyes than to each other and situated above c-o line. Pronotum black, finely punctate, thickly pilose, hairs silvery white, slightly gibbous; metopidium vertical, wider than high, finely punctate; supraocular callosities inconspicuous; humeral angles broadbased, their apices subacute; suprahumeral horns very short, much shorter than space between their bases, viewed in front obliquely directed upward, their apices moderately recurved, viewed from sides directed upward and forward, apices subacute; posterior process moderately sinuate, slender, contiguous with scutellum, but not elevated above tegmina, its apex acute, just passing the posterior angle of the inner margin of tegmina; tegmina dull subhyaline, reflecting the dark abdomen beneath, about 3.0X as long as wide, basal sixth black, coriaceous, 1st apical cell wedge-shaped, based on radial sector, R_1 oblique to subcosta, 1st discoidal cell shorter than the 2nd. Scutellum as wide as long, lateral areas creamy tomentose. Lateral areas of sternum opaque, dull white, body beneath black, thickly pilose. Legs brownish ochraceous.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 1.7 mm., at humeral angles 2.2 mm., at eyes 1.9 mm.

Female : Not known.

Material examined : One male in ZSI, Calcutta, Reg. No. 465/H15, coll. Punjab, 1-2-1952. Lectotype male in British Museum.

Distribution : INDIA : Punjab.

O. brevicornis is very closely related to *mysorensis* Ananthasubramanian in the short suprahumeral horns which are shorter than space between their bases, oblique position of R_1 of tegmina in relation to subcosta, and wedge-shaped 1st apical cell; it differs from *mysorensis* in the relatively short veins to the apical area of tegmina and in the position of the ocelli, besides the general colour. It is to be differentiated from all known species of the genus by the very short suprahumeral horns.

138. *Otinotus campbelli* Distant
(Fig. 143)

1916. *Otinotus campbelli* Distant, *Fauna Br. India*, 6 : 158.

Female : General colour dark brown with shades of black. Head fuscous brown, about 2.8X as wide across extremities of eyes as length of vertex, vertex 1.8X as wide as long, densely pilose with silvery hairs, upper margin strongly arcuate, lower margins broadly rounded and almost horizontally leading to frontoclypeus; frontoclypeus about 1.5X as long as wide, its lobes distinct, sparsely longly pilose; eyes large, dark brown; ocelli succineous, slightly closer to eyes than to each other and situated above c-o line. Pronotum brown with shades of black, densely pubescent, centrally longitudinally strongly carinate, percurrent through metopidium; metopidium convex, much broader than high; supraocular callosities prominent; humeral angles subprominent, their

apices blunt; suprahumeral horns shorter than space between their bases, a little upwardly directed, broadbased, their apices subacute and recurved; posterior process densely pilose at basal area, tricarinate, slender, slightly elevated at base from scutellum, sinuate, impinging on tegmina, apex acute, not passing the posterior angle of the inner tegminal margin; tegmina 3.5X as long as wide, dull bronzy ochraceous, veins dark brown, bearing short, silvery hairs, basal area obscurely coarsely punctate and black with two ochraceous spots, 1st apical cell long, narrow, about 6.0X as long as wide, R_1 straight to subcosta, 1st discoidal cell shorter than the 2nd. Scutellum fuscous brown at base, apex greyish white with dense silvery hairs. Legs fuscous brown.

Length from frontal margin to tips of tegmina 9.0 mm., to tip of posterior process 7.25 mm.; width across tips of suprahumeral horns 4.25 mm., at humeral angles 3.5 mm., at eyes 3.2 mm.

Male : Not known.

Material examined : One female in Tamil Nadu Agricultural University, Coimbatore, coll. by T.V. Campbell, Nilgiris, 1915. Holotype female in British Museum.

Distribution : INDIA : Tamil Nadu (Nilgiris).

This species is allied to *ammon* Buckton in the size, general form and disposition of suprahumeral horns and posterior process, but differs by the absence of white tomentosity on the lateral areas of sternum, presence of two ochraceous spots on the basal area of tegmina, and the shorter, broader suprahumeral horns.

139. *Otinotus elongatus* Distant
(Fig. 144)

1908. *Otinotus elongatus* Distant, *Fauna Br. India*, 4 : 41.

Female : General colour dark brown. Head obliquely directed backward, nearly 3.0X as wide across extremities of eyes as length of vertex, coarsely punctate, with sparse silvery hairs, vertex 2.0X as wide as long, base strongly arcuate, sinuate, lower margins broadly rounded; frontoclypeus about 1.5X as long as wide, extending for about three-fourths its length below lower margins of vertex, tip narrowly truncate, frontoclypeal lobes not distinct; eyes hemispherical, pale white; ocelli equidistant from each other and from eyes and situated above c-o line. Pronotum finely punctate, with short, adpressed silvery pilosity; metopidium strongly convex, finely pilose, wider than high; supraocular callosities small, darker than rest of metopidium; humeral angles prominently conical, projecting laterally, their apices blunt; suprahumeral horns longer than space between their bases, moderately broad at base, seen from sides projecting forward and upward, apices strongly recurved, centrally carinate, apices subacute, as viewed in front appearing narrower, gradually tapering to tip; posterior process long, slender, sinuate, scarcely elevated at base above scutellum, impinging on tegmina, its apex acute, passing considerably the posterior angle of the inner margin of tegmina and reaching the tip of the 5th apical cell of tegmina, tricarinate, dorsal carina strongly percurrent through metopidium; tegmina narrowly elongate, 4.0X as long as wide, semihyaline reflecting the dark brown abdomen

beneath, base coriaceous, black, veins light brown, apex narrowly rounded, apical limbus broad, R_1 straight to subcosta, 1st apical cell long, narrow, parallel-sided, about 8.0X as long as wide, discoidal cells subequal. Scutellum long as wide, white tomentose; lateral areas of sternum cretaceously sericeous.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 5.5 mm.; width across tips of suprahumeral horns 4.1 mm., at humeral angles 2.4 mm., at eyes 2.0 mm.

Male : Similar to female in general colour and form but smaller; abdomen narrow and more subcylindrical; suprahumeral horns more strongly recurved; apex of posterior process reaching only the 5th apical cell of tegmina.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 4.25 mm.; width across tips of suprahumeral horns 3.75 mm., at humeral angles 2.2 mm., at eyes 2.0 mm.

Material examined : 1 female and 1 male in the Govt. Museum, Madras ex *Lagerstroemia* sp. from Trivandrum, 14-5-1917; lectotype male (type locality: Calcutta) in British Museum.

Distribution : INDIA : Kerala State (Trivandrum), Karnataka State (Mysore), Assam, West Bengal, Orissa.

This species is nearest to *pallescens* Distant in the general colour, disposition of suprahumeral horns and tegminal venation, but differs in being quite elongate and compressed, the tegmina 4.0X as long as wide, and the apices of suprahumeral horns subacute.

140. *Otinotus indicatus* (Melichar)
(Fig. 145)

1903. *Centrotus indicatus* Melichar, *Hom. Faun. Ceylon* : 111.

1908. *Centrotus indicatus* : Distant, *Fauna Br. India*, 4 : 46.

1975. *Otinotus indicatus* : Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 219.

Female : General colour chestnut brown. Head thickly ochraceously pilose, 3.2X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, upper margin shallowly arcuate, lower margins obliquely sloping to frontoclypeus; eyes hemispherical, somewhat elongately globate, reddish brown; ocelli closer to eyes than to each other and situated on c-o line; frontoclypeus ochraceously pilose with long sparse hairs, slightly longer than wide, extending for about three-fourths its length below lower margins of vertex, tip broadly rounded, basal lobes distinct. Pronotum reddish brown, coarsely punctate, sparsely pilose; metopidium vertical, convex, nearly 2.0X as wide as high; supraocular callosities prominent; humeral angles broadly conical, posterior angles rounded; suprahumeral horns robust, chestnut brown, as long as space between their bases, viewed from sides obliquely raised upward and outward with apices obliquely truncate, viewed from above somewhat broad and bicarinate, viewed from front much narrower with their apices nearly acute; posterior process tricarinate, slightly elevated from base of scutellum, then sinuate, contiguous with inner margins of tegmina, apical region acuminate,

apex passing over three-fourths the length of 5th apical cell of tegmina, dorsal carination percurrent through metopidium, lateral carinae weak; tegmina ferruginous, pubescent, 3.0X as long as wide, basal sixth punctate, dark brown, opaque, veins reddish brown, 1st apical cell about 4.0X as long as wide, based on radial sector, R_1 oblique to subcosta, 1st discoidal cell much smaller than the 2nd; hind wings with 4 apical cells. Scutellum wider than long; lateral areas of sternum and a spot on each side of base of scutellum greyish ochraceous. Abdomen black.

Length from frontal margin to tips of tegmina 6.0-7.0 mm., to tip of posterior process 5.2-5.8 mm.; width across tips of suprahumeral horns 5.0-5.5 mm., at humeral angles 2.76-3.25 mm., at eyes 2.5-3.0 mm.

Male : Similar to female. Genitalia with sternal plate black distal half split, pubescent, lobes inconspicuous; lateral valves wedgeshaped, punctate, processes very prominent, as long as or slightly longer than the main body; aedeagus U-shaped, finely serrate on dorsal margin; parameres cuneiform.

Length from frontal margin to tips of tegmina 5.7-6.8 mm., to tip of posterior process 4.8-5.6 mm.; width across tips of suprahumeral horns 4.7-5.25 mm., at humeral angles 2.5-3.0 mm., at eyes 2.5-3.0 mm.

Fifth instar nymph : General colour greyish brown dorsally, light green ventrally. Head about 2.0X as wide as long, cranial tubercles very conspicuous, 0.3 mm. long, 1.0 mm. wide at base, bordered by small tuberculate spines; tip subacute; eyes nearly reniform, projecting outward and backward, dark brown; ocelli closer to eyes than to each other and situated on c-o line; upper margin of vertex strongly sinuate, emarginate, lower margins obliquely sloping to frontoclypeus, fringed with tuberculate spines; rostrum 1.5 mm. long, extending upto the middle of the abdominal segment II; thorax as wide as long, metopidium nearly vertical, median carina of dorsal process percurrent and bearing closely arranged spines, and with a prominent lateral tubercle mounted on a ridge on either side of the median carina; pronotal posterior process extending over a little more than half the length of mesonotum, tip bluntly acute; suprahumeral buds black, spinous; mesonotal process reaching three-fourth the length of metanotum; lateral tubercles on meso- and metathoracic tergites large, bearing clusters of spines; wing pads greyish brown, costal angles well demarcated. Abdomen nearly 1.5X as long as thorax attaining its maximum width at segment IV, anal tube stout, short, one-fifth as long as body; abdominal segments III-VII with ferruginous dorsal and dorso-lateral tubercles; each dorsal tubercle tipped with 3 short, stout spines, each dorso-lateral tubercle tipped with one or two spines; abdominal segment VIII with a single pair of tubercles; lateral lamellae of segments V-VIII uniform, light yellow, flattened and gently curved, each lamella measuring 0.75 mm. long, bordered with 22-27 bent spines mounted on short tubercles; smaller spines also scattered over lamellae; extreme bases of lateral lamellae with a cluster of microsetae; anal tube short and stout.

Material examined : 86 females, 24 males and numerous nymphs ex *Thespesia populnea*, *Psidium guajava* and *Lawsonia alba*, at Madras, December, 1966.

Distribution : INDIA : Tamil Nadu (Madras); SRI LANKA.

This species is very closely related to *O. obliquus* Ananthasubramanian and Ananthakrishnan, in many of its characters, but differs in the less obliquely forwardly directed suprahumeral horns which are as long as the space between their bases.

141. *Otinotus mimicus* Distant
(Fig. 146)

1916. *Otinotus mimicus* Distant, *Fauna Br. India*, 6 : 159.

1975. *Otinotus mimicus* : Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 217.

Femiale : General colour dark reddish brown. Head dark brown, slightly declivous, about 3.5X as wide across extremities of eyes as length of vertex, very finely punctate with short, adpressed shining white hairs, upper margin of vertex almost planate, lower margins obliquely sloping to frontoclypeus; eyes dull succineous, subglobose; ocelli pale white, almost equidistant from each other and from eyes and situated above c-o line; frontoclypeus extending for three-fourths its length below lower margins of vertex, basal lobes distinct, tip broadly rounded, sparsely pilose. Pronotum dark reddish brown, finely punctate and somewhat sparsely pilose with short, adpressed silvery hairs; metopidium about 2.0X as wide as high, convex, nearly vertical; supraocular callosities undivided, inconspicuous; humeral angles prominent, their apices subacute; suprahumeral horns short, stout, shorter than space between their bases, seen from front directed outward and slightly upward, apices slightly recurved, anterior carina strongly backwardly recurved, seen from above dorsal carina weak; posterior process slender, emerging from posterior margin of pronotum, slightly raised above base of scutellum, directed backward, sinuate, contiguous with inner margins of tegmina, apex acuminate, reaching about two-thirds the length of 5th apical cell of tegmina; scutellum triangular, wider than long, dark reddish brown, a pair of white spots at the basal angles, apices acute, emarginate; tegmina 3.0X as long as wide, pale shining ochraceous, basal area dark brown, coriaceous, punctate, enclosing a large round white spot, veins yellowish brown, apical limb narrow, 1st apical cell wedge-shaped, about 4.5X as long as wide, 1st discoidal cell shorter than the 2nd. Lateral areas of sternum with confluent white spots. Legs dark brown, tibiae yellowish brown, tarsi black at extremities.

Length from frontal margin to tips of tegmina 8.0 mm., to tip of posterior process 6.2 mm.; width across tips of suprahumeral horns 4.0 mm., at humeral angles 3.0 mm., at eyes 2.75 mm.

Male : Slightly smaller than female. Suprahumeral horns shorter, about half as long as distance between their bases, tips less recurved; frontoclypeus extending for more than three-fourths its length below lower margins of vertex. Genitalia as figured.

Length from frontal margin to tips of tegmina 5.7 mm., to tip of posterior process 4.4 mm.; width across tips of suprahumeral horns 2.8 mm., at humeral angles 2.4 mm., at eyes 2.3 mm.

Fifth instar nymph : General colour leafy green, pale white ventrally. Head more than 2.0X as wide as long, base of vertex planate, cranial tubercles short and blunt, each terminating in a slender tuberculate spines; frontoclypeus slightly extending below lower margins of vertex, its

free end truncate, lobes of frontoclypeus distinct; eyes dark reddish brown, semiglobate; ocelli succineous, slightly closer to eyes than to each other, and situated on c-o line. Thorax longer than the combined of abdominal segments I-VIII; metopidium convex, vertical, anterior process of dorsal crest inconspicuous, pronotal posterior process slender, tricarinate, contiguous with mesonotum, reaching the posterior margin of metanotum; suprahumeral buds prominent with acute tips; wing pads large, extending to the abdominal segment IV; anal tube longer than rest of abdomen, strongly raised.

Material examined : 10 females 5 males and 5 nymphs, ex *Cytissus scoparius*, in Nilgiri Hills (10,000 ft.), 20-1-1986.

Distribution : INDIA : Tamil Nadu (Nilgiri Hills).

This species is very closely allied to *mysorensis* Ananthasubramanian in the general body colour and in the disposition of the suprahumeral horns, but differs in the position of the ocelli and in the shape of the 1st apical cell of the tegmina.

142. *Otinotus mysorensis* Ananthasubramanian
(Fig. 147)

1980. *Otinotus mysorensis* Ananthasubramanian, *Entomon*, 5(9) : 119.

Female : General colour dark reddish brown. Head light greyish brown, declivous, 2.75X as wide across extremities of eyes as length of vertex, finely punctate with adpressed golden pilosity, upper margin of vertex almost planate, lower margins obliquely sloping to frontoclypeus; eyes dull black, subglobate; ocelli pale brown, closer to each other than to eyes and situated above c-o line; frontoclypeus densely pubescent, extending for three-fourths its length below lower margins of vertex, tip truncate. Pronotum reddish brown; metopidium light brown, 2.0X as wide as high, finely punctate with long golden pilosity; supraocular callosities large, divided; humeral angles prominent with subacute tips; suprahumeral horns short, black, broadbased, much shorter than space between their bases, seen from front directed outward with apical region turned backward, apex acute, seen from sides directed upward and backward; posterior process slender, emerging from posterior margin of pronotum, slightly raised above the apex of scutellum, sinuate, apically acuminate, contiguous with the inner margins of tegmina, tip extending upto 4th apical cell of tegmina; tegmina 3.3X as long as wide, pale bronzy, basal fifth coriaceous, veins yellowish brown, apical limb rather narrow, 1st apical cell 9.0X as long as wide, 1st and 2nd discoidal cells more or less of equal size. Scutellum triangular, as long as wide, dark brown with a prominent oval, white spot in each basal angle, tip emarginate. Legs yellowish brown.

Length from frontal margin to tips of tegmina 7.9 mm., to tip of posterior process 6.0 mm.; width across tips of suprahumeral horns 4.4 mm., at humeral angles 3.4 mm., at eyes 3.0 mm.

Male : Unknown.

Material examined : 3 females collected ex *Acalypha wilkesiana*, at Mysore, 20-2-1979; types in National Pusa Collections, IARI, New Delhi.

Distribution : INDIA : Karnataka State (Mysore).

O. mysorensis is very closely related to *mimicus* Distant in the general body colour and in the disposition of the suprahumeral horns, but differs from *mimicus* in the position of the ocelli which are closer to each other than to eyes and situated well above c-o line, and also in the nature of the 1st apical cell of tegmina which is 9.0X as long as wide.

143. *Otinotus obliquus* Ananthasubramanian and Ananthakrishnan
(Fig. 148)

1975. *Otinotus obliquus* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 222.

Female : General colour dark brown. Head 3.0X as wide across extremities of eyes as length of vertex, finely punctate with long, greyish white hairs, upper margin of vertex moderately arcuate, sinuate, lower margins gradually sloping to frontoclypeus; eyes dark brown, subovate; ocelli small, slightly closer to eyes than to each other and situated on c-o line; frontoclypeus slightly longer than wide, about three-fourths its length extending below lower margins of vertex, longly pilose, tip broadly rounded. Pronotum finely punctate with short, adpressed hairs, metopidium convex, vertical, 1.5X as wide as high; supraocular callosities conspicuous; humeral angles densely hairy, apices subacute; suprahumeral horns dark reddish brown, slightly longer than space between their bases, viewed from sides obliquely directed upward and forward, viewed from the front much narrower with anterior carinae closer to posterior margin, apices strongly recurved, obliquely truncate, viewed from above much flattened and weakly bicarinate; posterior process slender, emerging from posterior margin of pronotum, distinctly separated at base from scutellum, then contiguous with inner margins of tegmina, moderately sinuate towards middle, apex passing over half the length of 5th apical cell of tegmina, tip acute, lateral carinae weak, median carina strongly percurrent through metopidium; tegmina dark reddish brown, 3.0X as long as wide, wrinkled, pubescent, costal margin dark brown, veins castaneous, basal region dark brown and punctate, 1st apical cell 4.5X as long as wide, based on rs, 2nd discoidal cell about 3.0X as long as 1st, apical limbus narrow; hind wings with 4 apical cells. Scutellum as wide as long, exposed areas white tomentose; lateral areas of sternum greyish ochraceous, abdomen beneath dark brown. Legs black as far as femora, tibiae castaneous, tarsi light brown.

Length from frontal margin to tips of tegmina 8.0 mm., to tip of posterior process 7.0 mm.; width across tips of suprahumeral horns 7.0 mm., at humeral angles 3.4 mm., at eyes 3.2 mm.

Male : Similar to female, slightly smaller; genitalia similar to that of *indicatus* (Melichar), but the lateral valves much narrow.

Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 5.5 mm.; width across tips of suprahumeral horns 5.3 mm., at humeral angles 3.3 mm., at eyes 3.1 mm.

Fifth instar nymph : General colour brown with shades of green; closely resembling the fifth instar nymph of *indicatus*, but slightly larger, tegminal wing pads much broader, abdominal lateral lamellae larger, with the tuberculate spines shorter and more numerous.

Length from frontal margin to tip of anal tube 6.6 mm., length of anal tube 1.2 mm., length of thorax 2.7 mm., length of abdomen including anal tube 3.9 mm., width of abdomen across segment IV 2.9 mm., width of thorax 2.7 mm., width of head across eyes 2.6 mm., length of rostrum 1.6 mm., length of tegminal wing pad 1.7 mm., width 0.8 mm., length of lateral lamellae 0.9 mm.

Material examined : 4 females, 10 males and 10 nymphs ex *Trewia nudiflora*, *Phyllanthus* sp. and *Premna latifolia*, at Madras, 10-9-1967; type locality : Madras. 2 females ex *Thespesia populnea* at Trivandrum, 1-2-1979; 1 male, 1 female ex *Bauhinia* sp. at Bangalore (Lal Baug); 1 female ex *Thespesia populnea* at Coonoor (Sims Park), 1-1-1981.

Distribution : INDIA : Tamil Nadu (Madras, Coonoor), Karnataka (Bangalore), Kerala State (Trivandrum).

O. obliquus is nearest to *indicatus* (Melichar) in many of the characters, but differs by the more obliquely forwardly directed suprahumeral horns and greater length of the suprahumeral which are longer than the space between their bases.

144. *Otinotus oneratus* (Walker) (Fig. 149)

1858. *Centrotus oneratus* Walker, *Ins. Saund. Hom.*: 78.
 1869. *Centrotypus oneratus* : Stål, *Ofv. Vet.-Ak. Forh.* : 256.
 1903. *Oxyrhachis lignicola* Buckton, *Monogr. Membrac.* : 261.
 1908. *Otinotus oneratus* : Distant, *Fauna Br. India*, 4 : 40.
 1975. *Otinotus oneratus* : Ananthasubramanian and Ananthkrishnan, *Rec. zool. Surv. India*, 68 : 274.

Female : General colour castaneous brown. Head finely punctate, greyish with short, adpressed silvery hairs, nearly 3.0X as wide across extremities of eyes as length of vertex, vertex nearly 2.0X as wide as long, base of vertex shallowly arcuate, lower margins oblique to frontoclypeus; frontoclypeus 2.0X as long as wide, sides parallel, extending for half its length below lower margins of vertex, tip truncately rounded, longly pilose, frontoclypeal lobes small, indistinct; eyes hemispherical, reddish brown; ocelli a little elevated, almost equidistant from each other and from eyes and situated just above c-o line. Pronotum dark brown, with short, adpressed silvery hairs; metopidium a little convex, 2.0X as wide as high, supraocular callosities black, entire, bare; humeral angles broadly conical, apices obtuse; suprahumeral horns longer than space between their bases, viewed from above centrally carinate, flattened, basal areas darker, thickly pilose, viewed from front appearing slender, gradually narrowing from base to apex, directed outward and obliquely forward, tips slightly recurved; posterior process slender, gradually tapering from base to apex, tricarinate, weakly sinuate, almost contiguous with scutellum and impinging on inner margins of tegmina, apex acute, passing well beyond the

posterior angle of the inner margin of tegmina, in some specimens posterior half of the process slightly elevated over the tegmina, dorsal carina strongly percurrent through metopidium, lateral carinae weak; tegmina 3.0X as long as wide, pale semihyaline, basal sixth opaque, punctate, veins ochraceous, R₁ straight to subcosta, 1st apical cell long, narrow, parallel-sided, 7.0X as long as wide, 2nd discoidal cell slightly longer than the 1st. Scutellum slightly wider than long, tip emarginate; lateral areas of scutellum and sternum cretaceously sericeous. Abdomen dark brown. Legs dark brown upto distal half of femora, tibiae light brown, tarsi pale white.

Table 7

Host plants of *Otinotus oneratus*

Name of the plant	Natural Order
<i>Cajanus Cajan</i>	Fabaceae
<i>Crotalaria juncea</i>	"
<i>Lablab purpureus</i>	"
<i>Bauhinia purpurea</i>	Caesalpinaceae
<i>Bauhinia tomentosa</i>	"
<i>Bauhinia variegata</i>	"
<i>Caesalpinia coriaria</i>	"
<i>Caesalpinia pulcherrima</i>	"
<i>Cassia augustifolia</i>	"
<i>Cassia marginata</i>	"
<i>Tamarindus indicus</i>	"
<i>Prosopis spicigera</i>	Mimoseae
<i>Prosopis juliflora</i>	"
<i>Bauhinia tomentosa</i>	"
<i>Pithecolobium dulce</i>	"
<i>Enterolobium saman</i>	"
<i>Cestrum diurnum</i>	Solanaceae
<i>Cestrum nocturnum</i>	"
<i>Datura fastuosa</i>	"
<i>Solanum lycopersicum</i>	"
<i>Solanum torvum</i>	"
<i>Zizphus jujuba</i>	Rhamnaceae
<i>Zizphus oenoplia</i>	"
<i>Aegle marmelos</i>	Rutaceae
<i>Feronia elephantum</i>	"
<i>Capparis sepiaria</i>	Capparidaceae
<i>Morinda tinctoria</i>	Rubiaceae
<i>Morinda citrifolia</i>	"

<i>Thespesia populnea</i>	Malvaceae
<i>Lagerstroemia flosreginae</i>	Lythraceae
<i>Psidium guajava</i>	Myrtaceae
<i>Ficus religiosa</i>	Urticaceae
<i>Ficus bengalensis</i> (prop roots)	"

Length from frontal margin to tips of tegmina 5.5-7.0 mm., to tip of posterior process 5.0-6.3 mm.; width across tips of suprahumeral horns 2.9-3.5 mm., at humeral angles 2.2-2.4 mm., at eyes 2.0-2.2 mm.

Male : Smaller. General colour greyish brown; suprahumeral horns longer, more divergent, apical region more strongly recurved, tips acute; abdomen slender and tapering; genitalia with sternal plate forked at distal half, lobes distinct, base nearly 2.0X as wide as tip; aedeagus U-shaped, tip obtusely rounded, dorsal margin strongly serrate, teeth arranged in 4 rows; lateral valves oblong, about 1.75X as long as wide, process reduced to a strongly chitinised stump; parameres normal.

Length from frontal margin to tips of tegmina 4.75-5.50 mm., to tip of posterior process 3.25-5.50 mm.; width across tips of suprahumeral horns 4.25-5.50 mm., at humeral angles 1.9-2.1 mm., at eyes 2.0 mm.

Fifth instar nymph : Body somewhat compressed laterally, triangular in cross section; general colour dark reddish brown, rarely light green; head concealed from above by pronotal process, 2.0X as wide as long, base of vertex sinuate, cranial tubercles obsolete; eyes large, black; ocelli large, black; ocelli closer to eyes than to each other and situated slightly above c-o line; rostral tip extending a little beyond metasternum; metopidium receding, then curving forward into the pronotal crest, pronotal anterior process free from tubercles or spines; pronotal posterior process tricarinate, emerging from base of crest and extending over 0.75X of the length of mesonotum, median carina percurrent through anterior process; suprahumeral buds marked off as rounded prominences; mesonotum subquadrate; wing pads extending backward upto the posterior margin of abdominal segment II, costal angles obtuse; abdominal tergites sparsely hairy, anal segment about 0.25X as long as body, densely setose; genital rudiments distinct.

Material examined : Many adults and nymphs collected throughout the year 1965-66 from different places of southern India on different species of host plants (Table: 7). This is the most common species of Membracidae found all over India on a variety of host plants. Lectotype female in British Museum.

Distribution : INDIA : All over; SRI LANKA (Jaffna).

O. oneratus is very closely allied to *O. pallescens* Distant in the size and in the long posterior process scarcely raised above scutellum and its apex considerably passing the posterior angle of the inner margin of tegmina, but differs in the general colour, the colour of tegmina and its veins and particularly in the apices of the suprahumeral horns which are acute.

145. *Otinotus pallescens* Distant
(Fig. 150)

1908. *Otinotus pallescens* Distant, *Fauna Br. India*, 4 : 41.

Female : General colour pale brown. Head greyish white, finely punctate, with short, silvery hairs, 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, base of vertex shallowly arcuate, lower margins slightly obliquely continued to frontoclypeus; frontoclypeus longer than wide, longly pilose with white hairs, its lobes fused, free end extending for half the length of the main lobe below lower margins of vertex, tip roundedly truncate; eyes hemispherical, pale white; ocelli vitreous, a little closer to eyes than to each other and situated above c-o line. Pronotum tawny, finely pilose with silvery hairs; metopidium convex, vertical, densely pilose, wider than high; supraocular callosities inconspicuous; humeral angles prominent, blunt; suprahumeral horns longer than space between their bases, seen in front broadbased, strongly diverging, tips obtuse, seen from above directed laterad and gently recurved, seen from front projecting forward and upward, centrally carinate; posterior process long, slender, scarcely raised above scutellum, dorsal carina strongly percurrent through metopidium, apex black, considerably passing the posterior angle of the inner margin of tegmina following the contour of tegminal inner margin along its entire length and impinging on them; tegmina about 3.0X as long as wide, pale brown, semiopaque, veins dark brown, apical limb moderately broad, R₁ straight to subcosta, 1st apical cell long, narrow, parallel-sided, about 9.0X as long as wide, 2nd discoidal cell slightly longer than the 1st. Scutellum as long as wide, basal half dull ochraceous, distal half cretaceously sericeous. Legs light brown.

Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 6.25 mm.; width across tips of suprahumeral horns 3.5 mm., at humeral angles 2.2 mm., at eyes 2.0 mm.

Male : Similar to female. Genitalia as figured.

Material examined : 12 females 8 males ex *Bauhinia tomentosa* at Bangalore, 20-1-1987; 18 females and 6 males ex *Zizphus jujuba*, at Calcutta (Botanical Garden), 29-1-1979. Lectotype female in British Museum, type locality Bombay.

Distribution : INDIA : Maharashtra (Bombay), West Bengal (Calcutta), Karnataka (Bangalore), Punjab, Uttar Pradesh.

O. pallescens Distant is very closely related to *O. oneratus* (Walker), and this led Distant (1916) to conclude that "the variation both in coloration and in the apices of the lateral pronotal process will not admit of the above two forms being longer kept as separate species" However, present study confirms the distinctive nature of the species. The tawny colour of the body and the obtuse apices of the suprahumeral horns in *pallescens* are found to be constant characters in all the individuals of the population.

146. *Otinotus transversus* Distant
(Fig. 151)

1916. *Otinotus transversus* Distant, *Fauna Br. India*, 6 : 161.

Male : General colour dark brown. Head greyish brown, finely punctate, with short, adpressed white hairs, 3.0X as wide across extremities of eyes as length of vertex, upper margin of vertex shallowly arcuate, lower margins broadly rounded and continued to frontoclypeus; frontoclypeus longer than wide, parallel-sided, sparsely pilose with long silvery hairs, frontoclypeal lobes indistinct; eyes black, ocelli a little closer to eyes than to each other and located slightly above c-o line. Pronotum fuscous brown, coarsely punctate with short, adpressed pilosity; metopidium convex, gradually obliquely sloping back to disc, as wide as high, thickly coarsely punctate; supraocular callosities black, irregularly rounded, bare; humeral angles prominent, their apices subacute; suprahumeral horns moderately stout, laterally produced subhorizontally, shorter than space between their bases, apices acute; posterior process slender, tricarinate, lateral carinae prominent, black, distinctly elevated above scutellum, not elevated above tegmina, apex black, slightly passing the posterior angle of the inner margin of tegmina; tegmina subhyaline reflecting the abdomen beneath, veins black, basal angular area ochraceous, punctate, tegmina a little more than 3.5X as long as wide, 1st apical cell narrow, long, parallel-sided, about 8.0X as long as wide, 1st discoidal cell shorter than the 2nd. Scutellum white tomentose; sternum confluent maculose white.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 3.0 mm.; width across tips of suprahumeral horns 2.25 mm., at humeral angles 1.75 mm., at eyes 1.6 mm.

Female : Unknown.

Material examined : One male in Z.S.I., Calcutta, bearing the label Z.S.I. Reg. No. 266/H15, Hoshiarpur, 1-8-1966. Holotype male in British Museum; type locality Punjab.

Distribution : INDIA : Punjab (Hoshiarpur).

This species, one of the smallest of the genus, is allied to *elongatus* Distant in the long, rather compressed body and the tegminal characters, but differs by the nature of the lateral and subhorizontal disposition of the suprahumeral horns and the prominent lateral carinae of the posterior process.

Genus 19. *Emphusis* Buckton

1903. *Emphusis* Buckton, *Monogr. Membrac.* : 256.

This genus is closely related to *Centrotypus* Stål in the nature of the highly gibbous pronotum and in the tegmina, but can be easily separated by the disposition of the suprahumeral horns which are subhorizontally directed, apically recurved and in a continuous line with the crescentic anterior margin of the pronotum.

Head somewhat obliquely directed backward, 3.0X as wide across extremities of eyes as length of vertex, upper margin of vertex strongly arcuate, lower margins moderately oblique to frontoclypeus; frontoclypeus as long as wide, scarcely or well extending below lower margins of vertex; eyes moderately large, subovate; ocelli large, closer to eyes than to each other. Pronotum tumid, much punctured, strongly gibbous before base of posterior process, crescentic at anterior margin; metopidium convex, smoothly curving back to disc, broader than high, coarsely punctate, supraocular callosities inconspicuous; humeral angles short, tips subacute; suprahumeral horns robust, recurved at their apices, not inclined forward, subhorizontally directed in a continuous line with the crescentic anterior area, seen from front convex laterally, apices subacute; posterior process robust, impinging on scutellum, usually almost entirely covering it, nearly straight beyond base, following the contour of the inner margins of tegmina, strongly tricarinate, the lateral carinae terminating at the level of the scutellum, central carina strongly percurrent through metopidium; tegmina 3.0X as long as wide, variegated with rich brown, costal area usually black, R₁ straight to subcosta, 1st apical cell moderately long, 2nd discoidal cell nearly 1.5X as wide as the 1st; apical area variegated, apical limbus moderately broad. Hind wings with 4 apical cells.

Type species : *Emphusis obesus* (Fairmaire)

147. *Emphusis malleus* (Walker)
(Fig. 152)

1851. *Centrotus malleus* Walker, *List Hom.*, ii : 613.
1855. *Centrotus obesus* Fairmaire, *Hist. nat. de la France*, 223.
1886. *Centrotypus obesus* : Atkinson, *J. Asiat. Soc. Bengal*, 45 : 88.
1908. *Emphusis malleus* : Distant, *Fauna Br. India*, 4 : 37.

Female : General colour black. Head greyish black, finely pilose, hairs silvery white, head about 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, upper margin arcuate, sinuate, lower margins somewhat oblique to frontoclypeus; frontoclypeus broader at base, narrowly rounded at tip, densely pilose, frontoclypeal lobes inconspicuous, main lobe extending for two-thirds its length below lower margins of vertex; eyes metallic black, subglobose; ocelli black, closer to eyes than to each other and situated above c-o line. Pronotum indigo-black, strongly gibbous before base of posterior process, coarsely punctate with white, short, adpressed hairs, anterior margin crescentic, broadly rounded; metopidium 1.5X as wide as high, strongly convex, gradually sloping to disc; supraocular inconspicuous; humeral angles subprominent, broadbased, apices blunt; suprahumeral horns well developed, robust, shorter than space between their bases, subhorizontal, in a continuous line with the crescentic anterior margin of pronotum, apices broadly subacute, viewed from sides strongly recurved, viewed from above posteriorly bicarinate, basal areas coarsely punctate, densely pilose; posterior process robust, broad, basally impinging on scutellum, entirely covering it, nearly straight beyond base, following the contour of the inner margin, strongly tricarinate, the dorsal carina strong, continued forward through metopidium, lateral carinae weak, terminating in front behind disc, apex acute, passing the posterior angle of the inner margin of tegmina, tip slightly raised; tegmina stramineous, basal, costal and radial areas black, punctate, apical limbus bronzy brown, 1st radial vein slightly oblique to subcosta, 1st apical cell about 5.5X as long as wide, 1st and 2nd

discoïdal cells of nearly equal length, bronzy brown; scutellum about as wide as long, completely covered by pronotal posterior process, tip acute, emarginate. Legs black upto basal half of femora, rest light brown.

Length from frontal margin to tips of tegmina 8.5 mm., to tip of posterior process 7.5 mm.; width across tips of suprahumeral horns 6.0 mm., at humeral angles 3.3 mm., at eyes 3.0 mm.

Male : Smaller than female; tegmina fuscous brown; legs uniformly dark brown.

Length from frontal margin to tips of tegmina 7.5 mm., to tip of posterior process 7.0 mm.; width across tips of suprahumeral horns 5.6 mm., at humeral angles 3.0 mm., at eyes 2.75 mm.

Material examined : One female ex *Sechleira oleosa*, at Coorg, 12-1-1979; one male in FRI., Dehra Dun, coll. S. Kemp. from Castle Rock, N. Kanara, 11-26/10/1926.

Distribution : INDIA : Karnataka State (Coorg), Maharashtra (Bombay), SRI LANKA; NORTH BORNEO; MALAYSIA.

This species is very closely related to *perarmata* Distant in the general colour and disposition of the suprahumeral horns as well as the posterior process, but differs by the smaller size, the less obumbrant metopidium, the less strongly recurved apices of suprahumeral horns and the color pattern of tegmina.

148. *Emphusis perarmata* Distant
(Fig. 153)

1916. *Emphusis perarmatus* Distant, *Fauna Br. India*, 6 : 156.

1965. *Emphusis perarmata* : Metcalf and Wade, *Gen. Cat. Homopt.* 1(1) : 226.

Female : General colour black. Head somewhat obliquely directed backward, indigo black, punctate with short, greyish white hairs, about 3.3X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, coarsely granulate, upper margin arcuate, lower margins slightly obliquely continued to frontoclypeus; frontoclypeus slightly extending below lower margins of vertex, apex broadly rounded, densely longly pilose, frontoclypeal lobes indistinct; eyes small, pale dark, semicircular, ocelli black, closer to eyes than to each other and situated above c-o line. Pronotum coarsely punctate, indigo-black, highly elevated before base of posterior process; metopidium strongly obumbrant, convex, punctate, with short, sparse white hairs; supraocular callosities not distinct; humeral angles subprominent, their apices subacute; suprahumeral horns stout, shorter than space between their bases, seen from the front horizontal, apices strongly recurved, seen from sides slightly upwardly and backwardly directed, seen from above very flat, subhorizontal, inconspicuously carinate, densely and coarsely punctured in the basal areas, apices subacute; posterior process strongly tricarinate, slightly elevated above scutellum, broad basally, gradually tapering backwards, extending backward following the contour of the inner tegminal margin, apex passing well beyond the posterior angle of the inner margin of tegmina, tip reaching the 4th apical cell of tegmina, dorsal carina strongly percurrent

through metopidium, lateral carinae thin; tegmina stramineous, basal area black, punctate, costal and apical areas black, veins dark brown, apical veins a little curved, 1st apical cell 5.0X as long as wide, 1st discoidal cell much narrower than 2nd, apical limb broad; scutellum white tomentose at basal angles, rest ochraceous, tip acute, emarginate; body beneath shining black. Legs black upto femora, tibiae and tarsi light brown.

Length from frontal margin to tips of tegmina 10.0 mm., to tip of posterior process 9.4 mm.; width across tips of suprahumeral horns 7.0 mm., at humeral angles 3.5 mm., at eyes 3.2 mm.

Male : Not known.

Material examined : 1 female in the Government Museum, Madras, coll. F.N. Gravely, 14-5-1915, Trichur; 1 female collected by the author ex *Terminalia arjuna*, Emakulam, 10-1-1981. Type locality; Trichur (Kerala State).

Distribution : INDIA : Kerala State (Trichur, Emakulam).

This species is closely allied to *malleus* (Walker) in the general colour of the body, but differs from it in the larger size, highly obumbrant forwardly projecting broadly rounded metopidium and the more strongly recurved apices of the suprahumeral horns which are broader.

Genus 20. *Centrotypus* Stål

1866. *Centrotypus* Stål, *Hem. Afr.*, iv : 88.

1916. *Ellgius* Distant, *Rhynch. Notes* : 152.

1931. *Cryptoparma* Goding, *Jl. N. Y. ent. Soc.*, 39 : 3.

A very well defined and distinct genus of usually large decorative species easily diagnosed by the strongly gibbous, large and swollen pronotum, the large, wide-spreading and usually ampliate suprahumeral horns, and the long sinuate posterior process.

Head subquadrate, coarsely punctate, about 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, upper margin arcuate and sinuate, lower margins gradually rounded and continued to frontoclypeus; frontoclypeus longer than wide, extending for half its length below lower margins of vertex, tip rounded; eyes large, subglobose, and protruding; ocelli large, as a rule closer to each other than to eyes and situated above c-o line. Pronotum heavy, strongly gibbous; metopidium vertical, much wider than high, median carina entirely obsolete or finely percurrent through metopidium; supraocular callosities inconspicuous; humeral angles subprominent; suprahumeral horns robust, highly or moderately porrect at base, much longer than the space between their bases, more or less flattened, the width between their tips three-fourths, or as long as or longer than body length, apices subacute, acuminate or obliquely truncate; posterior process robust, shorter than tegmina, not sinuated on each side from base to scutellum, impinging on scutellum, covering it except its basal parts, tricarinate, lateral carinae terminating behind disc, median carina conspicuous in the posterior pronotal area, the carination either not or very obsoletely continued anteriorly, where it is replaced by a somewhat smooth line,

apex passing the posterior angle of the inner margin of tegmina, apex acute; scutellum about as wide as long, basal lateral angles ochraceous, apex emarginate; tegmina 3.0-4.0X as long as wide, costal and in some species the radial and apical areas black or brown, large central area hyaline, 5 apical and 2 discoidal cells, R_1 oblique to subcosta, 2nd discoidal cell much larger than the 1st, apical limb moderately broad, apex rounded; hind wings with 4 apical cells.

Type species : *Centrotypus amplicornis* Stål

Key to Indian species of *Centrotypus* Stål

- 1(12) Head and pronotum shining black, or black with a bluish or greyish hue.
- 2(9) Posterior process long, its apex passing well beyond the posterior angle of the inner margin of tegmina.
- 3(8) R_1 of tegmina oblique to subcosta.
- 4(5) Suprahumeral horns as long as space between their bases, their apices acute; ocelli equidistant from each other and from eyes and situated on c-o line; 1st apical cell of tegmina based on rs ; small species (5.0 mm. long). *parvus* Funkhouser
- 5(4) Suprahumeral horns longer than space between their bases, their apices obliquely truncate; ocelli closer to eyes than to each other and situated above c-o line; 1st apical cell of tegmina based on R_1 ; large species (10.0 mm. long). *flexuosus* (Fabricius)
- 6(7) Tegmina with costal and radial areas broadly dark brown, apical areas castaneous; suprahumeral horns bicarinate; apex of frontoclypeus narrow and rounded. *assamensis* (Fairmaire)
- 7(6) Tegmina with a broad subcostal longitudinal fascia extending from distal half of radial area to apices, costal area black from base to apex; suprahumeral horns tricarinate; apex of frontoclypeus broad and rounded. *securis* Buckton
- 8(3) R_1 of tegmina straight to subcosta.

- 9(2) Posterior process short, its apex just passing the posterior angle of the inner margin of tegmina.
- 10(11) Suprahumeral horns as long as space between their bases and directed obliquely upward; apex of frontoclypeus narrow and rounded. *ortus* Distant
- 11(10) Suprahumeral horns longer than space between their bases and directed subhorizontally; apex of frontoclypeus broad and truncate. *pulniensis* n.sp.
- 12(1) Head and pronotum dark brown, without bluish or greyish hues.
- 13(14) Tegmina hyaline, base and the whole of costal and subcostal areas from base to apex very pale ochraceous, a small transverse, pale ochraceous spot near end of clavus; ocelli equidistant from each other and from eyes. *flavescens* Distant
- 14(13) Tegmina bronzy ochraceous, distal three-fourths of 1st apical cell, the whole of 2nd apical and 1st discoidal cells castaneous, anal angle with an elongated castaneous, patch reaching the tip of the 1st anal vein; ocelli closer to eyes than to each other. *malabaricus* n.sp.

149. *Centrotypus assamensis* (Fairmaire)
(Fig. 154)

1846. *Centrotus assamensis* Fairmaire, *Ann. ent. Soc. Fr.* : 517.
1858. *Centrotus costalis* Walker, *Ins. Saund. Hom.* : 82.
1869. *Centrotypus assamensis* : Stål, *Ofv. Vet.-Ak. Forh.* : 286.
1908. *Centrotypus assamensis* : Distant, *Fauna Br. India*, 4 : 34.

Female : General colour shining black with a bluish hue. Head shining black, finely punctate, with short, adpressed silvery hairs, about 3.0X as wide across extremities of eyes as length of vertex, vertex a little more than 2.0X as wide as long, upper margin shallowly arcuate, lower margins obliquely continued to frontoclypeus; eyes subspherical; ocelli much closer to eyes than to each other and situated above c-o line; frontoclypeus 2.0X as long as wide, extending for two-thirds its length below lower margins of vertex, tip narrow and rounded, frontoclypeal lobes distinct. Pronotum highly gibbous, coarsely punctate, with short white hairs, metopidium slightly obumbrant, gradually sloping backward to disc, wider than high; humeral angles short, blunt; supraocular callosities inconspicuous; suprahumeral horns robust, moderately dilated at base,

viewed from sides directed upward and strongly recurved, apices subacute, posteriorly strongly carinate, viewed from above flat, depressed, bicarinate, the anterior carina weak, viewed from front directed obliquely upward, much narrow; posterior process broad at base, not sinuated on each side from base to scutellum, then gradually tapering, impinging on scutellum and inner tegminal margins, apex acuminate, a little raised, passing the posterior angle of the inner margin of tegmina, median carina strong at posterior half, obsolete anteriorly; tegmina 3.0X as long wide, pale reddish brown, costal and radial areas castaneous, apical area light yellow, large central area hyaline, 1st apical cell about 6.5X as long as wide, 2nd discoidal cell about 1.5X as long as the 1st, much broader, apical limbus broad.

Length from frontal margin to tips of tegmina 10.0 mm., to tip of posterior process 8.5 mm.; width across tips of suprahumeral horns 8.5 mm., at humeral angles 3.2 mm., at eyes 3.0 mm.

Male : Similar to female. Suprahumeral horns a little more porrect at base than in female; abdomen strongly tapering to the genital segments.

Length from frontal margin to tips of tegmina 9.75 mm., to tip of posterior process 8.0 mm.; width across tips of suprahumeral horns 8.25 mm., at humeral angles 3.0 mm., at eyes 2.8 mm.

Material examined : 2 females, 1 male in Government Museum, Madras, collected from Anamalai Hills, 5-5-1912; 1 female in FRI., Dehra Dun, collected from Maimo, Burma.

Distribution : INDIA : Tamil Nadu (Anamalai Hills), Assam; BURMA; MALAYSIA; CHINA.

C. assamensis is closely related to *flexuosus* (Fabricius) in the general colour, size of body, etc., but differs by the suprahumeral horns which show a weak anterior carina dorsally, and the subacute apices of the horns.

150. *Centrotypus flavescens* Distant
(Fig. 155)

1908. *Centrotypus flavescens* Distant, *Fauna Br. India*, 4 : 35.

Female : General colour dark brown. Head nearly vertical about 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.2X as wide as long, ochraceously densely pilose, upper margin shallowly arcuate, lower margins obliquely continuous to frontoclypeus; eyes large, black. Ocelli equidistant from each other and from eyes and situated on c-o line; frontoclypeus longer than wide, densely pilose, extending for three-fourths its length below lower margins of vertex, tip rounded. Pronotum ochraceous, with short, sparse, brown hairs arising from coarse punctures; metopidium strongly convex, coarsely punctate, wider than high; supraocular callosities distinct, rounded, undivided; humeral angles subprominent, their apices blunt; suprahumeral horns dilated at base, finely punctate, longer than space between their bases, moderately broad, viewed from above bicarinate, the first carina closer to the postero-lateral carina, apices obliquely truncate, viewed from sides strongly recurved; posterior process broad at

base, gradually tapering to apex, centrally longitudinally carinate behind middle, the central carination finely rather obsoletely continued through pronotum, lateral carinae strong, extending forward upto the level of scutellum, apex acute, passing well beyond the posterior angle of the inner margin of tegmina; tegmina about 3.25X as long as wide, hyaline, veins reddish brown, basal area opaque, punctate, with sparse pilosity, a small, transverse, pale ochraceous spot near end of clavus, 1st apical cell about 5.25X as long as wide, R_1 oblique to subcosta, 1st discoidal cell shorter than the 2nd, apical limb pale brown, broad, costal and subcostal areas from base to apex pale brown. Legs ochraceous.

Length from frontal margin to tips of tegmina 10.0 mm., to tip of posterior process 8.5 mm.; width across tips of suprahumeral horns 8.0 mm., at humeral angles 3.3 mm., at eyes 3.0 mm.

Male : Unknown.

Material examined : 3 females in FRI., Dehra Dun, collected from Dehra Dun. Lectotype in British Museum.

Distribution : INDIA : Uttar Pradesh (Dehra Dun).

C. flavescens is closely allied to *C. malabaricus* n.sp. in the general colour of the body and in the markings of the tegmina, but distinctly differs by the position of ocelli which are equidistant from each other and from eyes, and also by the length to width ratio of the tegmina.

151. *Centrotypus flexuosus* (Fabricius)
(Fig. 156)

1794. *Membracis flexuosus* Fabricius, *Ent. Syst.*, iv : 12.
1803. *Centrotus flexuosus* : Fabricius, *Syst. Rhyng.* : 18.
1869. *Centrotypus flexuosus* : Stål, *Hem. Fabr.*, ii : 51.
1908. *Centrotypus flexuosus* : Distant, *Fauna Br. India*, 4 : 33.

Female : General colour shining black with a hue of blue. Head black, thickly shortly pilose with white adpressed hairs, about 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.2X as wide as long, upper margin shallowly arcuate, lower margins obliquely curved to frontoclypeus; eyes hemispherical, pale white, ocelli black, closer to each other than to eyes and situated above c-o line; frontoclypeus about 2.5X as long as wide, extending for about two-thirds its length below lower margins of vertex, frontoclypeal lobes distinct. Pronotum strongly gibbous, metallic black with a blue hue, coarsely punctate, with short, sparse, adpressed white hairs; metopidium slightly convex, gradually sloping backward to disc, coarsely punctate, about 1.5X as wide as high; supraocular callosities inconspicuous; humeral angles moderately developed, their apices blunt; suprahumeral horns seen from above broad, depressed, laminate, with a posterior carina, apices obliquely, truncate, viewed from front somewhat narrow, directed outward and apically upwardly recurved, viewed from sides raised upward, not projecting forward, strongly recurved, coarsely punctate; posterior process stout, lateral carinae strong, median carina obsolete anteriorly and represented by a thin line, apex acuminate and a little

raised, anterior one-third of posterior process coarsely punctate, broad, not sinuated at the sides, concealing the entire scutellum, impinging on the tegminal inner margins, passing the posterior angle of the inner margin of tegmina; tegmina 3.5X as long as wide, pale ochraceous, base and radial areas black, apical area yellowish brown, large central area hyaline reflecting the body beneath, costal, radial and median veins stout, parallel, R_1 oblique to subcosta, 1st apical cell 6.0X as long as wide, 1st discoidal cell much smaller than the 2nd. Scutellum completely concealed by pronotum, as wide as long, apex emarginate.

Length from frontal margin to tips of tegmina 10.0 mm., to tip of posterior process 8.0 mm.; width across tips of suprahumeral horns 8.5 mm., at humeral angles 3.0 mm., at eyes 3.0 mm.

Male : Similar to female.

Material examined : One female in the FRI., Dehra Dun, collected from Cachar, Silchar, Assam; one female ex *Pterocarpus marsupium*, in Candala, Bombay, 31-12-1982; 1 male in FRI., Dehra Dun, without labels.

Distribution : INDIA : Assam (Silchar, Shillong); Maharashtra (Bombay); BURMA (Tenasserim); CHINA.

The species is closely related to *assamensis* (Fairmaire) in the general colour, size of the body, etc., but differs in the nature of the suprahumeral horns which are broad, depressed and laminate with apices obliquely truncate.

152. *Centrotypus malabaricus* n.sp.

(Fig. 157)

Female : General colour dark brown. Head vertical, about 2.75X as wide across extremities of eyes as length, coarsely punctate, vertex 2.0X as wide as long, upper margin strongly arcuate, lower margins obliquely continued to frontoclypeus, covered with short, adpressed brown hairs, eyes moderately developed, hemispherical, dull black, ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus about 2.0X as long as wide, parallel-sided, apex narrowly rounded, extending about half its length below lower margins of vertex, frontoclypeal lobes small, distinct. Pronotum highly gibbous above disc, broad at base, gradually narrowing backward, not sinuate from base of scutellum; metopidium convex, wider than high, coarsely punctate and sparsely pilose; supraocular callosities distinct, rounded, somewhat divided; humeral angles short, not conspicuous, their apices subacute; suprahumeral horns longer than space between their bases, seen from above flat, depressed, bicarinate, apex obliquely acute, seen from sides dilated at bases, densely pilose, strongly recurved, apices acute, seen from front somewhat narrow, directed obliquely upward, centrally carinate; posterior process tricarinate, dorsal carina prominent in the posterior half, apex passing well beyond the posterior angle of the inner margin of tegmina, acuminate, reaching the 4th apical cell of tegmina; tegmina bronzy ochraceous, 4.0X as long as wide, distal three-fourths of 1st apical cell, the whole of 2nd apical and 1st discoidal cells castaneous, anal angle with an elongated castaneous patch reaching the tip of the 1st anal vein, basal area black, punctate, 1st apical cell about 6.5X as long as wide, 1st

discoidal cell shorter than the 2nd, part of apical limb opposite to 1st and 2nd apical cells broad, castaneous; hind wings with 4 apical cells. Scutellum almost entirely concealed by pronotum. Legs with femora and tibiae castaneous, tarsi light yellow.

Length from frontal margin to tips of tegmina 8.5 mm., to tip of posterior process 7.25 mm.; width across tips of suprahumeral horns 7.75 mm., at humeral angles 3.3 mm., at eyes 2.9 mm.

Male : Unknown.

Material examined : 1 female collected on its host plant, *Dalbergia sissoo*, in Thaliparamba, Kerala, 2-6-1979. Holotype female in National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Kerala State (Thaliparamba).

C. malabaricus is nearest to *C. flavescens* Distant in the general colour and markings on tegmina, but differs by the relatively long, narrow tegmina, the position of the ocelli which are closer to eyes than to each other, and the shape of the 1st apical cell of tegmina.

153. *Centrotypus ortus* Distant

(Fig. 158)

1908. *Centrotypus ortus* Distant, *Fauna Br. India*, 4 : 35.

Female : General colour shining black. Head black, about 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, thickly ochraceously pilose, upper margin arcuate, sinuate, lower margins broadly rounded and continued to frontoclypeus; eyes large, dull white; ocelli black, closer to eyes than to each other and situated a little above c-o line; frontoclypeus longer than wide, its lobes fused, tip rounded, extending for three-fourths its length below lower margins of vertex, longly pilose. Pronotum strongly gibbous, thickly finely punctate; metopidium strongly convex, slightly wider than high; supraocular callosities inconspicuous; humeral angles moderately developed, their apices subacute; suprahumeral horns as long as space between their bases, bicarinate, the first carina as seen from above central, the second one behind it, seen from sides moderately recurved, apices subacute; posterior process rather short, strongly gibbous above disc, anteriorly broad and rounded, slightly raised above tegmina at base, not sinuate from base to scutellum, tricarinate, apex acute, just reaching the posterior angle of the inner margin of tegmina, central carination faintly continued through metopidium; tegmina 3.0X as long as wide, shining ochraceous, costal area from base to apex black and punctate, 1st apical cell about 5.0X as long as wide, 1st discoidal cell shorter than the 2nd. Legs dark brown except tarsi which are light yellow.

Length from frontal margin to tips of tegmina 10.0-11.0 mm., to tip of posterior process 8.0-8.5 mm.; width across tips of suprahumeral horns 7.0-7.5 mm., at humeral angles 3.2-3.5 mm., at eyes 3.0-3.25 mm.

Male : General colour similar to female; smaller, more densely pilose, suprahumeral horns shorter and slightly broader than in female; apical areas of tegmina ochraceous with a hue of black.

Length from frontal margin to tips of tegmina 9.0 mm., to tip of posterior process 7.2 mm.; width across tips of suprahumeral horns 6.5 mm., at humeral angles 2.8 mm., at eyes 2.7 mm.

Material examined : 2 females and 2 males collected from Aiyur, North Salem; 4 females from Jawalgiri; 1 female from Naganoor; 2 females from Fraserpet, Coorg; 1 female from Dehra Dun all in FRI., Dehra Dun. Holotype female (mutilated) in British Museum.

Distribution : INDIA : Tamil Nadu (Aiyur, N. Salem, Jawalgiri, Naganoor), Karnataka State (Coorg, Mysore), Uttar Pradesh (Dehra Dun), Madhya Pradesh (Balaghat).

The species is closely allied to *securis* Buckton in the general colour of body and tegmina, but differs by the shorter suprahumeral horns and distinctly shorter posterior process.

154. *Centrotypus parvus* Funkhouser
(Fig. 159)

1922. *Centrotypus parvus* Funkhouser, *Rec. Indian Mus.*, 24 : 325.

1951. *Cryptoparma parva* : Goding, *Jl. N. Y. ent. Soc.*, 58 : 268.

Male : General colour black. Head vertical, 3.3X as wide across extremities of eyes as length of vertex, nonpunctate, pubescent with white hairs, vertex black, 2.0X as wide as long, upper margin arcuate and sinuate, lower margins nearly horizontal, fringed with long, silvery hairs; eyes hemispherical, dark brown; ocelli vitreous, equidistant from each other and from eyes and situated on c-o line; frontoclypeus slightly longer than wide, dull black, longly sparsely pilose, extending for two-thirds its length below lower margins of vertex, apex narrow and rounded. Pronotum black, moderately gibbous above disc, finely punctate, with short, adpressed silvery hairs; metopidium convex, gradually sloping backward to disc, supraocular callosities inconspicuous; humeral angles short, apices acute; suprahumeral horns as long as distance between their bases, viewed from front somewhat slender, directed outward and upward, weakly bicarinate, apex acute, viewed from sides directed upward and strongly recurved, tricarinate, viewed from above moderately flat; posterior process broad at base, gradually tapering to apex which just reaches the posterior angle of the inner tegminal margin, posterior half very slender, tricarinate, the dorsal carina obsolete over disc; tegmina subhyaline with a hue of dark brown, about 3.0X as long as wide, basal sixth black, coarsely punctate, coriaceous, opaque, veins stout, black in the costal and subcostal areas, dark brown in the apical areas, R₁ oblique to subcosta, 1st apical cell based on rs, about 5.0X as long as wide, 2nd discoidal cell about 1.25X as long as the 1st, apical veins slightly curved, apical limbus broad, smoky hyaline. Lower surface of abdomen black, densely hairy, very much narrowed posteriorly. Legs dark brown.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.6 mm.; width across tips of suprahumeral horns 2.4 mm., at humeral angles 2.4 mm., at eyes 1.4 mm.

Female : Not known.

Material examined : 1 male specimen in Government Museum, Madras, collected from Nainital, 1929. Male holotype in Z.S.I., Calcutta, Reg. No. 16912, collected from Perak, Sumatra, 26-30/12/1915.

Distribution : INDIA : Uttar Pradesh (Nainital); SUMATRA.

C. parvus represents one of the smallest species of the genus and it is related to *flexuosus* (Fabricius) with which it shares in common the general body colour, the long posterior process the apex of which passes well beyond the anal angle of tegmina, and the R_1 of tegmina oblique to subcosta, but differs by the very small size of the body, short suprahumeral horns, and the position of the ocelli.

155. *Centrotypus pulniensis* n.sp.

(Fig. 160)

Female : General colour shining black. Head vertical, about 3.0X as wide across extremities of eyes as length of vertex, coarsely punctate, upper margin of vertex shallowly arcuate, lower margins broadly rounded; eyes large, hemispherical, dull black; ocelli very small, closer to eyes than to each other and situated above c-o line; frontoclypeus thickly pilose, extending for three-fourths its length below lower margins of vertex, tip truncate, frontoclypeal lobes very prominent. Pronotum black, coarsely punctate, with short, adpressed brown hairs, strongly gibbous above disc; metopidium strongly convex, darker laterally, wider than high; supraocular callosities black, large, undivided; humeral angles prominent, their apices blunt; suprahumeral horns 1.5X as long as space between their bases, viewed from front subhorizontal, gradually tapering to apex, viewed from sides strongly recurved, viewed from above, flat, bicarinate, apices subacute; posterior process robust, gibbous at base, broad, sides not sinuate, tricarinate, median carina obsolete anteriorly, apex acute, impinging on tegmina and just passing the posterior angle of the inner margin of tegmina; tegmina 3.0X as long as wide, large median area subhyaline reflecting the abdomen beneath, costal and radial areas black, granulate, apical areas dark reddish brown, apical limb light brown, veins brown, R_1 straight to subcosta, 1st apical cell 5.0X as long as wide, 1st discoidal cell shorter and smaller than 2nd, apical veins slightly curved, basal area black and coarsely punctate; hind wings with 4 apical cells. Scutellum completely concealed by pronotum, dark brown, as wide as long, apex emarginate. Legs castaneous upto tarsi, tarsi yellowish white.

Length from frontal margin to tips of tegmina 9.25 mm., to tip of posterior process 7.0 mm.; width across tips of suprahumeral horns 7.5 mm., at humeral angles 3.0 mm., at eyes 2.5 mm.

Male : Not known.

Material examined : 1 female ex *Lawsonia alba*, in Pulni Hills, 11-6-1985. Female holotype in National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Tamil Nadu (Pulni).

C. pulniensis is nearest to *C. ortus* Distant in the nature of the posterior process which is short, just passing the posterior angle of the inner margin of tegmina, R_1 of tegmina being straight to subcosta, and in the general colour, but it differs by the suprahumeral horns which are longer than the space between their bases, and the broad, truncate apex of frontoclypeus.

156. *Centrotypus securis* Buckton
(Fig. 161)

1903. *Centrotypus securis* Buckton, *Monogr. Membrac.* : 238.

1908. *Centrotypus securis* : Distant, *Fauna Br. India*, 4 : 34.

Female : General colour shining black. Head black, densely covered with brown hairs, about 3.25X as wide across extremities of eyes as length of vertex, vertex about 2.2X as wide as long, upper margin arcuate, lower margins broadly roundedly continued to frontoclypeus, thickly longly pilose; eyes moderately large, hemispherical, dull white; ocelli ochraceous, closer to eyes than to each other and situated above c-o line; frontoclypeus greyish black, about 2.0X as long as wide, extending for three-fourths its length below lower margins of vertex, frontoclypeal lobes short, distinct, densely ochraceously pilose. Pronotum black, strongly gibbous, coarsely punctate with long, adpressed, brown hairs; metopidium convex, wider than high; supraocular callosities indistinct; humeral angles short, broadbased, their apices subacute; suprahumeral horns longer than the space between their bases, broad, flat, tricarinate, viewed from sides directed upward with apices strongly recurved, lateral carinae closer to dorso-posterior carinae, apex broad, roundly oblique, viewed from front directed obliquely upward, viewed from above somewhat depressed, bicarinate; posterior process broad at base, covering the scutellum, gradually tapering backward, apex acute, passing the posterior angle of the inner margin of tegmina, coarsely punctate, tricarinate, dorsal carina rather very thin at the anterior half; tegmina about 3.5X as long as wide, shining ochraceous, apical area black, coarsely punctate, veins castaneous, a broad longitudinal fascia extending from subcostal area through radial area to the costal margin, basal sixth black, punctate, 1st apical cell about 5.0X as long as wide, apical limbus broad.

Length from frontal margin to tips of tegmina 10.0 mm., to tip of posterior process 9.25 mm.; width across tips of suprahumeral horns 10.0 mm., at humeral angles 3.1 mm., at eyes 2.9 mm.

Male : Similar to female in general colour, but smaller.

Length from frontal margin to tips of tegmina 8.5 mm., to tip of posterior process 7.75 mm.; width across tips of suprahumeral horns 8.25 mm., at humeral angles 2.8 mm., at eyes 2.6 mm.

Material examined : 2 females, 3 males ex *Olea glandulifera*, in Yercaud, 10-10-1972.

Distribution : INDIA : Tamil Nadu (Nilgiri Hills, Yercaud), Maharashtra (Bombay), Assam; BURMA; BORNEO; SUMATRA.

C. securis is closely related to *ortus* Distant in the general colour, size and disposition of the suprahumeral horns and the posterior process, but differs by the tricarinate suprahumeral and the markings on the tegmina.

Genus 21. *Acanthuchus* Stål

1866. *Centrotus* Stål, *Hem. Afr.*, 4 : 386.

1869. *Acanthuchus* Stål, *Ofv. Vet.-Svk. Forh.*, 24 : 282.

This genus is characterised by the presence of a strong, sharp spine on the middorsal aspect at the base of the posterior process and rarely a second elevation may be present near the middle of the posterior process.

Head subquadrate, vertex about 2.0X as wide as long, upper margin arcuate and sinuate, lower margins rather oblique to frontoclypeus; eyes subglobose; ocelli closer to eyes than to each other or equidistant from each other and from eyes and situated well above c-o line; frontoclypeus with basal lobes well demarcated, extending for half its length below lower margins of vertex. Pronotum convex, metopidium convex, vertical; suprahumeral horns as long as or longer than the space between their bases, dorsum bearing a sharp, triangular spine at the base of the posterior process, and rarely a second shorter one near the middle; humeral angles prominent; posterior process long, sinuate, contiguous with scutellum, impinging on inner tegminal margin, apex acuminate, just passing the posterior angle of the inner margin of tegmina or reaching almost the tips of tegmina; scutellum as wide as long, almost completely concealed by pronotum or partially exposed on each side, apex emarginate; tegmina 3.0X as long as wide, basal and costal areas coriaceous and punctate; veins stout, 5 apical and 2 discoidal cells; hind wings with 4 apical cells; legs simple.

Type species : *Centrotus trispinifer* (Stål)

157. *Acanthuchus minutispinus* Funkhouser
(Fig. 162)

1922. *Acanthuchus minutispinus* Funkhouser, *Rec. Indian Mus.*, 24 : 323.

Female : General colour black. Head vertical, 2.5X as wide at extremities of eyes as length of vertex, vertex 2.0X as wide as long, black, thickly pilose, hairs golden yellow, upper margin of vertex strongly arcuate, weakly sinuate, lower margins obliquely directed to frontoclypeus; frontoclypeus 2.0X as long as wide, densely pilose, extending for half its length below lower margins of vertex, apex narrowly truncate; eyes large, subglobose, pale white; ocelli light brown, equidistant from each other and from eyes and situated above c-o line. Pronotum black, finely punctate, with short, golden hairs; metopidium convex, vertical, as wide as high, punctate, densely pubescent; supraocular callosities conspicuous, rounded, undivided; humeral angles prominent, broadbased, apices blunt; suprahumeral horns well developed, as long as the space between their bases, tricarinate, viewed from above somewhat flattened dorsoventrally, extending outward, and upward and moderately recurved, apices acute, viewed from sides strongly raised upward and recurved, viewed from front, gradually narrowing to the apex; median spine small, triangular, arising from median dorsal carina just behind the bases of suprahumeral horns, black, pubescent; posterior process broad at base, concealing the scutellum almost completely, strongly tricarinate, median carina strongly percurrent through metopidium, impinging on the inner

margins of tegmina, apex just passing the posterior angle of the inner tegminal margin and turned upward; tegmina about 3.0X as long as wide, smoky-hyaline, basal sixth opaque, punctate, coriaceous, sparsely pilose, veins strong, light brown, apical veins almost straight, apical limb broad, R_1 straight to subcosta, 1st apical cell based on R_1 and rs, about 8.0X as long as wide, 1st discoidal cell a little shorter than the 2nd; scutellum slightly exposed, about as wide as long, apex emarginate; legs dark reddish brown; ventral surface of abdomen black, thickly pubescent.

Length from frontal margin to tips of tegmina 7.5 mm., to tip of posterior process 5.3 mm.; width across tips of suprahumeral horns 3.5 mm., at humeral angles 2.2 mm., at eyes 1.8 mm.

Male : Not known.

Material examined : Female holotype in the collections of Z.S.I., Calcutta, collected from Sureil, Darjeeling, 11-31/10/1917.

Distribution : INDIA : West Bengal (Darjeeling).

Genus 22. *Periaman* Distant

1908. *Periaman* Distant, *Fauna Br. India*, 4 : 37.

This genus is diagnosed by a rather nongibbous flat dorsum, slender or moderately broad suprahumeral horns which are not prominently gibbous before posterior process which is robust, gradually tapering to apex which usually does not extend beyond the posterior angle of the inner margin of tegmina; scutellum broadly exposed.

Head subquadrate, about 2.5X as wide across extremities of eyes as length of vertex, vertex wider than long, its upper margin arcuate and laterally sinuate, lower margins rounded and gradually sloping; frontoclypeus broad, extending for two-thirds its length below lower margins of vertex, apex rounded, its lobes indistinct, eyes large, hemispherical, protruding; ocelli large, prominent, closer to eyes than to each other and situated on c-o line. Pronotum convex, not strongly gibbous, metopidium vertical, convex, about as wide as high; humeral angles prominent, their apices blunt; suprahumeral horns varying in size, usually short, slender, triquerate, a little longer than the space between their bases; posterior process long, tectiform, tricarinate, not raised from scutellum, tapering behind to an acute point, apex either not passing or extending beyond the posterior angle of the inner margin of tegmina, median carina percurrent through metopidium; scutellum subtriangular, broadly exposed on each side, apex emarginate; tegmina 3.0X as long as wide, basal sixth weakly coriaceous, veins strong, 5 apical and 2 discoidal cells, R_1 oblique to subcosta, 1st apical cell based on R_1 and rs, long and narrow, tip of tegmina pointed, apical limb narrow. Hind wings with 4 apical cells. Legs simple.

Type species : *Periaman flavolineatus* Buckton

158. *Periaman pilosum* Distant
(Fig. 163)

1916. *Periaman pilosus* Distant, *Fauna Br. India*, 6 : 157.

1965. *Periaman pilosum* : Metcalf and Wade, *Gen. Cat. Homopt.*, 1(1) : 191.

Female : General colour shining black. Head obliquely inclined backward, densely pubescent, shining black, about 2.75X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, upper margin strongly arcuate, laterally sinuate, lower margins obliquely continued to frontoclypeus; frontoclypeus broad, densely pubescent, nearly obovate, extending for three-fourths its length below lower margins of vertex, apex broad and round, its lobes indistinct; eyes large, black with shades of brown; ocelli large, but mostly hidden by the dense pilosity of vertex, closer to eyes than to each other and situated on c-o line. Pronotum thickly, coarsely granulate, not prominently gibbous, shining black, thickly pubescent; metopidium about 1.5X as wide as high, obliquely continued backward to disc; supraocular callosities distinct, divided, bare; humeral angles moderately developed, apices obtuse; suprahumeral horns longer than space between their bases, viewed from sides directed upward, apices strongly recurved, viewed from front rather slender, directed outward and obliquely upward, apices acute, viewed from above strongly tricarinate, directed outward and backward; posterior process robust, directed backward at the level of dorsum, impinging on and partially covering the scutellum, strongly tricarinate, the median carina strongly percurrent through metopidium, basal area punctate, thickly pilose, apex acute, just passing the posterior angle of the inner margin of tegmina; tegmina 3.0X as long as wide, bronzy brown, basal sixth black, punctate, and pilose, apical veins moderately granulate, dark brown, R_1 oblique to subcosta, 1st apical cell based on rs, 6.0X as long as wide, base of 1st discoidal cell substylate, 2nd discoidal cell about as long as the 1st, broad; 2nd apical cell and anal angle black. Abdomen beneath black, sternum thickly darkly ochraceously pilose. Legs brownish ochraceous.

Length from frontal margin to tips of tegmina 8.5 mm., to tip of posterior process 6.0 mm.; width across tips of suprahumeral horns 3.5 mm., at humeral angles 2.3 mm., at eyes 2.0 mm.

Male : Unknown.

Material examined : 1 female from Debrepani, Darjeeling (6,000 ft.), 1 female from Lapchajagat (7,000 ft.), 2 females from Dehra Dun - all in FRI., Dehra Dun.

Distribution : INDIA : Uttar Pradesh (Dehra Dun), West Bengal (Darjeeling).

Genus 23. *Centruchus* Stål

1866. *Centruchus* Stål, *Hem. Afr.*, 4 : 93.

Head vertical, about 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, planate to slightly convex, upper margin arcuate, lower margins, weakly rounded or sinuate; eyes large, slightly oblique; ocelli a little closer to each other than to eyes and

situated on c-o line; frontoclypeus extending for about half its length below lower margins of vertex, its lobes subprominent or fused. Pronotum with the disc straight or moderately raised and rounded in front; metopidium about 2.0X as wide as high, very slightly backwardly sloping; humeral angles prominent and blunt; posterior process contiguous with or impinging on scutellum, usually almost entirely covering the scutellum, dorsum of posterior process slightly sinuate; suprahumeral horns close to humeral angles, robust, tricarinate, a little elevated in females, about horizontal or absent in males; posterior process robust, weakly arcuate above, elongately ampliate below, contiguous with scutellum and margins of tegmina, strongly tricarinate, apical third acuminate, apex acute; scutellum a little wider than long, tip concavely emarginate, apices acute; tegmina about 3.0X as long as wide, without pterostigma, with 5 apical and 2 discoidal cells, R_1 obliquely curved, 1st apical cell based on rs ; hind wings with 4 apical cells; legs simple.

Type species : *Centruchus fuscipennis* Germar

159. *Centruchus brevicornis* Funkhouser
(Fig. 164)

1936. *Centruchus brevicornis* Funkhouser, *Ann. ent. Soc. Am.*, 29(2) : 24:

Female : General colour dark brown. Head subquadrate, about 3.0X as wide across extremities of eyes as length of vertex, dark brown, finely punctate, densely pubescent, vertex 2.0X as wide as long, upper margin weakly sinuate, lower margins obliquely continued to frontoclypeus; eyes subprominent, brown, subglobose; ocelli dark brown, closer to eyes than to each other and situated on c-o line; frontoclypeus narrow at base, extending for half its length below lower margins of vertex, densely pubescent, apex truncate. Pronotum dark brown, strongly punctate, densely pubescent, metopidium dark brown, about 2.0X as wide as high, gradually sloping behind to disc; supraocular callosities inconspicuous; humeral angles prominent, their apices blunt; suprahumeral horns short, about 0.75X as long as the space between their bases, directed upward and backward, viewed from sides stout, tricarinate, viewed from above, flat, apices subacute; posterior process short, tectiform, broad at base, contiguous with scutellum and tegminal inner margin, apex acuminate, just reaching the posterior angle of the inner margin of tegmina, tricarinate, dorsal carina strongly percurrent through metopidium; tegmina about 3.0X as long as wide, wrinkled, hyaline, base dark brown, punctate, coriaceous, veins stout, brown, 1st apical cell about 6.0X as long as wide, R_1 oblique to subcosta, apical limb narrow; hind wings with 4 apical cells; sides of thorax white tomentose; legs with femora black, tibiae and tarsi brown, hind tarsi longest.

Length from frontal margin to tips of tegmina 5.7 mm., to tip of posterior process 3.8 mm.; width across tips of suprahumeral horns 2.7 mm., at humeral angles 2.0 mm., at eyes 1.8 mm.

Male : General colour as in female; slightly smaller; eyes dark brown; frontoclypeus highly pubescent; pronotum finely punctate, with pilosity denser than in female; suprahumeral horns shorter than in female, somewhat horizontal, not directed upward, about 0.5X as long as the space between their bases; posterior process longer than in female, apex subacute, passing the posterior angle of the inner margin of tegmina; tegmina less wrinkled, subhyaline, apical limb very narrow. Abdomen narrower and more tapering.

Material examined : 2 females and 1 male, in FRI., Dehra Dun, ex *Cedrus deodara* in Lolab Valley, Kashmir, 25-5-1934. Types in British Museum.

Distribution : INDIA : Kashmir (Lolab Valley).

Genus 24. *Neocentrus* Thirumalai and Ananthasubramanian

1981. *Neocentrus* Thirumalai and Ananthasubramanian, *Bull. zool. Surv. India*, 4(1) : 31.

This genus may be distinguished by the absence of suprahumeral horns, the somewhat declivous, short, posterior process emerging more or less horizontally from the posterior margin of pronotum, almost contiguous with scutellum, its apex scarcely passing the apex of claval area and not reaching the claval suture, and the long, narrow 1st apical cell of tegmina based on the short radial sector (rs).

Head vertical, about 3.0X as wide across extremities of eyes as length of vertex, upper margin of vertex weakly arcuate and sinuate, lower margins obliquely continued to frontoclypeus; eyes large, hemispherical; ocelli closer to eyes than to each other and situated on c-o line; frontoclypeus declivous, distinctly extending below lower margins of vertex, its apex broadly rounded, frontoclypeal lobes subprominent, with sutures indistinct. Pronotum convex, median carina percurrent, metopidium more than 2.0X as wide as high, obliquely continued behind to disc; humeral angles subprominent, their apices blunt; suprahumeral horns absent; posterior process short, declivous, emerging from the posterior margin of pronotum, strongly tricarinate, median carina percurrent, apex acute, not reaching the claval suture; scutellum triangular, wider than long, weakly convex, apex emarginate; tegmina nearly 3.0X as long as wide, without pterostigma, with 5 apical and 2 discoidal cells, R_1 oblique to subcosta, 1st apical cell about 7.0X as long as wide, based on rs which is very short, apical limb moderately broad; hind wings with 4 apical cells.

Type species : *Neocentrus rufus* Thirumalai and Ananthasubramanian

160. *Neocentrus rufus* Thirumalai and Ananthasubramanian
(Fig. 165)

1981. *Neocentrus rufus* Thirumalai and Ananthasubramanian, *Bull. zool. Surv. India*, 4(1) : 31.

Female : As in generic description with the following additional characters :

General colour dull brown. Vertex brown, finely punctate with long, golden hairs; eyes dull brownish; ocelli jet black; frontoclypeus extending for two-thirds its length below lower margins of vertex, covered with long, adpressed golden hairs. Pronotum coarsely punctate with golden pilosity; supraocular callosities black, divided, bare; posterior process sparsely hairy, a little elevated from scutellum and then contiguous with the inner tegminal margins, posterior three-fourths black; tegmina yellowish brown, basal fifth coriaceous, veins thick, reddish brown, 1st apical cell long, much narrow, nearly parallel-sided, 1st discoidal cell more or less elliptical, shorter than 2nd discoidal cell, R_{2+3} , M_1 and M_2 slightly curved. Abdomen black; legs black upto middle of tibiae, rest light brown.

Length from frontal margin to tips of tegmina 7.3 mm., to tip of posterior process 4.2 mm.; width across humeral angles 3.6 mm., at eyes 3.2 mm.

Material examined : 1 female from Silent Valley, Kerala, half way to Valiyaparathodu; coll. Dr. R.S. Pillai & Party, 27-4-1980, Reg. No. zsi/szi/srs I/H. Holotype female in ZSI., Calcutta.

Distribution : INDIA : Kerala State (Valiyaparathodu, Silent Valley).

Tribe CENTROTINI Goding

1892. *Centrotini* Goding, *Trans. ent. Soc. Am.*, 19 : 253.

The tribe Centrotini is separated from the Leptocentrini by the presence of three apical cells in the hind wings. In most cases, the frontoclypeal lobes are fused to the frontoclypeus on their inner margins for almost its entire length. The scutellum is always exposed and well developed. Tegmina with a well developed pterostigma at R₁ (except in some genera such as *Centrotus*).

Key to the genera of CENTROTINI

- | | | |
|------|--------------------------------------------------------------------------------------------------------------------|----------------------------|
| 1(4) | Base of posterior process not touching the scutellum. | |
| 2(3) | Posterior process robust, not angulate at base; inferior margin of posterior process ampliate or lobed at middle. | <i>Centrotus</i> Fabricius |
| 3(2) | Posterior process slender, angulate at base; inferior margin of posterior process not ampliate or lobed at middle. | <i>Anchon</i> Buckton |
| 4(1) | Base of posterior process impinging on scutellum. | |
| 5(6) | Posterior process with a high dorsal node; suprahumeral horns robust. | <i>Antialcidas</i> Distant |
| 6(5) | Posterior process without a high dorsal node; suprahumeral horns moderately stout. | <i>Maurya</i> Distant |

Genus 25. *Centrotus* Fabricius

1803. *Centrotus* Fabricius, *Syst. Rhyng.* : 17.
 1916. *Beaufrontiana* Distant, *Rhynchotal notes* : 30.
 1928. *Paratricentrus* Kato, *Trans. Nat. Hist. Soc. Formosa*, 18 : 95.

According to Funkhouser (1951), the bibliography of the genus *Centrotus* shows a total of 279 different species which at one time or another have been assigned to it of which only 40 now remain and some of these are very doubtful as to their correct generic classification.

Of the 6 species of *Centrotus* described by Distant (1908), 2 have been transferred to other genera, and the remaining 4 are represented in Sri Lanka.

Head subquadrate, vertex wider than long, base arcuate and weakly sinuate, lower margins rather steeply downwardly sloping to frontoclypeus; eyes subglobose; ocelli closer to eyes than to each other or equidistant from each other and from the eyes and situated slightly above centroocular line; frontoclypeus slightly declivous, about 2.0X as long as wide, extending for half its length below lower margins of vertex, frontoclypeal lobes fused to about three-fourths its length with their lateral margins rounded and prominent, tip truncately rounded. Pronotum moderately high, metopidium about 2.0X as wide as high, convex, slightly receding; humeral angles obtusely rounded, posterior margin arcuate over base of scutellum; suprahumeral horns well developed, tricarinate; posterior process emerging behind suprahumeral horns, slightly convexly elevated or horizontal, ventrally arching a little over scutellum and impinging on its tip, ampliate in middle, then gradually acuminate to tip which extends beyond the posterior angle of the inner margin of tegmina, tricarinate, the median or dorsal carina strongly percurrent; scutellum well developed, well exposed, triangular, about as wide as long, apex emarginate; tegmina 2.5-3.0X as long as wide, with a pterostigma (except in the species of the genus *Centrotus*), 5 apical and 2 discoidal cells, veins to apical area straight, apical limb narrow; legs simple, hind tibiae with 3 rows of cucullate setae, hind tarsi the longest.

Type species : *Cicada cornuta* Linnaeus

161. *Centrotus indicus* n.sp.

(Fig. 166)

Female : General colour dark brown. Head brown, longly pilose 2.5X as wide across extremities of eyes as length of vertex, vertex about 1.8X as wide as long, densely pubescent, upper margin strongly arcuate, lower margins almost broadly rounded; eyes large, hemispherical, dull white; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus densely pilose, extending for half its length below lower margins of vertex, apex truncate, frontoclypeal lobes fused with the main lobe. Pronotum dark brown, sparsely pilose; metopidium 2.0X as wide as high, vertical, sparsely pilose; supraocular callosities subprominent, undivided; humeral angles prominent, their apices blunt; suprahumeral horns slightly longer than the space between their bases, seen from above broad, obliquely upturned, tricarinate, their apices obliquely truncate, as seen from sides directed upward and backward, as seen from front somewhat narrow, directed outward and upward, apices subacute; posterior process separate from scutellum, slightly sinuate, contiguous with inner tegminal margins and gradually tapering to apex which passes the posterior angle of the inner margins of tegmina, median carina strongly percurrent through metopidium; tegmina bronzy hyaline, 3.0X as long as wide, veins to apical area almost straight, apical limb narrow, R_1 oblique to subcosta, 1st discoidal cell much smaller than the 2nd, petiolate, 1st apical cell wedge-shaped, about 3.0X as long as wide; hind wings with 3 apical

cells; scutellum as long as wide, apex emarginate. Body beneath dark brown. Legs with femora dark brown, tibiae and tarsi light brown.

Length from frontal margin to tips of tegmina 7.5 mm., to tip of posterior process 6.7 mm.; width across tips of suprahumeral horns 6.8 mm., at humeral angles 3.3 mm., at eyes 3.4 mm.

Male : Not known.

Material examined : One female in the Government Museum, Madras, ex *Tecoma stans*, at Neendakara, Quilon, Kerala, 1-2-1926.

Distribution : INDIA : Kerala State (Quilon).

Genus 26. *Anchon* Buckton

1903. *Anchon* Buckton, *Monogr. Membrac.* : 214.

The genus *Anchon* is diagnosed by the elbowed posterior process high above scutellum and slender divaricate suprahumeral horns.

Head vertical, 2.5-3.0X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, upper margin arcuate and sinuate, lower margins oblique to frontoclypeus; eyes hemispherical; ocelli in most species closer to eyes than to each other and situated above c-o line; frontoclypeus weakly declivous, frontoclypeal lobes fused. Pronotum moderately high, convex; metopidium wider than high, convex, vertical to slightly backwardly sloping; humeral angles prominent; suprahumeral horns usually slender with apical part somewhat expanded, apices pointed, horns directed upward and outward, then slightly decurved; posterior process emerging behind suprahumeral horns and well above posterior margin, basally obliquely rising for some distance, then elbowed with or without forming an anterior node, then directed backward tapering to an acuminate apex which passes beyond the posterior angle of the inner margin of tegmina, usually impinging on the anal angles of the tegmina, not touching the scutellum, median carina percurrent, lateral carinae rather weak; scutellum wider than long, basally convex, apex emarginate, a little raised; tegmina 2.5-3.0X as long as wide, with a large pterostigma almost absorbing R₁, 5 apical and 2 discoidal cells, veins to apical area somewhat curved, veins strong, apical limb broad, apex somewhat narrow; hind wings with 3 apical cells (except in some Indian species where there are 4 apical cells).

Type species : *Centrotus nodicornis* Germar

Key to Indian species of *Anchon*

- 1(4) Posterior process straight or substraight beyond basal angle.

- 2(3) Suprahumeral horns as long as space between their bases, somewhat recurved, their margins not spinous, apices biangulate; ocelli closer to eyes than to each other; tegmina greyish opaque with 2 brown spots at apical margin; fuscous-brown species. *rectangulatum* (Kirby)
- 3(2) Suprahumeral horns 2.0X as long as space between their bases, straight, their margins finely spinous, apices convexly truncate; posterior process spinose; ocelli closer to each other than to eyes; tegmina umber-brown, without brown spots at apical margin; reddish brown species. *echinatum* Distant
- 4(1) Posterior process slightly but distinctly sinuate beyond basal angle.
- 5(6) Basal angle of posterior process rounded; suprahumeral horns 2.0X as long as space between their bases, their apical margin subtruncate with an obliquely raised angulation beyond middle behind which it is obliquely concavely excavate; pronotum brown testaceous; tegmina semiopaque, grey. *pilosum* (Walker)
- 6(5) Basal angle of posterior process acute; suprahumeral horns 3.0X as long as space between their bases, their apices strongly angulate posteriorly, after which they are concave and lobate on posterior margin; pronotum and tegmina umber-brown. *ulniforme* Buckton

162. *Anchon echinatum* Distant
(Fig. 167)

1908. *Anchon echinatum* Distant, *Fauna Br. India*, 4 : 51.

Female : General colour umber-brown. Head light brown, about 3.3X as wide across extremities of eyes as length of vertex, sparsely pilose, hairs greyish white, vertex 2.3X as wide as long, upper margin arcuate, lower margins obliquely continued to frontoclypeus; eyes large, hemispherical, greyish white; ocelli vitreous, closer to each other than to eyes and situated above c-o line; frontoclypeus, highly pilose, projecting for one-third its length below lower margins of vertex, tip broadly rounded, frontoclypeal lobes inconspicuous. Pronotum thickly pilose, hairs

long, greyish white hairs, with a cretaceously sericeous line on each side, starting from behind each suprahumeral horn and running to the base of scutellum, metopidium vertical, about 2.25X as wide as high, sparsely pilose; supraocular callosities almost obsolete; suprahumeral horns 2.0X as long as space between their bases, almost straight, their margins finely spinous, as seen from above broad and flattened, their apices ampliate, convexly subacute, as seen in front directed obliquely outward and upward, tricarinate; posterior process fringed with fine spinules slightly inwardly angulate at basal elevation, then obliquely and slightly sinuately continued to just beyond the posterior angle of the inner margin of tegmina, apex acuminate and black, median carina weakly percurrent through metopidium; tegmina about 3.0X as long as wide, umber-brown, paler at base, a prominent brown spot at posterior angle of inner margin, pterostigma prominent, absorbing R₁, 1st apical cell about 4.0X as long as wide. Legs brownish-ochraceous.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 4.25 mm.; width across tips of suprahumeral horns 3.5 mm., at humeral angles 2.0 mm., at eyes 1.8 mm.

Male : Similar to female in general colour and tegminal colour patterns. Smaller than female; echinulation on the margins of suprahumeral horns and posterior process more conspicuous; abdomen much narrower; dark brown.

Length from frontal margin to tips of tegmina 5.75 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 3.2 mm., at humeral angles 1.9 mm., at eyes 1.75 mm.

Material examined : 2 females and 2 males from Sabari Hills, Kerala, in the Z.S.I., Southern Regional Station, Madras; 1-5-1981. Holotype female in British Museum.

Distribution : INDIA : Kerala State (Sabari Hills); BURMA.

A. echinatum is closely related to *ulniforme* Buckton in the general colour of body and tegmina, but differs by the shape of suprahumeral horns and their length, and also by the presence of conspicuous echinulation on the margins of suprahumeral horns and posterior process.

163. *Anchon pilosum* (Walker)
(Fig. 168)

1851. *Centrotus pilosus* Walker, *List. Hom.*, ii : 606.
1869. *Xiphopoeus pilosus* : Stål, *Ofv. Vet. -Ak. Forh.* : 285.
1903. *Platybelus pilosus* : Melichar, *Hom. Faun. Ceylon* : 119.
1908. *Anchon pilosum* : Distant, *Fauna Br. India*, 4 : 49.

Female : General colour dark brown. Head densely pilose with greyish hairs, 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, upper margin arcuate and sinuate, lower margins obliquely continued to frontoclypeus; eyes hemispherical, pale white; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus densely pilose, extending for about half its length below lower margins of vertex, apex broadly rounded,

frontoclypeal lobes not distinct. Pronotum densely pilose with long greyish white hairs; metopidium densely longly pilose, vertical, about 2.0X as wide as high, supraocular callosities obsolete; humeral angles prominent, apices subacute; suprahumeral horns 2.0X as long as space between their bases, thickly pilose at basal area, seen from sides directed upward, their apices a little widened, the apical margin subtruncate, obliquely concavely excavate, seen from front much narrower, and somewhat recurved; posterior process obliquely erect at base and then obliquely sinuately directed backward, becoming gradually more slender to apex which extends a little beyond the posterior angle of the inner margin of tegmina, strongly centrally ridged above, the ridge extending through the pronotum but becoming faint on the metopidium; tegmina 3.0X as long as wide, greyish, semi-opaque, talc-like, veins pale brown, a brown patch near posterior angle of inner margin, pterostigma black, prominent, 1st apical cell partially encroached by pterostigma, 1st apical cell about 4.0X as long as wide, 1st and 2nd discoidal cell subequal, basal one-sixth of tegmina black. Legs pale testaceous, greyish pilose. Body beneath thickly greyish pilose.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 4.25 mm.; width across tips of suprahumeral horns 3.75 mm., at humeral angles 2.2 mm., at eyes 2.0 mm.

Male : General colour brownish testaceous. Smaller than female. Pronotum darker than in female; suprahumeral horns shorter, posterior process dark reddish at base, apex black.

Length from frontal margin to tips of tegmina 5.75 mm., to tip of posterior process 3.8 mm.; width across tips of suprahumeral horns 3.5 mm., at humeral angles 2.0 mm., at eyes 1.8 mm.

Material examined : 10 females and 4 males ex *Vigna catieng* in Trivandrum, Kerala State, 20-8-1980. Holotype male in British Museum; type locality : North India.

Distribution : INDIA : Kerala State (Trivandrum); Karnataka (Mysore); Tamil Nadu (Coimbatore); Maharashtra (Bombay); SRI LANKA.

A. pilosum is closely allied to *A. ulniforme* Buckton in the nature of the posterior process which is distinctly sinuate beyond basal angle, but differs by the basal angle of the posterior process rounded and not acute; the suprahumeral horns shorter with differences in the apical area of the horns.

164. *Anchon rectangulatum* (Kirby)
(Fig. 169)

1891. *Centrotus rectangulatus* Kirby, *J. Linn. Soc.*, 24 : 166.
1903. *Platybelus pilosus* : Melichar, *Hom. Faun. Ceylon* : 119.
1903. *Anchon rectangulatum* : Buckton, *Monogr. Membrac.* : 266.
1908. *Anchon rectangulatum* : Distant, *Fauna Br. India*, 4 : 51.

Female : General colour fuscous brown. Head light fuscous, densely pilose with silvery hairs, about 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as

long, upper margin shallowly arcuate, lower margins roundedly leading to frontoclypeus; eyes vitreous brown; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus longly pilose, broad, extending for half its length below lower margins of vertex, apex broad, rounded, its lobes inconspicuous. Pronotum fuscous-brown, densely pilose, hairs long and silvery white, a conspicuous cretaceously white line on each side starting from behind suprahumeral horns and continued on base of scutellum; metopidium dark brown; vertical, sparsely pilose, humeral angles subprominent, tips blunt; supraocular callosities inconspicuous; suprahumeral horns as long as space between their bases, seen from above broad, flattened, strongly angularly produced behind middle, then concavely sinuate, then more obtusely angulate, seen from front much narrower, more recurved, their apices appearing biangulate, as seen from sides obliquely directed upward and forward with apices amplified; posterior process almost straight behind basal angle, somewhat prominently incurved at basal elevation and obliquely straight backward, its apex passing the posterior angle of the inner margin of tegmina, tip acuminate and black, median carina strongly percurrent through metopidium; tegmina greyish opaque, about 3.0X as long as wide, basal sixth dark fuscous, coriaceous, apical area somewhat paler, a large brown patch near posterior angle of inner tegminal margin and another spot at apex, pterostigma prominent, fuscous brown, 1st apical cell wedge-shaped, R_1 oblique to subcosta, 2nd discoidal cell larger than the 1st, veins to apical area straight, apical limbus wide; hind wings with 4 apical cells; scutellum as wide as long, basal half white tomentose; legs ochraceous brown, femora excluding apex black.

Length from frontal margin to tips of tegmina 6.5 mm., to tip of posterior process 5.4 mm.; width across tips of suprahumeral horns 4.2 mm., at humeral angles 2.1 mm., at eyes 2.0 mm.

Male : Smaller than female. General colour black. Pronotum black with shades of brown; lateral areas of sternum cretaceously sericeous; tegmina greyish opaque with shades of black, the dark brown spots at apices and near and angles more conspicuous than in female.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 4.25 mm.; width across tips of suprahumeral horns 3.5 mm., at humeral angles 1.9 mm., at eyes 1.7 mm.

Material examined : 4 females and 2 males ex *Butea monosperma* at Mysore, 31-10-1981. Lectotype male in British Museum.

Distribution : INDIA : Karnataka State (Mysore); SRI LANKA.

A. rectangulatum is closely allied to *A. dirce* Buckton in the disposition of the suprahumeral horns and posterior process, but differs in the basal elevation of the posterior process being prominently incurved so that the space between the suprahumeral horns and the posterior process is much less than in *dirce*; the medial apical prolongation of the suprahumeral horns is also somewhat more prominently angulated than in *dirce*.

165. *Anchon ulniforme* Buckton
(Fig. 170)

1903. *Anchon ulniforme* Buckton, *Monogr. Membrac.* : 216.

1908. *Anchon ulniforme* : Distant, *Fauna Br. India*, 4 : 50.

Female : General colour dark reddish brown. Head vertical, nearly 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, weakly convex transversely, finely punctate with short adpressed pilosity, upper margin shallowly arcuate; lower margins broadly rounded to frontoclypeus; eyes subglobose, mottled with light brown; ocelli closer to eyes than to each other and situated well above c-o line; frontoclypeus declivous as wide as long, extending of half of its length below lower margins of vertex, its lobes fused to the whole length, tip broad and rounded. Pronotum thickly pilose, slightly granulose, dark reddish on metopidium and basal stem of posterior process, with a cretaceous serious oblique line on each side commencing behind each suprahumeral horn and continued to the base of scutellum, finely punctate with short, adpressed golden hairs, short reddish brown tubercles on and behind suprahumeral horns on the basal stem of posterior process, each tubercle terminating in a bristle; metopidium vertical, nearly 2.0X as wide as high, supraocular callosities concolorous with metopidium, slightly divided; humeral angles prominent, their apices subacute, posterior angles obtusely rounded; suprahumeral horns strongly tubercular, 3.0X as long as space between their bases, tricarinate, seen from front appearing narrow and gently curved, apices ampliate and subacute, seen from sides broadbased, directed obliquely upward and forward, their apices truncate and angulate posteriorly, seen from above somewhat broad, strongly carinate behind middle, the apices ampliate and truncate, concave and lobate on posterior margins and strongly angulate posteriorly; posterior process broadly based, emerging behind the middle of disc, finely tuberculate at basal stem, apex pitch black, at basal elevation inwardly angulate, then obliquely and sinuately continued, apical half gradually acuminate to tip which almost touches the apical limbus beyond the tip of abdomen. Lateral areas of sternum cretaceous sericeous. Scutellum brown, punctate with long hairs, nearly 2.0X as wide as long, tip slightly rising with a U-shaped emargination, apices acute. Tegmina 3.3X as long as wide, dark reddish brown, apical area nearly hyaline, veins brown, a prominent dark brown patch at posterior angle of inner tegminal margin, apical limbus moderately broad, tip acutely rounded, base coriaceous and punctate, pterostigma black, about 4.0X as long as wide, 1st discoidal cell slightly shorter and narrower than the 2nd, veins bordering 2nd and 3rd apical cells slightly curved; hind wings with 4 apical cells. Legs black upto apices of femora, apical region of femora, tibiae and tarsi light brown.

Length from frontal margin to tips of tegmina 6.5 mm., to tip of posterior process 5.5 mm.; width across tips of suprahumeral horns 4.6 mm., at humeral angles 2.25 mm., at eyes 2.0 mm.

Male : General colour as in female, but devoid of the cretaceous sericeous line on each side behind the suprahumeral horns; metopidium broader than high; suprahumeral horns broad, strongly tuberculate, 3.0X as long as the space between their bases, directed obliquely upward, width across suprahumeral horns much less than in female, apices of suprahumeral horns slightly widened and obliquely concavely excavate; posterior process obliquely elevated at base, slightly ampliate, its apex extending well beyond the tip of abdomen. Tegmina 3.0X as long as wide, 1st apical cell 5.0X as long as wide, 2nd discoidal 2.0X as long as the 1st, a chocolate brown patch extending from the anal angle to the 4th apical cell of tegmina. Genitalia with subgenital plate dark brown, deeply cleft to the base, its tip slightly expanded and rounded; lateral valves wedge-shaped, their processes short and nodular; parameres halberdshaped, light brown; aedeagus U-shaped, dorsal margin of posterior arm weakly serrate.

Length from frontal margin to tips of tegmina 4.5 mm., to tip of posterior process 4.0 mm.; width across tips of suprahumeral horns 2.6 mm., at humeral angles 1.7 mm., at eyes 1.5 mm.

Fifth instar nymph : General colour yellowish green in life, fading to greyish brown in cabinet specimens. Length of body 4.3-5 mm. Body nearly triangular in cross section, laterally compressed, densely bristled; head about 2.75X as wide across extremities of eyes as length of vertex, nearly vertical, upper margin of vertex nearly shallowly arcuate and sinuate with a row of tuberculated spines, rostral tip reaching abdominal segment III, cranial tubercles obsolete, being represented by a pair of stout tuberculate spines; eyes large, bordered by short spines; ocelli inconspicuous; prothorax larger than pterothorax, pronotum higher than wide, rising vertically from frontal margin and curving into a broadly rounded slightly laterally compressed crest which terminates in a cluster of tuberculate spines, then descending and produced posteriorly into a simple acute process; pronotal tuberculate spines prominent, each tubercle terminating in a single or double spine directed forward; pronotal posterior process prominent, extending as far behind as the middle of mesonotum, suprahumeral buds large, oval, projecting laterad and forward, fringed with a cluster of tuberculate spines; mesonotal process overlapping metanotum; metanotum narrow, about half as long as mesonotum; mesonotum twice as wide as long, with a pair of stout dorsal tubercles, each tipped with a pair of backwardly directed spines; tegminal wing pads about 1.3 mm. long, greyish brown, their costal angles distinct, fringed with a row of short tuberculate spines; hind wing pads shorter, partially overlapped by tegminal wing pads. Legs uniformly brown, fringed with short tuberculate spines, tibiae slightly flat. Abdomen about 1.5X as long as thorax, attaining its maximum width at the level of abdominal segment IV; abdominal segments III-VII, each with ferruginous dorsal tubercles or scoli directed upward, each of them about 0.25 mm., long, tipped with a long, slender tuberculate spine besides two subsines at the basal half; abdominal lateral lamellae of segment II shorter than those of segments III-VIII which are flat, crescentic and large, each lamellae bearing 5 or 6 backwardly inclined tuberculate spines; anal tube stout, a little more than one-fifth of the total body length, fringed with rows of tuberculate spines, genital rudiments distinctly visible.

Material examined : 90 females, 45 males and several nymphs ex *Cajanus cajan*, *Lablab purpureus* and *Phaseolus mungo*, at Madras, December to February, 1986.

Distribution : INDIA : Tamil Nadu (Madras), Kerala State (Trivandrum), Karnataka (Mysore, Coorg), West Bengal (Darjeeling), Uttar Pradesh; BURMA (Tenasserim); SUMATRA; JAVA.

A. ulniforme is closely related to *A. pilosum* (Walker) in the nature of the posterior process which is slightly but clearly sinuate beyond basal angle, but differs by the basal angle of posterior process being acute, the suprahumeral horns longer than those of *pilosum* and their apices strongly angulate, besides differences in the tegminal colour and venational details.

Distant (1908), while describing the generic diagnosis of *Anchon* Buckton, referred to the presence of only 3 areas in the hind wings; this condition may perhaps be true of the type species, *Anchon* (= *Centrotus*) *nodicornis*, described by Germar (1835) from Cape of Good Hope and redescribed by Capener (1972) although no mention was made about the hind wings by both the

authors. Capener (1968) stated that the number of apical cells in the hind wings was remarkably constant in all the species of all tribes included in the Subfamily Centrotinae. The number of apical cells in the hind wings has formed an important criterion to separate the two tribes, Leptocentrini and Centrotini, from each other, the former having 4 apical cells and the latter, 3. On this basis, the genus *Anchon* was allocated to the tribe *Centrotini*. Ananthasubramanian and Ananthakrishnan (1975) noted 4 apical cells in the hind wings of all the specimens of *A. echinatum* Distant collected from southern India. Examination of the hind wings of *A. ulniforme* in the present study also reveals 4 apical cells. That this situation is not an intraspecific variation is obvious as revealed from the examination of a long series of specimens belonging to the same population.

Genus 27. *Antialcidas* Distant

1916. *Antialcidas* Distant, *Ann. Mag. nat. Hist.*, (8)17 : 326.

This genus is characterised by the posterior process laminate, its basal part impinging on the scutellum, its dorsal node strongly and convexly elevated. The genus is closely related to *Pantaleon* Distant. The only notable difference between *Pantaleon* and *Antialcidas* is that in *Pantaleon* the apices of suprahumeral horns are strongly dentate while in *Antialcidas* they are simple and devoid of teeth.

Head subquadrate, wider than long, vertex wider than long, its upper margin arcuate and weakly sinuate, lower margins obliquely rounded and continued to frontoclypeus; eyes large subglobose; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus longer than wide, extending for half its length below lower margins of vertex, tip rounded, frontoclypeal lobes indistinct. Pronotum convex; metopidium vertical, wider than high; humeral angles subprominent, their apices acute; suprahumeral horns large, stout, broad-based, their apices more or less angulate or acute without teeth, directed upward and outward, as long or longer than the space between their bases; posterior process emerging from the apex of pronotum, laminate, its base impinging on scutellum, then slightly elevated and slightly arched, apex impinging on the inner tegminal margin, dorsal node strongly convexly elevated; scutellum triangular, wider than long; tegmina semiopaque, coriaceous and punctate, apical angles acute, R1 straight to subcosta, pterostigma absent, 2 discoidal and 5 apical cells, veins to apical area curved.

Type species : *Centrotus trifoliacea* Walker

166. *Antialcidas attenuatus* Funkhouser (Fig. 171)

1922. *Antialcidas attenuatus* Funkhouser, *Rec. Indian Mus.*, 29 : 327.

Female : General colour shining brown. Head vertical, subquadrate, about 2.5X as wide across extremities of eyes as length of vertex, brown with shades of black, densely pubescent with golden hairs, median area of vertex and sides of genae lined with streaks of long, white hairs, vertex about 1.75X as wide as long, its upper margin arcuate and sinuate, lower margins obliquely rounded to frontoclypeus; eyes large, light brown; ocelli vitreous, slightly elevated,

closer to eyes than to each other and situated above c-o line; frontoclypeus longer than wide, densely pubescent, extending to about half its length below lower margins of vertex, its lobes fused along its entire length, its tip rounded. Pronotum shining brown, finely punctate, covered with dense, short, adpressed golden hairs, a white streak of silvery hairs extending from head on each side of median line between the suprahumeral horns to the base of posterior process; metopidium about 1.7X as wide as high, almost vertical above head, convex, gradually sloping behind to disc, densely pubescent, median carina strongly percurrent; humeral angles prominent, triangular, their apices acute, projecting outward beyond eyes; supraocular callosities subprominent, undivided; suprahumeral horns large, stout, broadbased, triquerate, about as long as space between their bases, seen from above, somewhat flat, directed outward and backward, seen from sides directed upward, apices strongly recurved, seen from front somewhat narrower, tricarinate; posterior process impinging on scutellum at base, then elevated in a subtriangular crest extending upward, about as high as the suprahumeral horns, apical part attenuated, tip sharp, upturned, just reaching the posterior angle of the inner margin of tegmina, median carina prominent and continued forward through pronotum; scutellum wider than long, its apex emarginate; tegmina smoky-hyaline marked with brown at apical areas, basal fifth opaque, coriaceous, punctate, with golden hairs, R_1 perpendicular to subcosta, 1st apical cell based on R_1 and rs , about 4.75X as long as wide, 1st discoidal cell much shorter than the 2nd, veins to apical area strongly curved upward, apical limb moderately broad. Legs simple, uniformly brown. Undersurface of body dark brown.

Length from frontal margin to tips of tegmina 4.6 mm., to tip of posterior process 2.6 mm.; width across tips of suprahumeral horns 2.2 mm., at humeral angles 2.0 mm., at eyes 1.75 mm.

Male : Not known.

Material examined : Holotype female in ZSI., Calcutta, collected from Sureil, 5000 ft., Darjeeling, Oct. 11-31, 1917 (N. Annandale and F.H. Gravely).

Distribution : INDIA : West Bengal (Darjeeling).

Genus 28. *Maurya* Distant

1916. *Maurya* Distant, *Ann. Mag. nat. Hist.*, 19 : 326.

Head vertical, subquadrate, wider than long, vertex with upper margin arcuate, lower margins broadly rounded; eyes large, subglobose; ocelli prominent, closer to eyes than to each other and situated above c-o line; frontoclypeus extending for more than half its length below lower margins of vertex, apex rounded, frontoclypeal lobes indistinct. Pronotum strongly centrally longitudinally ridged, with a high dorsal node, metopidium nearly vertical, wider than high, median carina strongly percurrent; humeral angles prominent, triangular, blunt; suprahumeral horns short, stout, broad, sublamineate, not as long as distance between their bases, their apical margins oblique; posterior process heavy, laminate, broad for about half its length where it is convex above, then suddenly attenuated to apex, tectiform, impinging on scutellum and tegmina, apex just reaching the posterior angle of the inner margin of tegmina; scutellum narrowly

exposed at the sides; tegmina hyaline, wrinkled, about 3.0X as long as wide, without pterostigma, 5 apical and 2 discoidal cells, R₁ oblique to subcosta, rs short, 1st apical cell moderately long, somewhat parallel-sided, based on rs, apical limb narrow; hind wings with 4 apical cells. Legs simple.

Type species : *Centrotus gibbosulus* Walker

167. *Maurya bicolor* Funkhouser
(Fig. 172)

1936. *Maurya bicolor* Funkhouser, *Ann. ent. Soc. Am.*, 29(2) : 246.

Female : General colour brown with shades of bright yellow. Head bright reddish brown, subquadrate, 3.0X as wide across extremities of eyes as length of vertex, finely punctate, sparsely covered with golden hairs, vertex about 2.0X as wide as long, upper margin arcuate, lower margins broadly rounded; eyes subglobose, dull white; ocelli glossy, closer to eyes than to each other and situated above c-o line; frontoclypeus parallel-sided, extending for three-fourths its length below lower margins of vertex, densely pilose, apex roundedly truncate. Pronotum brown with shades of bright yellow, coarsely punctate, sparingly pubescent, central part of dorsum bright yellow; metopidium somewhat convex, vertical, 2.0X as wide as high, sparsely pilose; supraocular callosities subprominent, divided; humeral angles prominent, triangular, blunt; suprahumeral horns bright yellow at bases, as long as the space between their bases, tricarinate, seen from above somewhat flattened dorsoventrally, apices transversely truncate, seen from sides directed upward with a slight forward projection; posterior process tectiform, the central carination strongly percurrent through metopidium, slightly arcuate just before tip, just reaching the posterior angle of the inner margin of tegmina, distal half dark brown; scutellum narrowly exposed, about as wide as long, apex emarginate; tegmina 3.0X as long as wide, subhyaline, marooned with black, tip sharply pointed, bases dark brown, punctate, coriaceous, sparsely hairy, a brown patch at the distal half of 2nd apical cell, veins strong, brown, R₁ oblique to subcosta, 1st apical cell based on rs, about 5.0X as long as wide, 2 discoidal and 5 apical cells, apical limb very narrow. Abdomen beneath dark brown, slightly tomentose; legs with femora, tibiae and tarsi uniformly bright reddish brown.

Length from frontal margin to tips of tegmina 6.6 mm., to tip of posterior process 4.5 mm.; width across tips of suprahumeral horns 3.8 mm., at humeral angles 2.3 mm., at eyes 2.1 mm.

Male : Not known.

Material examined : One female in FRI., Dehra Dun, collected from Darjeeling (6,000 ft.), 4-9-1929.

Distribution : INDIA : West Bengal (Darjeeling).

Tribe UROXIPHINI Goding

1931. *Uroxiphini* Goding, *Jl. N. Y. ent. Soc.*, 39 : 301.

Pronotum more or less gibbous, with a posterior process, suprahumeral horns absent, rarely a slight tubercle or short carina above each humeral angle; apex of scutellum emarginate; tegmina with 2 or 3 discoidal and 5 apical cells, apical areas often multicellular; hind wings with 4 apical cells; legs simple.

Key to the genera of UROXIPHINI

- | | | |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| 1(6) | Posterior process touching scutellum and tegmina. | |
| 2(5) | Sides of scutellum visible. | |
| 3(4) | Pronotum with 2 anterior lobes; apical veins to tegmina straight. | <i>Insitoroides</i> Funkhouser |
| 4(3) | Pronotum without anterior lobes; apical veins to tegmina strongly curved. | <i>Aleptocentrus</i> Thirumalai and Ananthasubramanian |
| 5(2) | Scutellum entirely concealed; pronotum without central dorsal elevation. | <i>Cryptaspidia</i> Stål |
| 6(1) | Posterior process not touching scutellum and tegmina. | |
| 7(10) | Pronotum elevated into a high cone, the posterior process arising from the tip of this cone. | |
| 8(9) | Posterior process very short, sinuate, not touching the inner margins of tegmina and not reaching the inner tegminal angles. | <i>Sinodemanga</i> Chou and Yuan |
| 9(8) | Posterior process moderately long, straight, its apex touching the inner margins of tegmina and passing beyond the inner tegminal angles. | <i>Demanga</i> Distant |
| 10(7) | Pronotum not elevated into a high cone, the posterior process arising from near the base of pronotum, its apical area strongly upturned. | <i>Occator</i> Distant |

Genus 29. *Insitoroides* Funkhouser

1933. *Insitoroides* Funkhouser, *Indian Forest Rec.*, 17(10) : 3.

The diagnostic characters of this genus are : Pronotum produced in two prominent anterior lobes, the first bulbous, the second laterally compressed; scutellum only faintly exposed on either side; posterior process present; tegmina with 5 apical and 3 discoidal areas, clavus acute; hind wings with 4 apical cells; legs simple.

Type species : *Insitoroides typicus* Funkhouser

168. *Insitoroides typica* Funkhouser
(Fig. 173)

1933. *Insitoroides typicus* Funkhouser, *Indian Forest Rec.*, 17(10) : 4.

1965. *Insitoroides typica* : Metcalf and Wade, *Gen. Cat. Homopt.*, 1(1) : 182.

General colour brown. Head vertical, triangular, brown, about 2.5X as wide across extremities of eyes as length of vertex, densely pubescent with greyish hairs, vertex about 1.75X as wide as long, upper margin arcuate and sinuate, lower margins broadly rounded and continued to frontoclypeus; eyes large, brown; ocelli prominent, vitreous, closer to eyes than to each other and situated above c-o line; frontoclypeus triangular, not extending below lower margins of vertex, apex truncate, sparsely longly pilose. Pronotum chocolate brown dorsally, dark brown ventrally, finely punctate, with sparse greyish white hairs; metopidium vertical, about 2.0X as wide as high, finely punctate, with sparse greyish white, adpressed hairs; pronotum produced above as an anterior bulbous forwardly projecting elevation, about as long as the width of head, and a posterior subtriangular, laterally compressed process, the anterior process with a rounded apex, the posterior process with a subacute apex; humeral angles large, light brown, projecting beyond eyes, their apices obtusely rounded; supraocular callosities conspicuous, rounded, undivided; suprahumeral horns absent; posterior process tectiform, broad at base, very faintly exposing the scutellum, chocolate brown, densely pubescent, strongly tricarinate, dorsal carina percurrent through metopidium, apex depressed, blunt, reaching the posterior angle of inner margin of tegmina; tegmina 3.0X as long as wide, opaque, mottled with white and brown, basal sixth coriaceous, punctate, R_1 long, parallel to R_{2+3} , 1st apical cell about 7.0X as long as wide, 2nd apical cell very short, 1st discoidal cell about 2.0X as long as the 3rd, apical limb very narrow; hind wings with 4 apical cells; scutellum dark brown, as wide as long; abdomen beneath dark brown; legs dark brown except tarsi which are yellowish.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.75 mm.; width across tips of humeral angles 2.0 mm., at eyes 1.7 mm.

Male : Not known.

Material examined : Holotype in FRI., Dehra Dun, collected from Fraserpet, Coorg, Mysore.

Distribution : INDIA : Karnataka State (Fraserpet, Coorg).

Genus 30. *Aleptocentrus* Thirumalai and Ananthasubramanian

1985. *Aleptocentrus* Thirumalai and Ananthasubramanian, *Entomon*, 10(3) : 227.

The genus *Aleptocentrus* is characterised by the absence of suprahumeral horns, the posterior process long, sinuate, passing the posterior angle of the inner margin of tegmina, not impinging on the inner tegminal margin; tegmina with 4 apical and 2 discoidal cells, tegminal apical veins R_{2+3} and R_{4+5} strongly curved towards the costal margin, while M_1 and M_2 are curved towards the cubital vein; scutellum much reduced in the middle.

Head vertical, about 2.5X as wide across extremities of eyes as length of vertex, upper margin of vertex moderately arcuate, weakly sinuate, lower margins obliquely continued to frontoclypeus; eyes subglobose; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus extending for two-thirds its length below lower margins of vertex. Pronotum elevated at disc; metopidium vertical; humeral angles prominent, blunt; scutellum partially exposed; tegmina 2.5X as long as wide, lacking pterostigma, apical limb moderately broad.

This genus is closely related to *Pogontypus* Distant (1908) in the posterior process touching the scutellum and tegmina, and in the strongly curved apical veins to tegmina; it differs from *Pogontypus* in the short, concavely sinuate posterior process, its apex not passing the posterior angle of the inner margin of tegmina; in *Pogontypus* the posterior process is longer and more slender. The tegminal venation of *Aleptocentrus* presents a striking similarity to that of *Cocosterphus* Stål.

Type species : *Aleptocentrus notabilis* Thirumalai and Ananthasubramanian.

169. *Aleptocentrus notabilis* Thirumalai and Ananthasubramanian
(Fig. 174)

1985. *Aleptocentrus notabilis* Thirumalai and Ananthasubramanian, *Entomon*, 10(3) : 227.

Female : General colour brown with shades of black. Head dark brown, finely punctate with long golden hairs, 2.5X as wide across extremities of eyes as length of vertex, vertex black, upper margin arcuate and sinuate, lower margin somewhat oblique and continued to frontoclypeus; eyes dull brown; ocelli dark brown, prominent, closer to eyes than to each other and situated above c-o line; frontoclypeus longer than wide, highly pilose with golden hairs, extending for one-third its length below lower margins of vertex, tip nearly truncate. Pronotum dark reddish brown, punctate with adpressed golden pilosity; metopidium vertical, 2.0X as wide as high, gradually sloping back to disc; supraocular callosities bare, divided; posterior process dark brown, sparsely pilose, slightly concave and moderately gibbous near its apex, passing backward a little beyond the claval area, not impinging on the inner tegminal margin, tip reaching the base of 5th apical cell; tegmina light brown, basal third coriaceous, veins moderately thick, dark yellow, with pale virescent markings admixed with irregular brown patches, apical limb pale white, 1st apical cell 5.0X as long as wide, 2nd discoidal cell about 1.5X as long as the 1st, R_{2+3} and R_{4+5} are curved upward, M_1 and M_2 curved downward, small tubercles arranged sparsely on the veins. Abdomen and legs dark brown; ovipositor black.

Length from frontal margin to tips of tegmina 4.53 mm., to tip of posterior process 3.3 mm.; width across tips of humeral angles 2.1 mm., at eyes 1.87 mm.

Male : Not known.

Material examined : Holotype female from Sabarigiri, Western Ghats, Kerala, 440 ft. coll. R.S. Pillai and G. Thirumalai, 6-5-1981, deposited in ZSI., Calcutta.

Distribution : INDIA : Kerala State (Sabarigiri).

Genus 31. *Cryptaspidia* Stål

1870. *Cryptaspidia* Stål, *Afv. Vet. -Ak. Forh.* : 23.

Pronotum slightly gibbous, without central dorsal elevation; suprahumeral horns absent; posterior process short, straight, somewhat flattened, touching the scutellum and the tegmina, or apically elevated; scutellum entirely concealed; tegmina with 5 apical and 2 discoidal cells, veins to apical area more or less straight, apical limb moderately broad; hind wings with 4 apical cells; legs simple.

The members of the genus *Cryptaspidia* are closely allied to *Gargara* Amyot and Serville and *Tricentrus* Stål; from *Gargara* they differ in having longer bodies and entirely concealed scutellum, and from *Tricentrus* by the absence of spines on hind trochanters and the hind wings with 4 apical cells.

Type species : *Cryptaspidia pubera* Stål

170. *Cryptaspidia fasciata* Funkhouser (Fig. 175)

1936. *Cryptaspidia fasciata* Funkhouser, *Ant. ent. Soc. Am.*, 29 : 248.

Male : General colour black. Head black, subquadrate, about 2.6X as wide across extremities of eyes as length of vertex, coarsely punctate, sparingly pubescent, vertex about 2.0X as wide as long, upper margin arcuate, lower margins obliquely continued to frontoclypeus; eyes large, hemispherical, ocelli shining white, closer to eyes than to each other and situated above c-o line; frontoclypeus broad, flat, pilose, extending for about one half its length below lower margins of vertex, frontoclypeal lobes indistinct, apex truncate. Pronotum black, coarsely punctate, with short, adpressed, golden pilosity; metopidium about 2.0X as wide as high, sloping backward to disc, coarsely punctate; supraocular callosities inconspicuous; humeral angles prominent, apices blunt; posterior process somewhat flattened, tectiform, tricarinate, the central carination obsolete through pronotum, apex acuminate, just reaching the internal angles of tegmina; tegmina hyaline, basal sixth black, coriaceous, punctate about 3.0X as long as wide, a large reddish brown patch at the apical area of clavus and a wide transverse reddish brown fascia halfway across the apical area, R_1 oblique to subcosta, 1st apical cell wedgeshaped, about 4.0X as long as wide, based on rs , discoidal cells subequal, veins to apical area straight, apical limb moderately broad. Scutellum entirely concealed. Abdomen black, genital segments pitch black. Legs with femora and bases of tibiae black, tarsi light brown.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.1 mm.; width across tips of humeral angles 2.25 mm., at eyes 1.75 mm.

Female : Not known.

One male in the Government Museum, Madras, collected from Dehra Dun, 3-3-1917. Holotype male in British Museum; type locality Berenag, Almora, U.P., India.

Distribution : INDIA : Uttar Pradesh (Almora, Dehra Dun).

171. *Cryptaspidia piceola* (Melichar)

(Fig. 176)

1903. *Gargara piceola* Melichar, *Hom. Faun. Ceylon* : 122.

1908. *Gargara piceola* : Distant, *Fauna Br. India*, 4 : 60.

1951. *Cryptaspidia piceola* : Goding, *Jl. N. Y. ent. Soc.*, 58 : 266.

Female : General colour dark brown with shades of black. Head subquadrate, finely and thickly punctate, with sparse, adpressed, silvery pilosity, 3.0X as wide across extremities of eyes as length of vertex, upper margin of vertex arcuate, lower margins broadly rounded; eyes large, piceous; ocelli glossy white, equidistant from each other and from eyes and situated above c-o line; frontoclypeus semicircular, sparsely pilose with golden hairs, extending for half its length below lower margins of vertex, apex nearly truncate. Pronotum dark brown with shades of black, thickly punctate, sparsely pilose; metopidium about 2.0X as wide as high, somewhat sloping backward to disc; humeral angles prominent, their apices obtuse; supraocular callosities subprominent, undivided; posterior process short, longly triangular, flattened and stretched out straight behind, covering the scutellum entirely, apex acuminate, not reaching the internal tegminal angle, central carination weakly and finely continued through metopidium; tegmina hyaline, strongly wrinkled, 3.0X as long as wide, basal sixth black, coriaceous, thickly punctate, veins dark brown, strongly and distinctly punctured, R_1 oblique to subcosta, 1st apical cell based on rs , about 4.0X as long as wide, 1st discoidal cell slightly shorter than the 2nd, apical limb very narrow; hind wings with 4 apical cells. Abdomen dark brown. Legs rusty brown except femora which are black.

Length from frontal margin to tips of tegmina 3.0 mm., to tip of posterior process 1.7 mm.; width across tips of humeral angles 1.7 mm., at eyes 1.4 mm.

Male : Not known.

Material examined : One female in FRI., Dehra Dun, collected from Fraserpet, Coorg, 7-2-1931.

Distribution : INDIA : Karnataka State (Fraserpet, Coorg); SRI LANKA.

C. piceola resembles *C. fasciata* in the general disposition of posterior process and frontoclypeus besides similarities in the wing venation, but differs by its smaller size, general colour and tegminal colour patterns and the position of ocelli.

Genus 32. *Sinodemanga* Chou and Yuan

1982. *Sinodemanga* Chou and Yuan, *Entomotaxonomia* 4(3) : 176, 180.

Chou and Yuan (1982) diagnose this genus as follows : Large-sized insects, body covered with long hairs. Head subquadrate, broader than high, vertex arcuate; eyes ovate; ocelli smaller, apart from each other than from the eyes and situated slightly above the line drawn through centre of eyes; inferior margins of genae round, with obvious edges; lateral lobes of clypeus incompletely fused with median lobe and extending for two-thirds its length below inferior margins of genae. Pronotum elevated into a high erect cone, not bearing suprahumeral; metopidium sloping, triangulate, higher than broad; posterior process arising from tip of the cone, slightly curved, sloping downward, base far away from scutellum, very short, tip not reaching to tornus of tegmina and farther away from anal margins of tegmina; humeral angles developed and blunt; scutellum entirely exposed, broader than long, tip notched. Tegmina narrow, outer margin highly oblique, basal area narrowly coriaceous, punctate, the rest semihyaline, side of veins and superficies bearing hairs, five apical and two discoidal cells; hind wings with four apical cells, apical limb broad. Anterior tibiae slightly flattened and wider; hind tarsi longest.

Type species : *Sinodemanga xizangensis* Chou and Yuan

The genus *Sinodemanga* is related to *Demanga* Distant in the pronotum elevated into a high cone, and the posterior process arising from the tip of this cone, but differs from it in having a very short posterior process, its tip not reaching the posterior angle of the inner margin of tegmina and farther away from their anal margin.

172. *Sinodemanga brunnea* (Funkhouser)
(Fig. 177)

1922. *Machaerotypus brunneus* Funkhouser, *Rec. Indian Mus.*, 24 : 328.

1940. *Acentrotus brunneus* : Kato, *Ent. World*, 8 : 151.

1982. *Sinodemanga brunnea* : Chou and Yuan, *Entomotaxonomia*, 4(3) : 181.

Female : General colour brown. Head vertical, 3.0X as wide across extremities of eyes as length of vertex, ochraceous brown, coarsely punctate, sparingly covered with long silvery hairs, vertex 2.0X as wide as long, upper margin shallowly arcuate, lower margins rounded, densely pilose; eyes large, ovate, light brown, ocelli large, greyish white, closer to eyes than to each other and situated well above c-o line; frontoclypeus 1.3X as long as wide, extending for about three-fourths its length below lower margins of vertex, densely pilose, apex rounded, frontoclypeal lobes fused with the main lobe. Pronotum brown, coarsely punctate, with dense, pilosity, swollen,

subglobose, highly elevated; metopidium about 1.6X as high as wide, coarsely punctate, supraocular callosities smooth, irregular; humeral angles triangular, their apices subacute; suprahumeral horns absent; posterior process short, sinuate, arising from the highest point of pronotum, its apex acute, not reaching the internal angles of tegmina; dorsal carina obsolete through pronotum; scutellum wider than long, well exposed, coarsely punctate, with dense silvery pilosity, apices weakly notched; tegmina about 3.0X as long as wide, smoky-hyaline, sparingly pilose, apex somewhat darker, basal one-eighth black, coriaceous, punctate, veins thick, brown, 1st apical cell about 7.0X as long as wide, parallel-sided, R_1 oblique, forming the base of 1st apical cell, 1st discoidal cell nearly as long as the 2nd, veins to apical area long, slightly curved, apical limbus broad. Body beneath dark brown, pubescent. Legs with tibiae light brown, tarsi with claws shaded with black.

Length from frontal margin to tips of tegmina 10.0 mm., to tip of posterior process 5.0 mm.; width across tips of humeral angles 4.0 mm., at eyes 3.2 mm., height of metopidium 4.0 mm.

Male : Not known.

Material examined : One female in ZSI., Calcutta, from Mungpoo (3,000 ft.), Darjeeling, Oct. 11-31, 1917.

Distribution : INDIA : West Bengal (Darjeeling).

S. brunnea is closely related to *S. xizangensis* Chou and Yuan in its general colour and dimensions, but differs by the terminal part of the posterior process curved upward and not straight.

Genus 33. *Demanga* Distant

1908. *Demanga* Distant, *Fauna Br. India*, 4 : 69.

Head about 3.0X as wide across extremities of eyes as length of vertex; face strongly deflected, frontoclypeus parallel-sided, its lobes indistinct; eyes large, hemispherical; ocelli equidistant from each other and from eyes. Pronotum convex, rounded, unarmed; metopidium vertical, wider than high; humeral angles strong, subprominent, apices sharp; suprahumeral horns absent; posterior process arising from the tip of the elevated disc of pronotum, remote from scutellum at base, straightly obliquely deflected from near base, apex just passing the inner tegminal angle and impinging on inner tegminal margin, tricarinate, median carina strongly percurrent through metopidium; scutellum entirely exposed, as wide as long, apex biangulate; tegmina about 3.0X as long as wide, with 5 apical and 2 discoidal cells, 1st apical cell narrow, parallel-sided, R_1 not oblique to subcosta, apical limbus broad; hind wings with 4 apical cells. Legs heavy, robust, femora nearly cylindrical, tibiae slightly flattened, all tarsi about equal in length.

Type species : *Demanga sooknana* Distant

173. *Demanga sooknana* Distant
(Fig. 178)

1908. *Demanga sooknana* Distant, *Fauna Br. India*, 4 : 69.

Female : General colour black. Head black, about 3.1X as wide across extremities of eyes as length of vertex, thickly pilose, hairs reddish brown, vertex about 2.25X as wide as long, upper margin shallowly arcuate, lower margins nearly horizontal and slightly curved; eyes black, hemispherical; ocelli dull black, about as far from eyes as from each other and situated just above c-o line; frontoclypeus nearly rectangular, extending for about three-fourths its length below lower margins of vertex, apex truncate, longly pilose, frontoclypeal lobes indistinct. Pronotum black, finely punctate, thickly covered with reddish brown hairs; metopidium about 1.7X as wide as high, vertical, finely punctate; humeral angles subprominent, their apices acute; suprahumeral horns absent; posterior process arising high from the posterior upper area of pronotal disc, well elevated from scutellum, obliquely directed backward, its apex impinging on the inner margin of tegmina near its posterior angle, apex acute, central dorsal carina strongly percurrent through metopidium; tegmina bronzy subhyaline, about 3.0X as long as wide, brownish opaque, coarsely punctate at base, veins reddish brown, R1 perpendicular to subcosta, 1st apical cell long, narrow, parallel-sided, about 6.0X as long as wide, 1st discoidal cell somewhat rectangular, veins to apical area straight, apical limb moderately broad; hind wings with 4 apical cells. Body beneath black, densely pilose; scutellum as wide as long, with a piceous spot on each side of basal margin, rest dark brown, apex subangulate. Legs simple, distal area of tibiae slightly amplified, femora black, rest castaneous.

Length from frontal margin to tips of tegmina 8.0 mm., to tip of posterior process 6.1 mm.; width across tips of humeral angles 3.0 mm., at eyes 2.6 mm.

Male : Similar to female in the general colour and other characters but smaller.

Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 5.25 mm.; width across tips of humeral angles 2.75 mm., at eyes 2.5 mm.

Material examined : 1 female and 1 male in the Government Museum, Madras, with the label : *Gargara* sp., ex *Salix* sp., from Darjeeling, 5-1-1925 (tegmina and hind wings removed from both specimens).

Distribution : INDIA : West Bengal (Darjeeling).

Genus 34. *Occator* Distant

1916. *Occator* Distant, *Fauna Br. India*, 6 : 174.

Head vertical, about 3.0X as wide as long, vertex 2.0X as wide as long, upper margin arcuate, lower margins obliquely rounded to frontoclypeus; eyes subglobose; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus about as wide as long, its lobes indistinct. Pronotum subglobose, not elevated into a high cone; metopidium vertical, wider than high; humeral angles poorly developed; supraocular callosities distinct; posterior process arising from near base of pronotum, slender, not touching scutellum and tegmina, the apical area strongly upturned, apex not passing the posterior angle of the inner margin of tegmina, tricarinate, dorsal

carina strongly percurrent through metopidium; scutellum completely exposed; tegmina 2.75X as long as wide, 5 apical and 2 discoidal cells, veins to apical area nearly straight; hind wings with 4 apical cells; legs simple.

The genus *Occator* is related to *Machaerotypus* Uhler and *Demanga* Distant in the absence of suprahumeral horns, the posterior process not touching the scutellum and the tegmina, and the scutellum completely exposed; it differs from *Machaerotypus* in the shorter posterior process which is characteristically upturned, and from *Demanga* in the pronotum not elevated into a high cone. Though *Occator* presents many characters in common with *Sinodemanga* Chou and Yuan, it is distinct in the nature of tegminal veins.

Type species : *Occator erectus* Distant

174. *Occator erectus* Distant
(Fig. 179)

1916. *Occator erectus* Distant, *Fauna Br. India*, 6 : 174.

Female : General colour black. Head shining black above, thickly punctate, densely pilose, about 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, upper margin arcuate, lower margins obliquely rounded to frontoclypeus; eyes hemispherical, dull black; ocelli succineous, closer to eyes than to each other and situated above c-o line; frontoclypeus as wide as long, extending for three-fourths its length below lower margins of vertex, its apex roundedly truncate, frontoclypeal lobes indistinct. Pronotum black, thickly punctate; metopidium vertical, 2.0X as wide as high; supraocular callosities rounded, undivided, bare; humeral angles feeble, obsolete produced, their apices subacute; suprahumeral horns absent; posterior process moderately slender, well remote from scutellum and tegmina, tricarinate, dorsal carina strongly percurrent through metopidium, the apical area upwardly turned, apex acute, not reaching the inner tegminal angle; tegmina 2.75X as long as wide, shining ochraceous, basal sixth and two-thirds of costal margin black, R₁ slightly obliquely disposed to subcosta, 1st apical cell wedge-shaped, about 4.0X as long as wide, 1st discoidal cell much shorter than the 2nd, veins to apical area straight. Scutellum as wide as long, black, apex emarginate. Abdomen beneath black. Sternum behind eyes with a distinctly greyish spot. Legs black upto femora, tibiae dark brown, tarsi light brown.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 2.7 mm.; width across tips of humeral angles 1.5 mm., at eyes 1.4 mm.

Male : Not known.

Material examined : 1 female in the Indian Museum, collected from Kurseong, 4,700-5,000 ft. by N. Annandale, Oct. 11-31, 1917.

Distribution : INDIA : (Kurseong, E. Himalayas).

Tribe GARGARINI Distant

1908. *Gargararia* Distant, *Fauna Br. India*, 4 : 45.

1925. *Gargarini* : Lallemand, *Ark. Zool.*, 18 : 6.

The tribe *Gargarini* is characterised by the partially concealed scutellum exposed laterally and at basal angles and weakly chitinised in the middle, the broad close-fitting posterior process, absence of suprahumeral horns, and the hind wings with 3 apical cells. It is distinguished from the closely related tribe, *Coccosterphini* Distant by the absence of tubercles on pronotum, posterior process and tegminal veins. In the *Gargarini* the veins to the apical area of tegmina are straight while in *Coccosterphini* they are curved.

Key to the Genera of GARGARINI

- 1(4) Posterior process straight.
- 2(3) Disc of pronotum elevated; dorsal carina of posterior process raised into a strong ridge; frontoclypeal lobes distinct. *Gargarina* Ananthasubramanian
- 3(2) Disc of pronotum not elevated; dorsal carina of posterior process not raised into a ridge; frontoclypeal lobes indistinct. *Gargara* Amyot and Serville
- 4(1) Posterior process strongly sinuate. *Ebhul* Distant

Genus 35. *Gargarina* Ananthasubramanian

1980. *Gargarina* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Paper No.* 16 : 33.

Allied to *Gargara* Amyot and Serville but differing from it in the pronotum elevated at the disc, the dorsal carina of the posterior process raised above the level of disc and in having distinct frontoclypeal lobes which are not fused with frontoclypeus. Head vertical, 2.0X as wide across extremities of eyes as length of vertex, vertex about 1.5X as wide as long eyes subglobate; ocelli closer to eyes than to each other and situated on c-o line. Pronotum elevated at the disc, metopidium convex, backwardly sloping to disc, disc convex, suprahumeral horns absent, a pair of granulate rounded knobs situated dorsolaterally on pronotum; humeral angles prominent, their apices subacute; posterior process fitting tightly against scutellum and contiguous with inner tegminal margin, reaching the anal angles of tegmina, dorsal carina very strong, raised as a ridge; scutellum deeply excavated, incompletely chitinised at middle and concealed by the posterior process; tegmina about 2.6X as long as wide, with 5 apical and 2 discoidal cells, 2nd discoidal cell much shorter than the 1st, apical limb moderately broad; hind wings with 3 apical cells. Legs simple.

Type species : *Gargarina carinata* Ananthasubramanian

175. *Gargarina carinata* Ananthasubramanian
(Fig. 180)

1980. *Gargarina carinata* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Paper No. 16* : 33.

Male : As in generic description with the following additional characters : General colour dark castaneous. Head dark brown, vertex finely punctate, ocelli succineous; frontoclypeus densely longly pilose, its lobes shortly pilose, tip broadly rounded, extending a little below the lower margins of vertex. Pronotum coarsely granulate, with golden pilosity, supraocular callosities undivided, nearly circular, very conspicuous, impunctate, black; metopidium about 1.5X as wide as high, sparsely tuberculate, disc dark castaneous, with long golden hairs gradually rising backward to posterior process; posterior process strongly dorsally keeled, apex bluntly acute and slightly elevated above anal angles of tegmina; lateral margins of scutellum sericeous; tegmina smoky brown, veins reddish brown, basal sixth and costal margin coriaceous, 1st apical cell about 7.0X as long as wide, 1st discoidal cell larger than the 2nd, apical limb broadest opposite to 3rd apical cell, R_1 slightly oblique to subcosta. Sides of thorax black; legs dull black; abdomen beneath dark brown.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 3.6 mm.; width across tips of humeral angles 3.1 mm., at eyes 2.6 mm.

Female : Unknown.

Material examined : Holotype male, Reg. No. ZSI. 688/H15, collected from NEFA, Sabansiri Div., Tamen, 459 m., 26-5-1966.

Distribution : INDIA : Assam (North East Frontier Agency).

Genus 36. *Gargara* Amyot and Serville

1843. *Gargara* Amyot and Serville, *Hemip.* : 537.

Small to moderately large, body robust, somewhat heavy, pronotal posterior process broadly triangular and concealing most of the scutellum.

Head vertical, about 2.5X as wide across extremities of eyes as length of vertex, vertex about 1.75X as wide as long; eyes hemispherical; ocelli closer to eyes than to each other; frontoclypeus extending below lower margins of vertex, its lobes entirely fused and together forming a broad rounded tip. Pronotum not gibbous, metopidium usually convex and backwardly sloping, disc convex, without suprahumeral horns; humeral angles subprominent, blunt; posterior process triangular when viewed from above, straight, fitting tightly against scutellum and contiguous with tegmina, its apex about reaching anal angles of tegmina, ventrally basally hollow; scutellum triangular, deeply excavated at tip, incompletely chitinised in middle; tegmina 2.5-3.0X as long

as wide, 5 apical and 2 discoidal cells, without pterostigma, in some species the membrane at R₁ somewhat chitinised, forming an incipient pterostigma, tip rounded, apical limbus moderately broad; hind wings with 3 apical cells. In the males, the parameres with roundedly hooked tips; sternal plate apically narrowly divided.

Type species : *Cicada genistae* Fabricius

Key to Indian species of *Gargara*

- 1(60) Posterior process tricarinate.
- 2(57) Apex of posterior process just reaching or distinctly passing the apex of clavus.
- 3(32) Apex of posterior process just reaching the apex of clavus.
- 4(25) Median carina of posterior process strongly or finely percurrent through metopidium.
- 5(18) Median carina of posterior process finely percurrent through metopidium.
- 6(9) Tegmina not marked with fasciae or spots.
- 7(8) Pronotum pale yellow, finely granulose; posterior process moderately sinuate at base; tegmina subhyaline, extreme basal angle and the veins pale yellow, 1st discoidal cell petiolate; apex of frontoclypeus truncate. *contraria* Distant.
- 8(7) Pronotum ochraceous brown, not granulose; posterior process not sinuate at base; tegmina greyish, semiopaque, the base ferruginous brown, 1st discoidal cell not petiolate; apex of frontoclypeus truncately rounded. *mixta* (Buckton)
- 9(6) Tegmina marked with fasciae or spots.
- 10(13) Pronotum black.

- 11(12) Tegmina subhyaline, apical margin with a pale brownish transverse spot near end of clavus and at the extreme near end of clavus and at the extreme apical margin, 1st and 2nd discoidal cells of nearly equal size. *robusta* Distant
- 12(11) Tegmina greyish opaque, apical area much clouded with fuscous brown, 1st discoidal cell shorter than 2nd. *confusa* Distant
- 13(10) Pronotum brown with hues of grey, red or black.
- 14(15) Pronotum greyish brown; tegmina with a greyish brown transverse fascia across the apical cells, apical limbus shaded with black. *pulniensis* Ananthasubramanian.
- 15(14) Pronotum reddish or dark brown.
- 16(17) Pronotum dark brown; tegmina fuscous brown, mottled with black, 1st discoidal cell petiolate, much smaller than 2nd; apex of frontoclypeus truncate. *nigrolimbata* Ananthasubramanian.
- 17(16) Pronotum reddish brown; tegmina subhyaline, base and a broad transverse fascia beyond middle piceous-brown, 1st discoidal cell not petiolate, nearly as large as 2nd; apex of frontoclypeus rounded. *delimitata* Distant.
- 18(5) Median carina of posterior process strongly percurrent through metopidium.
- 19(22) Tegmina hyaline, 1st discoidal cell petiolate; apex of frontoclypeus broad, rounded.
- 20(21) Pronotum ferruginous; tegmina with a transverse brown fascia beyond middle and another one on the apical margin; tarsi pale white; ocelli closer to eyes than to each other. *albitarsis* Ananthasubramanian
- 21(20) Pronotum black; tegmina with a brown spot on apical margin behind clavus and another on the apical limbus; tarsi ferruginous; ocelli equidistant from each other and from eyes. *maculata* Funkhouser

- 22(19) Tegmina subhyaline; 1st apical cell not petiolate; apex of frontoclypeus truncate or rounded.
- 23(24) Pronotum ferruginous; tegmina black, three opaque transverse fascia separated by white, more or less confluent spots; apex of frontoclypeus rounded. *pulchripennis* Stål.
- 24(23) Pronotum black; tegmina without fasciae; apex of frontoclypeus truncate. *flavolineata* Distant.
- 25(4) Median carina of posterior process faintly percurrent through or obscure on metopidium.
- 26(29) Median carina of posterior process faintly percurrent through metopidium; tegmina hyaline or subhyaline.
- 27(28) Pronotum black, coarsely punctate, tegmina subhyaline, basal area and a very large central area black. *splendidula* Distant
- 28(27) Pronotum golden brown, finely punctate, tegmina hyaline, with a white transverse fascia following the basal area. *aurea* Funkhouser.
- 29(26) Median carina of posterior process obscure on metopidium; tegmina hyaline or subhyaline.
- 30(31) Pronotum dark purplish brown; posterior process straight; tegmina subhyaline, without subapical fascia. *affinis* Distant.
- 31(30) Pronotum brown; posterior process constricted at base, strongly swollen at middle, apically abruptly narrowed; tegmina amber hyaline, with a brown subapical fascia. *penangi* Funkhouser.
- 32(3) Apex of posterior process distinctly passing the apex of clavus.
- 33(52) Median carina of posterior process strongly or finely percurrent through metopidium.

- 34(45) Median carina finely percurrent through metopidium.
- 35(36) Pronotum granulose; tegmina subhyaline median fascia obliquely continued, upper half of apical margin black; black species. *rivulata* Distant.
- 36(35) Pronotum not granulose.
- 37(40) Length of body not exceeding 3.0 mm.
- 38(39) 1st discoidal cell of tegmina petiolate, and much shorter than the 2nd discoidal cell; pronotum black. *madrasensis* Ananthasubramanian and Ananthakrishnan.
- 39(38) 1st discoidal cell of tegmina not petiolate and as long as the 2nd discoidal cell; pronotum greyish or dark brown. *hraswa* nom. nov.
- 40(37) Length of body exceeding 3.0 mm.
- 41(42) Tegmina subhyaline, with 3 discoidal cells; brown species. *discoidalis* Ananthasubramanian
- 42(41) Tegmina hyaline with 2 discoidal cells.
- 43(44) Apex of frontoclypeus broadly rounded; tegmina with smoky brown patches on apical limbus, without incipient pterostigma; rusty brown species. *rustica* Ananthasubramanian and Ananthakrishnan.
- 44(43) Apex of frontoclypeus broad and truncate; tegmina with a distinct brown spot on R₁ and rs, and a light spot at anal angle, an incipient pterostigma absorbing the R₁. *malabarica* Ananthasubramanian and Ananthakrishnan.
- 45(34) Median carina of posterior process strongly percurrent through metopidium.
- 46(49) Posterior process more or less sinuate at base, broadened at middle, narrow at apex; apex of frontoclypeus broadly rounded.

- 47(48) Tegmina fuscous brown, grey mottled, 1st discoidal cell as long as the 2nd, not petiolate, apical margin grey; large black species. *caelata* Distant.
- 48(47) Tegmina hyaline, without spots, 1st discoidal cell much shorter than the 2nd, petiolate, apical margin vitreous; small brown species. *kandala* n.sp.
- 49(46) Posterior process not sinuate at base, not broadened at middle; apex of frontoclypeus; truncate.
- 50(51) Tegmina subhyaline, costal and apical margins black, 1st discoidal cell with a long petiole; black species. *extrema* Distant.
- 51(50) Tegmina hyaline, without spots or fascia, 1st discoidal cell with a very short petiole; greyish brown species. *pellucida* Ananthasubramanian.
- 52(33) Median carina of posterior process obscure on metopidium.
- 53(54) Pronotum granulose; tegmina wrinkled, pale bronzy ochraceous; conspicuously large species. *majuscula* Distant
- 54(53) Pronotum not granulose, densely pilose.
- 55(56) Tegmina subhyaline, median fascia, subapical fascia and apical margin fuscous; posterior process broad, abruptly acute, with lateral margins convex, central area ochraceous, sides lighter. *sikhimensis* Distant
- 56(55) Tegmina vitreous, base and median fascia black; posterior process narrow, gradually tapering to an acute apex; black species. *nigrofasciata* Stål
- 57(2) Apex of posterior process not reaching the apex of clavus.

- 58(59) Median carina of posterior process finely continued on metopidium; sternum and basal areas of lateral abdominal margins greyish black; tegmina light pinkish brown, veins yellowish, a black spot opposite to 3rd apical cell and another one on the posterior angle of inner margin. *brevis* Ananthasubramanian
- 59(58) Median carina of posterior process subobsolete, more obsoletely continued on metopidium; sternum and basal areas of lateral abdominal margins more or less cretaceously sericeous; tegmina subhyaline, venation fuscous, a transverse pale ochraceous fascia following the piceous basal area. *tumida* Melichar.
- 60(1) Posterior process unicarinate; female tegmina with a fuscous transverse band behind middle, apical area yellowish; male tegmina hyaline; general colour of females varying from black to yellowish ferruginous, the paler forms with spots or bands on posterior process; males black. *varicolor* Stål.

176. *Gargara affinis* Distant
(Fig. 181)

1908. *Gargara affinis* Distant, *Fauna Br. India*, 4 : 61.

Female : General colour purplish brown. Head light brown, densely pilose, 2.75X as wide across extremities of eyes as length of vertex, vertex 1.75X as wide as long, its upper margin shallowly arcuate, lower margins truncately rounded; eyes large, hemispherical; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus semicircular, extending for one-half its length below lower margins of vertex, finely pilose, apex broadly rounded. Pronotum purplish brown with a hue of black, densely pilose, metopidium 1.6X as wide as high, finely pilose gradually sloping behind to disc; humeral angles subprominent, their apices blunt; posterior process robust, laterally compressed, tricarinate, median carina finely percurrent through metopidium, apex acute, distinctly passing the posterior angle of the inner margin of tegmina; tegmina subhyaline, without fascia or markings, basal sixth purplish brown, punctate, coriaceous, sparsely pilose, 1st apical cell 5.0X as long as wide, discoidal cells subequal, 1st discoidal cell not petiolate, apical limb broad. Body beneath dark brown. Legs with femora (except their apices) black, apices of femora, tibiae and tarsi ochraceous.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 3.3 mm., width across humeral angles 2.0 mm., at eyes 1.75 mm.

Male : General colour dark purplish brown; slightly smaller than female, abdomen narrow, subcylindrical, genitalia black, tips of parameres roundly hooked; sternal plate apically somewhat broad.

Length from frontal margin to tips of tegmina 3.8 mm., to tip of posterior process 3.0 mm.; width across tips of humeral angles 1.75 mm., at eyes 1.6 mm.

Material examined : 2 females and 1 male in FRI., Dehra Dun, collected from Dehra Dun.

Distribution : INDIA : Karnataka State (Coorg, Mysore), Maharashtra (Bombay), Uttar Pradesh (Dehra Dun); BURMA (Tenasserim); BORNEO; PHILIPPINE ISLANDS.

G. affinis is closely allied to *G. robusta* Distant from which it differs in general colour, the posterior process longer and more laterally compressed, and absence of fascia or markings on the tegmina.

177. *Gargara albitarsis* Ananthasubramanian and Ananthakrishnan
(Fig. 182)

1975. *Gargara albitarsis* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 242.

Female : General colour dark brown, shaded with black on dorsolateral areas of metopidium, lateral carinae and apical fourth of posterior process. Head about 2.5X as wide across extremities of eyes as length of vertex, vertex about 1.75X as wide as long, finely granulate, upper margin nearly planate, lower margins slightly obliquely continued to frontoclypeus; eyes dull red; ocelli shining white, closer to eyes than to each other and situated above c-o line; frontoclypeus dark reddish brown, extending for one-quarter of its length below lower margins of vertex, apex broadly rounded, longly hairy. Pronotum ferruginous, strongly punctate with short, adpressed, pale yellow hairs; metopidium strongly convex at base, then vertical, gradually sloping backward to disc; supraocular callosities conspicuous, entire; humeral angles subprominent, their apices subacute; posterior process straight, tricarinate, apex acuminate, median carina finely percurrent, apex of posterior process just reaching the anal angle of tegmina; tegmina 2.5X as long as wide, basal sixth and three-fourths of costal margin castaneous and punctate, apical limb broad, apex narrow, reddish brown transverse fascia beyond middle, a broad reddish brown fascia on the apical limb and extending into apical cells, veins light brown, 1st apical cell about 4.4X as long as wide, 1st discoidal cell petiolate, shorter than the 2nd. Legs with coxae and basal half of trochanters jet black, rest dark brown except tarsi which are pale white. Abdomen beneath pubescent.

Length from frontal margin to tips of tegmina 4.25 mm., to tip of posterior process 3.0 mm.; width across tips of humeral angles 2.1 mm., at eyes 1.9 mm.

Male : Differing from the female in being smaller and darker; metopidium less convex, abdominal sternites less pubescent.

Length from frontal margin to tips of tegmina 3.75 mm., to tip of posterior process 2.7 mm.; width across tips of humeral angles 1.9 mm., at eyes 1.6 mm.

Fifth instar nymph : General colour green with reddish spots scattered over. Body laterally compressed; head with rostral tip extending as far back as thoracic segment III, 3.0X as wide across extremities of eyes as length of vertex, upper margin of vertex planate, lower margin obliquely rounded; frontoclypeus densely pilose, its apex reaching lower margins of vertex. Ocelli conspicuous. Pronotum with metopidium convex and gradually sloping backward, and fringed with a row of short tuberculate spines, pronotal posterior process very short, just overlapping the base of mesonotum, its apex broadly rounded, mesonotum about 2.0X as long as metanotum; wing pads moderately large, extending upto abdominal segment II, their costal angles not demarcated; abdomen excluding anal tube as long as thorax, tuberculate spines inconspicuous, arranged in a row near the posterior margin of abdominal tergites, dorsal tubercles inconspicuous and adpressed to the body with the spines turned backward; lateral lamellae of abdominal segments III-VIII short, broad, each lamella bearing 5 slender tuberculate spines, besides 2 or 3 shorter spines; anal tube 0.2X as long as body, fringed with rows of tuberculate spines. Length of body 3.1 mm.

Material examined : 4 females, 3 males and 10 nymphs ex *Tecoma grandiflora*, in Madras, 2-1-1967; types in the National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Tamil Nadu (Madras).

G. albitarsis is closely related to *G. madrasensis* Ananthasubramanian and Ananthakrishnan in the general disposition of the posterior process and wing venation, but differs by the petiolate 1st discoidal cell and colour of tarsi which are characteristically pale white.

178. *Gargara aurea* Funkhouser
(Fig. 183)

1933. *Gargara aurea* Funkhouser, *Indian Forest Rec.*, 27 : 8.

Female : General colour golden brown with brown black markings. Head subquadrate, black, finely punctate, sparsely hairy, 2.8X as wide across extremities of eyes as length of vertex, vertex about 1.75X as wide as long, upper margin arcuate, lower margins rounded; eyes large hemispherical pale white; ocelli small, vitreous, closer to eyes than to each other and situated above c-o line; frontoclypeus black, densely pilose, extending for two-thirds its length below lower margin of vertex, apex broadly rounded. Pronotum golden brown, with brown and black spots, finely punctate, densely pubescent with short, adpressed, golden hairs, dorsal median area a little convex; metopidium 2.0X as wide as high, with a dark brown fascia on either side of the faint median carina; humeral angles prominent, their apices blunt; posterior process robust, triangular, tricarinate, median carina faintly percurrent through metopidium, apical area black,

apex just passing the posterior angle of the inner margin of tegmina; tegmina hyaline, 2.5X as long as wide, basal third opaque, a transverse fascia following basal area, 1st apical cell 3.0X as long as wide, 1st discoidal cell not petiolate, about as long as 2nd, apical limb broad. Body beneath brown with black markings; legs pale yellow.

Length from frontal margin to tips of tegmina 3.0 mm., to tip of posterior process 2.2 mm.; width across tips of humeral angles 1.8 mm., at eyes 1.5 mm.

Male : Not known.

Material examined : One female in FRI., Dehra Dun, collected from Fraserpet, Coorg.

Distribution : INDIA : Karnataka State (Fraserpet, Coorg).

G. aurea is closely allied to *G. splendidula* Distant in the disposition of the posterior process and the median carina faintly percurrent through metopidium but differs in the general colour, the finely punctate pronotum, the hyaline tegmina with a white transverse fascia following the basal area and in the nature of frontoclypeus.

179. *Gargara brevis* Ananthasubramanian
(Fig. 184)

1980. *Gargara brevis* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Paper No. 16* : 32.

Female : General colour black. Head greyish black, 2.5X as wide across extremities of eyes as length of vertex, sprinkled with short, adpressed silvery hairs, vertex about 1.8X as wide as long, upper margin feebly arcuate, lower margins broadly rounded; eyes dark brown, subglobose; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus wider than long, densely pilose, extending for one-half its length below lower margins, greyish black, thickly pilose, metopidium black, about 2.0X as wide as high; disc slightly elevated, finely punctate; humeral angles prominent, their bases thickly pilose, apices blunt; posterior process short, extending only upto the 2nd anal vein, black, strongly tricarinate, median carina finely percurrent through metopidium, apex subacute, impinging on inner tegminal margins; tegmina light pinkish brown with yellowish veins, about 2.75X as long as wide, apex broadly rounded, apical limb broad, with a black spot opposite to the 3rd apical cell, another black patch on the posterior angle of the inner margin, 1st apical cell about 5.0X as long as wide, 1st discoidal cell petiolate, much shorter than the 2nd, in the type the median is delaminated and, with an incipient cross vein between subcostal and radial veins. Legs entirely dark brown. Abdomen black.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 2.4 mm.; width across tips of humeral angles 2.3 mm., at eyes 1.9 mm.

Male : Not known.

Material examined : Holotype female Z.S.I. Reg. No. 687/H15, from Belur, Howrah, 14-1-1966 (coll. T.R. Mitra and party).

Distribution : INDIA : West Bengal (Belur, Howrah district).

G. brevis is closely related to *G. tumida* Distant in the very short posterior process not passing the apex of clavus, but differs by the median carina finely percurrent, colour of lateral areas of sternum, colour and markings on the tegmina and the small size of body.

180. *Gargara caelata* Distant
(Fig. 185)

1916. *Gargara caelata* Distant, *Fauna Br. India*, 6 : 172.

Female : General colour black. Head somewhat deflected, about 2.7X as wide across extremities of eyes as length of vertex, thickly finely punctate, with short, sparse pilosity, vertex 2.0X as wide as long, upper margin strongly arcuate, lower margins broadly rounded; eyes large, subglobose, pale white with a hue of black, ocelli small, closer to eyes than to each other and situated above c-o line, frontoclypeus extending for one-third its length below lower margins of vertex, sparsely pilose, apex broadly rounded. Pronotum black, thickly finely punctate, its central carina castaneous red, metopidium obliquely sloping back to disc, about 1.75X as wide as high, finely punctate; humeral angles prominent, triangular, their apices subacute; posterior process stout, tricarinate, sinuate at base, moderately amplified at middle, the apex narrow, subacute, median carina strongly percurrent through metopidium; tegmina fuscous brown, 2.75X as long as wide, basal area dark brown, mottled with greyish, apical marginal area more distinctly greyish, 1st apical cell broad, wedge-shaped, about 3.0X as long as wide, 1st and 2nd discoidal cells of equal size, 1st discoidal cell petiolate, apical limb moderately broad. Body beneath black. Legs with apices of femora castaneous red, rest black.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 4.1 mm.; width across tips of humeral angles 2.5 mm., at eyes 2.2 mm.

Male : Not known.

Material examined : One female in FRI., Dehra Dun, collected from Nilgiri Hills; one female in Tamil Nadu Agricultural College, collected from Nilambur, Nilgiri Hills. Holotype female in British Museum.

Distribution : INDIA : Tamil Nadu (Nilgiri Hills).

G. caelata is very closely allied to *G. kandala* n.sp. in the nature of the pronotum and the posterior process, but differs by the tegmina which are fuscous brown, 1st and 2nd discoidal cells of equal size and by the petiolate condition of the 1st apical cell.

181. *Gargara confusa* Distant
(Fig. 186)

1916. *Gargara confusa* Distant, *Fauna Br. India*, 6 : 171.

Male : General colour black. Head vertical, greyish black, about 3.0X as wide across extremities of eyes as length of vertex, covered with white hairs sparsely arranged, vertex about 1.8X as wide as long, upper margin arcuate, lower margins more or less rounded; eyes hemispherical, pale white; ocelli small, much closer to eyes than to each other and situated above c-o line; frontoclypeus extending for one-half its length below lower margins of vertex, its apex broadly rounded. Pronotum black, very thickly punctate; metopidium nearly 2.0X as wide as high, gradually sloping backward to disc; humeral angles prominent, their apices subacute; posterior process slender, straight, gradually narrowed to apex, apex acute just reaching the apex of clavus, median carina finely percurrent through metopidium; tegmina about 3.0X as long as wide, greyish opaque, apical area much clouded with fuscous brown, 1st apical cell about 4.0X as long as wide, 1st discoidal cell shorter than the 2nd, not petiolate. Legs with femora (except their apices) black, apices of femora, whole of tibiae and claws testaceous, tarsi ochraceous.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 2.8 mm.; width across tips of humeral angles 2.0 mm., at eyes 1.8 mm.

Female : Not known.

Material examined : 3 males in Z.S.I. Calcutta, collected from suburbs. Lectotype male in British Museum; type locality; Calcutta.

Distribution : INDIA : West Bengal (Calcutta).

This species is closely related to *G. sikhimensis* Distant in the general colour, and nature of frontoclypeus, but differs by the smaller size, the more slender, unicolorous posterior process, and the colour and markings of the tegmina.

182. *Gargara contraria* Distant.

(Fig. 187)

1916. *Gargara contraria* Distant, *Fauna Br. India*, 6 : 170.

Female : General colour pale yellow. Head yellowish, about 3.0X as wide across extremities of eyes as length of vertex, densely pilose, vertex 2.0X as wide as long, upper margin arcuate, lower margins broadly rounded; eyes hemispherical, pale white; ocelli white, closer to eyes than to each other and situated above c-o line; frontoclypeus extending for two-thirds its length below lower margins of vertex, parallel-sided longly sparsely pilose; apex truncate. Pronotum broad, finely granulose, sparsely pilose; metopidium obliquely sloping to disc, about 2.0X as wide as high, light yellow; humeral angles subprominent, their apices subacute; posterior process somewhat broad, reaching the apex of clavus, median carina finely percurrent through metopidium; tegmina subhyaline, extreme basal angle and veins pale yellow, 1st apical cell wedge-shaped, 1st discoidal cell petiolate. Body beneath black, much greyish tomentose. Legs with femora reddish brown, tibiae and tarsi pale yellow.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 3.0 mm.; width across tips of humeral angles 1.9 mm., at eyes 1.7 mm.

Male : Not known.

Material examined : One female in Z.S.I., Calcutta, collected from Lahore. Holotype female in British Museum; type locality; Lahore.

Distribution : INDIA ; PAKISTAN (Lahore).

This species is allied to *G. citrea* Distant in general colour and size, but differs by the much less sinuate margins of the posterior process, different colour of tegmina, body beneath and legs.

183. *Gargara delimitata* Distant
(Fig. 188)

1908. *Gargara delimitata* Distant, *Fauna Br. India*, 4 : 66.

Female : General colour castaneous brown. Head vertical, about 2.8X as wide across extremities of eyes as length of vertex, finely palely pilose, vertex 1.9X as wide as long, upper margin strongly arcuate, lower margins broadly rounded; eyes subglobose, piceous, ocelli closer to eyes than to each other and situated well above c-o line; frontoclypeus extending for one-half its length below lower margins of vertex, its apex broadly rounded. Pronotum reddish brown, clothed with fine, pale white hairs; metopidium 2.0X as wide as high; humeral angles prominent, their apices subacute; posterior process straight, median carina very fine, almost obscurely continued through metopidium; tegmina subhyaline, 3.0X as long as wide, basal one-sixth punctate, pilose, coriaceous, oblique, piceous brown, a broad transverse piceous brown fascia just beyond middle, 1st apical cell wedge-shaped, about 3.0X as long as wide, 1st discoidal cell not petiolate, nearly as long as the 2nd. Legs castaneous-brown.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 2.9 mm.; width across tips of humeral angles 2.0 mm., at eyes 1.8 mm.

Male : Not known.

Material examined : 3 females in Z.S.I., Calcutta, collected from Margherita, Assam, 3-4-1964. Holotype female in British Museum, Type locality; Margherita (Assam).

Distribution : INDIA : Assam.

This species is closely related to *G. nigrolimbata* Ananthasubramanian in the nature of the posterior process the apex of which just reaches the apex of clavus and the median carina finely percurrent, but differs in the general colour, tegminal markings, non-petiolate 1st discoidal cell and the apex of frontoclypeus which is broadly rounded.

184. *Gargara discoidalis* Ananthasubramanian
(Fig. 189)

1980. *Gargara discoidalis* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Paper No. 16* : 30.

Female : General colour rusty brown. Head declivous, about 2.8X as wide across extremities of eyes as length of vertex, light brown, densely pilose with adpressed golden hairs, vertex 2.0X as wide as long, upper margin shallowly arcuate, lower margins broadly rounded; eyes subglobose, reddish brown; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus light brown, extending for one-half its length below lower margins of vertex, apex broadly rounded, longly pilose. Pronotum rusty brown, metopidium greyish brown, nearly 2.0X as wide as high, convex at basal half, and obliquely directed backward to disc, disc slightly convex and punctate, humeral angles prominent, their apices subacute, posterior process greyish brown, a little ampliate at middle, basally broad and tapering to apex which is subacute, black, passing well beyond the posterior angle of the inner margin of tegmina, median carina finely percurrent through metopidium; tegmina subhyaline about 2.25X as long wide, tip broadly rounded, apical limb broad, extreme base coriaceous and punctate, veins pinkish brown, R₁ and rs reddish brown, chitinised, forming an incipient pterostigma, 5 apical and 3 discoidal cells, 1st apical cell 10.0X as long as wide, 1st discoidal cell not petiolate, 2nd and 3rd discoidal cells of equal size. Legs light brown.

Length from frontal margin to tips of tegmina 3.8 mm., to tip of posterior process 2.8 mm.; width across tips of humeral angles 2.0 mm., at eyes 1.75 mm.

Male : Not known.

Material examined : Holotype female Reg. No. ZSI., 685/H15, from Manoharpur, Bihar 29-12-1967, coll. Raj Tilak.

Distribution : INDIA : Bihar (Manoharpur).

This species is closely related to *G. rustica* Ananthasubramanian and Ananthakrishnan in the general colour and shape of the metopidium and posterior process, but differs by the presence of an incipient pterostigma and a 3rd discoidal cell in the tegmina.

185. *Gargara extrema* Distant
(Fig. 190)

1916. *Gargara extrema* Distant, *Fauna Br. India*, 6 : 171.

1975. *Gargara extrema* : Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 246.

Female : General colour black. Head about 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, finely pilose, hairs silvery white, upper margin of

vertex arcuate, lower margins roundedly oblique; eyes hemispherical, reddish brown, ocelli succineous, a little closer to eyes than to each other and situated above c-o line; frontoclypeus longly sparsely pilose, extending for one-fourth its length below lower margins of vertex, apex truncate. Pronotum black, with shades of brown, finely pilose; metopidium 1.5X as wide as high, obliquely sloping backward to disc, finely pilose; supraocular callosities large, black, impunctate; humeral angles prominent, apices black, subacute; posterior process broadly triangular, centrally slightly sinuate, apex acute, black, passing beyond apex of clavus, median carina strongly percurrent through metopidium; tegmina 3.0X as long as wide, subhyaline, basal sixth punctate, dark reddish brown, costal margin narrowly black, thickened at R₁ apical limbus speckled with black spots, 1st apical cell about 6.0X as long as wide, 1st discoidal cell petiolate. Legs upto basal half of femora black, tibiae reddish brown, tarsi pale yellow with shades of black. Body beneath black.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 4.2 mm., width across tips of humeral angles 2.7 mm., at eyes 2.2 mm.

Male : Slightly smaller than female. General colour jet black. Tegmina with a narrow apical black band extending over apical limbus and a broad subapical band.

Length from frontal margin to tips of tegmina 5.6 mm., to tip of posterior process 4.0 mm., width across tips of humeral angles 2.7 mm., at eyes 2.2 mm.

Fifth instar nymph : General colour deep brown. Body robust, highly pilose; head vertical, about 2.5X as wide as long, tuberculate spines prominently projecting forward; pronotum high, sloping gradually backward, pronotal posterior process extending backward over the basal half of mesonotum, tuberculate spines on thoracic tergites stout, short; wing pads large, their apices reaching the abdominal segment III, costal angles distinctly demarcated, fringed with long bristles; lateral lamellae of abdominal segments III-VIII long, narrow, each bearing 4 or 5 long tuberculate spines directed backward; anal tube 0.2X as long as body. Length of body 4.5 mm.

Material examined : 40 females and 6 males along with many nymphs ex *Solanum melongena*, in Madras during October-December, 1967; 10 females 4 males ex *Acalypha wilkesiana*, in Ernakulam (Kerala), 1-1-1981; 5 females, 1 male ex *Terminalia catappa* in Trivandrum (Kerala), 2-1-1983; 25 females, 5 males and numerous nymphs ex *Bauhinia tomentosa*, in Bangalore (Karnataka), 5-6-1985. Holotype male in British Museum; type locality: Peradeniya (SRILANKA).

Distribution : INDIA (All over); SRILANKA.

This species is closely related to *rivulata* Distant in the nature of the frontoclypeus and posterior process, but differing in the pilosity of the body and markings on the tegmina.

186. *Gargara flavolineata* Distant
(Fig. 191)

1908. *Gargara flavolineata* Distant, *Fauna Br. India*, 4 : 65.

Female : General colour black. Head black, a little more than 3.0X as wide across extremities of eyes as length of vertex, finely pilose with pale white hairs, vertex 2.0X as wide as long, upper margin arcuate, lower margins roundedly continued to frontoclypeus; eyes large, hemispherical, pale white; ocelli closer to eyes than to each other and situated well above c-o line; frontoclypeus black, extending for three-fourths its length below lower margins of vertex, densely pubescent, apex truncate. Pronotum black, obscurely punctate, densely pilose, central area to posterior process and central carinate line to pronotum ferruginous-brown; humeral angles moderately developed; metopidium somewhat obliquely sloping; posterior process robust, somewhat obliquely continued to apex which is acuminate, reaching the posterior angle of the inner margin of tegmina, strongly tricarinate, median carina strongly percurrent through metopidium; tegmina subhyaline, wrinkled, devoid of fascia, nearly 3.0X as long as wide, basal sixth ferruginous-brown, opaque, R₁ long, 1st apical cell 4.5X as long as wide, 1st discoidal cell not petiolate, apical limbus broad. Body beneath black, densely palely pilose. Legs with femora (except their apices) black, apices of femora, tibiae and tarsi dark ochraceous.

Length from frontal margin to tips of tegmina 4.5 mm., to tip of posterior process 3.0 mm.; width across tips of humeral angles 2.0 mm., at eyes 1.8 mm.

Male : General colour ferruginous-brown. Apical margin of tegmina slightly fuscous; abdomen beneath highly pubescent.

Length from frontal margin to tips of tegmina 4.0 mm.; to tip of posterior process 2.8 mm., at humeral angles 1.8 mm., at eyes 1.7 mm.

Material examined : 1 male and 1 female in ZSI., Calcutta, collected from Ranchi.

Distribution : INDIA : Bihar (Ranchi).

G. flavolineata is closely related to *rivulata* Distant in the nature of the metopidium and posterior process, but differs by the markings on the tegmina.

187. *Gargara hraswa* nom. nov.

1870. *Centrotus minusculus* Walker, *Proc. Linn. Soc. London, Jl.*, 10 : 191.

1915. *Gargara minuscula* : Distant, *Ann. Mag. nat. Hist.*, 8(16) : 492.

1978. *Gargara minuscula* : Ananthasubramanian, *Entomon*, 3(2) : 291 (Junior homonym).

Gargara hraswa nom. nov. (Present work).

Female : General colour grey or dark brown. Head vertical, about 2.5X as wide across extremities of eyes as length of vertex, vertex 1.9X as wide as long, finely punctate, sparsely covered with golden hairs, upper margin arcuate, lower margins obliquely continued to frontoclypeus; eyes subglobose, reddish brown; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus densely pilose, extending for half its length below lower margins of vertex, apex broadly rounded. Pronotum dark brown laterally and light brown

medially, densely pilose; metopidium dark brown, vertical upto one-third its height and then obliquely continued backward to disc; supraocular callosities black, rather concealed by pilosity from surrounding areas; humeral angles light brown, subprominent, blunt; posterior process broad at base, gradually narrowing to apex, apex acute, passing beyond the anal angle of tegmina, median carina percurrent through metopidium; tegmina 2.3X as long as wide, hyaline, basal area dark brown, coriaceous, punctate, veins yellowish brown, apical limb broad, 1st and 2nd discoidal cells of equal length. 1st discoidal cell not petiolate. Lateral areas of abdomen punctate; ovipositor dark brown. Legs with coxae and trochanters dark brown, rest light brown.

Length from frontal margin to tips of tegmina 3.0 mm., to tip of posterior process 2.2 mm.; width across tips of humeral angles 1.9 mm., at eyes 1.48 mm.

Male : General colour as in female. Pilosity of body denser. Genitalia as figured.

Fifth instar nymph : General colour dull yellowish brown, sprinkled with black dots over the bases of tuberculate spines. Head directed downward, vertex 2.5X as wide as long, slightly convex at base, fringed with tuberculate spines, upper margin sinuate, lower margins obliquely rounded; frontoclypeus not extending below lower margins of vertex; ocelli inconspicuous; eyes subprominent; apex of rostrum extending upto abdominal segment I; metopidium convex and backwardly sloping to disc; pronotal posterior process nearly 0.5X as long as pronotum, its apex subacute and passing over the basal half of mesonotum; wing pads light brown, costal angles not distinct. Abdomen with dorsal tubercles well developed, each tubercle tipped with a long spine and a cluster of small spines emerging from base; lateral lamellae on abdominal segments III-VIII conspicuous, each fringed with 5 to 6 tuberculate spines besides short spines; anal tube about 0.25X as long as body. Length of body 2.7 mm.

Material examined : 24 females 4 males, 10 fifth instar nymphs ex *Moringa oleifera*, in Madras, August, 1977; 2 females ex *Bauhinia purpurea*, 20-3-1987 in Ernakulam (Kerala). Types in National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Tamil Nadu (Madras), Kerala (Ernakulam).

G. hraswa which is one of the very small species of the genus, is closely related to *G. madrasensis* Ananthasubramanian and Ananthakrishnan in the nature of the metopidium and the small size of the body, but it differs by the nonpetiolate nature of the 1st discoidal cell of the tegmina.

188. *Gargara kandala* n.sp.

Female : General colour yellowish brown. Head brown with shades of yellow, about 3.0X as wide across extremities of eyes as length of vertex, finely pilose, vertex 2.0X as wide as long, upper margin strongly arcuate, lower margins somewhat obliquely continued to frontoclypeus; eyes subglobose, pale white, ocelli about equidistant from each other and from eyes and situated above c-o line; frontoclypeus sparsely longly pilose, extending for half its length below lower margins of vertex, apex broadly rounded. Pronotum coarsely punctate, with dense pubescence.

metopidium about 2.0X as wide as high, punctate, sparingly pilose, somewhat vertical to about half its height from vertex, then obliquely continued backward to disc; humeral angles moderately developed, their apices blunt; posterior process tricarinate, more or less sinuate at base, broader at middle, narrow at apex, apex black, acuminate, distinctly passing the apex of clavus, median carina strongly percurrent through metopidium; tegmina hyaline, 3.0X as long as wide, 1st apical cell 5.5X as long as wide, 1st discoidal cell much shorter than the 2nd, petiolate, apical margin hyaline. Body beneath greyish brown. Legs with femora (except their apices) black, apices of femora, tibiae and tarsi light brown.

Length from frontal margin to tips of tegmina 3.4 mm., to tip of posterior process 2.9 mm., width across tips of humeral angles 1.8 mm., at eyes 1.6 mm.

Male : Not known.

Fifth instar nymph : General colour light brown with shades of grey. Body subcylindrical, 3.2 mm. long; head inclined backward, about 2.0X as wide as long, eyes large, greyish black; ocelli inconspicuous; rostrum extending to the abdominal segment III. Pronotum densely pilose, metopidium sloping backward, pronotal posterior process gradually tapering, apex acute, passing over mesonotum; mesonotal process nearly as long as pronotal process; wing pads greyish brown, extending backward as far back as abdominal segment V, costal angles broadly rounded. Abdominal segments slightly telescoped, dorsal tubercles prominent, suberect, lateral lamellae of segments III-VIII large, each bearing about 8 thin spines mounted on tubercles; anal tube 0.2X as long as body, stout and cylindrical, with longitudinal rows of spines on tubercles.

Material examined : Holotype female and 2 female paratypes, one 5th instar neponotype, ex *Prosopis juliflora*, in Kandala scrub jungle, Bombay, 30-12-1981; types deposited in National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Maharashtra (Bombay).

G. kandala is allied to *caelata* Distant in the nature of the pronotum and posterior process, but differs in the colour of tegmina which is without fascia or spots, and the very short 1st discoidal cell which is petiolate.

189. *Gargara maculata* Funkhouser
(Fig. 194)

1936. *Gargara maculata* Funkhouser, *Ann. ent. Am.*, 29 : 249.

Female : General colour black. Head slightly deflected, subquadrate, 2.8X as wide across extremities of eyes as length of vertex, black, finely punctate, thickly pilose hairs short, golden yellow, vertex about 2.0X as wide as long, upper margin arcuate, lower margins rounded and somewhat flaring; eyes large, pale white; ocelli vitreous, equidistant from each other and from eyes and situated well above c-o line; frontoclypeus densely longly pilose, extending for more than half its length below lower margins of vertex, its apex broadly rounded. Pronotum black,

finely punctate, densely pubescent with golden hairs; metopidium 2.0X as wide as high, basal third nearly vertical, upper two-thirds gradually sloping backward to disc; humeral angles subprominent, triangular, apices obtuse; posterior process heavy, tectiform, slightly sinuate at base and arcuate near middle, apex acuminate, just reaching the apex of clavus; lateral basal areas of scutellum exposed; tegmina hyaline 2.0X as long as wide basal sixth black, coriaceous and punctate, a brown spot on apical margin just behind tip of posterior process, and another one on apex of tegmina, veins of discoidal area brown, costal and apical veins sparsely pilose, 1st apical cell about 4.0X as long as wide, 1st discoidal cell petiolate, apical limb broad. Lateral areas of thorax cretaceously sericeous, body beneath black, pilose. Legs ferruginous.

Length from frontal margin to tips of tegmina 4.75 mm., to tip of posterior process 3.2 mm.; width across tips of humeral angles 2.5 mm., at eyes 2.0 mm.

Male : Not known. (Funkhouser's type in the British Museum is found to be a female).

Material examined : 2 females ex *Bauhinia tomentosa*, in Andamans 9-2-1985. Holotype female in British Museum; type locality Andaman Is.

Distribution : INDIA : Andamans.

G. maculata is closely allied to *G. madrasensis* Ananthasubramanian and Ananthakrishnan in the general colour and tegminal venation, but differs by the large size and the characteristic markings on the tegmina.

190. *Gargara madrasensis* Ananthasubramanian and Ananthakrishnan
(Fig. 195)

1975. *Gargara madrasensis* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68: 244.

Female : General colour black. Head vertical, more than 2.5X as wide across extremities of eyes as length of vertex, vertex about 1.6X as wide as long, finely punctate, densely pilose with pale yellowish hairs, upper margin shallowly arcuate, lower margins obliquely continued to frontoclypeus; eyes subglobose, light brown; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus densely pilose; metopidium convexly obumbrant and sloping backward to disc; supraocular callosities conspicuous, entire; humeral angles subprominent, their apices blunt; posterior process broad at base, gradually tapering to apex which is acute and reaches the apex of clavus, median carina finely percurrent through metopidium; scutellum aborted centrally, basal lateral areas exposed, punctate, densely pilose; tegmina 2.5X as long as wide, hyaline, basal fifth dark brown, coriaceous and punctate, veins light brown, sparsely hairy, 2nd discoidal cell about 2.3X as long as the 1st which is petiolate. Thoracic lateral areas and tergites of abdomen punctate, light brown. Legs light reddish brown.

Length from frontal margin to tips of tegmina 2.75 mm., to tip of posterior process 2.0 mm., width across tips of humeral angles 1.75 mm., at eyes 1.5 mm.

Male : Smaller. General colour dark brown, more densely pilose; eyes pale white; subgenital plate dark brown.

Length from frontal margin to tips of tegmina 2.3 mm., to tip of posterior process 1.5 mm.; width across tips of humeral angles 1.4 mm., at eyes 1.1 mm.

Fifth instar nymph : General colour deep brown. Head directed downward, 2.0X as wide as long, vertex with tuberculate spines directed forward, ocelli obscure, eyes subprominent, dull black; pronotum with dorsal tuberculate spines directed backward, metopidium sloping backward; pronotal posterior process as long as pronotum, extending over the entire length of mesonotum, its apex acute; wing pads yellowish brown, costal margins not demarcated; abdomen with dorsal tubercles well developed, each tubercle being tipped with a long spine besides a cluster of small spines at the base; lateral lamellae of abdominal segments III-VIII short, semicircular, each bearing 5-7 tuberculate spines; anal tube nearly 0.2X as long as body. Length of body 3.0 mm.

Material examined : 14 females 5 males, 4 fifth instar nymphs ex *Caesalpinia pulcherrima*, in Madras, 1-8-1967.

Distribution : INDIA : Tamil Nadu (Madras).

The species is closely related to *G. hraswa* Ananthasubramanian in the nature of the metopidium and size of body, but differs by the petiolate 1st discoidal cell of tegmina which is much smaller than the 2nd.

191. *Gargara majuscula* Distant
(Fig. 196)

1908. *Gargara majuscula* Distant, *Fauna Br. India*, 4 : 61.

Female : General colour black with a hue of grey. Head 2.6X as wide across extremities of eyes as length of vertex, finely punctate, finely pilose, hairs greyish white, vertex 1.7X as wide as long, upper margin arcuate, lower margins more or less rounded; eyes large, pale white; ocelli conspicuous, glossy, closer to eyes than to each other and situated above c-o line, frontoclypeus sparsely longly pilose, extending for three-fourths its length below lower margins of vertex, apex truncate. Pronotum black, granulate, thickly finely punctate; metopidium slightly convex, pilose; humeral angles prominent, their apices extending beyond eyes and subacute; posterior process tricarinate, apex acute and extending distinctly beyond the anal angle of the tegmina, median carina very obscurely continued through metopidium; tegmina pale bronzy, ochraceous, wrinkled, 2.75X as long as wide, 1st discoidal cell shorter than 2nd, not petiolate, apical limb narrow. Body beneath and legs greyish pilose.

Length from frontal margin to tips of tegmina 8.0 mm., to posterior process 6.1 mm.; width across tips of humeral angles 4.0 mm., at eyes 2.75 mm.

Male : Similar to female but smaller and darker. General colour jet black. Posterior process slightly shorter.

Length from frontal margin to tips of tegmina 7.0 mm., to tip of posterior process 4.8 mm., width across tips of humeral angles 3.5 mm., at eyes 2.5 mm.

Material examined : 1 female and 1 male in ZSI., Calcutta, collected from Pashok, Darjeeling, June, 1916 (L.C. Hartless). Holotype female in British Museum.

Distribution : INDIA : West Bengal (Darjeeling), Sikkim.

This is the largest species of *Gargara* which is closely related to *sikhimensis* in the nature of the posterior process with the median carina very obscurely continued through the metopidium and well developed humeral angles, but differs in the larger size, granulose pronotum and markings on the tegmina.

192. *Gargara malabarica* Ananthasubramanian and Ananthakrishnan
(Fig. 197)

1975. *Gargara malabarica* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68: 248.

Female : General colour ochraceous brown. Head vertical, about 3.0X as wide across extremities of eyes as length of vertex, black with shades of brown, vertex 2.0X as wide as long, upper margin shallowly arcuate, lower margins obliquely continued to frontoclypeus; eyes dark brown; ocelli closer to eyes than to each other and situated slightly above c-o line; frontoclypeus extending for half its length below lower margins of vertex, apex broad, truncate. Pronotum dark brown; darker on carinae and apical fourth of posterior process; metopidium 2.0X as wide as high, convex and sloping backward to disc; supraocular callosities inconspicuous; humeral angles prominent, light brown, tips blunt; posterior process strongly tricarinate, apex acute, passing well beyond the posterior angle of the inner margin of tegmina, apical fourth jet black, median carina finely percurrent through metopidium; scutellum aborted centrally, lateral basal areas punctate and tomentose; tegmina hyaline, 2.4X as long as wide, basal fifth reddish brown, a distinct reddish brown patch on R_1 and rs , a lighter spot at anal angle; 1st apical cell 2.0X as long as the 2nd. Lateral areas of thorax densely white tomentose. Legs reddish brown except coxae which are black. Abdominal tergites dark brown, genital plates densely pubescent.

Length from frontal margin to tips of tegmina 4.5 mm., to tip of posterior process 3.4 mm., width across tips of humeral angles 2.2 mm., at eyes 2.0 mm.

Male : Smaller and darker. Upper margin of vertex arcuate and sinuate; frontoclypeus extending for one-third its length below lower margins of vertex. Pronotum finely punctate with closely adpressed pale yellow hairs, tip of posterior process jet black, extending well beyond the apex of clavus; tegmina nearly 2.5X as long as wide, 1st apical cell 4.0X as long as wide, discoidal cells subequal, reddish brown patch at R_1 less conspicuous than in female, apical limbus broad. Genitalia with subgenital plate cleft to about one-half its length, divided lobes diverging, their apices broadly rounded, sparsely pilose, parameres hook-like and recurved, lateral valves triangular, their process obsolete, shape of anal ring and connective as in the figure.

Fifth instar nymph : General colour greyish brown. Head directed backward, 2.0X as wide as long; eyes large, black; ocelli inconspicuous; pronotum densely pilose dorsally, metopidium obliquely sloping backward to disc; posterior pronotal process extending over three-fourths the length of mesonotum, its apex acute; mesonotal process obsolete; metanotum about one-third as long as mesonotum; wing pads large, extending as far back as abdominal segment IV, claval area well demarcated, costal margin dark brown, costal angles broadly rounded and not sharply demarcated. Abdomen densely pilose, dorsal tubercles prominent, lateral lamellae of abdominal segments III-VIII of moderate length, each bearing 5 or 6 tuberculate spines; anal tube 0.2X as long as body, stout, nearly cylindrical, bearing longitudinal rows of tuberculate spines. Body length 4.0 mm.

Material examined : 8 females, 7 males and 10 fifth instar nymphs ex *Vitex neundo* in Walayar forests, 1-12-1967; Palghat, 3-12-1967. Types in National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Kerala State.

This species is nearest to *extrema* Distant in the nature of posterior process and in the position of ocelli and nature of metopidium, but differs by the median carina which is finely percurrent; in the length to width ratio of the tegmina, discoidal cells and also in the markings on the tegmina the two species show differences.

193. *Gargara mixta* (Buckton)
(Fig. 198)

1903. *Meropa mixta* Buckton, *Monoqr. Membrac.* 257.

1903. *Gargara variegata* Melichar, *Hom. Faun. Ceylon* : 123.

1908. *Gargara mixta* Distant, *Fauna Br. India*, 4 : 65.

1975. *Gargara mixta* Ananthasubramanian and Ananthakrishnan, *Rec. zool. Surv. India*, 68 : 240.

Female : General colour light brown. Head 2.5X as wide across extremities of eyes as length of vertex, finely punctate with adpressed golden pilosity, vertex 1.5X as wide as long, upper margin almost planate, lower margins obliquely continued to frontoclypeus, eyes reddish brown, subglobose; ocelli closer to eyes than to each other and situated on c-o line; frontoclypeus greyish brown, extending for one-half its length below lower margins of vertex, apex truncately rounded. Pronotum thickly ochraceously pilose, light brown; metopidium 1.75X as wide as high, obliquely sloping backward to disc; supraocular callosities small, undivided, bare; humeral angles short, their apices black subacute, just reaching the posterior angle of the inner margin of tegmina, median carina finely continued on metopidium; scutellum 2.5X as wide as long, centrally aborted, deeply excavated strongly chitinised at lateral areas, apices acute; tegmina 3.0X as long as wide, greyish semiopaque, base and costal area ochraceous, in some specimens hyaline, R_1 oblique to subcosta, forming with rs the base for the 1st apical cell, veins thick, 1st apical cell narrow, about as long as the 2nd. Legs shaded with black upto basal half of femora, tibiae reddish brown, tarsi light brown. Body beneath dark brown.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 4.3 mm., width across tips of humeral angles 2.6 mm., at eyes 2.4 mm.

Male : Smaller than female. Pronotum jet black, tips of posterior process black; tegmina hyaline, costal margin shaded with black, apical sixth including apical limb black, in some specimens a subapical narrow transverse fascia. Genitalia as figured.

Length from frontal margin to tips of tegmina 4.5 mm., to tip of posterior process 3.3 mm., width across tips of humeral angles 2.3 mm., at eyes 2.0 mm.

Fifth instar nymph : General colour pale green with castaneous patches sprinkled over tergites; head directed backward, vertex about 2.0X as wide as long, planate at base, thickly pilose with chalazae and tuberculate spines, lower margins broadly rounded; frontoclypeus densely pilose; ocelli inconspicuous; apical area of rostrum reaching the metasternum. Thorax triangular in cross section; metopidium convex and backwardly sloping to disc; pronotal posterior process bluntly acute, extending over half the length of mesonotum, supraocular callosities obscure; mesonotum with a pair of stout, lateral tubercles, mesonotal process produced over basal area of metanotum; tegminal wing pads well developed, their costal angles broadly rounded and confluent with costal margin. Abdomen narrow at the level of segment II, dorsal tubercles long, bearing long spines arranged characteristically, posterior margins of abdominal tergites with a pair of dorsolateral tuberculate spines and a row of smaller spines; anal tube nearly 0.2X as long as body, bearing long longitudinal rows of tuberculate spines; genital rudiments black. Length from frontal margin to tips of anal tube 5.0 mm.

Material examined : 40 females, 10 males, many nymphs of all stages ex *Lagerstroemia sp.* and *Syzygium jambolanum*, in Madras, 10-30/12/1966. Lectotype female in British Museum.

Distribution : INDIA : all over; SRILANKA (Colombo); BURMA (Tenasserim); BORNEO; CHINA.

G. mixta is closely related to *G. contraria* Distant in the apex of posterior process just reaching the posterior angle of the inner margin of tegmina, the median carina finely percurrent through metopidium and the tegmina, (in female) not marked by fasciae or spots, but differs by the nonsinuate basal part of posterior process, apex of frontoclypeus truncated, rounded and the nonpetiolate 1st discoidal cell of tegmina.

194. *Gargara nigrofasciata* Stål
(Fig. 199)

1870. *Gargara nigrofasciata* Stål, *Hem. Phil* : 729.

Female : General colour black. Head vertical, about 3.0X as wide across extremities of eyes as length of vertex, greyish black, clothed with silvery white hairs, upper margin feebly arcuate, lower margins broadly rounded; eyes subglobose, pale white; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus as wide as long, densely pilose, extending

for two-thirds its length below lower margins of vertex, apex truncate. Pronotum black, nongranulose, densely pilose, metopidium 2.0X as wide as high, obliquely sloping backward to disc; humeral angles subprominent, apices subacute; posterior process narrow, gradually tapering to an acute apex which reaches the posterior angle of the inner margin of tegmina, median carina obscure on metopidium. Tegmina 3.0X as long as wide, vitreous hyaline, reflecting the black body beneath, basal sixth black coriaceous, a median black transverse fascia prominent, 1st apical cell 4.0X as long as wide, 1st discoidal cell shorter than the 2nd, petiolate, apical limb broad. Legs with basal areas of femora black, apices of femora, whole length of tibiae and tarsi testaceous.

Length from frontal margin to tips of tegmina 2.3 mm., to tip of posterior process 2.3 mm.; width across tips of humeral angles 1.5 mm., at eyes 1.0 mm.

Male : Not known.

Material examined : One female in ZSI., Calcutta, from Talewadi, near Castle Rock, Bombay, Oct. 3, 1916 (S. Kemp).

Distribution : INDIA : Maharashtra (Bombay).

G. nigrofasciata is closely allied to *G. sikhimensis* Distant in the pronotum densely pilose and nongranulose and the median carina of posterior process obscure on metopidium, but differs by the small size, by the shape of posterior process and by markings on the tegmina.

195. *Gargara nigrolimbata* Ananthasubramanian
(Fig. 200)

1980. *Gargara nigrolimbata* Ananthasubramanian, *Rec. zool. Surv. India, Occ. Paper No. 16* : 31.

Male : General colour dark brown. Head reddish brown, nearly 3.0X as wide across extremities of eyes as length of vertex, thickly pilose, vertex about 2.0X as wide as long, its upper margin arcuate, lower margins broadly rounded toward frontoclypeus; eyes subglobose, dark brown; ocelli brown, closer to eyes than to each other and situated on c-o line; frontoclypeus extending for half its length below lower margins of vertex, its apex nearly truncate. Pronotum dark brown, lateral aspects cretaceously sericeous, metopidium convex, finely punctate, with silvery hairs, humeral angles moderately large, apices blunt; supraocular callosities jet black, divided; posterior process black, not raised above the level of disc, rather parallel-sided upto three-fourths its length, apex subacute, reaching the posterior angle of the inner margin of tegmina, lateral carina obscure on pronotum, median carina finely percurrent through metopidium; tegmina about 2.45X as long as wide, fuscous brown, mottled with black on veins bordering 2nd apical cell; apical limb broad, mottled with black patches, 1st apical cell 8.0X as long as wide, 1st discoidal cell petiolate, much smaller than the 2nd. Legs upto femora dark brown, rest greyish brown. Abdomen dark brown.

Length from frontal margin to tips of tegmina 4.4 mm., to tip of posterior process 2.8 mm.; width across tips of humeral angles 2.6 mm., at eyes 2.2 mm.

Female : Not known.

Material examined : Holotype male Reg. No. ZSI., 686/H15, from Wakro, North East Frontier Agency, Jan., 1970; coll. J.M. Julka.

Distribution : INDIA.

G. nigrolimbata is closely allied to *albitarsis* Ananthasubramanian and Ananthakrishnan in the general colour, nature of the posterior process and the petiolate 1st discoidal cell of tegmina but differs in the markings of tegmina, especially the apical limbus mottled with black patches.

196. *Gargara pellucida* Ananthasubramanian
(Fig. 201)

1980. *Gargara pellucida* Ananthasubramanian, *Entomon*, 5(2) : 24.

Female : General colour greyish brown. Head about 3.0X as wide across extremities of eyes as length of vertex, densely covered with golden yellow hairs, upper margin of vertex arcuate, lower margins broadly rounded to frontoclypeus; eyes subglobose, pale yellow; ocelli black, slightly closer to eyes than to each other and situated above c-o line; frontoclypeus greyish brown, extending for half its length below lower margins of vertex, apex truncate. Pronotum greyish brown; metopidium 2.0X as wide as high, punctate, with short golden pilosity, obliquely continued backward to disc; humeral angles moderately prominent, pale brown, their posterior angles rounded, apices blunt; posterior process arising horizontally from behind disc, tricarinate, median carina percurrent through metopidium, apex black, acute, just passing the anal angles of tegmina; scutellum 2.0X as wide as long, deeply excavated, incompletely chitinised in middle, punctate laterally; tegmina hyaline, somewhat reflecting the body beneath, 3.0X as long as wide, basal sixth coriaceous, 1st discoidal cell petiolate, petiole short, 2nd discoidal cell as long as the 1st, apical limbus narrow. Legs yellowish brown.

Length from frontal margin to tips of tegmina 4.4 mm., to tip of posterior process 3.3 mm., width across tips of humeral angles 2.3 mm., at eyes 2.15 mm.

Male : Not known.

Material examined : Holotype female and 2 paratype females ex *Gymnosporia montana*, in Palghat (Kerala), 10-10-1973; type in National Pusa collections, IARI., New Delhi.

Distribution : INDIA : Kerala State (Palghat).

This species is closely related to *rustica* Ananthasubramanian and Ananthakrishnan in the distinct jet black apex of posterior process and the hyaline tegmina, but differs by the presence of

a short petiole for the 1st discoidal cell of tegmina which is of equal length to 2nd discoidal cell, the narrow apical limbus and the absence of tomentosity on the lateral areas of thorax.

197. *Gargara penangi* Funkhouser
(Fig. 202)

1918. *Gargara penangi* Funkhouser, *J. Br. Asiatic Soc.*, 79 : 11.

Female : General colour dark brown. Head light brown, about 3.0X as wide across extremities of eyes as length of vertex, thickly pilose, vertex 2.0X as wide as long, upper margin strongly arcuate, lower margins rounded; eyes subglobose, pale white; ocelli small, black, closer to eyes than to each other and situated well above c-o line; frontoclypeus densely pilose, black, extending for about half its length below lower margins of vertex, apex broadly rounded. Pronotum dark brown, thickly pubescent, finely punctate; metopidium, brown, finely punctate with short, pale white hairs, about 1.75X as wide as high, gradually obliquely sloping backward to disc; humeral angles prominent, blunt; posterior process robust, tricarinate, constricted at base, middle strongly swollen and carinate, abruptly narrowed at apical area, apex acute, passing distinctly the apex of clavus, median carina obsolete or almost obscure anteriorly; tegmina amber-hyaline, nearly 3.0X as long as wide, basal sixth dark brown, punctate, coriaceous, pilose, with an irregular brown subapical transverse band, veins stout, pilose, 1st apical cell about 4.5X as long as wide, 1st discoidal cell as long as the 2nd, without petiole, apical limbus broad. Body beneath dark brown. Legs with femora dark brown, tibiae and tarsi light brown.

Length from frontal margin to tips of tegmina 4.5 mm., to tip of posterior process 3.4 mm., width across tips of humeral angles 2.1 mm., at eyes 1.8 mm.

Male : Smaller, general colour dark brown with the black hue more prominent on pronotum; subapical transverse band on tegmina rather obscure.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 3.1 mm.; width across tips of humeral angles 1.9 mm., at eyes 1.75 mm.

Material examined : 7 females and 2 males in FRI., Dchra Dun, collected from Salem and Coorg.

Distribution : INDIA : Tamil Nadu (Salem), Karnataka (Coorg); MALAYSIA; Penang; BORNEO.

G. penangi is closely related to *G. affinis* Distant in the general colour, colour of tegmina and the disposition of the posterior process, the dorsal carina of which is obscure on the pronotum, but it differs by the posterior process having a constriction at base, strongly swollen at middle and abruptly narrowed apically, and also by the presence of a conspicuous subapical transverse fascia on the tegmina.

198. *Gargara pulchripennis* Stål.
(Fig. 203)

1870. *Gargara pulchripennis* Stål, *ofv. Vet.-Ak. Forh.*, 27 : 729.

Female : General colour dark brown. Head ferruginous, 2.8X as wide across extremities of eyes as length of vertex, finely covered with pale white hairs, vertex about 1.9X as wide as long, upper margin strongly arcuate, lower margins slightly obliquely continued to frontoclypeus; eyes large, projecting laterad; ocelli vitreous, closer to eyes than to each other and situated above c-o line; frontoclypeus dark brown, densely pubescent, extending only slightly below lower margins of vertex, apex broadly rounded. Pronotum ferruginous, finely punctate, with short, adpressed pilosity; metopidium 2.0X as wide as high; supraocular callosities prominent, undivided; humeral angles prominent, projecting laterally well beyond eyes, their apices subacute; posterior process broad, tectiform, apex blunt, just reaching the apex of clavus, median carina strongly percurrent through metopidium, lateral carinae rather obscure; tegmina about 3.0X as long as wide, fuscous with shades of black, 3 transverse bands separated by whitish more or less confluent and checkered areas, 1st apical cell about 5.0X as long as wide, 1st discoidal cell subequal to the 2nd, not petiolate. Legs ferruginous.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 2.75 mm.; width across tips of humeral angles 2.0 mm., at eyes 1.7 mm.

Male : Similar to female in size and measurements. General colour ferruginous with shades of black; tegmina fuscous black with the transverse fascia more or less confluent.

Material examined : 1 female in ZSI., Calcutta: 11 females and 6 males in FRI., Dehra Dun.

Distribution : INDIA; Tamil Nadu (Aiyur, Salem), Karnataka (Fraserpet, Coorg); PHILIPPINES.

The species is closely allied to *flavolineata* Distant in the disposition of the posterior process and tegminal venation, but differs in the general colour, frontoclypeal apex and more particularly in the characteristic markings on the tegmina.

199. *Gargara pulniensis* Ananthasubramanian
(Fig. 204)

1980. *Gargara pulniensis* Ananthasubramanian, *Entomon*, 5(2) : 125.

Female : General colour greyish brown shaded with black on disc and apex of posterior process. Head greyish brown, about 2.4X as wide as long, vertex 1.5X as wide as long, its upper margin nearly planate, lower margins rounded and continued to frontoclypeus; eyes subglobose, reddish brown; ocelli dull black, closer to eyes than to each other and situated on c-o line; frontoclypeus extending for three-fourths its length below lower margins of vertex, apex broadly rounded. Pronotum finely punctate, with short, adpressed golden pilosity; metopidium 1.4X as

wide as high, convex at base, gradually sloping behind to disc; supraocular callosities irregularly broken, black, bare; humeral angles greyish brown, projecting well beyond eyes laterally, apices subacute; posterior process slightly ampliate, greyish brown at middle, tricarinate, median carina finely percurrent through metopidium, apex acuminate, black, reaching the posterior angle of the inner margin of tegmina; tegmina 3.0X as long as wide, basal sixth coriaceous, rest hyaline with a greyish brown transverse fascia across the apical cells, apical limbus broad, shaded with black, costal margin and R_1 thickened, apical veins slightly curved, 1st discoidal cell not petiolate, equal in length to the 2nd. Legs greyish brown.

Length from frontal margin to tips of tegmina 4.7 mm., to tip of posterior process 3.1 mm.; width across tips of humeral angles 2.0 mm., at eyes 1.8 mm.

Male : Not known.

Material examined : Holotype female and one female paratype, ex *Ventilago* sp., in Pulney Hills (6,000 ft.) 11-4-1977, collected by Dr. S. Varadarasan. Types in National Pusa collection, IARI., New Delhi.

Distribution : INDIA : Tamil Nadu (Pulney Hills).

G. pulniensis is closely allied to *G. albitarsis* Ananthasubramanian in the presence of a dark transverse fascia on the tegmina, but differs by the absence of petiole for the 1st discoidal cell of tegmina, position of ocelli and colour of legs.

200. *Gargara rivulata* Distant (Fig. 205)

1908. *Gargara rivulata* Distant, *Fauna Br. India*, 4 : 64.

Female : General colour black. Head black, finely palely hairy, 3.0X as wide across extremities of eyes as length of vertex, vertex 2.25X as wide as long, finely pilose, upper margin arcuate, lower margins rounded; eyes hemispherical, dull black; ocelli glossy, closer to eyes than to each other and situated above c-o line; frontoclypeus sparsely finely pilose, extending for about two-thirds its length below lower margins of vertex, apex truncate. Pronotum black, finely granulose; metopidium 2.0X as wide as high, finely granulose, obliquely continued behind to disc; posterior process robust, tricarinate, tapering to apex, apex acute, just passing the apex of the clavus, median carina finely percurrent through metopidium; tegmina subhyaline, veins of apical third of claval area black, apical margin black, a subapical transverse black band, apical limbus broad, 1st apical cell 5.0X as long as wide, 1st and 2nd discoidal cells subequal, 1st discoidal cell not petiolate. Body beneath black. Legs upto tibiae black, tarsi brownish ochraceous.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 4.3 mm.; width across tips of humeral angles 3.0 mm., at eyes 2.7 mm.

Male : Similar to female. General colour jet black; the transverse subapical band on tegmina broader and darker. Abdomen very narrow, genitalia typical for the genus.

Material examined : 3 females and 2 males in Tamil Nadu Agricultural University, collected from Sikkim, January, 1927. Holotype female in British Museum.

Distribution : INDIA : Sikkim; JAVA.

G. rivulata is closely related to *G. extrema* Distant in the nature of the frontoclypeus and posterior process, but differs in the pilosity of the body and markings of the tegmina.

201. *Gargara robusta* Distant
(Fig. 206)

1908. *Gargara robusta* Distant, *Fauna Br. India*, 4 : 61.

Female : General colour black. Head black, about 2.9X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, upper margin strongly arcuate, lower margins broadly rounded; eyes greyish white; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus sparsely pilose, nearly semicircular, extending for half its length below lower margins of vertex, apex broadly rounded. Pronotum black, thickly coarsely punctate, sparingly pilose; metopidium gradually sloping backward to disc, about 1.5X as wide as high; humeral angles prominent, their apices subacute; posterior process robust, broad at base, tricarinate, median carina finely continued through metopidium, apex subacute, just reaching the apex of clavus; tegmina subhyaline, wrinkled, reflecting the black body beneath, basal area black, punctate, a brown transverse band at apical margin and a brown spot behind claval apex, 1st apical cell based on rs, about 4.0X as long as wide, discoidal cells subequal, 1st discoidal cell without petiole. Legs with femora (except their apices) black, apical areas of femora, tibiae and tarsi ochraceous.

Length from frontal margin to tips of tegmina 3.5 mm., to tip of posterior process 2.0 mm., width across tips of humeral angles 1.7 mm., at eyes 1.5 mm.

Male : Similar to female; the brown transverse band at apical margin of tegmina more pronounced than in female.

Material examined : 2 females and 1 male in FRI., Dehra Dun, collected from Dehra Dun; 1 female in ZSI, Calcutta.

Distribution : INDIA; Uttar Pradesh (Dehra Dun), West Bengal (Calcutta): BORNEO.

G. robusta is closely related to *G. confusa* Distant in the coarsely punctate pronotum and pronotal posterior process, but differs by the stout and robust posterior process which just reaches the apex of the clavus and the subequal discoidal cells.

202. *Gargara rustica* Ananthasubramanian and Ananthkrishnan
(Fig. 207)

1975. *Gargara rustica* Ananthasubramanian and Ananthkrishnan, *Rec. zool. Sur. India*, 68 : 251.

Female : General colour rusty brown. Head declivous, about 2.5X as wide across extremities of eyes as length of vertex, vertex about 1.75X as wide as long, upper margin shallowly arcuate, lower margins obliquely continued to frontoclypeus; eyes subglobose, dark brown; ocelli jet black, slightly closer to eyes than to each other and situated well above c-o line; frontoclypeus greyish brown, extending for one-third its length below lower margins of vertex, apex broadly rounded and fringed with pale yellow hairs. Pronotum reddish brown; metopidium convex, coarsely punctate, with golden hairs, disc slightly convex, their posterior angles rounded, apices blunt; posterior process arising horizontally from disc, fitting tightly against scutellum and contiguous with tegmina, basally, broad, gradually tapering backward, terminal fourth jet black, apex acute, passing the anal angles of tegmina; scutellum 2.0X as wide as long, deeply excavated at middle, strongly chitinised and punctate laterally; tegmina hyaline, 2.5X as long as wide, extreme base coriaceous and punctate, veins reddish brown, bordered with short hairs, 1st discoidal cell not petiolate, 2nd discoidal cell 0.5X as long as the 1st, rusty brown patches on apical limbus. Lateral areas of thorax cretaceously sericeous. Legs light reddish brown except coxae and trochanters which are black. Abdomen dark brown, lateral areas of sternites white tomentose; ovipositor black.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 3.2 mm., width across tips of humeral angles 2.1 mm., at eyes 1.8 mm.

Male : General colour jet black, smaller than female; eyes pale white with shades of yellow; metopidium, disc and posterior process pitch black with short, adpressed, silvery white hairs; tegmina subhyaline, sprinkled with rusty spots, veins black. Genitalia as figured.

Length from frontal margin to tips of tegmina 3.3 mm., to tip of posterior process 2.6 mm., width across tips of humeral angles 1.8 mm., at eyes 1.5 mm.

Fifth instar nymph : General colour pale green. Head directed backward, 2.5X as wide as long, vertex covered with long, slender tuberculate spines; eyes small, pale white; ocelli inconspicuous; pronotum with 2 stout dorsal tubercles tipped with spines slanting backward, pronotal posterior process thickly spinose, passing over the entire length of mesonotum, metopidium convex, thickly covered with tuberculate spines; mesonotum half as long as pronotum, its process shorter, passing over the basal half of metanotum; wing pads large, their apices narrow, costal angles indistinct; dorsal tubercles on abdominal tergites large, inclined backward, arranged regularly, lateral lamellae of segments III-VIII short, each with 4 or 5 long tuberculate spines and smaller spines scattered irregularly on the lamellae; anal tube about 0.2X as long as body, covered with long tuberculate spines arranged in several rows. Length of body 3.5 mm.

Material examined : 35 females, 13 males and 21 fifth instar nymphs ex *Zizyphus jujuba* in Madras, November, 1967. Types in National Pusa collections, IARI., New Delhi.

Distribution : INDIA; Tamil Nadu (Mádras).

This species is closely related to *G. discoidalis* Ananthasubramanian in the general colour, shape of metopidium and posterior process, but distinctly differs by the absence of the 3rd discoidal cell and an incipient pterostigma on the tegmina partially absorbing the R₁.

203. *Gargara sikhimensis* Distant
(Fig. 208)

1908. *Gargara sikhimensis* Distant, *Fauna Br. India*, 4 : 64.

Female : General colour black. Head black, finely palely pilose, about 3.0X as wide across extremities of eyes as length of vertex, vertex 2.0X as wide as long, upper margin strongly arcuate, lower margins broadly rounded; eyes small, pale white; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus greyish black, densely pilose, extending for half its length below lower margins of vertex, apex broadly rounded. Pronotum black, finely pilose with pale white hairs, coarsely punctate, the punctures partially covered by pilosity; metopidium 2.5X as wide as high, nearly vertical to about half its height, then sloping back to disc; humeral angles prominent, extending well beyond eyes, their apices blunt; posterior process robust, broad at base, centrally ochraceous, coarsely punctate, lateral margins a little convex, apex abruptly acute, extending to the apex of clavus, median carina strongly percurrent, but becoming obscure on pronotum; tegmina 2.7X as long as wide, subhyaline, basal area black, followed by a pale transverse fascia, another subapical fascia black, margin fuscous brown, 1st apical cell 3.0X as long as wide, 1st discoidal cell nonpetiolate, shorter than the 2nd. Body beneath black. Legs with coxae, trochanters and femora black, tibiae and tarsi light brown.

Length from frontal margin to tips of tegmina 5.5 mm., to tip of posterior process 3.8 mm.; width across tips of humeral angles 2.8 mm., at eyes 2.0 mm.

Male : Smaller. General colour black. Pronotum densely pilose, strongly punctate; tegmina smoky hyaline, basal sixth black, transverse fascia following the basal sixth not conspicuous, subapical and apical fascia fuscous brown.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.5 mm., width across tips of humeral angles 2.4 mm., at eyes 2.0 mm.

Material examined : 5 females and 5 males ex *Albizia lebbek*, in Shimoga 12.12.1981.

Distribution : INDIA; Karnataka State (Shimoga), Sikkim.

G. sikhimensis is allied to *G. confusa* Distant in the general colour, measurements and punctulations on pronotum, but distinctly differs by the very prominent humeral angles, robust pronotal posterior process and the characteristic markings on the tegmina.

204. *Gargara splendidula* Distant
(Fig. 209)

1916. *Gargara splendidula* Distant, *Fauna Br. India*, 6 : 172.

Female : General colour black. Head black, finely pilose, about 3.2X as wide across extremities of eyes as length of vertex, vertex about 2.5X as wide as long, upper margin shallowly arcuate, lower margins broadly rounded; eyes very large, subglobose, dull black; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus extending for three-fourths its length below lower margins of vertex, densely pubescent, apex truncate. Pronotum black, coarsely punctate, sparsely pilose; metopidium strongly oblique and to disc; posterior process black, coarsely punctate, tricarinate, median carina very strong, the carination faintly continued on the pronotum, basal part broad, abruptly narrowed to apical area which is acuminate, the apex reaching the posterior angle of the inner tegminal margin; tegmina subhyaline, basal sixth black, coriaceous, central area with a large, black transverse band, apical area fuscous, 1st apical cell 3.0X as long as wide, discoidal cells subequal, 3rd apical cell divided by a spurious transverse vein, apical limbus broad.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.75 mm.; width across tips of humeral angles 2.5 mm., at eyes 2.2 mm.

Male : Smaller than female; tegmina almost entirely fuscous, the black transverse band more or less confluent with the dark hue of the apical area.

Length from frontal margins to tips of tegmina 4.2 mm., to tip of posterior process 3.25 mm.; width across tips of humeral angles 2.25 mm., at eyes 2.0 mm.

Material examined : 1 female from Ferozpur (600 ft.), 5 females and 4 males from Lolab Valley, Khurana (5,500 ft.), 2 females from Putshai (6,000 ft.); 2 females from Dehra Dun; 1 female from Fraserpet, Coorg³/₄all in FRI., Dehra Dun.

Distribution : INDIA : Kashmir, Punjab; Karnataka (Coorg, Fraserpet); Uttar Pradesh (Dehra Dun).

Allied to *G. aurea* Funkhouser in the disposition of the posterior process and humeral angles and also in the median carina of posterior process finely percurrent through metopidium; it distinctly differs from *aurea* in the colour of pronotum, its coarsely nature and in the markings on the tegmina.

205. *Gargara tumida* Melichar
(Fig. 210)

1903. *Gargara tumida* Melichar, *Hom. Ceylon* : 123.

1908. *Gargara tumida* Distant, *Fauna Br. India*, 4 : 62.

Female : General colour piceous black. Head piceous, about 3.25X as wide across extremities of eyes as length of vertex, thickly pilose with short, adpressed silvery hairs, vertex about 2.2X as wide as long, upper margin strongly arcuate, lower margins rounded; eyes large, piceous; ocelli closer to eyes than to each other and situated well above c-o line; frontoclypeus extending for two-thirds its length below lower margins of vertex, densely pilose, apex truncate. Pronotum piceous black, densely pubescent, hairs silvery white; metopidium nearly 2.0X as wide as high, moderately obliquely continued backward to disc; humeral angles subprominent, their apices blunt; posterior process very short, broad, tricarinate, median carina subobsolete, more obsoletely continued on metopidium, apex acuminate, not reaching the apex of claval area; tegmina subhyaline, 3.0X as long as wide, veins somewhat fuscous, basal area piceous, coriaceous and punctate, followed by a narrow, transverse, pale ochraceous fascia, apical margin broadly palely ochraceous, 1st apical cell about 6.0X as long as wide, 1st discoidal as long as the 2nd, nonpetiolate. Sternum and basal areas of lateral abdominal margins white tomentose. Legs thickly pilose, ochraceous, coxae and femora (except their apices) black, apices of femora and tibiae ochraceous, tarsi light yellowish brown.

Length from frontal margin to tips of tegmina 6.5 mm., to tip of posterior process 4.1 mm., width across tips of humeral angles 3.0 mm., at eyes 2.5 mm.

Male : Not known.

Material examined : 3 females in Z.S.I., Calcutta, collected from Pashok (2,500 ft.), Darjeeling, May, 26, 1914 (F.H. Gravely).

Distribution : INDIA; West Bengal (Darjeeling).

G. tumida is closely related to *brevis* Ananthasubramanian in the short, broad posterior process which does not reach the apex of the clavus of tegmina, but differs by the median carina subobsolete on the posterior process and more obsoletely continued on metopidium, the markings on the tegmina and the colour of the legs.

206. *Gargara varicolor* Stål
(Fig. 211)

1870. *Gargara varicolor* Stål, *Ofv. Vet.-Ak. forh.*: 728.

Female : General colour varying from black to yellowish ferruginous. Head reddish brown, densely pubescent, 3.0X as wide across extremities of eyes as length of vertex, vertex wider than long, upper margin shallowly arcuate, lower margins somewhat rounded; eyes hemispherical, pale yellowish white; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus thickly pilose, slightly longer than wide, extending slightly below lower margins of vertex, its apex broadly rounded. Pronotum normally black, but highly variable in colour, coarsely punctate, with short, golden pilosity; metopidium 1.75X as wide as high, gradually sloping backward to disc; humeral angles prominent, projecting laterad well beyond the level of eyes, apices blunt; supraocular callosities large, rounded, undivided, bare; posterior process

parallel-sided upto middle and then acuminate, with scattered dark brown spots, median carina obsolete or almost absent, apex just reaching the apex of clavus; tegmina subhyaline, basal area black, punctate, 1st apical cell 4.5X as long as wide, 1st discoidal cell lacking petiole, nearly of the same length as the 2nd. Legs ferruginous.

Length from frontal margin to tips of tegmina 4.5 mm., to tip of posterior process 3.4 mm.; width across tips of humeral angles 2.25 mm., at eyes 1.8 mm.

Material examined : 4 females and 2 males, from Aiyur, Salem; 8 females and 3 males from Coorg; 2 females from Chichawatni, Punjab; 8 females and 3 males from Dehra Dun; 1 female from Naini Tal in FRI., Dehra Dun.

Distribution : INDIA; Tamil Nadu (Aiyur, Salem), Karnataka (Coorg), Punjab (Chichawatni), Uttar Pradesh (Dehra Dun, Naini Tal).

The species is closely allied to *tumida* Distant in the shape of the posterior process and median carina obsolete on pronotum, but differs by the general colour which is highly variable.

Genus 37. *Ebhul* Distant

1908. *Ebhul* Distant, *Fauna Br. India*, 4 : 59.

The highly sinuate pronotal posterior process separates this genus from the other genera of the tribe.

Head subtriangular, 2.0X as wide across extremities of eyes as length of vertex, ocelli closer to eyes than to each other; frontoclypeus extending below lower margins of vertex, its lobes indistinct. Pronotum convexly gibbous, anteriorly almost perpendicularly reclined and flattened in front and above eyes, centrally longitudinally strongly ridged; humeral angles prominent, projecting beyond eyes; suprahumeral horns absent; posterior process strongly sinuately waved, arched at base abutting the scutellum, then concavely sinuate following the direction of the tegmina, its apex just passing the posterior angle of the inner margin of tegmina; scutellum as long as or slightly longer than broad, its apex bifurcate; tegmina about 3.0X as long as wide, without pterostigma, richly marked with spots and fasciae, apical area crossed by a series of rather inconsistent cross veins, R_1 not oblique to subcosta, 1st apical cell roughly rectangular, 5 apical and 2 discoidal cells, apical limb moderately wide; hind wings with 3 apical cells. Legs simple, tibiae slightly dilated.

Type species : *Centrotus varius* Walker

207. *Ebhul maculipennis* Funkhouser (Fig. 212)

1922. *Ebhul maculipennis* Funkhouser, *Rec. Indian Mus.*, 29 : 326.

Female : General colour dark brown. Head subtriangular, about 2.0X as wide across extremities of eyes as length of vertex, hardly punctate, densely pilose with short, adpressed white hairs, base partly hidden under the overhanging margin of pronotum, vertex 1.3X as wide as long; eyes grey, mottled with brown; ocelli opalescent, closer to eyes than to each other and situated above c-o line; frontoclypeus 2.0X as long as wide, brown, densely pilose with silvery hairs, extending for two-thirds its length below lower margins of vertex, apex broadly rounded, frontoclypeal lobes indistinct. Pronotum dark brown, sparsely pilose, with hardly any punctures, elevated over humeral angles, metopidium about 2.0X as wide as high, depressed at base, lower anterior margin projecting forward over the head, upper margin keeled, median carina strongly pèrcurrent; humeral angles prominent, triangular, apices subacute, projecting outward beyond eyes as far as twice the width of eyes; scutellum well exposed, slightly longer than broad, apex bifurcate; posterior process long, slender, strongly sinuate, elevated at base over scutellum, then following the contour of inner tegminal margin, apex black, subacute passing the posterior angle of the inner margin of tegmina; tegmina about 2.7X as long as wide, opaque, basal half brilliant yellow, apical half dark brown with yellowish spots, 5 apical and 2 discoidal cells, R₁ not oblique to subcosta, 1st apical cell based on R₁, about 3.0X as long as wide, apical limbus moderately broad. Body beneath, ovipositor and legs upto bases of tibiae dark brown, tarsi bright yellow.

Length from frontal margin to tips of tegmina 6.0 mm., to tip of posterior process 4.5 mm.; width across tips of humeral angles 1.7 mm., at eyes 1.5 mm.

Male : Smaller and darker than female. Tegmina about 3.0X as long as wide, yellow spots at the apical area more pronounced.

Length from frontal margin to tips of tegmina 5.5 mm., to tip of posterior process 4.1 mm.; width across tips of humeral angles 1.6 mm., at eyes 1.5 mm.

Material examined : One female in ZSI., Calcutta, collected at Pashok, Darjeeling (2,000 ft.), May 16 June 14, 1916 (F.H. Gravely); 2 females and 1 male in FRI., Dehra Dun, collected at Khasi Hills, Assam; holotype female in ZSI., Calcutta.

Distribution : INDIA : Assam (Khasi Hills), Uttar Pradesh (Darjeeling); NEPAL.

E. maculipennis is allied to *E. carinatus* Funkhouser, a Philippine species, in the general disposition of posterior process, but differs in the shape of metopidium and markings on the tegmina.

208. *Ebhul varium* (Walker)
(Fig. 213)

1858. *Centrotus varius* Walker, *List Hom. Suppl.* : 162.
1869. *Leptobelus varius* : Stål, *Ofv. Vet. -Ak. Forh.* : 285.
1908. *Ebhul varius* : Distant, *Fauna Br. India*, 4 : 59.
1965. *Ebhul Varium* : Metcalf and Wade, *Gen. Cat. Homopt.*, 1(1) : 373.

Female : General colour black. Head subtriangular, about 2.0X as wide across extremities of eyes as length of vertex, dark brown, coarsely punctate, sparsely pilose with pale white hairs, vertex about 1.3X as wide as long, upper margin arcuate, lower margins obliquely continued to frontoclypeus; eyes moderately large, dull black; ocelli small, black, closer to eyes than to each other and situated above c-o line; frontoclypeus densely pilose, extending for two third its length below lower margins of vertex, apex broadly rounded, frontoclypeal lobes indistinct. Pronotum black, finely punctate, sparsely pilose, convexly gibbous, flattened in front above eyes, centrally longitudinally ridged, humeral angles prominent, projecting beyond eyes; supraocular callosities obsolete; posterior process ochraceous at its medial concave sinuation, strongly punctate, very strongly sinuately waved, apical area black, passing the posterior angle of the inner margin of tegmina, tricarinate, central carination strongly percurrent through metopidium; scutellum slightly longer than wide, finely punctate, sparsely pilose, its apex bifurcate; tegmina about 3.0X as long as wide, greyish-white, basal half mottled with brown and black, divided from the clavus by a white line between the cubital and 1st anal veins, apical area mottled with black where some of the veins are rufescent, R_1 perpendicular to subcosta, 1st apical cell based on R_1 , somewhat rectangular, about 2.0X as long as wide, 5 apical and 2 discoidal cells, a spurious cross vein at about the middle of 3rd apical cell, apical limb moderately broad. Body beneath, legs and rostrum piceous brown, tibiae darker above than beneath.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.6 mm.; width across tips of humeral angles 2.1 mm., at eyes 1.7 mm.

Male : Similar to female in size and general colour, but the apical area of posterior process not black and the apex just reaching the posterior angle of the inner margin of tegmina; apical limb of tegmina narrower than in female. Body beneath and legs light brown, tibiae and tarsi light yellowish brown.

Material examined : 1 female and 1 male in FRI., Dehra Dun, collected at Sylhet, Assam.

Distribution : INDIA : Assam; BURMA (Maymyo); BORNEO (Sarawak).

The species is related to *maculipennis* Funkhouser in the general disposition of frontoclypeus and posterior process, but differs in the distinctly punctate nature of the pronotum, scutellum and posterior process and also in the markings on the tegmina.

Tribe COCCOSTERPHINI Distant

1908. *Coccosterphusaria* Distant, *Fauna Br. India*, 4 : 70.

1922. *Coccosterphini* Schmidt, *Arch. Naturgesch.* 88 : 265.

Pronotum either tuberculate or not; pronotal posterior process (except in the genus *Kanada* Distant) concavely depressed at base and laminately convexly raised at apex and the metopidium not depressed; scutellum somewhat abortive in the middle; tegmina with or without pterostigma, tegminal veins coarsely or finely tuberculate; veins to apical areas of tegmina moderately straight or curved; legs simple.

Key to genera of COCCOSTERPHINI

- 1(8) Posterior process concavely depressed at base, laminately convexly raised at apex; metopidium not depressed.
- 2(5) Pronotum tuberculate; tegmina not longer than abdomen.
- 3(4) Tegmina with a distinct pterostigma absorbing R₁. *Eucocosterphus*
Ananthasubramanian and Ghosh
- 4(3) Tegmina lacking pterostigma. *Cocosterphus* Stål
- 5(2) Pronotum not tuberculate; tegmina far surpassing apex of abdomen.
- 6(7) Pronotum gibbous, not compressed; tegmina with veins at the apical areas somewhat curved. *Parayasa* Distant
- 7(6) Pronotum anteriorly prominently elevated, its apical surface anteriorly and posteriorly subconvexly amplified; tegmina with veins at the apical areas moderately straight. *Insitor* Distant
- 8(1) Posterior process broad at base, straight, neither concavely depressed at base nor laminately convexly raised at apex; metopidium depressed and strongly sloping posteriorly to disc. *Kanada* Distant

Genus 38. *Eucocosterphus* Ananthasubramanian and Ghosh

1987. *Eucocosterphus* Ananthasubramanian and Ghosh, *Entomon*, 12(4) : 343.

Closely allied to *Cocosterphus* Stål, but differing from it in the presence of a distinct tegminal pterostigma partially absorbing R₁; male genitalia with processes of the lateral valves conspicuously long; nymphs with large, heavily chitinised thoracic and abdominal dorsal and dorsolateral tubercles and spines.

Type species : *Anomus mucronicollis* de Motschulsky

Key to Indian species of *Eucoasterphus* Ananthasubramanian and Ghosh

- 1(2) Apex of posterior process not reaching the posterior angle of the inner margin of tegmina; tegmina purplish brown, sprinkled with small, pale brown spots, apical area pale hyaline; large species. *mucronicollis* (de Motschulsky)
- 2(1) Apex of posterior process reaching the posterior angle of the inner margin of tegmina.
- 3(4) Frontoclypeus extending well below lower margins of vertex; pronotum light brown, with a strong basal ridge projecting forward, a broader less elevated ridge on either side; metopidium with two broad nearly oval ridges one on either side of the median carina; tegmina greyish white, with a broad, transverse, brownish, ochraceous fascia at about its middle. *paludatus* (Distant)
- 4(3) Frontoclypeus extending only slightly below lower margins of vertex; pronotum rusty brown; metopidium with a median and a pair of lateral greyish white streaks; tegmina with a rusty brown transverse fascia on its distal half. *tuberculatus* (de Motschulsky)

209. *Eucoasterphus mucronicollis* (de Motschulsky)
(Fig. 214)

1859. *Anomus mucronicollis* de Motschulsky, *Etud. Ent.*, 8 : 109.

1903. *Cocosterphus mucronicollis* : Melichar, *Hom. Faun. Ceylon* : 120.

1987. *Eucoasterphus mucronicollis* : Ananthasubramanian and Ghosh, *Entomon*, 12(4) : 343.

Female : General colour purplish brown with a dark hue. Head light reddish brown, about 3.0X as wide across extremities of eyes as length of vertex, densely greyishly pilose, vertex about 2.2X as wide as long, upper margin arcuate, lower margins somewhat broadly rounded; eyes dull white, hemispherical; ocelli glossy, closer to eyes than to each other and situated above c-o line; frontoclypeus slightly longer than wide, densely longly pilose, extending for half its length below lower margins of vertex, apex truncate. Pronotum purplish brown, densely pubescent, compactly tuberculate, tubercles longer than hairs; metopidium convex, gradually sloping behind to disc, strongly tuberculate and densely pubescent; humeral angles prominent, their apices blunt, posterior process robust, moderately laminately convexly gibbous before apex which does not reach the posterior angle of the inner tegminal margin; tegmina about 2.75X as long as wide, purplish brown sprinkled with small paler spots which often coalesce in transverse rows to form subprominent fasciae, one fascia immediately following basal area and another at about middle,

apical area largely hyaline except for purplish brown patches at the apices of 2nd and 3rd apical cells and beneath inner tegminal angle and 5th apical cell, veins stout, tuberculate, a distinct pterostigma partially absorbing R_1 which is oblique to subcosta, 1st apical cell about 3.5X as long as wide, apical limb narrow, 1st discoidal cell petiolate, basal area of tegmina opaque, thickly greyishly pilose, coriaceous; body beneath dark brown; legs with femora black, tibiae pale testaceous, tarsi light yellow, claws piceous.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.3 mm.; width across tips of humeral angles 2.1 mm., at eyes 1.9 mm.

Male : Smaller and dark brown. Pronotum with larger tubercles than in female; posterior process just reaching the apex of clavus; tegmina dark brown with purplish brown spots more conspicuous than in female, obscuring the venation.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 3.25 mm.; width across tips of humeral angles 1.75 mm., at eyes 1.6 mm.

Material examined : One female and one male ex *Eupatorium odorum*, in Coorg, 30-1-1985; one female in FRI., Dehra Dun, collected from (Fraserpet Karnataka), 24-10-1930. (Cotype in Museum Hongrois).

Distribution : INDIA : Karnataka (Coorg, Fraserpet); SRI LANKA.

210. *Eucocosterphus paludatus* (Distant)
(Fig. 215)

1916. *Cocosterphus paludatus* Distant, *Fauna Br. India*, 6 : 175.

1987. *Eucocosterphus paludatus* : Ananthasubramanian and Ghosh, *Entomon*, 12(4) : 343.

Female : General colour light brown. Head nearly vertical, 2.5X as wide across extremities of eyes as length of vertex, thickly pilose, vertex about 2.0X as wide as long, upper margin arcuate, lower margins narrowly rounded; eyes large, pale white; ocelli closer to eyes than to each other and situated on c-o line; frontoclypeus greyish pilose, extending for three-fourths its length below lower margins of vertex, apex broadly rounded, frontoclypeal lobes indistinct. Pronotum light brown, finely tuberculate on median dorsal ridge, with a broad, elongate, tuberculate ridge on either side; metopidium vertical with two broad, nearly oval ridges at the sides of the median carina which is finely percurrent; suprahumeral absent; humeral angles prominent, thickly pilose, extending beyond eyes, apices blunt; supraocular callosities small, entire, rounded; posterior process broadly triangular at base, then concavely sinuate, apical area strongly compressed and convex; scutellum aborted at middle; tegmina 2.5X as long as wide, with a distinct pterostigma, greyish white, basal third black, coriaceous, followed by a transverse fascia, distal area sprinkled with brown spots, veins reddish brown with small, sparse tubercles arranged linearly, 5 apical and 2 or 3 discoidal cells, variations in apical venation common due to the formation of spurious cross veins, apical limb narrow, apex rounded; hind wings with 3 apical cells; legs black upto three-fourths of femoral length, tibiae ochraceous, tarsi light brown.

Length from frontal margin to tips of tegmina 3.6-4.0 mm., to tip of posterior process 2.7-2.9 mm.; width across tips of humeral angles 2.3-2.5 mm., at eyes 1.8-2.0 mm.

Male : Similar to female, smaller. Genitalia with sternal plate cleaved two-thirds its length from apex; lateral valves wedge-shaped, their processes long, unchitinised, longly pilose; aedeagus U-shaped, its apex acuminate; apices of parameres slightly amplate, connecting plate rectangular.

Length from frontal margin to tips of tegmina 3.5-3.8 mm., to tip of posterior process 2.6-2.8 mm.; width across tips of humeral angles 2.1-2.4 mm., at eyes 1.6-1.9 mm.

Fifth instar nymph : Body nearly cylindrical and heavy, foreshadowing the shape of the adult; general colour brown dorsally, pale green ventrally; head 2.5X as wide as long, base of vertex nearly planate, cranial tubercles persistent, frontoclypeus not extending below lower margins of vertex, rostral tip extending upto mid-coxae. Thorax about as long as abdomen, pronotum sprinkled with short spines on tubercles, metopidium convex, a longitudinal carina on disc confluent with a pair of lateral ridges, giving a characteristic cruciform structure, covered with dense tuberosities, median ridge continued over posterior process which overlaps the basal half of mesonotum, mesonotum with a median ridge, metanotum narrow, bearing a cluster of spines on a smaller median ridge; wing pads greyish brown, costal angles distinctly demarcated; abdominal dorsal tubercles toothlike and heavy, lateral lamellae with 6 or 7 penicillate spines; anal tube short, about 0.14X as long as body. Length of body 4.0 mm., length of anal tube 0.60 mm.

Material examined : 80 females, 19 males and numerous nymphs ex *Cestrum diurnum*, *Lawsonia alba* and prop roots of *Ficus bengalensis*, in Madras, September, 1965. Lectotype female in British Museum.

Distribution : INDIA : Tamil Nadu (Chikkaballipura, Madras), Orissa (Puri), West Bengal (Calcutta).

E. paludatus is closely related to *E. tuberculatus* (de Motschulsky) in the general shape, size and in the disposition of the posterior process, but differs in the general colour, in the frontoclypeus extending well below lower margins of vertex, in the presence of two broad, nearly oval ridges one on either side of the median carina of metopidium, and different markings on the tegmina.

211. *Eucocosterphus tuberculatus* (de Motschulsky)
(Fig. 216)

1859. *Anomus tuberculatus* de Motschulsky, *Etud. Ent.*, 8 : 109.

1903. *Cocosterphus tuberculatus* : Melichar, *Hom. Faun. Ceylon* : 121.

1903. *Gargara fasciata* Melichar, *Hom. Faun. Ceylon* : 122.

1987. *Eucocosterphus tuberculatus* : Ananthasubramanian and Ghosh, *Entomon*, 12(4) : 343.

Female : General colour dark brown. Head 2.0X as wide as long, rusty brown, sparsely pilose with pale white hairs, base strongly arcuate, sinuate; eyes prominently projecting; ocelli closer to

eyes than to each other and situated above c-o line; frontoclypeus extending only slightly below lower margins of vertex. Pronotum rusty brown above, thickly finely punctate, tuberculate, with short, greyish white hairs in between tubercles; metopidium about 2.0X as wide as high, gradually sloping backward to disc, with a median and two lateral greyish white streaks, and a pair of broad, oval tuberculate ridges one on either side of median ridge; posterior process distinctly keeled dorsally, finely tuberculate, apical area black, strongly compressed and convex, tuberculate, apex reaching tip of clavus; tegmina about 2.75X as long as wide, subhyaline, with a distinct pterostigma, basal third coriaceous and rusty brown, a broad rusty brown transverse fascia beyond middle of tegmina, apical area speckled with reddish brown patches, apical area variable due to spurious cross veins; hind wings with 3 apical cells. Legs with tibiae rusty brown, trochanters and femora black, tarsi yellowish with black spots.

Length from frontal margin to tips of tegmina 3.4-3.8 mm., to tip of posterior process 2.4-2.7 mm.; width across tips of humeral angles 1.7-1.9 mm., at eyes 1.7 mm.

Male : Smaller than female. Jet black. Genitalia similar to that of *Paludatus* (Distant).

Length from frontal margin to tips of tegmina 3.0-3.5 mm., to tip of posterior process 2.2-2.5 mm.; width across tips of humeral angles 1.5-1.7 mm., at eyes 1.5 mm.

Fifth instar nymph : Similar to the V instar nymph of *E. paludatus*, differing mainly in the colour patterns. General colour greyish with shades of black; head, pronotum, lateral parts of abdominal segments III-VI black, dorsal tubercles dark brown, rest of body greyish; lower surface of abdomen pale green; anal tube about 0.2X as long as body.

Length of body 4.0 mm., length of anal tube 0.90 mm.

Material examined : 85 females, 20 males and numerous nymphs ex *Morinda tinctoria*, in Madras, October to December, 1966. Cotype in Museum Mongroid, Budapest.

Distribution : INDIA : Tamil Nadu (Madras); SRILANKA.

The species is closely related to *paludatus* (Distant) in its general size and shape, differing mainly by the ridges on the metopidium, position of ocelli and the colour patterns of tegmina.

Genus 39. *Cocosterphus* Stål

1869. *Cocosterphus* Stål, *Hem. Fabr.*, 8 : 67.

1903. *Phaerotus* Buckton, *Monogr. Membrac.* : 255.

Body small, somewhat obovate; head declivous, 2.5-3.0X as wide across extremities of eyes as length of vertex, width across eyes equalling to width of metopidium; eyes somewhat deflexed; ocelli usually closer to eyes than to each other and situated on or above c-o line; apex of frontoclypeus on a line with lower margins of vertex or extending below to different degrees, frontoclypeal lobes fused with the main lobe and indistinct. Pronotum moderately convex, finely or coarsely tuberculate; metopidium about 1.5X as wide as high; humeral angles prominent; suprahumeral horns absent; posterior process viewed from above broadly triangular, depressed

from base to middle, closely fitting against scutellum and contiguous with tegminal inner margins, apex laminately convexly raised, reaching the apex of clavus; scutellum aborted in middle, apices acute; tegmina 2.5-2.75X as long as wide, pterostigma absent, apex rounded, apical limb narrow, basal fourth opaque, coriaceous, veins stout, bearing small or large nodulose tubercles, 5 apical and 2 or 3 discoidal cells, outer discoidal cell petiolate or not, apical cells often divided by abnormal spurious cross veins; hind wings with 3 apical cells. Legs simple, tibiae prismatic, anterior tibiae a little depressed.

The genus *Cocosterphus* is allied to *Gargara* Amyot and Serville, but very distinct in having the pronotum behind the lateral angles gradually passing into the posterior process which has no sinus at the base.

Type species : *Membracis minutus* Fabricius

Key to the Indian species of *Cocosterphus* Stål

- | | | |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| 1(4) | Frontoclypeus extending only very slightly below lower margins of vertex; tip of posterior process acuminate, its subapical part with a few larger tubercles. | |
| 2(3) | Tegmina greyish flavescent, its apical area tinted with reddish brown patches; 1st apical cell about 2.0X as long as its maximum width. | <i>minutus</i> (Fabricius) |
| 3(2) | Tegmina uniformly shaded with black; 1st apical cell about 3.0X as long as its maximum width. | <i>mysorensis</i> Ananthasubramanian and Ghosh |
| 4(1) | Frontoclypeus extending well below lower margins of vertex; tip of posterior process not acuminate, subapical part of posterior process devoid of large tubercles. | |
| 5(8) | Pronotum black; tegmina variable in colour and patterns, tinted with black or brown patches or spots, apical limb narrow. | |
| 6(7) | 1st discoidal cell of tegmina petiolate. | <i>decoloratus</i> Distant |
| 7(6) | 1st discoidal cell of tegmina nonpetiolate. | <i>obscurus</i> Distant |
| 8(5) | Pronotum pale yellow; tegmina more or less hyaline, devoid of black or brown patches or spots, apical limb practically obsolete. | <i>luteus</i> Funkhouser |

212. *Coccosterphus decoloratus* Distant

1908. *Coccosterphus decoloratus* Distant, *Fauna Br. India*, 4 : 71.

Female : General colour black. Head dark brown, about 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.25X as wide as long, strongly arcuate at base, lower margins broadly rounded; eyes dull black; ocelli closer to eyes than to each other and situated well above c-o line; frontoclypeus nearly as long as wide, sparsely pilose with pilosity longer at the apex, extending for two-thirds its length below lower margins of vertex, apex truncate. Pronotum black, strongly tuberculate, prominently ridged and moderately arched, metopidium black, obliquely directed backward to disc, tuberculate, sparsely hairy, obtusely angulate before the base of posterior process; humeral angles prominent, projecting beyond eyes; posterior process concave at base, strongly convexly laminately produced before apex, central ridge finely tuberculate, sparsely pilose, apex black, acute and just reaching the posterior angle of the inner margin of tegmina; tegmina nearly 3.0X as long as wide, tinted with reddish brown and greyish spots, the latter presenting a broad subbasal and subapical transverse fascia, basal one-third black, coriaceous, punctate, veins finely tubercular, 5 apical and 2 discoidal cells, 1st discoidal cell petiolate, pterostigma absent, apex somewhat rounded, apical limb narrow, 1st apical cell about 3.0X as long as wide; hind wings with 3 apical cells; legs piceous, tarsi ochraceous.

Length from frontal margin to tips of tegmina 2.75-3.0 mm., to tip of posterior process 2.1-2.25 mm.; width across tips of humeral angles 1.4 mm., at eyes 1.1 mm.

Male : Similar to female in general colour, but smaller; tegmina with dark brown spots, cretaceous transverse fascia following the basal area narrower than that in female.

Length from frontal margin to tips of tegmina 2.75 mm., to tip of posterior process 2.0 mm.; width across tips of humeral angles 1.2 mm., at eyes 1.1 mm.

Material examined : 5 females, 1 male ex *Boerhaavia diffusa*, in Trivandrum, 12-12-1979; 3 females ex *Boerhaavia repens*, in Bangalore, 9-12-1979; 2 females in the collections of ZSI., Calcutta. Lectotype male in British Museum; type locality : Calcutta.

Distribution : INDIA : Kerala (Trivandrum), Karnataka (Bangalore), West Bengal (Calcutta).

C. decoloratus is closely related to *C. obscurus* Distant in the frontoclypeus extending well below lower margins of vertex, apex of posterior process acute, and the subapical part of posterior process devoid of large tubercles, but differs by the 1st discoidal cell of tegmina petiolate.

213. *Coccosterphus luteus* Funkhouser

(Fig. 218)

1933. *Coccosterphus luteus* Funkhouser, *Indian Forest Rec.*, 17 : 9.

Female : General colour uniformly pale yellow. Head vertical, subquadrate, sparsely pubescent with short hairs, 2.75X as wide across extremities of eyes as length of vertex, vertex

2.0X as wide as long, upper margin strongly arcuate, lower margins broadly rounded; eyes large, hemispherical, dull white; ocelli yellow, equidistant from each other and from eyes and situated on c-o line; frontoclypeus longer than wide, extending for about half its length below lower margins of vertex, frontoclypeal lobes fused along their entire length to the main lobe. Pronotum yellow, finely punctate, sparingly pubescent; metopidium somewhat convex, about 2.0X as wide as high; humeral angles very prominent, triangular, stout, extending well beyond eyes, apices subacute; posterior process robust, triangular, hardly sinuate, apex acute, just reaching the posterior angle of the inner tegminal margin, dorsal carina strongly percurrent through metopidium; tegmina opaque yellow, without spots and fasciae, about 2.6X as long as wide, apex rounded, without a distinct apical limbus, base weakly punctate, veins to apical area rather straight, 1st apical cell about 3.75X as long as wide, 3 discoidal cells, the 2nd discoidal shortest, veins very thin, brownish yellow; scutellum aborted in the middle. Legs pale yellow. Body beneath yellow.

Length from frontal margin to tips of tegmina 3.8 mm., to tip of posterior process 2.8 mm.; width across tips of humeral angles 2.0 mm., at eyes 1.7 mm.

Male : Not known.

Material examined : 2 females in FRI., Dehra Dun, collected from Aiyur, Salem.

Distribution : INDIA : Tamil Nadu (Aiyur, Salem).

Coccosterphus luteus is rather unique in having a pronotum and posterior process devoid of granules or tubercles; the posterior process is straight and shows no sinuations; the tegminal veins to the apical area are straight. It looks more like *Gargara* in all the above characters.

214. *Coccosterphus minutus* (Fabricus)
(Fig. 219)

1798. *Membracis minuta* Fabricius, *Ent. Syst. Suppl.* : 514.
1803. *Centrotus minutus* : Fabricius, *Syst. Rhyng.* 22.
1851. *Scaphula (?) minuta* : Walker, *List Hom. B.M.*, 2 : 589.
1869. *Coccosterphus minutus* : Stål, *Hom. Fabr.*, 8 : 51.
1903. *Scaphula minuta* : Buckton, *Monogr. Membrac.* : 149.
1908. *Coccosterphus minutus* : Distant, *Fauna Br. India*, 4 : 71.

Female : General colour black. Head 2.5X as wide as long, sprinkled with granules, sparsely pilose with short, adpressed, pale white hairs, vertex wider than long, upper margin arcuate, lower margins broadly rounded; eyes dull white, hemispherical; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus highly pilose, extending for half its length below lower margins of vertex, apex broadly rounded. Pronotum black, with large tubercles; metopidium nearly vertical; humeral angles prominent, apices blunt; suprahumeral horns absent; posterior process seen from above broadly triangular, a little elevated behind disc, dorsal carina obsolete anteriorly, interrupted in the median depressed part, apical area laminately convexly

raised and strongly tuberculate, apex acuminate, reaching the apex of clavus; scutellum aborted at middle, tegmina 2.5X as long as wide, lacking pterostigma, pale, greyish flavescent, basal third coriaceous, punctate and black, veins more or less infusate, coarsely tuberculate, apical area tinted with reddish brown patches, 1st apical cell wedge-shaped, 2.0X as long as wide, 1st discoidal cell stylate; hind wings with 3 apical cells. Legs simple. Abdomen beneath black.

Length from frontal margin to tips of tegmina 3.0-3.25 mm., to tip of posterior process 2.2-2.4 mm.; width across tips of humeral angles 1.8-2.0 mm., at eyes 1.7-1.8 mm.

Male : Smaller than female. Pronotum and legs black, tegmina as long as abdomen, semilucid yellow with white dots. Genitalia with sternal plate jet black, cleaved to about three-fourths its length from apex, lateral valves wedge-shaped, their processes very short, unchitinised; aedeagus U-shaped, tip acuminate; tips of parameres slightly amplified; connection plate triangular.

Length from frontal margin to tips of tegmina 2.5-2.7 mm., to tip of posterior process 1.8-2.2 mm.; width across tips of humeral angles 1.6-1.8 mm., at eyes 1.6 mm.

Fifth instar nymph : General colour green. Head with dense granules and very short tuberculate spines; base of vertex planate, fringed with small hairs or chalazae, tip of rostrum extending to base of mesosternite; eyes prominent; ocelli inconspicuous; frontoclypeus longer than wide, its lower margin not extending below lower margins of vertex and densely setose; pronotum with prominent dorsal tubercles tipped with spines inclined backward, metopidium receding, granulose, a transverse keel on either side of median carina with closely arranged bristles; pronotal posterior process high above mesonotum, passing over the basal half of the latter and bearing tubercles, tipped with short spines; posterior areas of thoracic tergites fringed with rows of fine bristles; mesonotal process tuberculate, slightly overlapping metanotum; wing pads broad, granulate, costal angles well demarcated and bordered with tuberculate spines. Abdominal segments with well developed dorsal tuberculate spines adpressed to body; lateral lamellae of segments III-VIII semicircular, each bordered with 7 penicillate spines; anal tube shorter than the combined length of the three preceding segments; genital rudiments distinct. Length of body 2.9 mm.

Material examined : 104 females, 32 males and numerous nymphs ex *Prosopis spicigera*, *Acalypha indica*, *Parthenium* and *Boerhaavia diffusa*, in Madras, January, 1966.

Distribution : INDIA : Tamil Nadu (Madras), Kerala (Trivandrum), West Bengal (Calcutta).

This species is closely related to *C. mysorensis* Ananthasubramanian and Ghosh in the general colour, size and nature of the posterior process, but differs by the colour and markings on the tegmina and the length to width ratio of 1st apical cell of tegmina.

215. *Coccosterphus mysorensis* Ananthasubramanian and Ghosh
(Fig. 220)

1987. *Coccosterphus mysorensis* Ananthasubramanian and Ghosh, *Entomon*, 12(4) : 218.

Male : General colour dark brown. Head subtriangular, about 2.5X as wide across eyes as length of vertex, densely pilose and hardly punctate, vertex 1.5X as wide as long, upper margin arcuate, lower margins broadly rounded; eyes grey, mottled with brown; ocelli opalescent, closer to eyes than to each other and situated above c-o line; frontoclypeus longer than wide, extending only very slightly below lower margins of vertex, sparsely longly pilose. Pronotum black, sprinkled with large tubercles and granules; metopidium nearly vertical to about two-thirds its height, then obliquely directed backward to disc; humeral angles prominent, their apices blunt; posterior process broadly triangular, moderately raised behind disc, dorsal carina interrupted near the median depressed part, apical region laminate, convex, slightly raised, apex acuminate, reaching the posterior angle of the inner margin of tegmina; tegmina about 2.5X as long as wide, without a pterostigma, shaded with black, basal two-third punctate, pitch black, coriaceous, 1st apical cell about 3.0X as long as wide, 2nd discoidal cell about 1.5X as long as the 1st, apical limb narrow, veins stout, bearing large tubercles; hind wings with 3 apical cells. Legs black upto middle of femora, tibiae yellowish, tarsi pale white. Genitalia similar to that of *minutus* (Fabricius).

Female : Unknown.

Material studied : One male ex *Flacourtia* sp., in Coorg, 24-12-1983. Type deposited in Government Museum, Madras.

Distribution : INDIA : Karnataka (Coorg).

C. mysorensis is closely related to *minutus* (Fabricius) in its general colour, size and disposition of posterior process, but differs markedly in the colour patterns of tegmina which are completely shaded with black, and also in length-width ratio of the 1st apical cell of tegmina.

216. *Coccosterphus obscurus* Distant (Fig. 221)

1908. *Coccosterphus obscurus* Distant, *Fauna Br. India*, 4 : 71.

Female : General colour black. Head vertical, greyish brown, 3.0X as wide across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, upper margin arcuate, lower margins broadly rounded; eyes large, hemispherical, succineous; ocelli vitreous, closer to eyes than to each other and situated well above c-o line; frontoclypeus about as wide as long, sparsely pilose, extending for half its length below lower margins of vertex. Pronotum black, highly tuberculate and finely granulate between the tubercles, sparsely pilose with very short, adpressed hairs; metopidium obliquely directed backward to disc, about 2.0X as wide as high, strongly tuberculate; humeral angles prominently projecting laterad beyond eyes, apices subacute; posterior process slender at base, laminately convexly gibbous before apex which is acuminate and just reaches the posterior angle of the inner margin of tegmina, dorsal carina strongly percurrent through metopidium; tegmina 2.6X as long as wide, piceous, sprinkled with small cretaceous spots which almost coalesce at about the middle to form a narrow, obliquely transverse fascia, pterostigma absent, R_1 oblique to subcosta, 1st apical cell based on rs , about 4.0X as long

as wide, 1st discoidal cell nonpetiolate, 2nd discoidal cell much larger than the 1st, veins tuberculate, basal area of tegmina black, granulose. Legs except tarsi black, tarsi stramineous.

Length from frontal margin to tips of tegmina 2.8-3.0 mm., to tip of posterior process 2.6 mm.; width across tips of humeral angles 1.4 mm., at eyes 1.2 mm.

Male : Smaller, tegmina predominantly castaneous with sparse cretaceous spots which do not form fasciae; genitalia as in *minutus* (Fabricius).

Length from frontal margin to tips of tegmina 2.5 mm., to tip of posterior process 2.2 mm.; width across tips of humeral angles 1.2 mm., at eyes 1.0 mm.

Material studied : 2 females and 1 male, in ZSI., Calcutta, ex *Boerhaavia repens*, 2-1-1968. Lectotype male in British Museum.

Distribution : INDIA : West Bengal (Calcutta).

C. obscurus is very closely related to *decolaratus* Distant in the general colour, size, tuberculate pronotum and markings on the tegmina, but differs in the nature of the 1st discoidal cell which is not petiolate.

Genus 40. *Parayasa* Distant

1916. *Parayasa* Distant, *Fauna Br. India*, 6 : 176.

Body small. Head about 3.0X as wide across extremities of eyes as length of vertex, upper margin of vertex arcuate, sinuate, lower margins somewhat rounded or obliquely continued to frontoclypeus; eyes large, subglobose; ocelli conspicuous, closer to eyes than to each other; frontoclypeus either slightly or considerably projecting below lower margins of vertex, its apex rounded, frontoclypeal lobes either fused and indistinct or distinct. Pronotum not tuberculate, either granulose or nongranulose, rather low, not tuberculate; metopidium wider than high, vertical or obliquely sloping backward to disc; humeral angles prominent, posterior margins rounded; suprahumeral horns absent; posterior process broadly triangular at base, more or less convexly sinuate, closely fitting against scutellum and contiguous with inner margins of tegmina, strongly tricarinate, dorsal carina percurrent through metopidium, apex either convexly gibbous or acute, and reaching only upto the tip of 2nd anal cells of tegmina or the apex of clavus; tegmina 2.5-3.0X as long as wide, 5 apical cells and 2 discoidal cells, the 1st discoidal cell stylate, costal margin opposite to R_1 thickened in some species, apical limb narrow, veins finely tuberculate; hind wings with 3 apical cells; scutellum much aborted at middle.

Type species : *Parayasa typica* Distant

Key to Indian species of *Parayasa* Distant

- 1(20) Apex of posterior process not reaching the apex of clavus.
- 2(13) Apex of posterior process more or less convexly gibbous.
- 3(6) Pronotum granulose.
- 4(5) Tegmina greyish white, much spotted and suffused with brown; ocelli situated on the c-o line; brownish ochraceous species. *maculosa* Distant
- 5(4) Tegmina jet black except anal area, costal and part of apical areas, a median fascia and most of 4th apical cell which are greyish white; ocelli situated above c-o line; black species. *typica* Distant
- 6(3) Pronotum not granulose.
- 7(8) Posterior process strongly concavely sinuous; tegmina dark brownish yellow, the costal area and a broad central fascia distinctly darker, apical area mottled with brown; ocelli situated on c-o line. *affinis* Distant
- 8(7) Posterior process very slightly concavely sinuous; tegmina subhyaline; ocelli situated above c-o line. *atricapilla* Distant
- 9(12) Metopidium moderately or strongly obliquely sloping backward to disc; tegmina 3.0X as long as wide, length of petiole of 1st discoidal cell less than the length of the cell; ocelli situated on c-o line.
- 10(11) Frontoclypeus extending only slightly below the lower margins of vertex; tegmina with a broad yellowish fascia following the dark basal area; rest of tegmina black except 1st and 2nd apical cells and a few spots near apical area which are greyish white; metopidium moderately obliquely sloping behind to disc. *affixa* Distant

- 11(10) Frontoclypeus extending for three-fourths its length below lower margins of vertex; tegmina pale ochraceous with a greyish transverse oblique fascia at about two-thirds its length from base and another oblique fascia at about middle, rest pale virescent, a distinct brownish patch extending into 5th apical cell near claval suture; metopidium strongly obliquely directed backward to disc. *variegata* Thirumalai and Ananthasubramanian
- 12(9) Metopidium vertical; tegmina 2.5X as long as wide, petiole of 1st discoidal cell as long as the cell, tegmina with about basal half brownish yellow, a median fascia coloured grey virescent, remaining areas pale virescent with small brown spots. *elegantula* Distant
- 13(2) Apex of posterior process not convexly gibbous.
14(19) Dorsum of posterior process straight.
- 15(18) Apex of posterior process not elevated; ocelli situated on or above c-o line.
- 16(17) Pronotum granulate; apex of posterior process reaching the tip of the 2nd anal vein of tegmina; tegmina brownish ochraceous, base and opaque median fascia dark ochraceous; ocelli closer to eyes than to each other and situated on c-o line; dark castaneous species. *margherita* Distant
- 17(16) Pronotum not granulate; apex of posterior process passing beyond the tip of 2nd anal vein of tegmina; tegmina dull greyish, much mottled with pale brown, basal and costal areas and 2 large subquadrate spots beyond middle much darker; ocelli equidistant from each other and from eyes and situated well above c-o line. *rustica* Distant
- 18(15) Apex of posterior process elevated; ocelli situated above c-o line; tegmina hyaline, yellow, much spotted and suffused with fuscous brown; body pilose. *pilosa* Ananthasubramanian

- 19(14) Dorsum of posterior process strongly concave; apex of posterior process distinctly obliquely elevated; tegmina pale greyish green, the basal area, a transverse fascia near middle, a large spot near apex of clavus and some small spots on apical area fuscous brown; ocelli situated on c-o line; dark brown species. *dissimilis* Distant
- 20(1) Apex of posterior process just reaching the apex of clavus.
- 21(24) Apex of posterior process more or less convexly gibbous; ocelli closer to eyes than to each other.
- 22(23) Tegmina pale virescent, 2.5X as long as wide, a fuscous transverse fascia at about the middle, veins finely tuberculate; frontoclypeus only slightly extending below lower margins of vertex; dark yellowish brown species. *fasciata* Ananthasubramanian
- 23(22) Tegmina hyaline, 3.0X as long as wide, costal margin thickened to form an incipient pterostigma; frontoclypeus extending for two-thirds its length below lower margins of vertex; black species. *nigrolimbata* Ananthasubramanian
- 24(21) Apex of posterior process not convexly gibbous; ocelli equidistant from each other and from eyes.
- 25(26) Tegmina subhyaline, angular basal area brown, apical cells paler; frontoclypeal lobes indistinct; black species. *modesta* Distant
- 26(25) Tegmina yellowish brown, basal sixth indigo black, followed by a white transverse fascia, apical margin darker; frontoclypeal lobes distinct; indigo black species. *nilgiriensis* Distant

217. *Parayasa affinis* Distant
(Fig. 222)

1916. *Parayasa affinis* Distant, *Fauna Br. India*, 6 : 179.

Female : General colour dark brownish ochraceous. Head 2.75X as wide across extremities of eyes as length of vertex, finely pilose, vertex black, about 1.5X as wide as long, upper margin

slightly arcuate, lower margin somewhat obliquely continued to frontoclypeus; eyes hemispherical, pale white; ocelli vitreous, closer to eyes than to each other and situated on c-o line; frontoclypeus wider than long, extending for three-fourths its length below lower margins of vertex, apex broadly rounded, frontoclypeal lobes indistinct. Pronotum black at anterior and lateral areas, brown dorsally, finely punctate, with short, adpressed hairs; metopidium black, finely punctate, about 2.5X as wide as high, obliquely continued behind to disc; supraocular callosities subprominent; humeral angles prominent, broad-based, finely punctate, apices subacute; posterior process concavely sinuate, apex moderately black, not reaching the posterior angle of the inner margin of tegmina, dorsal carina strongly percurrent through metopidium; tegmina 3.0X as long as wide, basal third black, coriaceous and punctate, apical area pale greyish, mottled with brown, costal area darker than apical area, a dark, broad, transverse fascia (about one-sixth as long as tegmina) at about the middle, with some transverse linear greyish spots, 1st apical cell based on rs, about 4.0X as long as wide, 1st discoidal cell with a very short petiole, veins to apical area almost straight. Sternum dark brown. Legs with femora dark brown, tibiae and tarsi light brown, tibiae pilose, posterior tibiae a little curved.

Length from frontal margin to tips of tegmina 3.5 mm., to tip of posterior process 2.3 mm., width across tips of humeral angles 1.9 mm., at eyes 1.7 mm.

Male : Not known.

Material examined : 5 females ex *Euphorbia hirta*, in Kodaikanal, 1-12-1981, Holotype female in British Museum; type locality: Nandi durg, Southern India.

Distribution : INDIA : Tamil Nadu (Kodaikanal).

This species is closely related to *atricapilla* Distant in the general colour and markings of the pronotum, but differs in its larger size, in the position of ocelli, more distinctly concavely sinuate posterior process, more broadly subacute humeral angles, strongly percurrent dorsal carina and tegminal markings which show a distant broad, dark, transverse fascia at about the middle.

218. *Parayasa affixa* Distant

(Fig. 223)

1916. *Parayasa affixa* Distant, *Fauna Br. India*, 6 : 177.

Female : General colour brownish ochraceous. Head brown about 3.0X as wide across extremities of eyes as length of vertex, densely pilose, hairs short and golden yellow, vertex black, densely pilose, lower margins obliquely continued to frontoclypeus; eyes hemispherical, black; ocelli black, closer to eyes than to each other and situated on c-o line; frontoclypeus brownish ochraceous, wider than long, extending slightly below lower margins of vertex, apex broadly rounded. Pronotum brownish ochraceous, finely punctate, with short, adpressed golden pilosity; metopidium about 2.0X as wide as high, moderately obliquely sloping behind disc, black, finely punctate and densely pilose, with a large oval central coarsely punctate patch; supraocular callosities large, black, undivided; humeral angles subprominent, apices subacute; posterior

process concavely sinuate, convexly gibbous at apex, apex black, not reaching the posterior angle of the inner margin of tegmina, dorsal carina prominent, strongly percurrent through metopidium; tegmina 3.0X as long as wide, basal fourth black, punctate and coriaceous, followed by a pale ochraceous transverse fascia which is about 0.2X as long as tegmina, median and apical areas except parts of 1st discoidal cell black, 1st apical cell about 4.5X as long as wide, 1st discoidal cell petiolate, veins brownish ochraceous, hind tibiae somewhat curved, densely pilose, apices black.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 2.4 mm.; width across tips of humeral angles 1.7 mm., at eyes 1.4 mm.

Male : General colour as in female; pilosity on head, pronotum and tibiae denser; tegmina with ochraceous fascia narrower than in female; genitalia as in *elegantula* Distant.

Length from frontal margin to tips of tegmina 3.5 mm., tips of posterior process 2.25 mm.; width across tips of humeral angles 1.4 mm., at eyes 1.3 mm.

Material examined : 5 females in FRI., Dehra Dun (2 collected from Jawalgiri, Salem, and 3 from Fraserpet, Coorg); 1 female in ZSI., Calcutta; 1 male ex *phyllanthus niruri*, in Coorg, 20-12-1979.

Holotype female in British Museum. Type locality: Nilgiris.

Distribution : INDIA : Tamil Nadu (Salem, Ooty), Karnataka (Fraserpet, Coorg).

P. affixa resembles *P. variegata* Thirumalai and Ananthasubramanian in the position of the ocelli and length of the petiole and 1st discoidal cell of tegmina, but differs by the relative downward extension of frontoclypeus below lower margins of vertex, and the characteristic markings on the tegmina.

219. *Parayasa atricapilla* Distant (Fig. 224)

1916. *Parayasa atricapilla* Distant, *Fauna Br. India*, 6 : 179.

Female : General colour brownish ochraceous. Head black, vertical, about 2.6X as wide across extremities of eyes as length of vertex, vertex about 1.7X as wide as long, upper margin shallowly arcuate, lower margins slightly oblique and continuous to frontoclypeus; eyes large, pale white; ocelli closer to eyes than to each other and situated well above c-o line; frontoclypeus slightly extending below lower margins of vertex, longly pilose, apex rounded. Pronotum brownish ochraceous above, black anterolaterally, finely punctate and densely pilose with short, adpressed hairs; metopidium black, about 2.5X as wide as high, finely punctate, with short, silvery pilosity, obliquely continued behind to disc; supraocular callosities conspicuous, irregularly shaped, bare; humeral angles subacutely prominent; posterior process moderately concavely sinuate, apex black, not reaching the posterior angle of the inner margin of tegmina, dorsal carina obscurely continued on metopidium; tegmina subhyaline, reflecting the dark abdomen beneath, 3.0X as

long as wide, basal third brownish ochraceous, coriaceous and punctate, costal margin and veins somewhat reddish brown, rest of the tegminal areas wrinkled with opaline lustre, 1st apical cell based on rs, about 5.0X as long as wide, costal margin opposite R₁ slightly thickened, 1st discoidal cell petiolate, petiole about 0.3X as long as the cell. Abdomen black. Legs dark testaceous, hind tibiae slightly curved and pilose.

Length from frontal margin to tips of tegmina 3.0 mm., to tip of posterior process 1.8 mm., width across tips of humeral angles 1.4 mm., at eyes 1.2 mm.

Male : Not known.

Material examined : 3 females ex *Flacourtia* sp., in Mudumalai (Tamil Nadu), 30-2-1985; 1 female in ZSI., Calcutta. Holotype female in British Museum. Type locality: Nilgiri Hill.

Distribution : INDIA : Tamil Nadu (Mudumalai; Nilgiris).

In its general colour *P. atricapilla* Distant closely resembles *affinis*, but it differs in the moderately concavely sinuate posterior process, markings on tegmina, position of ocelli, central carination obscure on metopidium and also in the nature of humeral angles.

220. *Parayasa dissimilis* Distant
(Fig. 225)

1916. *Parayasa dissimilis* Distant, *Fauna Br. India*, 6 : 179.

Male : General colour dark brown. Head fuscous brown, nearly 3.0X as wide across extremities of eyes as length of vertex, finely pilose, hairs, greyish white, vertex about 2.0X as wide as long, upper margin very shallowly arcuate, lower margins roundedly continued to frontoclypeus; eyes hemispherical, pale white; ocelli somewhat projecting, closer to eyes than to each other and situated on c-o line; frontoclypeus wider than long, extending slightly below lower margins of vertex, its apex rounded, longly densely pilose. Pronotum fuscous brown, somewhat gibbous above disc, finely granulose thickly pilose, with greyish hairs; metopidium about 3.0X as wide as high, moderately obliquely sloping behind to disc, finely granulose, with short, pale white adpressed hairs; supraocular callosities conspicuous, jet black, bare, undivided; humeral angles prominent, extending beyond eyes, their apices subacute; posterior process short, concavely sinuate, apex slender, gradually tapering, elevated from inner tegminal margins over an angle of about 20°, not reaching the posterior angle of the inner margin of tegmina, dorsal carina weakly percurrent; tegmina nearly 3.0X as long as wide, pale greyish green (the green colour fading on long preservation), basal fourth black, coriaceous, a distinct transverse black fascia at middle, broader at costal area and narrower at claval area, subapical area with small black spots which coalesce to form narrow oblique fascia, veins reddish brown with small tubercles at intervals, veins to apical area somewhat curved, 1st apical cell about 4.5X as long as wide, based on rs, 1st discoidal cell petiolate. Legs with femora black, their apices, tibiae and tarsi pale reddish brown.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 2.2 mm., width across tips of humeral angles 1.6 mm., at eyes 1.4 mm.

Female : Not known.

Material examined : One male in ZSI., Calcutta collected from Kodaikanal, 4-6-1968. Holotype male in British Museum. Type locality: Kodaikanal.

Distribution : INDIA : Tamil Nadu (Kodaikanal).

P. dissimilis is easily separated from other species of the genus by the very short posterior pronotal process which is distinctly upturned well above the inner margins of the tegmina. The characteristic markings on the tegmina also establish the identity of this species.

221. *Parayasa elegantula* Distant
(Fig. 226)

1916. *Parayasa elegantula* Distant, *Fauna Br. India*, 6 : 178.

1987. *Parayasa elegantula* : Ananthasubramanian and Ghosh, *Bull. zool. Surv. India*, 8(1-3) : 159.

Female : General colour pale brownish yellow. Head vertical, 3.0X as wide across extremities of eyes as length of vertex, finely pilose, hairs white, vertex densely pubescent, upper margin shallowly arcuate, lower margins somewhat subhorizontally continued to frontoclypeus; eyes subglobose, pale yellow; ocelli closer to eyes than to each other and situated above c-o line; frontoclypeus broader than long, extending for about half its length below lower margins of vertex, sparsely longly pilose, frontoclypeal lobes indistinct. Pronotum ochraceous, thickly pilose, hairs short, greyish white, adpressed; metopidium 2.7X as wide as high, vertical; supraocular callosities entire, bare; humeral angles prominent, thickly pilose, apices subacute; posterior process distinctly concavely sinuate, its apex black, nearly reaching the posterior angle of the inner margin of tegmina; scutellum obsolete in the middle; tegmina 2.6X as long as wide, basal third coriaceous, punctate, dark brown, followed by a broad whitish fascia, a narrow yellowish transverse fascia at about the middle, apical half pale white with small brownish patches, veins light brownish yellow, apical limb moderately broad, hyaline, with a distinct spot opposite to the 5th apical cell, 1st apical cell about 5.0X as long as wide, veins to apical area moderately inwardly curved, 1st discoidal cell petiolate, petiole nearly as long as the cell; hind wings with 3 apical cells. Legs dark brown in the coxal segment, tibiae yellowish brown, tarsi pale white, femora of pro- and mesothoracic legs with a longitudinal row of setae, hind tibiae with 3 longitudinal rows of cucullate setae; abdomen pale brownish yellow beneath, black above, finely pilose.

Length from frontal margin to tips of tegmina 3.5 mm., to tip of posterior process 2.4 mm.; width across apices of humeral angles 1.9 mm., at eyes 1.7 mm.

Male : Similar to female in size and general colour. Genitalia with aedeagus U-shaped, shaft with minute spines on dorsal surface; parameres cuneiform, apodeme short, shank expanded terminally and finely longly pilose; lateral valves triangular, their processes long, slender weakly

chitinised, about 0.5X as long as the valve; subgenital plate cleft to about half its length from apex, basal region conspicuously wide, terminal lobes not distinct.

Fifth instar nymph : General colour light green. Body laterally compressed. Head 3.0X as wide as long, densely pilose obscuring the ocelli, rostral apex reaching abdominal segment II; vertex planate at base, frontoclypeus densely pilose, not extending below lower margins of vertex. Thorax with metopidium of pronotum convex, gradually sloping behind to disc, fringed with numerous tuberculate spines; pronotal posterior process extending over basal half of mesonotum, apex subacute; mesonotum about 4.0X as long as metanotum; wing pads conspicuous, their apices reaching the basal part of abdominal segment III; legs with foretibiae rather flat and compressed. Abdomen triangular in cross section, abdominal dorsal tubercles less prominent than those of preceding immature stage; lateral lamellae of abdominal segments III-VIII more or less rectangular, fringed with 8 tuberculate setae arranged in a digitate manner. Anal tube 0.25X as long as body, with tuberculate setae arranged as in instar IV; genitalic rudiments about 0.3X as long as anal tube. Length of nymph 3.4 mm.

Material examined : Numerous females, males and nymphs ex *Vitex negundo*, in Mudumalai, 1-2-1986. Lectotype female in British Museum. Type locality: Somerdale, Ootacamund.

Distribution : INDIA : Tamil Nadu (Ootacamund, Mudumalai).

P. elegantula is closely related to *P. fasciata* Ananthasubramanian in the general colour and size, colour and markings on the tegmina and disposition of the posterior process, but differs by the downward extension of frontoclypeus and size of discoidal cells of tegmina.

222. *Parayasa fasciata* Ananthasubramanian (Fig. 227)

1981. *Parayasa fasciata* Ananthasubramanian, *Entomon*, 5(2) : 126.

Female : General colour brownish ochraceous. Head ochraceous brown, 2.6X as wide as long, densely covered with golden hairs, upper margin of vertex slightly sinuate, lower margins obliquely roundedly continued to frontoclypeus; eyes subglobose, fuscous brown; ocelli shining white, closer to eyes than to each other and situated above c-o line; frontoclypeus extending for one-third its length below lower margins of vertex, apex truncate, frontoclypeal lobes indistinct. Pronotum ochraceous brown, finely tuberculate with short, golden pilosity; metopidium 2.0X as wide as high, convex, obliquely sloping backward to disc; supraocular callosities large, rounded; humeral angles prominent, broadbased, apices subacute; posterior process yellowish brown, concavely sinuate, its apex acute, just reaching the posterior angle of the inner margin of tegmina; tegmina palely virescent, 2.6X as long as wide, basal sixth ochraceous, a fuscous transverse fascia at about the middle, apical limb narrow, apex subacutely rounded, R_1 obliquely placed to subcosta, 2nd discoidal cell divided by a spurious cross vein, veins to apical area straight. Abdomen dark brown. Legs black except tibiae and tarsi which are light brown.

Length from frontal margin to tips of tegmina 3.9 mm., to tip of posterior process 2.8 mm., width across tips of humeral angles 2.0 mm., at eyes 1.6 mm.

Male : Smaller than female; general colour dark brownish ochraceous; tegmina smoky brown with a broad fascia near middle, apical limb tinted with black.

Length from frontal margin to tips of tegmina 3.4 mm., to tip of posterior process 2.72 mm.; width across tips of humeral angles 1.9 mm., at eyes 1.5 mm.

Fifth instar nymph : General colour pale yellowish brown. Body laterally compressed, 3.0 mm. long. Head declivous, cranial tubercles persistent, rostral tip reaching abdominal segment I; eyes reddish brown; ocelli inconspicuous. Thorax slightly shorter than the abdomen excluding the anal tube; pronotum with scattered tuberculate spines; metopidium obliquely sloping backward to disc, pronotal posterior process as long as mesonotum; wing pads extending as far back as abdominal segment III, costal angles not demarcated; lateral lamellae of abdominal segments III-VIII bearing 6 penicillate spines each; anal tube about 0.17X as long as body.

Material examined : 7 females, 3 males and 2 fifth instar nymphs ex *Mollugo* sp., in Dimbam Forest (Tamil Nadu), 22-2-1979. Types in National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Tamil Nadu.

P. fasciata is of interest in having fine tubercles on the pronotum as in the genus *Coccosterphus* Stål although the tubercles are small. The nymphal characters of this species as also the closely related species, *P. elegantula* Distant, particularly the tuberculate spines borne on the abdominal lateral lamellae, also show similarity to those of *Coccosterphus*.

223. *Parayasa maculosa* Distant
(Fig. 228)

1916. *Parayasa maculosa* Distant, *Fauna Br. India*, 6 : 177.

Female : General colour brownish ochraceous. Head vertical, yellowish brown, about 2.8X as wide across extremities of eyes as length of vertex, thickly finely pilose, hairs silvery white, upper margin of vertex arcuate, lower margins slightly obliquely continued to frontoclypeus; eyes hemispherical, dull white; ocelli black, closer to eyes than to each other and situated on c-o line; frontoclypeus extending for two-thirds its length below lower margins of vertex, apex rounded. Pronotum brownish ochraceous, finely granulose, with thick, silvery white hairs; metopidium vertical, about 2.3X as wide as high, gradually sloping backward to disc; humeral angles very prominent, basal areas finely granulose, projecting well beyond eyes, tips subacute; posterior process concavely sinuate, not reaching the posterior angle of the inner margin of tegmina, apical area jet black, dorsal carina strongly percurrent through metopidium; tegmina about 3.0X as long as wide, greyish white, much spotted and suffused with fuscous brown, the spots coalescing at middle to form a fascia, basal fourth black, thickly punctate, veins yellowish brown, with small granules at intervals, R₁ oblique to subcosta, 1st apical cell based on rs, about 3.5X as long as wide, 1st discoidal cell petiolate, veins to apical area slightly curved. Body beneath brownish ochraceous, sternum largely suffused with greyish. Legs with femora black, their apices, tibiae and tarsi pale castaneous, posterior tibiae a little curved.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 2.5 mm.; width across tips of humeral angles 1.8 mm., at eyes 1.5 mm.

Male : Similar to female in general colour; slightly smaller; tegmina with basal third very dark and opaque, middle and apical areas much spotted with ochraceously brown patches which do not form any distinct fascia as in female; genitalia as in *P. elegantula*.

Length from frontal margin to tips of tegmina 3.75 mm., to tip of posterior process 2.25 mm.; width across tips of humeral angles 1.6 mm., at eyes 1.4 mm.

Material examined : 3 females and 1 male ex *Clerodendron* sp. in Kodaikanal, 26-6-1969; 2 females 2 males ex *Boerhaavia diffusa*, in Coorg, 20-12-1979; one female in ZSI., Calcutta.

Distribution : INDIA : Tamil Nadu (Kodaikanal), Karnataka (Coorg). Lectotype female in British Museum; type locality : Nandidurg, Tamil Nadu.

This species is closely related to *P. typica* Distant in the disposition of the posterior process which does not reach the posterior angle of the inner margin of tegmina, the position of the ocelli and the granulose pronotum, but it differs by the colour and characteristic markings on the tegmina.

224. *Parayasa margherita* Distant (Fig. 229)

1916. *Parayasa margherita* Distant, *Fauna Br. India*, 6 : 180.

Female : General colour dark castaneous. Head brown with shades of black, nearly 3.0X as wide across extremities of eyes as length of vertex, finely pilose, hairs silvery white, vertex brown, 2.0X as wide as long, upper margin arcuate, lower margins strongly obliquely continued to frontoclypeus, eyes hemispherical, light brown with shades of black; ocelli vitreous, closer to eyes than to each other and situated on c-o line; frontoclypeus as long as wide, extending for three-fourths its length below lower margins of vertex, apex broadly rounded frontoclypeus distinct. Pronotum dark-reddish brown, finely granulose, sparsely pilose with short, adpressed white hairs; metopidium strongly obliquely continued behind to disc, 2.3X as wide as high, dark castaneous, finely granulose; supraocular callosities rather inconspicuous; humeral angles prominent, their apices subacute, posterior process robust, practically nonsinuate, almost straight, apex slightly black, not convexly gibbous, subacute, not reaching the posterior angle of the inner margin of tegmina, dorsal carina strongly percurrent through metopidium; tegmina 3.0X as long as wide, brownish ochraceous, an opaque, obliquely transverse fascia beyond middle, the area near apical limb dark castaneous, 1st apical cell, long, narrow, based on R_1 and rs , about 4.5X as long as wide, 1st discoidal cell not petiolate, nearly as long as 2nd discoidal cell, veins dark reddish brown; hind wings with 3 apical cells. Legs with femora black, their apices dark ochraceous, tibiae a little paler than femora, tarsi light brown, their extreme apices black.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 2.25 mm.; width across tips of humeral angles 1.6mm., at eyes 1.4 mm.

Male : Not known.

Material examined : One female in Z.S.I., collected from Assam (2,500 ft.). Holotype female in British Museum.

Distribution : INDIA : Assam.

Distant (1916) in his remarks on the affinities of this species stated that *P. Margherita* Possess characters which were scarcely congeneric, such as the practically non-sinuate posterior pronotal posterior process, the longer and straighter apical areas to the tegmina, etc. but was rather inclined to retain it in the present genus till further material was available. Capener, who examined the type in the British Museum in 1963, allocated it to the genus *Gargara*. It may, however, be noted that there are other species such as *P. modesta* Distant and *P. nilgiriensis* Distant which also have straight, nonsinuate posterior process, and to which *P. Margherita* is closely related.

225. *Parayasa modesta* Distant
(Fig. 230)

1916. *Parayasa modesta* Distant, *Fauna Br. India*, 6 : 181.

Female : General colour black. Head black, nearly 3.0X as wide across extremities of eyes as length of vertex, sparsely pilose, hairs white, adpressed, vertex 2.0X as wide as long, upper margin arcuate, lower margins obliquely continued to frontoclypeus; eyes large hemispherical, pale white with a hue of black; ocelli equidistant from each other and from eyes and situated above c-o line; frontoclypeus black, slightly wider than long, extending two-thirds its length below lower margins of vertex, longly sparsely pilose, apex broadly rounded, frontoclypeal lobes indistinct. Pronotum black, slightly convex, thickly punctate, densely pubescent; metopidum black 2.0X as wide as high, nearly vertical; supraocular callosities very conspicuous, large, oval black undivided; humeral angles subpriminent, apices blunt; posterior process straight from base, nonsinuate, gradually tapering to an acute apex which just reaches the apex of clavus, median carina finely percurrent through metopidum; tegmina 3.0X as long as wide, dull subhyaline with a slight dull ochraceous hue reflecting the abdomen beneath, basal one-fourth coriaceous, punctate and brown, veins dull ochraceous, costal margin distinctly thickened opposite to 1st apical cell absorbing part of R_1 to form an incipient pterostigma, 1st apical cell about 5.0X as long as wide, 1st discoidal cell petiolate, petiole very short. Legs with femora black, their apices, tibiae, and tarsi pale testaceous, cucullate setae on hind tibiae dark brown, arranged in 3 rows, apices of tarsi black.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 2.5 mm., width across tips of humeral angles 1.6 mm., at eyes 1.4 mm.

Male : Similar to female in general colour and size. Genitalia similar to *ellegantula* distant.

Material examined : 2 female and 3 male ex *Agapanthus umbellatus*, in Niligiri Hills, 12-12-1985. Holotype female in British Museum. Type locality : Niligiri Hills.

P. modesta is closely related to *P. niligiriensis* Distant in the straight posterior pronotal process which is not concavely sinuous, but differs by the smaller size, general colour, the shorter posterior process, and also by the markings on the tegmina.

226. *Parayasa nigrolimbata* Ananthasubramanian
(Fig. 231)

1981. *Parayasa nigrolimbata* Ananthasubramanian, *Entomon*, 5(2) : 127.

Female : General colour black. Head 3.0X as wide across extremities of eyes as length of vertex, sprinkled with short, adpressed golden pilosity, vertex 2.0X as wide as long, upper margin sinuate lower margins broadly rounded; eyes subglobose, ochraceous brown; ocelli black, closer to eyes than to each other and situated above c-o line; frontoclypeus dark brown, densely pilose, extending for about two-thirds its length below lower margins of vertex, apex truncate, frontoclypeal lobes short. Pronotum black, finely granulate, scattered with silvery hairs; metopidium convex, about 1.5X as wide as high, humeral angles subprominent, their apices blunt; posterior process arising horizontally from disc, only weakly concavely sinuate apical area slightly gibbous apex subacute, just reaching the posterior angle of the inner margin of tegmina, median carina finely percurrent through metopidium; tegmina hyaline, nearly 3.0X as long as wide, basal fifth coriaceous, veins light pinkish and hairy, apical limbus black, costal margin thickened, the thickening extending into the 1st apical cell and terminating in a club-shaped chitinised lobe forming an incipient pterostigma, 1st discoidal cell petiolate, 1st apical cell 5.0X as long as wide, R₁ perpendicular to subcosta. Legs with coxae and trochanters dark brown, femora light brown, tibiae and tarsi yellow.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 2.8 mm.; width across tips of humeral angles 1.9 mm., at eyes 1.8 mm.

Male : Not known.

Material examined : One female ex *Gymnosporia montana*, in Coorg, 19-2-1979. Type locality Coorg; type in National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Karnataka (Coorg).

P. nigrolimbata is closely allied to *P. modesta* Distant in the very slightly sinuate posterior process which just reaches the posterior angle of the inner tegminal margin, the hyaline tegmina and the incipient pterostigma, but differs by the dark patch on the apical limbus of tegmina and the frontoclypeus extending for two-thirds its length below lower margins of vertex.

227. *Parayasa niligiriensis* Distant
(Fig. 232)

1916. *Paraysaa niligiriensis* Distant, *Fauna Br. India*, 6 : 180-181.

Female : General colour indigo black. Head 2.75 X as wide across extremities of eyes as length of vertex, indigo black, finely punctate, sparsely pilose, hair short, silvery, vertex 2.0X as

wide as long, upper margin arcuate, lower margins somewhat subhorizontally continued to frontoclypeus; frontoclypeus extending for about three-fourths its length below lower margins of vertex, apex truncate, frontoclypeal lobes quite distinct; eyes subglobose, pale white with a black hue; ocelli equidistant from each other and from eyes and situated above c-o line. Pronotum indigo black, finely punctate, with short silvery hairs; metopidum about 2.0X as wide as high, obliquely sloping behind to disc, disc not elevated; supraocular callosities very prominent, undivided, darker than rest of metopidum; humeral angles subprominent, their apices obtuse; posterior process not concavely sinuate, straight, contiguous with inner tegminal margin, apex acute, just reaching the apex of clavus, median carina finely percurrent through metopidum; tegmina nearly 3.0X as long as wide, pale ochraceous, subhyaline reflecting the dark abdomen beneath, basal fifth indigo black, coriaceous, subhyaline reflecting the dark abdomen beneath, basal fifth indigo black, coriaceous and punctate, immediately followed by a whitish transverse fascia, extreme apical margin along costal area distinctly darker, costal margin opposite to 1st apical cell, thickened, R_1 partly absorbed into an incipient pterostigma, 1st apical cell about 5.0X as long as wide, 1st discoidal cell petiolate, veins to apical area except R_{2+3} straight. Scutellum with the lateral areas more or less greyishly tomentose. Legs ochraceous, apical area of tarsi black.

Length from frontal margin to tips of tegmina 5.5 mm., to tip of posterior process 3.5 mm.; width across tips of humeral angles 2.0 mm., at eyes 1.8 mm.

Male : Similar to female in general colour. Distinctly smaller than female; pronotum densely pubescent; humeral angles a little more prominent, their apices subacute; posterior process with the median carina almost entirely obsolete on the metopidum, a little sinuate near base and slightly shorter than in female.

Length from frontal margin to tips of tegmina 5.0 mm., to tip of posterior process 3.0 mm.; width across tips of humeral angles 1.8 mm., at eyes 1.6 mm.

Material examined : 3 females and 1 male in Tamil Nadu Agricultural University, Coimbatore, ex *Indigo splendens*, at Nilgiri Hills (coll. T.V. Campbell). Lectotype male in British Museum; type locality : Nilgiri Hills.

Distribution : INDIA : Tamil Nadu (Nilgiri Hills).

P. nilgiriensis is allied to *P. margherita* Distant and *P. modesta* Distant in the straight posterior process which is not concavely sinuous, but differs from *margherita* by the longer posterior process, the general colour and the veins to apical area of tegmina being curved with the exception of R_{2+3} ; from *modesta* it differs by the larger size, general colour and the longer posterior process which is contiguous with the inner tegminal margin exposing the scutellum at the basal angles.

228. *Parayasa pilosa* Ananthasubramanian
(Fig.233)

1981. *Parayasa pilosa* Ananthasubramanian, *Entomon*, 5(2) : 125.

Female : General colour dark brown. Head ochraceous brown, densely pilose, hairs golden yellow, head nearly 3.0X as wide across extremities of eyes as length of vertex, upper margin of vertex shallowly arcuate, lower margins obliquely continued to frontoclypeus; eyes subglobose, brown; ocelli black, closer to eyes than to each other and situated on c-o line; frontoclypeus densely longly pilose, its apex truncate, extending just below lower margins of vertex, frontoelypeal lobes indistinct. Pronotum brown, not tuberculate, finely punctate with long, golden pilosity; metopidium 2.0X as wide as high, convex, gently sloping back to disc; supraocular callosities large, oval and bare; humeral angles conspicuous, their apices subacute; posterior process brown, highly pilose, closely fitting against scutellum, convex at base, then concavely sinuate, apex slightly raised, reddish, not reaching the posterior angle of inner tegminal margin, dorsal carina finely percurrent through metopidium; tegmina hyaline with shades of yellow, much spotted and suffused with fuscous brown, 3.0X as long as wide, veins bordered with golden pilosity, costal margin reddishbrown, with a distinct thickening just behind the level of R₁ forming an incipient pterostigma, veins too apical area curved, 2nd discoidal cell bisected by a spurious cross vein, 1st apical cell about 2.0X as long as wide. Legs with coxae and trochanters black, femora ochraceous brown, tibiae and tarsi light brown.

Length from frontal margin to tips of tegmina 3.5 mm., to tip of posterior process 2.4 mm.; width across tips of humeral angles 1.8 mm., at eyes 1.6 mm.

Male : Not known.

Material Examined : One female, Sirumalai (Tamil Nadu) ex *Elateria cardamomum*, 1-8-1978. Holotype female in National Pusa Collections, IARI., New Delhi.

Distribution : INDIA : Tamil Nadu (Sirumalai)

P. pilosa is closely related to *maculosa* Distant in the nature of the posterior process, frontoclypeus and much spotted fuscous brown patches on tegmina, but differs by the presence of an incipient pterostigma.

229. *Parayasa rustica* Distant
(Fig. 234)

1916. *Parayasa rustica* Distant, *Fauna Br. India*, 6 : 181

Female : General colour tawny brown. Head about 3.0X as wide across extremities of eyes as length of vertex, pale tawny brown, thickly longly pilose hairs pale white, vertex a little more than 2.0X as wide as long, upper margin shallowly arcuate, lower margins slightly obliquely continued to frontoclypeus; eyes dark brown; ocelli equidistant from each other and from eyes and situated well above c-o line; frontoclypeus moderately broad, projecting only slightly lower margins of vertex, apex broadly rounded, frontoclypeal lobes indistinct. Pronotum pale tawny brown, thickly punctate and densely pilose; metopidium strongly obliquely sloping back to disc, coarsely punctate and pubescent; supraocular callosities conspicuous, nearly circular, black; humeral angles subprominent, their apices blunt; posterior process only very slightly concavely sinuate, its apical area black, gradually tapering, apex subacute, not reaching the posterior angle

of the inner margin of tegmina; tegmina nearly 3.0X as long as wide, dull greyish, much mottled with pale brown, basal fourth black, punctate and coriaceous, costal margin near R_1 slightly thickened, 1st apical cell based on rs , about 4.0X as long as wide. Legs dark ochraceous, trochanters black, tibiae pale reddish brown, pilose, tarsi light brown.

Length from frontal margin to tips of tegmina 4.0 mm., to tip of posterior process 2.5 mm.; width across tips of humeral angles 1.5 mm., at eyes 1.4 mm.

Male : Not known.

Material examined : One female in ZSI., Calcutta collected from Nilgiris; 4 females ex *Eupatorium odorum*, at Naduvattam, Tamil Nadu, 30-12-1985. Holotype female in British Museum. Type locality : lovedale, Nilgiris.

Distribution : INDIA : Tamil Nadu (Nilgiris).

P. rustica is closely related to *modesta* Distant in the nature of the posterior process which is scarcely concavely sinuate and practically straight, the apical area gradually tapering to an acute apex which never reaches the posterior angle of the inner tegminal margin; it differs from *modesta* in the colour of pronotum and the characteristic markings on the tegmina.

230. *Parayasa typica* Distant
(Fig. 235)

1916. *Parayasa typica* Distant, *Fauna Br. India*, 6 : 177

Female : General colour black. Head black, about 3.0X as wide across extremities of eyes as length of vertex, finely pilose, vertex about 2.0X as wide as long, upper margin shallowly arcuate, lower margins obliquely rounded to frontoclypeus; eyes large, dull black; ocelli black, closer to eyes than to each other and situated slightly above c-o line; frontoclypeus densely longly pilose, extending for two-thirds its length below lower margins of vertex, apes narrowly rounded, frontoclypeal lobes indistinct. Pronotum black, finely granulate, with short, adpressed silvery hairs; metopidium 1.5X as wide as high, densely pilose, vertical, centrally carinate, gradually sloping behind disc; supraocular callosities conspicuous, undivided, bare; humeral angles prominent, apices subacute; posterior process concavely sinuate, not nearly reaching the posterior angle of the inner margin of tegmina, apical area jet black; tegmina about 3.0X as long as wide, black except claval and subclaval areas, median fascia, 1st apical and most of the 2nd and 4th apical cells which are greyish white, basal one-fourth coriaceous, strongly punctate. Body beneath black. Legs with femora black, their apices, tibiae and tarsi dark brown, posterior tibiae a little curved.

Length from frontal margin to tips of tegmina 4.5 mm., to tip of posterior process 2.7 mm.; width across tips of humeral angles 1.8 mm., at eyes 1.4 mm.

Male : General colour jet black. Central carina on metopidium black, posterior half of posterior process jet black, more conspicuously carinate, apical area prominently gibbous;

tegmina uniformly black except for some greyish spots in the claval, subclaval and apical areas; genitalia similar to the of *ellegantula* Distant.

Material examined : 2 females in ZSI., Calcutta, collected from Calcutta, 1-8-1968; 2 females and 3 males collected by beating wild shrubs at Kodiakanal, 14-8-1981. Lectotype male in British Museum. Type locality : Kodaikanal.

Distribution : INDIA : Tamil Nadu (Kodaikanal); West Bengal (Calcutta).

P. typica is closely related to *maculosa* Distant and *affinis* Distant in the disposition of the posterior process which is concavely sinuate, not reaching the apex of clavus; it differs from *maculosa* by the position of the ocelli, and from *affinis* by the granulose nature of the pronotum and the characteristic markings on the tegmina.

231. *Parayasa variegata* Thirumalai and Ananthasubramanian
(Fig. 236)

1981. *Parayasa variegata* Thirumalai and Ananthasubramanian, *Bull. zool. Surv. India*. 4(1) : 33.34.

Female : General colour ochraceous brown. Head declivous, about 3.0X as across extremities of eyes as length of vertex, vertex about 2.0X as wide as long, finely punctate, with short golden yellow hairs, upper margin strongly arcuate and carinate, lower margins obliquely continued to frontoclypeus; eyes pale reddish brown, ovate in frontal view; ocelli black, not very prominent, closer to eyes than to each other and situated on c-o line; frontoclypeus light brown, extending for three-fourths its length below lower margins of vertex, tip longly pilose, broadly rounded. Pronotum reddish brown, strongly punctate, with short, adpressed, golden pilosity; metopidium about 2.0 as wide as high, strongly obliquely directed to disc; disc with a pair of board carinate areas of reddish brown colour; supraocular callosities black, divided; humeral angles prominent, their apices blunt; posterior process concavely sinuate, slightly convexly gibbous at apex which is black and not reaching the posterior angle of the inner margin of tegmina, dorsal carina strongly percurrent through metopidium; tegmina 3.0X as long as wide, pale ochraceous, basal sixth black, coraceous, a translucent fascia at about the middle and another obliquely transverse fascia at about two-thirds the distance from base, rest palely virescent, a distinct brown patch extending into the 5th apical cell near claval suture, veins ochraceous with small tubercles at intervals, an incipient pterostigma formed by thickening of costal area, absorbing R_1 partly, 1st apical cell long, narrow, about 5.5X as long as wide, 1st discoidal cell large elliptical, 2nd discoidal cell divided by a transverse vein, R_{4+5} strongly curved, apical limb narrow. Lateral areas of thorax shaded black; abdomen black, reaching about the apex of 1st apical cell. Legs with tibiae light brown.

Length from frontal margin to tips of tegmina 4.0 mm., to posterior process 2.4 mm.; width across tips of humeral angles 1.8mm., at eyes 1.5 mm.

Male : Not known.

Material examined : 3 females from silent Valley, Kerala (1,005 metres), collected by R.S. Pillai & Party 2-5-1980. Holotype female and 2 female paratypes in ZSI., Calcutta.

Distribution : INDIA : Kerala State (Silent Valley).

P. variegata is closely related to *P. elengatula* Distant and *P. affixa* Distant in the general colour and size of the body and disposition of the posterior process, but differs from *elegantula* by the absence of a pair of broad carinate reddish brown areas on the disc, and from *affixa* by the nature of the frontoclypeus and by the markings on the tegmina.

Genus 41. *Insitor* Distant

1916. *Insitor* Distant, *Fauna Br. India*, 6 : 176

The peculiar pronotal character which distinguishes this genus from other genera of the tribe is that the disc is elevated medially into a laterally compressed structure amplified into a hemispherical process, one at the anterior end and the other at the posterior dorsal area.

Head subquadrate, 2.0X as wide as long, upper margin of vertex arcuate, lower margins broadly rounded; eyes globular, ocelli conspicuous, equidistant from each other and from eyes and situated on c-o line; frontoclypeus extending for two-thirds its length below lower margins of vertex, apex rounded. Pronotum anteriorly elevated, laterally compressed, anterior and posterior margins of disc roundedly angulate and compressed; metopidium vertical with the crest overhanging the head; suprahumeral horns absent humeral angles prominent, their apices rounded; posterior process short, strongly concavely sinuate and apically convexly amplified, its apex reaching the posterior angle of the inner margin of tegmina, median carina percurrent and strongly elevated on metopidium; scutellum aborted in the middle; tegmina with 5 apical and 2 discoidal cells, veins to apical area moderately straight, apical limb narrow; hind wings with 3 apical cells. Legs simple.

Type species : *Insitor exemplificatus* distant.

232. *Insitor exemplificatus* Distant (Fig. 237)

1916. *Insitor exemplificatus* Distant, *Fauna Br. India*, 6 : 176.

(Search for this species in its type locality and elsewhere was not successful, and the following description is based on the detailed notes kindly provided by Mr. A. L. Capner who examined the holotype female in the British Museum in 1963.)

Female : General colour dark brown. Head 3.0X as wide across extremities of eyes as length of vertex, sparsely pilose, vertex 2.0X as wide as long, its upper margin shallowly arcuate, lower margins somewhat roundedly continued to frontoclypeus; eyes large fuscous brown; ocelli equidistant from each other and front eyes and situated above c-o line; frontoclypeus semicircular, extending for two-thirds its length below lower margins of vertex, tip rounded, longly thickly pilose, frontoclypeal lobes indistinct. Pronotum dark brown, thickly strongly punctate, centrally carinate, anteriorly elevated, laterally compressed, its apical surface anteriorly and posteriorly

subconvexly amplified ; metopidium vertical, about 2.0X as wide as high, strongly punctate, sparsely pilose; humeralangles subprominent; supraocular callosities entire, pitch black, bare; posterior process short, strongly concavely sinuate, central carina strongly percurrent through metopidium, apical area convexly sinuate, central carina strongly percurrent through metopidium, apical area convexly amplified, apex reaching-only the tip of 2nd anal vein. Tegmina dull hyaline with a greyish hue, 3.0X as long as wide, 1st apical cell wedge-shaped, based on rs, 4.0X-as long as wide, R₁ oblique to subcosta, 1st discoidal cell about as long as the 2nd, non petiolate, veins to apical area moderately straight, apical limb narrow, basal sixth of tegmina brownish ochraceous, a transverse fascia beyond middle; broad near outer margin, becoming evanescent near inner margin of tegmina, a horizontal black patch in the claval area, a dark patch at the posterior angle of the inner tegminal margin continuous with the transverse fascia, apical area with scattered black spots, scutellum exposed at the basal lateral areas, aborted at middle. Legs simple, ochraceous.

Length from frontal margin to tips of tegmina 3.5 mm., to tip of posterior process 2.6 mm.; width across tips of humeral angles 1.25 mm., 1.19 mm.

Male : Not known.

Material examined : As noted above.

Distribution : INDIA : Tamil Nadu (Nilgiri Hills).

Genus 42. *Kanada* Distant

1908. *Kanada* Distant, *Fauna Br. India*, 4 : 74.

This genus is very closely related to *Gargara*, but differs in having no true scutellum and in having the mesonotum produced backward in a flat spine on each side.

Head subquadrate, 3.0X as wide across extremities of eyes as length of vertex 2.0X as wide as long, upper margin weakly arcuate, slightly sinuate, lower margins broadly rounded and nearly horizontal; eyes globular, small; ocelli conspicuous, about equidistant from each other and from eyes and situated above c-o line; frontoclypeus near quadrangular, extending for three-fourths its length below lower margins of vertex, its apex truncate. Pronotum subelongate, discmoderately convex; metopidium obliquely continued behind to disc, strongly and broadly foveate on each side behind eyes; suprahumeral horns absent; humeralangles subprominent, triangular, apices acute; posterior process broad at base concealing the scutellum, then narrowed to apex, straight, impinging on inner tegminal margin, apex acute, passing slightly beyond the posterior angle of the inner margin of tegmina; scutellum aborted in the middle; mesonotum with a backwardly directed laminate spine on each side; tegmina broad and hyaline, base coriaceous and punctate,

veins strong, 5 apical and 2 discoial cells, tip rounded, apical limbus broad; hind wings with 3 apical cells. Legs heavy, tibiae strongly longitudinally grooved.

Type specie : *Kanada irvinei* Distant.

233. *Kanada irvinei* Distant

(Fig. 238)

1908. *Kanada irvinei* Distant, *Fauna Br. India*, 4 : 75.

Female : General colour yellowish brown. Head 3.0X as wide across extremities of eyes as length of vertex, covered with silvery hairs, vertex 2.0X as wide as long, upper margin weakly arcuate and slightly sinuate, lower margins broadly rounded and subhorizontal; eyes piceous brown; ocellipale white, more or less equidistant from each other and from eyes and situated a little above c-o line; frontoclypeus narrow at base, extending for three-fourths its length below lower margins of vertex, densely pilose, its apex truncate; frontoclypeal lobes indistinct. pronotum ochraceous, densely covered with fine, adpressed, silvery hairs, disc somewhat convex; metopidium about 2.0X as wide as high, strongly obliquely continued to disc; supraocular callosities inconspicuous; humeral angles subprominent, their apices acute; suprahumeral horns absent; posterior process slightly elevated at base, broad for about two-thirds its length then gradually narrowed to an acute apex, apex acute, black, passing the posterior angle of the inner margins of tegmina, dorsal carina strong, becoming almost obsolete on disc and metopidium; tegmina 3.0X as long as wide, hyaline, talc-like, wrinkled, basal fifth opaque, coriaceous, R_1 oblique to subcosta, 1st apical cell wedge-shaped based on rs , about 5.0X as long as wide, 1st discoidal cell nonpetiolate, slightly shorter than the 2nd, veins to apical area almost straight. Legs heavy femora dull castaneous, tibiae and tarsi ochraceous.

Length from frontal margin to tips of tegmina 3.5 mm., to tip of posterior process 2.7 mm.; width across tips of humeral angle 1.35 mm., at eyes 1.25 mm.

Male : Not known.

Material examined : 3 females ex *Solanum xanthocarpum*, in Coorg, 12-1-1981. Holotype female in British Museum. Type locality : Ranchi, Bihar.

Distribution : INDIA : Bihar (Ranchi), Karnataka (Coorg).

HOST-PLANTS LIST

<i>Name of Membracid</i>	<i>Name of host plant</i>	<i>Natural Order</i>
<i>Anchon pilosum</i> (Walker)	<i>Vigna catiang</i>	Fabaceae
<i>Anchon rectangulatum</i> (Kirby)	<i>Butea forndosa</i>	Fabaceae
<i>Anchon ulniforme</i> Buckton	<i>Cajanus cajan, phaseolus mungo</i>	Fabaceae
<i>Centrotus indicus</i> n.sp	<i>Tecoma stans</i>	Fabaceae
<i>Centrotypus flexuosus</i> (Fabr.)	<i>Pterocarpus marsupium</i>	Fabaceae
<i>Centrotypus malabaricus</i> n.sp.	<i>Dalbergia sissoo</i>	Fabaceae
<i>Centrotypus pulmiensis</i> n.sp.	<i>Lawsonia alba</i>	Lythraceae
<i>Centrotupus securis</i> Buckton	<i>Olea glandulifera</i>	Oleaceae
<i>Centruchus brevicornis</i> Funkhouser	<i>Cedra deodara</i>	Mellaceae
<i>Coccosterphus decoloratus</i> Distant	<i>Boerhaavia repens, B. Diffusa</i>	Nyctaginaceae
<i>Coccosterphus minutus</i> (Fabr.)	<i>Prosopis spicigera</i>	Mimoseae
	<i>Acalypha indica</i>	Euphorbiaceae
	<i>Parthenium hysterophorus</i>	Compositae
<i>Coccosterphus mysorensis</i>		
Ananthasubramanian and Ghosh	<i>Flacourtia sp.</i>	
<i>Coccosterphus obscurus</i> Distant	<i>Boerhaavia repens</i>	Nyctaginaceae
<i>Convecton cavendus</i> Distant	<i>Cinchona officinalis</i>	Rubiaceae
<i>Deitzius tomentosus</i>		
(Ananthasubramanian) com. nov.	<i>Artocarpus intergrifolia</i>	Moraceae
<i>Demanga sookana</i> Distant	<i>Salix sp.</i>	Salicaceae
<i>Dograna suffulta</i> Distant	<i>Michaelia champaka</i>	Magnoliaceae
	<i>Butea frondosa</i>	Fabaceae
<i>Emphusis malleus</i> (Walker)	<i>Sachleichera oleosa</i>	Sapindaceae
<i>Emphusis perarmatus</i> Distant	<i>Terminalia arjuna</i>	Combretaceae
<i>Eucoccosterphus mucronicollis</i>	<i>Eupatorium</i>	Compositae
(de Mostschulsky)		
<i>Eucoccosterphus paludatus</i> (Distant)	<i>Bauhinia tomentosas</i>	Caesalpiniaceae
	<i>Cestrum diurnum</i>	Solanaceae
	<i>Lawsonia alba</i>	Lythraceae
	<i>Ficus bengalensis</i> -prop roots	Moraceae
<i>Eucoccosterphus tuberculatus</i>	<i>Morinda tinctoria</i>	Rubiaceae
(De Motschulsky)	<i>Phyllanthus emblica</i>	Euphorbiaceae
<i>Gargara albitarsis</i>	<i>Tecoma grandiflora</i>	
Ananthasubramanian and Ananthakrishnan		
<i>Gargara extrema</i> Distant	<i>Solanum melongena,</i>	Solanaceae
	<i>Capsicum frutescens</i>	Solanaceae

<i>Name of Membracid</i>	<i>Name of host plant</i>	<i>Natural Order</i>
	<i>Acalypha indica</i> ,	Euphorbiaceae
	<i>A. wilkesiana</i>	Solanaceae
<i>Gargara hraswa</i> nom. nov	<i>Moringa oleifera</i>	Moringaceae
<i>Gargara kandala</i> n.sp.	<i>Prosopis juliflora</i>	Mimosaceae
<i>Gargara madrasensis</i>	<i>Cestrum diurnum</i>	Solanaceae
Ananthasubramanian and Ananthakrishnan	<i>Caesalpinia pulcherrima</i>	Caesalpiniaceae
<i>Gargara malabarica</i>	<i>Phyllanthus emlica</i>	Euphorbiaceae
Ananthasubramanian and Ananthakrishnan		
<i>Gargara mixta</i> (Buckton)	<i>Lagerstroemia</i> sp.	Lythraceae
	<i>Syzygium jambolanum</i>	Myrtaceae
<i>Gargara pellucida</i> Ananthasubramanian	<i>Gymnosporia montana</i>	
<i>Gargara rustica</i>	<i>Zizyphus jujuba</i> , <i>Z. aenoplia</i>	Rhamnaceae
Ananthasubramanian and Ananthakrishnan		
<i>Gargara varicolor</i> Stål	<i>Acalypha wilkesiana</i>	Euphorbiaceae
	<i>Solanum verbascifolium</i>	Solanaceae
<i>Hypsauchenia subfusca</i> Buckton	<i>Salix elegans</i>	Salicaceae
<i>Hypsolyrium uncinatum</i> (Stål)	<i>Cyphomandra</i> sp., <i>Artemisia</i> sp.	
<i>Insitor exemplificatus</i> Distant	<i>Tecoma grandis</i>	
<i>Kanada irvinei</i> Distant	<i>Solanum torvum</i>	Solanaceae
<i>Lanceonotus cinnamomi</i>	<i>Cinnamomum</i> sp.	Laurineae
Ananthasubramanian		
<i>Lanceonotus luteinervis</i>	<i>Michelia champaka</i>	Mangoliaceae
(Funkhouser) com. nov.		
<i>Leptocentrus albonotatus</i> Distant	<i>Coffea arabica</i>	Rubiaceae
<i>Leptocentrus bajulans</i> Distant	<i>Casuarina equisetifolia</i>	Casuarinaceae
<i>Leptocentrus bauhiniae</i>	<i>Bauhinia tomentosa</i>	Caesalpiniaceae
Ananthasubramanian and Ananthakrishnan		
<i>Leptocentrus leucaspis</i> (Walker)	<i>Terminalia catappa</i>	Combretaceae
	<i>Pongamia glabra</i>	Fabaceae
	<i>Bauhinia tomentosa</i>	Caesalpiniaceae
<i>Leptocentrus longispinus</i> Distant	<i>Michelia champaka</i>	Magnoliaceae
	<i>Pongamia glabra</i>	Fabaceae
<i>Leptocentrus major</i>	<i>Michelia champaka</i>	Magnoliaceae
Ananthasubramanian and Ananthakrishnan		
<i>Leptocentrus mangiferae</i>	<i>Mangifera indica</i>	Anacardiaceae
Ananthasubramanian and Ananthakrishnan		

<i>Name of Membracid</i>	<i>Name of host plant</i>	<i>Natural Order</i>
<i>Leptocentrus moringae</i> Ananthasubramanian and Ananthakrishnan	<i>Moringa oleifera</i>	Moringaceae
<i>Leptocentrus nigra</i> Ananthasubramanian and Ananthakrishnan	<i>Phyllanthus sp.</i> <i>Cajanus cajan</i>	Euphorbiaceae Fabaceae
<i>Leptocentrus obliquus</i> Distant	<i>Terminalia arjuna</i>	Combretaceae
<i>Leptocentrus reponens</i> (Walker)	<i>Butea monosperma</i>	Fabaceae
<i>Leptocentrus rhizophagus</i> Ananthasubramanian and Ananthakrishnan	<i>Ficus bengalensis</i> Prop roots	Moraceae
<i>Leptocentrus scutellatus</i> Distant	<i>Cytissus scoparius</i>	Fabaceae
<i>Leptocentrus substitutus</i> (Walker)	<i>Tectona grandis</i> <i>Cajanus cajan</i> <i>Cestrum diurnum</i>	Verbenaceae Fabaceae Solanaceae
<i>Leptocentrus taurus</i> (Fabr.)	vide Table : 6	
<i>Leptocentrus ustus</i> Buckton	<i>Casurina equisetifolia</i>	Casuarinaceae
<i>Leptocentrus varicornis</i> Ananthasubramanian and Ananthakrishnan	<i>Zizyphus jujuba</i>	Rhamnaceae
<i>Nilautama typica</i> Distant	<i>Bauhinia tomentosa</i>	Caesalpiniaceae
<i>Otinotus albomaculatus</i> Distant	<i>Cinchona sexirubra</i>	Rubiaceae
<i>Otinotus ammon</i> Buckton	<i>Santalum album</i>	Santalaceae
<i>Otinotus aureus</i> Ananthasubramanian	<i>Cytissus scoparius</i>	Fabaceae
<i>Otinotus badius</i> Distant	<i>Eucalyptus globulus</i>	Myrtaceae
<i>Otinotus elongatus</i> Distant	<i>Lagerstroemia sp.</i>	Lythraceae
<i>Otinotus indicatus</i> (Melichar)	<i>Thespesia populnea</i> <i>Lawsonia alba</i> <i>Psidium guajava</i>	Malvaceae Lythraceae Myrtaceae
<i>Otinotus mimicus</i> Distant	<i>Cytissus scoparius</i>	Fabaceae
<i>Otinotus mysorensis</i> Ananthasubramanian	<i>Acalypha wilkesiana</i>	Euphorbiaceae
<i>Otinotus obliquus</i> Ananthasubramanian and Ananthakrishnan	<i>Trewia nudiflora</i> <i>Premna latifolia</i> <i>Thespesia populnea</i> <i>Bauhinia sp.</i>	Verbenaceae
<i>Otinotus oneratus</i> (Walker)	Vide Table : 7	
<i>Otinotus pallescens</i> Distant	<i>Zizyphus jujuba</i> <i>Bauhinia tomentosa</i>	Rhamnaceae Caesalpiniaceae

<i>Name of Membracid</i>	<i>Name of host plant</i>	<i>Natural Order</i>
<i>Oxyrhachis brevicornutus</i> Ananthasubramanian and Ananthakrishnan	<i>Acacia lecopphlaea</i> <i>Cassia sp.</i>	Mimoseae Caesalpiniaceae
<i>Oxyrhachis krusadiensis</i> Ananthasubramanian and Ananthakrishnan	<i>Cassia sp.</i> <i>Prosopis spicigera</i>	Caesalpiniaceae Mimoseae
<i>Oxyrhachis lefroyi</i> Distant	<i>Butea frondosa</i> <i>Cassia auriculata</i>	Fabaceae Caesalpiniaceae
<i>Oxyrhachis mangiferana</i> Distant	<i>Mangifera indica</i>	Anacardiaceae
<i>Oxyrhachis minusculus</i> Ananthasubramanian and Ananthakrishnan	<i>Casuarina equisetifolia</i>	Casuarinaceae
<i>Oxyrhachis palus</i> Distant		
<i>Oxyrhachis rufescens</i> Walker	<i>Peltophorum ferrugineum</i> <i>Acacia auriculiformis, A. arabica</i> <i>A. melanoxylon, Parkia</i> <i>biglandulosa, Pithecolobium dulce,</i> <i>Prosopis juliflora, P. spicigera.</i> <i>Bauhinia purpurea, B. tomentosa,</i> <i>Caesalpinia coriaria, C. pulcherrima,</i> <i>Cassia fistula, C. glauca,</i> <i>Delonixregia, Peltophorum</i> <i>ferrugineum, Tamarindus indicus.</i> <i>Butea frondosa, Crotolaria juncea,</i> <i>C. verrucosa, Pterocarpus</i> <i>marsupium, Erythriina indica</i> <i>Sesbania aegyptiaca</i>	Caesalpiniaceae Mimoseae Mimoseae Mimoseae Mimoseae Caesalpiniaceae Caesalpiniaceae Caesalpiniaceae Caesalpiniaceae Caesalpiniaceae Fabaceae Fabaceae Fabaceae Fabaceae Fabaceae
<i>Oxyrhachis subjecta</i> Walker	<i>Glyricidia maculata</i>	Fabaceae
<i>Oxyrhachis tuberculus</i> (Ananthasubramanian) nom. nov.	<i>Prosopis spicigera</i>	Mimoseae
<i>Oxyrhachis uncatatus</i> Melichar	<i>Prosopis spicigera, P. juliflora.</i>	Mimoseae
<i>Parayasa affinis</i> Distant	<i>Euphorbia hirta</i>	Euphorbiaceae
<i>Parayasa affixa</i> Distant	<i>Phyllanthus niruri</i>	Euphorbiaceae
<i>Parayasa atricapilla</i> Distant	<i>Flacourtia sp.</i>	
<i>Parayasa ellegantula</i> Distant	<i>Viltex negundo</i>	Verbenaceae
<i>Parayasa faciata</i> Ananthasubramanian	<i>Mollugo sp.</i>	Aizaceae
<i>Parayasa maculosa</i> Distant	<i>Clerodendorn sp.</i> <i>Boerhaavia diffusa</i>	Verbenaceae Nyctaginaceae

<i>Name of Membracid</i>	<i>Name of host plant</i>	<i>Natural Order</i>
<i>Parayasa modesta</i> Distant	<i>Agapanthus umbellatus</i>	Liliaceae
<i>Parayasa nigrolimbata</i> Ananthasubramanian	<i>Gymnosporia montana</i>	
<i>Parayasa nilgiriensis</i> Distant	<i>Indigofera splendens</i>	Fabaceae
<i>Parayasa pilosa</i> Ananthasubramanian	<i>Elatteria cardamoni</i>	Zingiberaceae
<i>Parayasa rustica</i> Distant	<i>Eupatorium odorum</i>	Compositae
<i>Tlingana consobrina</i> Distant	<i>Agapanthus umbellatus</i>	Liliaceae
<i>Telingana curvispina</i> (Stal)	<i>Aspidium sp.</i>	Pterophyta
<i>Telingana flavipes</i> (Kirby)	<i>Agapanthus umbellatus</i>	Liliaceae
<i>Telingana imitator</i> (Kirby)	<i>Cytissus coparia</i>	Fabaceae
<i>Telingana nigroalata</i> Ananthasubramanian and Ananthakrishnan	<i>Agapanthus umbellatus</i>	Liliaceae
<i>Telingana subsimilis</i> (Walker)	<i>Santalum album</i>	Santalaceae
<i>Telingana travancorensis</i> Distant	<i>Spathodea campanulata</i>	
<i>Tricentrus assamensis</i> Distant	<i>Santalum album</i>	Santalaceae
<i>Tricentrus albomaculatus</i> Distant	<i>Datura fastuosa</i>	Solanaceae
<i>Tricentrus ananthasubramanianii</i> Sharma and Badan	<i>Dalbergia sisoo, D. latifolia</i>	Fabaceae
<i>Tricentrus atrus</i> Ananthasubramanian	<i>Anacardium occidentale</i>	Anacardiaceae
<i>Tricentrus bifurcus</i> Distant	<i>Eupatorium odorum</i>	Compositae
<i>Tricentrus concolor</i> n. sp.	<i>Cajanus cajan</i>	Fabaceae
<i>Tricentrus congestus</i> (Walker)	<i>Vernonia cinerea</i>	Compositae
<i>Tricentrus decornis</i>	<i>Eugenia caryophyllata</i>	Myrtaceae
	<i>Lagerstroemia sp.</i>	Lythraceae
	<i>Cryptostegia sp.</i>	Asclepiadaceae
<i>Tricentrus fairmairei</i> (Stal)	<i>Solanum verbascifolium</i>	Solanaceae
	<i>S. trilobatum</i>	Solanaceae
<i>Tricentrus gibbosulus</i> (Walker)	<i>Xanthium ap.</i>	Compositae
<i>Tricentrus hameedi</i> n.sp.	<i>Ficus bengalensis</i> prop roots	Urticaceae
<i>Tricentrus indicus</i> nom. nov.	<i>Polygonum sp.</i>	Polygonaceae
<i>Tricentrus nobilis</i> Ananthasubramanian	<i>Boerhaavia repens</i>	Nyctaginaceae
<i>Tricentrus pilosus</i> Ananthasubramanian and Ananthakrishnan	<i>Thespesia populnea</i>	Malvaceae
	Prop roots of <i>Ficus bengalensis</i>	Urticaceae
<i>Tricentrus pronus</i> Distant	<i>Acalypha wilkesiana</i>	Euphorbiaceae
<i>Tricentrus sissoo</i> Sharma and Badan	<i>Dalbergia sissoo</i>	Fabaceae
	<i>Pterocarpus marsupium</i>	Fabaceae
<i>Tricentrus spathodei</i> Ananthasubramanian	<i>Spathodea campanulata</i>	
<i>Tricentrus subangulatus</i> Distant	<i>Acacia nilotica</i>	Mimoseae

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FAMILY MEMBRACIDAE

PLATE I



Characteristic resting posture of membracid adults on their host plants,
A. *Leptocentrus bauhiniae*; B. *L. rhizophagus*; C. *L. leucaspis*.

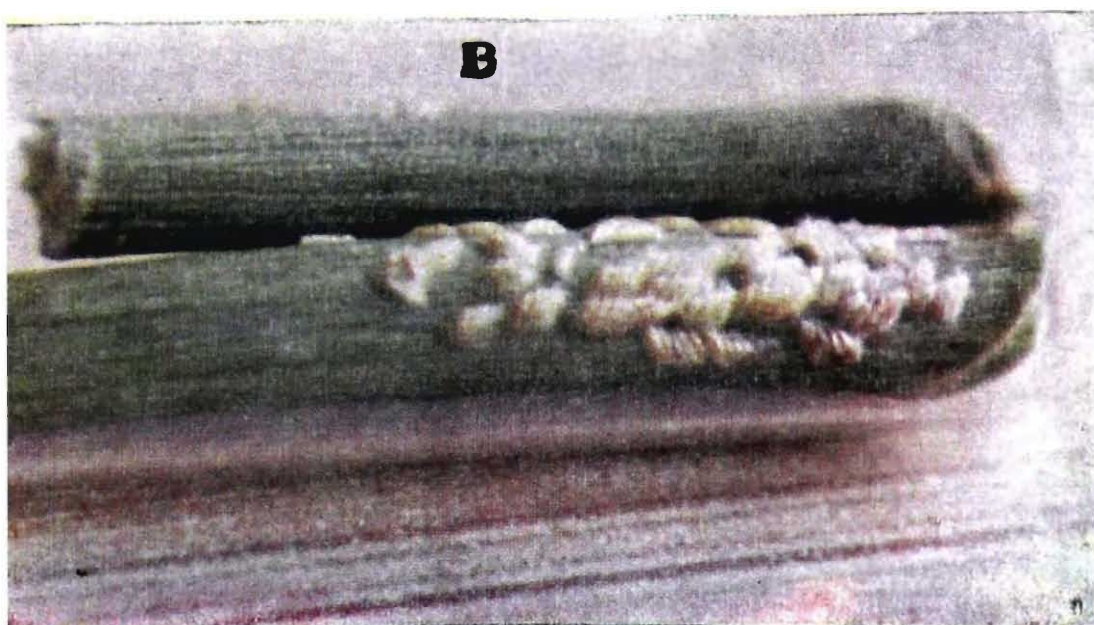
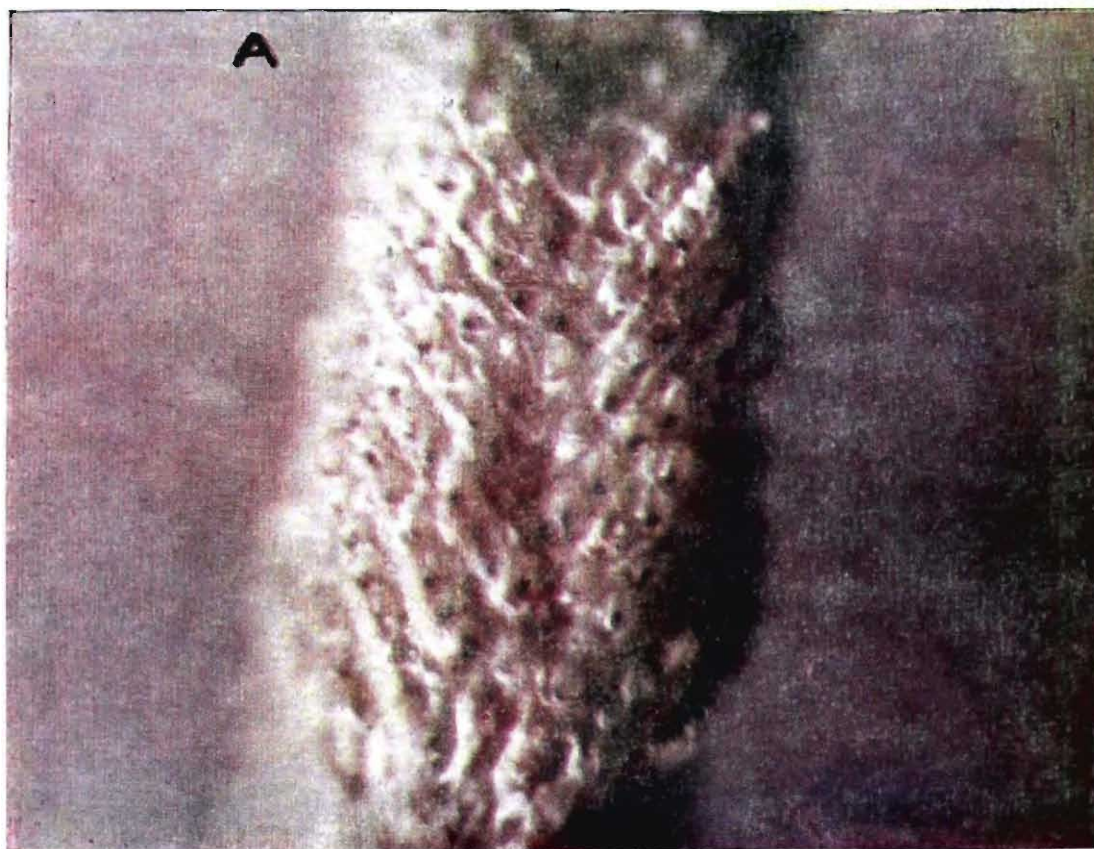
PLATE II



Gregarious habit in *Oxyrhachis taranda*.

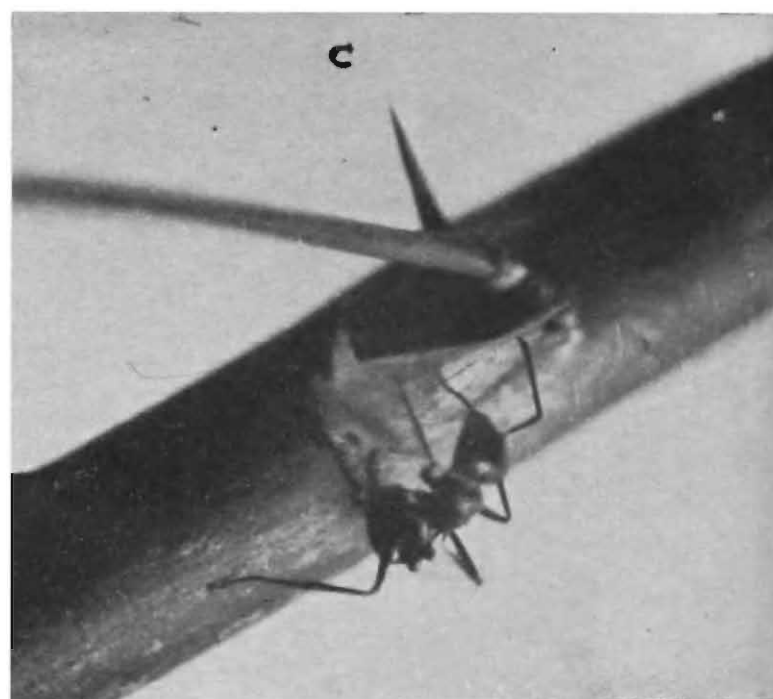
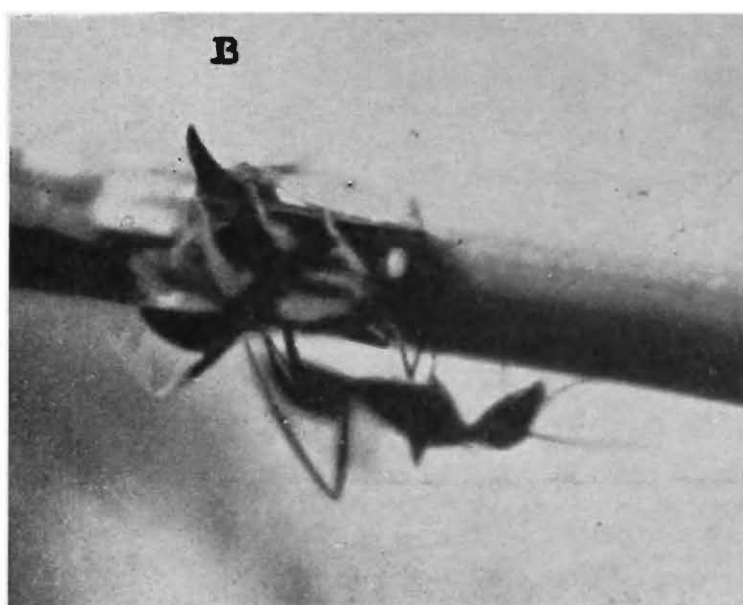
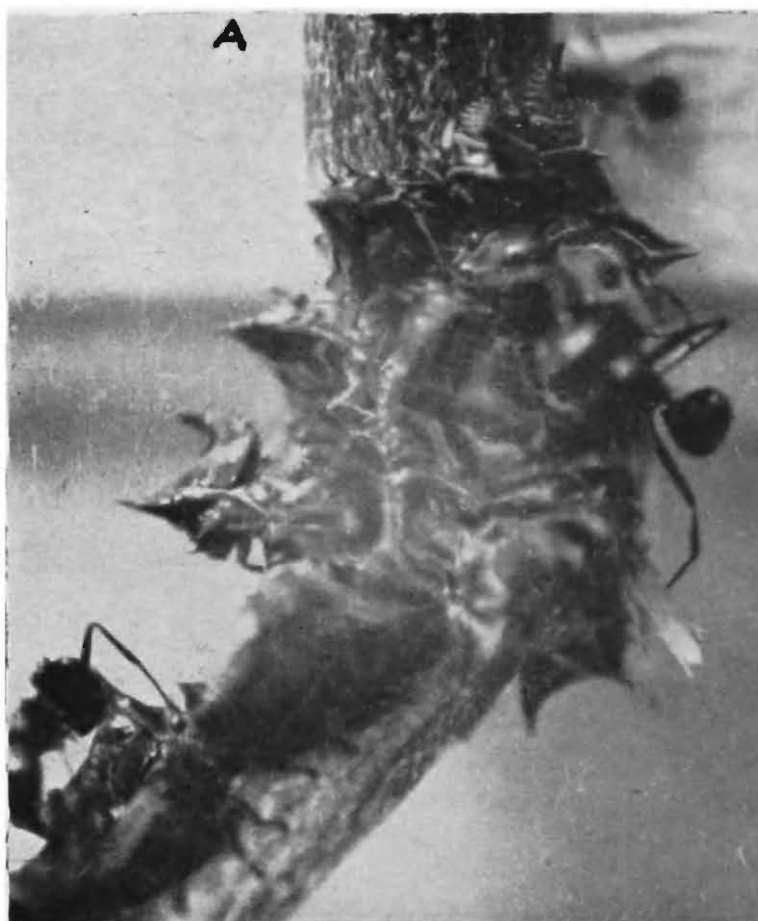
FAMILY MEMBRACIDAE

PLATE III



Arrangement of eggs in egg slits of host plants. A. *Oxyrhachis rufescens*; B. *Otinotus oneratus*.

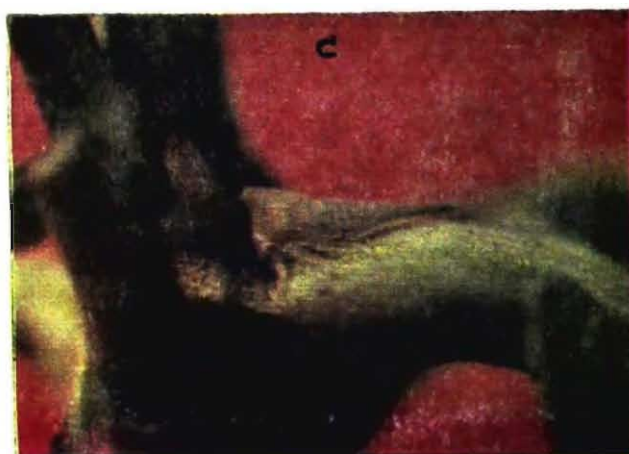
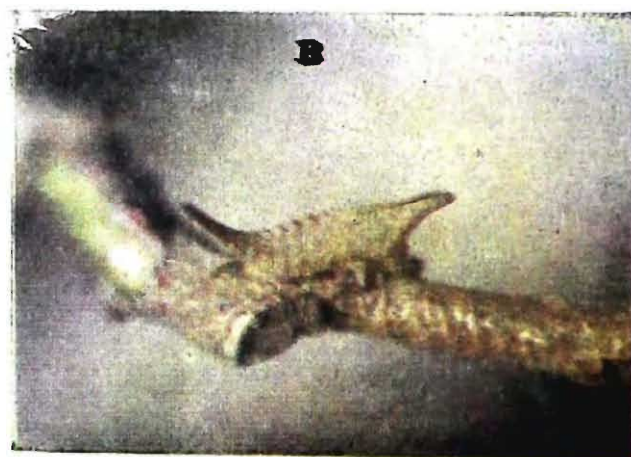
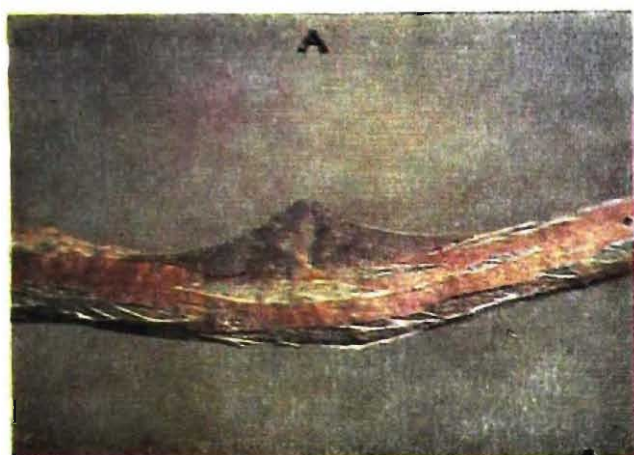
PLATE IV



Ant attendance. A. Colony of *Oxyrhachis taranda* attended by a swarm of ants (*Camponotus compressus*); B. A solitary adult of *Otinotus oneratus* attended by ants; C. A camponotine ant attending on a brooding female *Oxyrhachis taranda*,

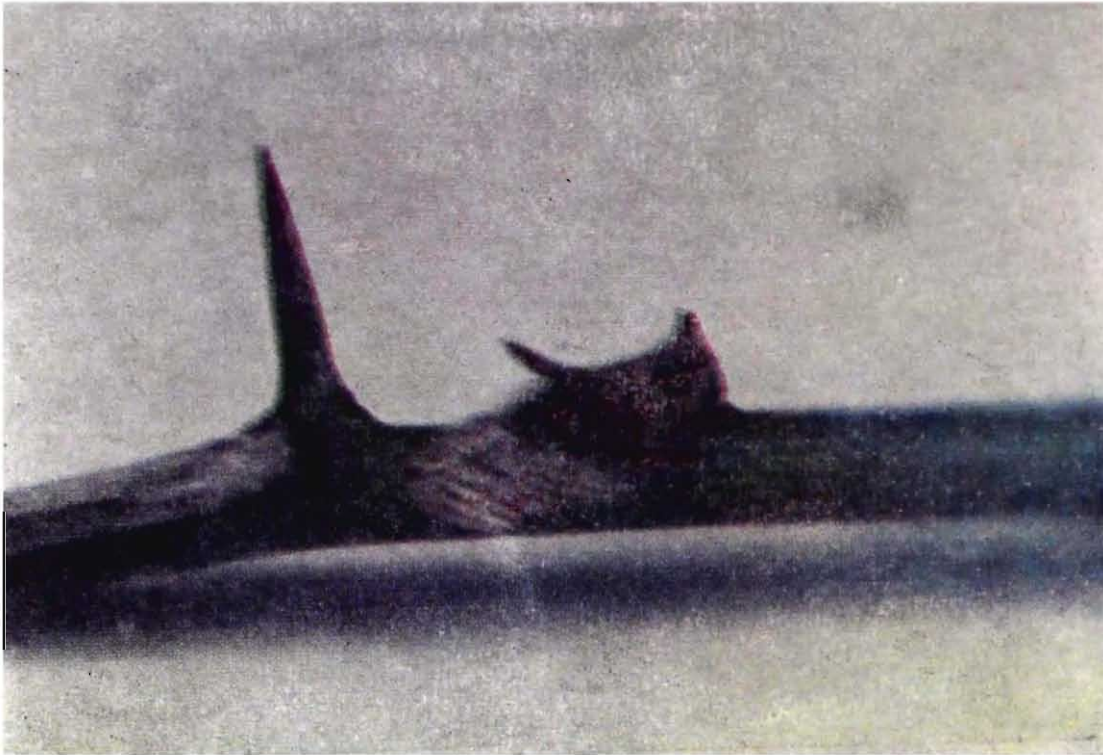
FAMILY MEMBRACIDAE

PLATE V



Cryptic behaviour of membracid nymphs : A. Nymphs of *Leptocentrus rhizophagus* with their colour blended with that of the free-hanging prop roots on which they thrive ; B. *L. varicornis* ; C. *L. moringae*.

PLATE VI



Parental care in membracids. Female *Oxyrhachis taranda*
gauring her egg mass.

PLATE VII

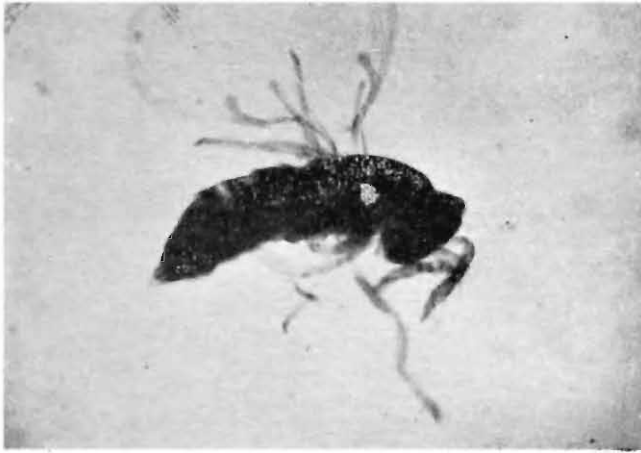


Natural enemies : A spider preying on the nymph of *Oxyrhachis taranda*.

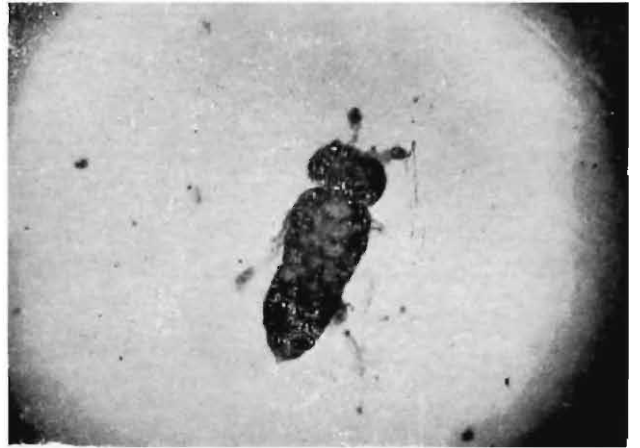
FAMILY MEMBRACIDAE

PLATE VIII

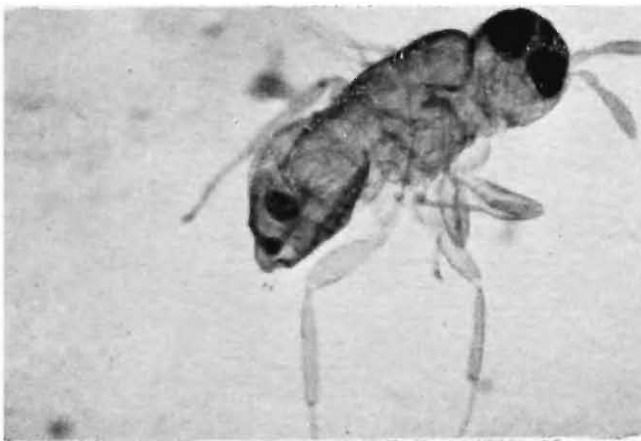
A



B



C



D

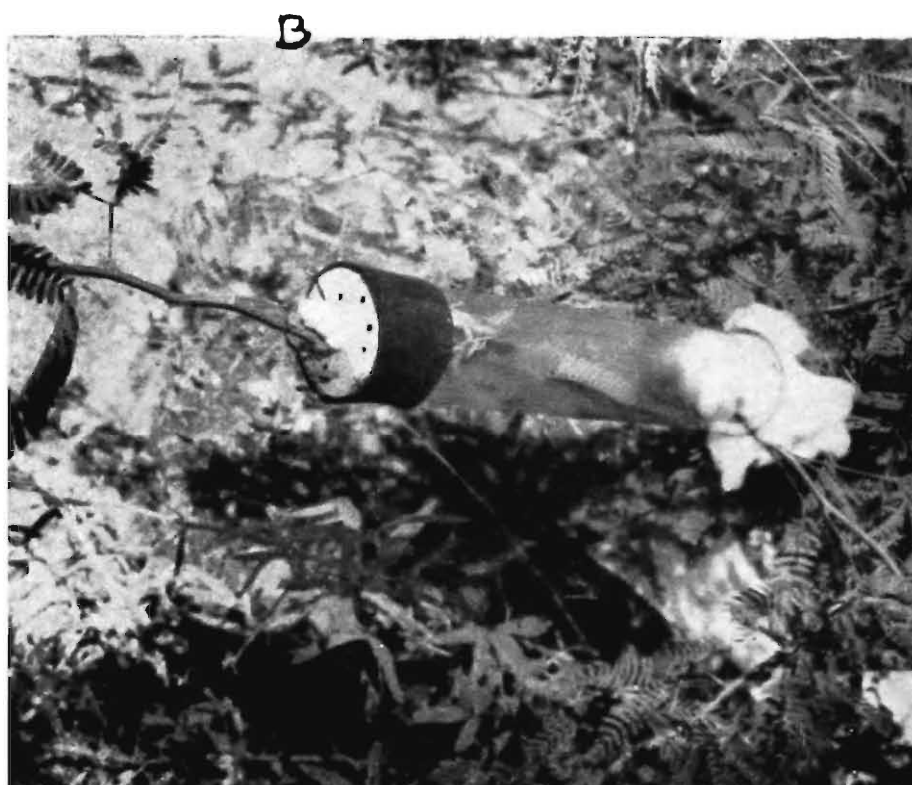
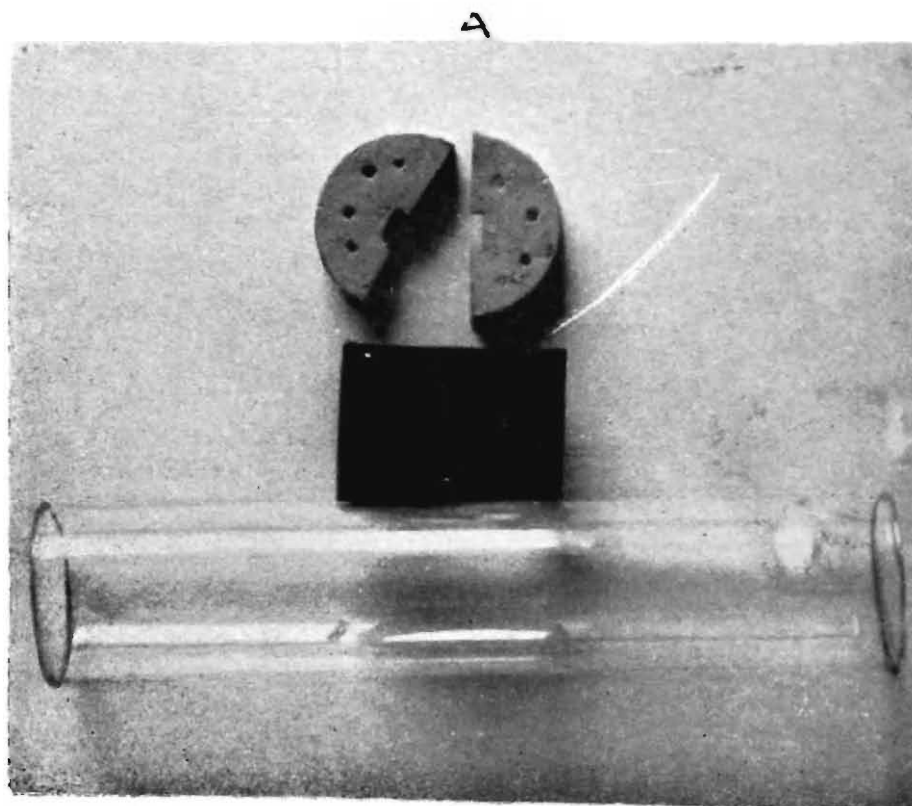


E



Chalcidoid egg parasitoids of membracids : A. *Mirufens afrangiata* ;
B. *Brachygrammatella indica* ; C. *Centrodora azeëzi* ; D. *Mirufens*
brevifuniculata ; E. *Gonatocerus narayani*.

PLATE IX



Rearing tube for rearing membracids on their host plants

A. Tube open at both ends ; Cork with slot.

B. A colony of *Oxyrhachis rufescens* enclosed in the tube.

Key to lettering of figures

- A₁, A₂, A₃**, — Anal veins
aa - Anal angle
1 ac - First apical cell
2 ac - Second apical cell
3 ac - Third apical cell
4 ac - Fourth apical cell
5 ac - Fifth apical cell
ae - Aedeagus
an - Anal ring
an.c - Anterior carina
ap.l. - Apical lobe of sternal plate
ap.lim. - Apical limb
ca - Costal angle
cn - Connective
c-o-l - Centro-ocular line
co-sc - Costa-subcosta
cp - Cranial process
cu - Cubitus
d - Disc
1 dc - First discoidal cell
2 dc - Second discoidal cell
d.p.c. - Dorso-posterior carina
f - Frontoclypeus
G - Gibba
h.f. - Hamular fold
l.a. - Lateral angle
l.c. - Lateral carina
l.l. - Lateral lamella
l.s. - Lateral surface
lv - Lateral valve
m - Metopidium
M₁, M₂ - Media
mc - Median carina
ms - Mesonotum
mt - Metanotum
oc - Ocellus
p - Pronotum
pa - Paramere
pp - Posterior process
pr.h - Pronotal horn
pr.p - Propleural process
p.s - Posterior surface
pt.s - Pterostigma
p.w - Posterior wing pad
R - Radius
r - rostrum
sbc - Sub-basal cell
sh - Suprahumeral horn
sh.b - Suprahumeral bud
soc - Supraocular callosity
soe - Supraocular expansion
st - Sternal plate
sub.c - Subcostal cell
tw - Tegminal wing pad
vk - Ventral keel

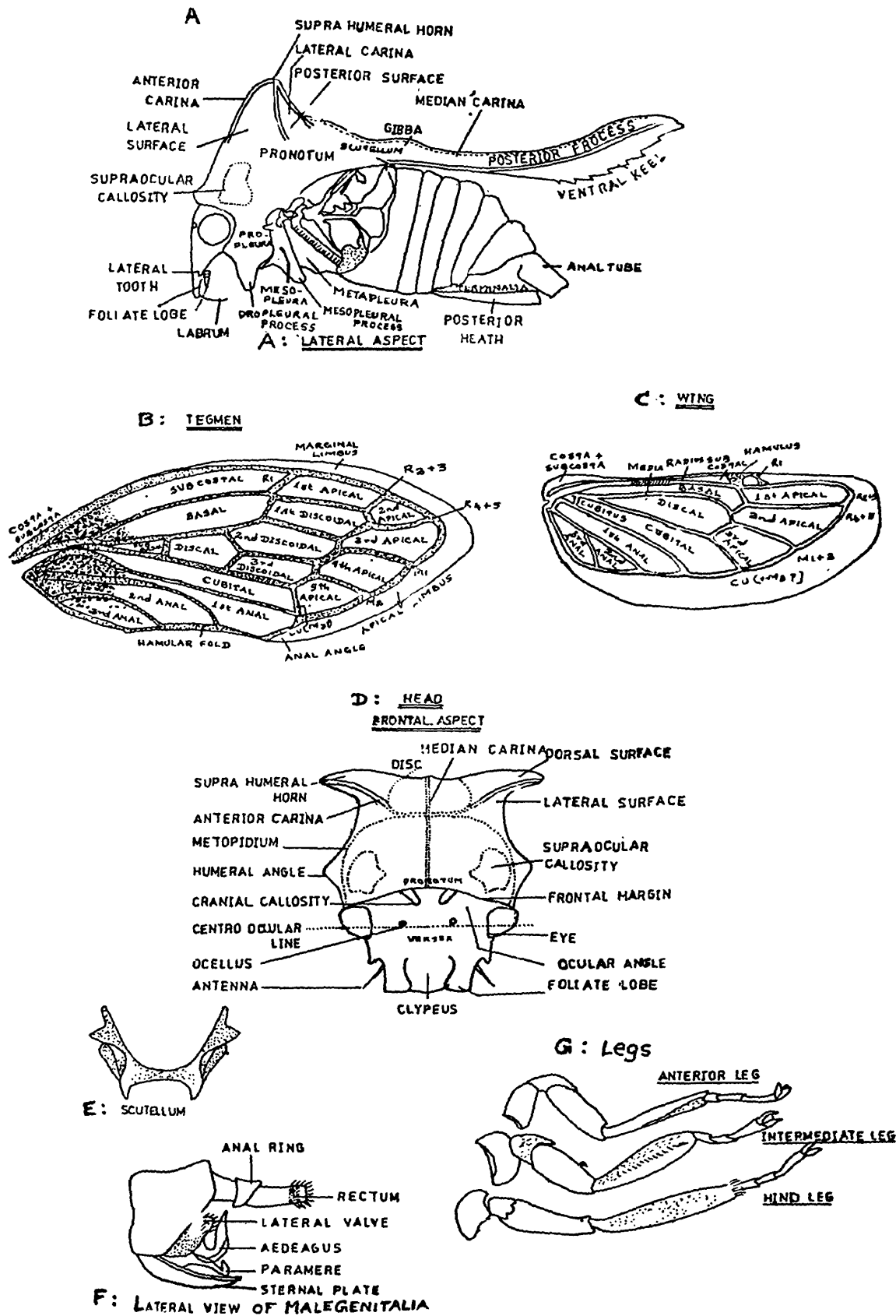


Fig. 1 : General structure of membracid as illustrated by *Oxyrhachis* (Adopted from Capener, 1962a)

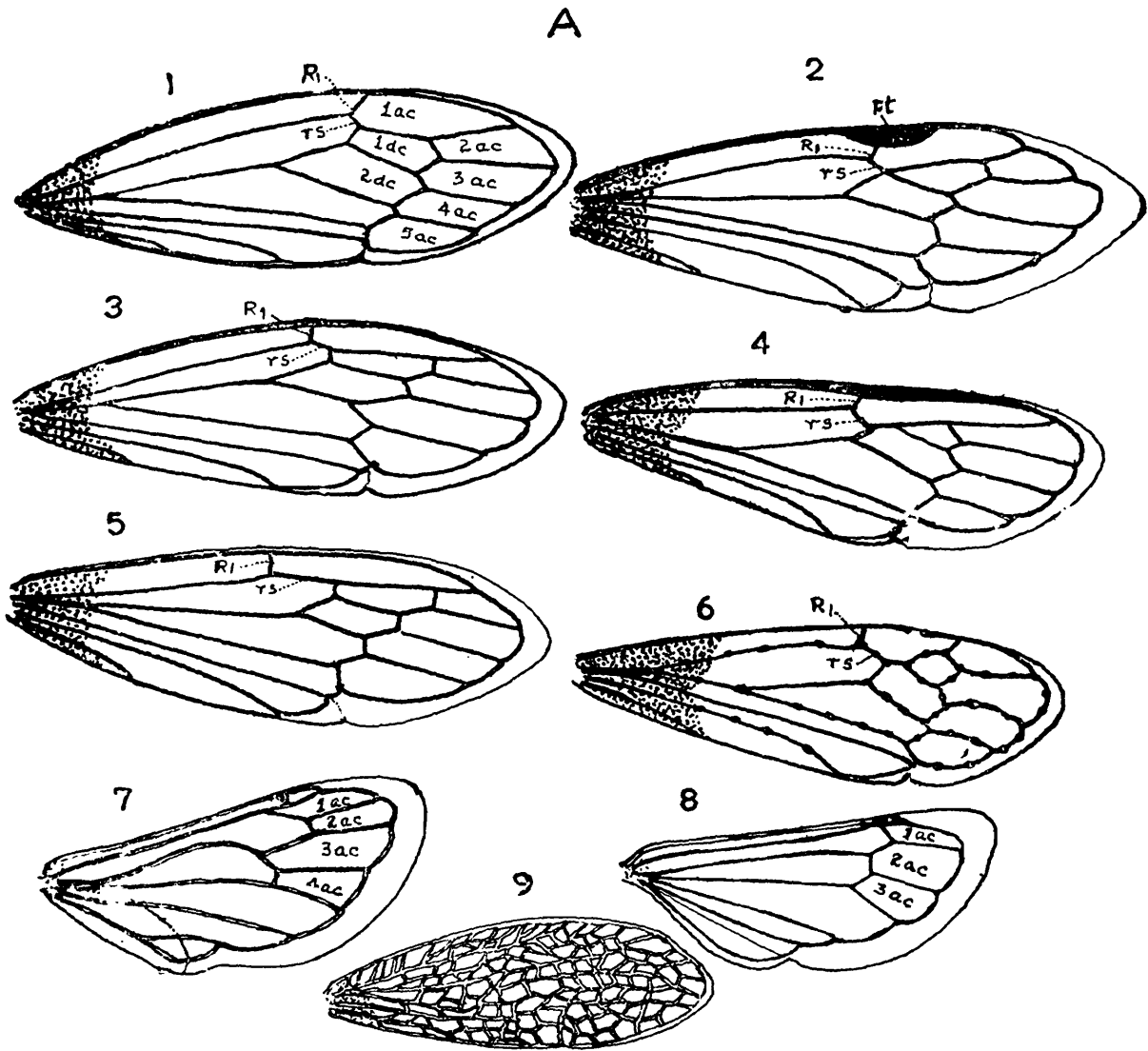
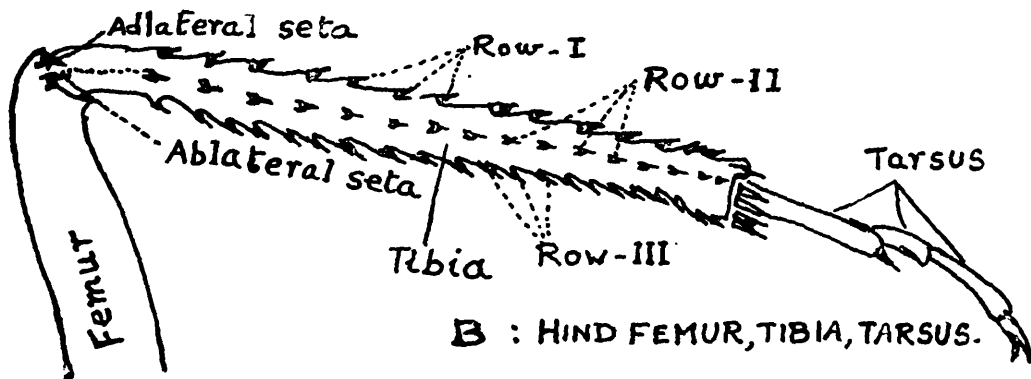


Fig. 2: A. Variations in wing venation.
 Tegmina of 1. *Otinotus mimicus* ; 2 *Otinotus oneratus* ;
 3. *Leptocentrus taurus* ; 4. *Anchon ulniforme* ;
 5. *Gargara extrema* ; 6. *Coccosterphus minutus* ;
 9. *Darthula hardwickii* ;
 Hind wings of 7. *Leptocentrus taurus* ; 8. *Tricentrus pilosus*.



B. Hind leg showing the arrangement of cucillate setae.

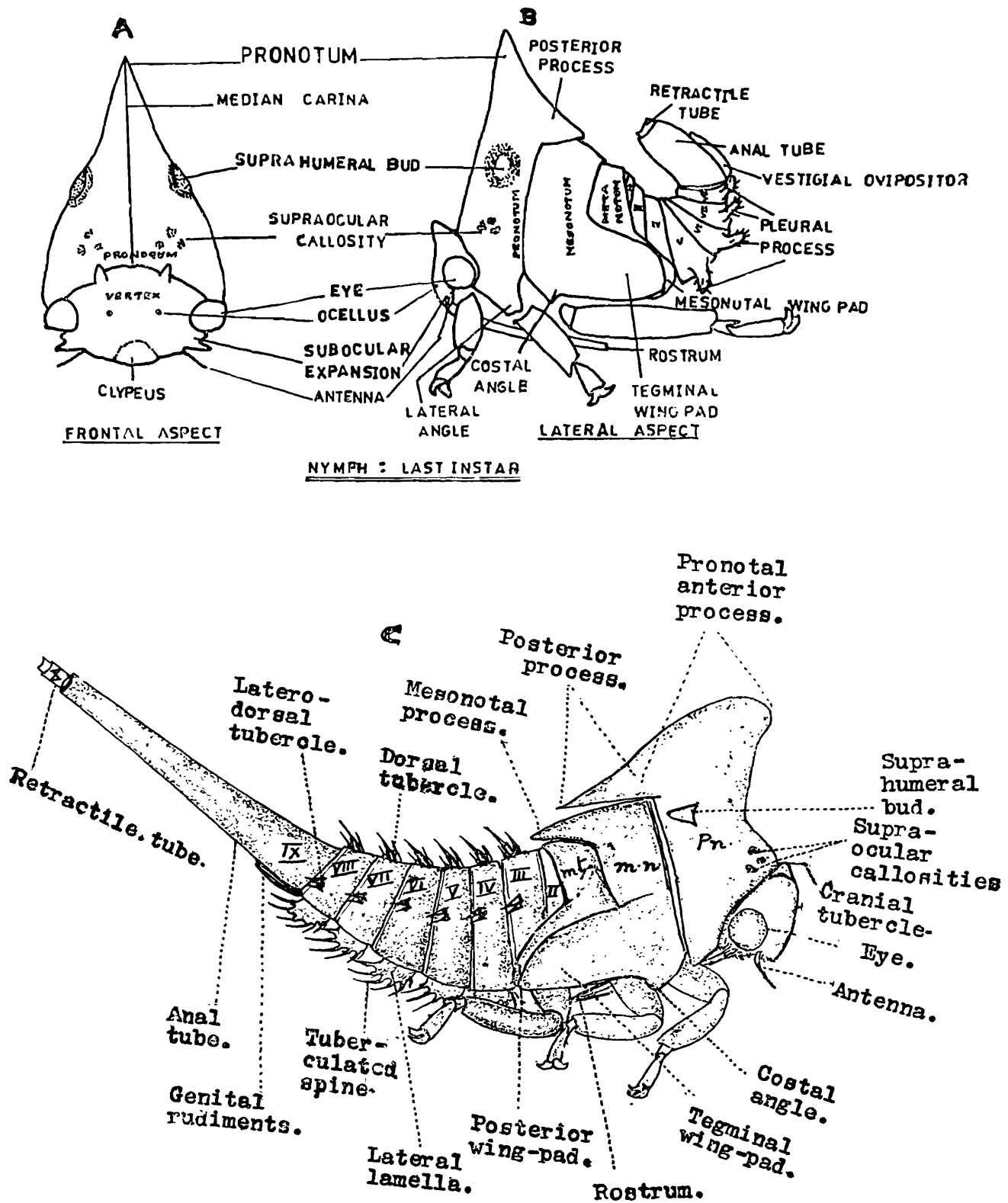


Fig. 3 : Structure of fifth instar nymphs.
Oxyrhachis A. Frontal view ; B. lateral view.
Leptocentrus. C. Lateral view.

PRONOTAL SHAPES IN THE LAST NYMPHAL INSTARS OF DIFFERENT MEMBRACIDAE.

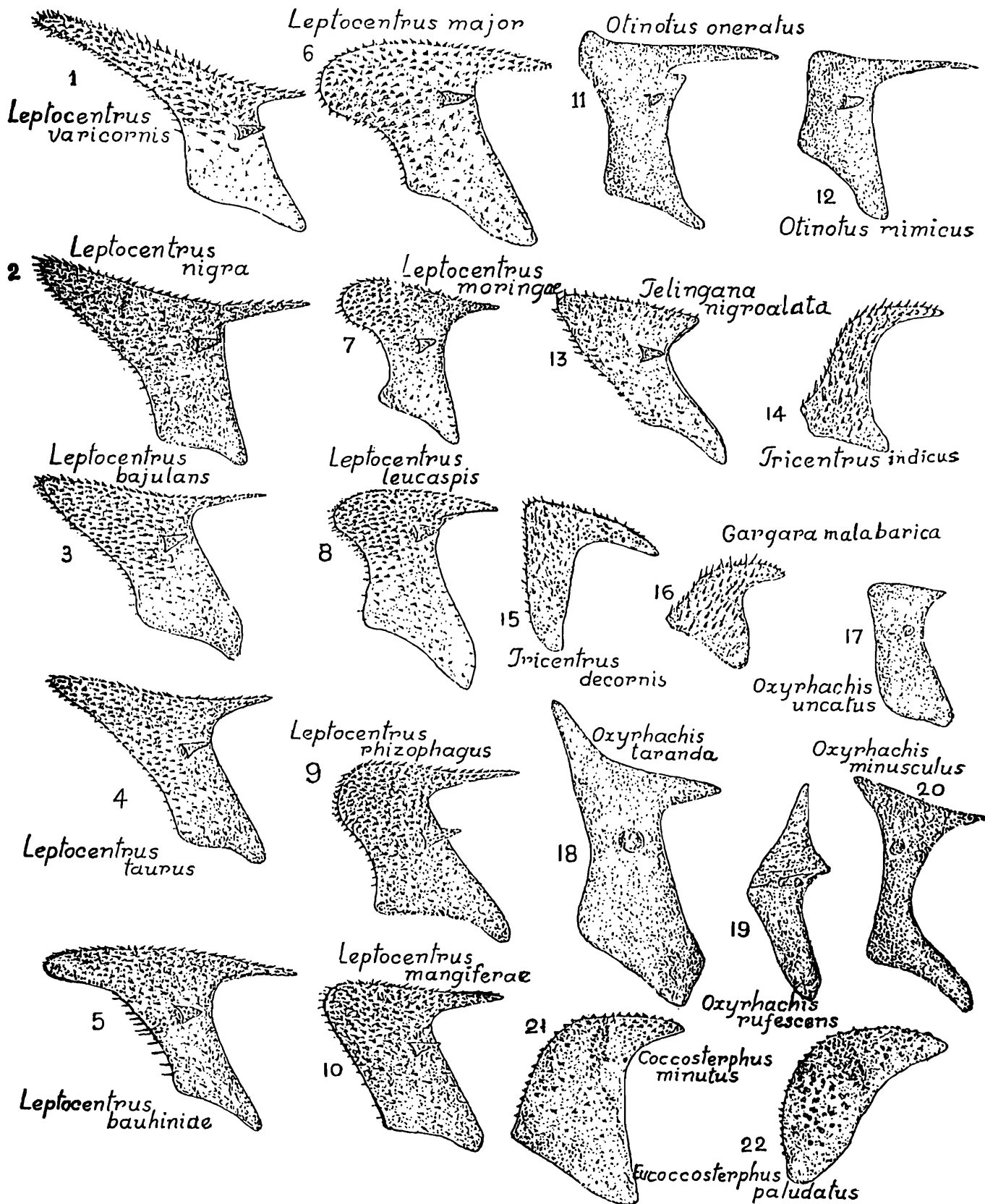


Fig. 4: Pronotal shapes in the last nymphal instars of some Membracidae.

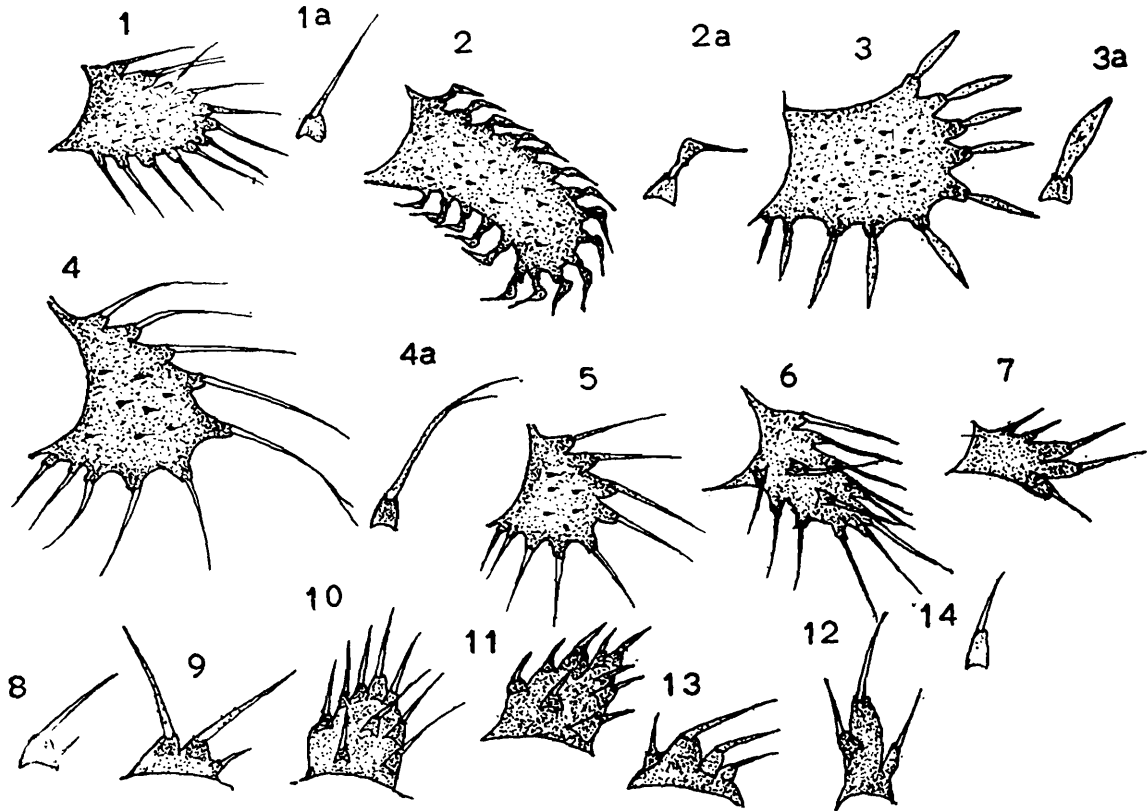


Fig. 5 : Types of lateral lamellae, dorsal tubercles and spines in membracid nymphs. Abdominal lamellae of the fifth instar nymphs of 1. *Tricentrus pilosus*: 1a, long setiform spines borne on lamella. 2. *Otinotus indicatus* ; 2a, short, bent spine borne on lamella. 3. *Eucocosterphus paludatus* : 3a, Penicillate spine borne on lamella. 4. *Leptocentrus leucaspis* ; 4a, branched spine borne on lamella. 5. *Tricentrus albomaculatus* : 6. *Gargara mixta* : 7. *Oxyrhachis rufescens*. 8. Abdominal dorsal tubercle in the first instar nymph of *Leptocentrus taurus*. 9. Prothoracic dorsal tubercle in the first instar nymph of *Leptocentrus taurus*. Abdominal dorsal tubercles or scoli in the 5th instar nymphs of 10. *Gargara mixta* : 11. *Eucocosterphus paludatus* ; 12. *Anchon ulniforme* ; 13. *Leptocentrus taurus*. 14. Sensory seta.

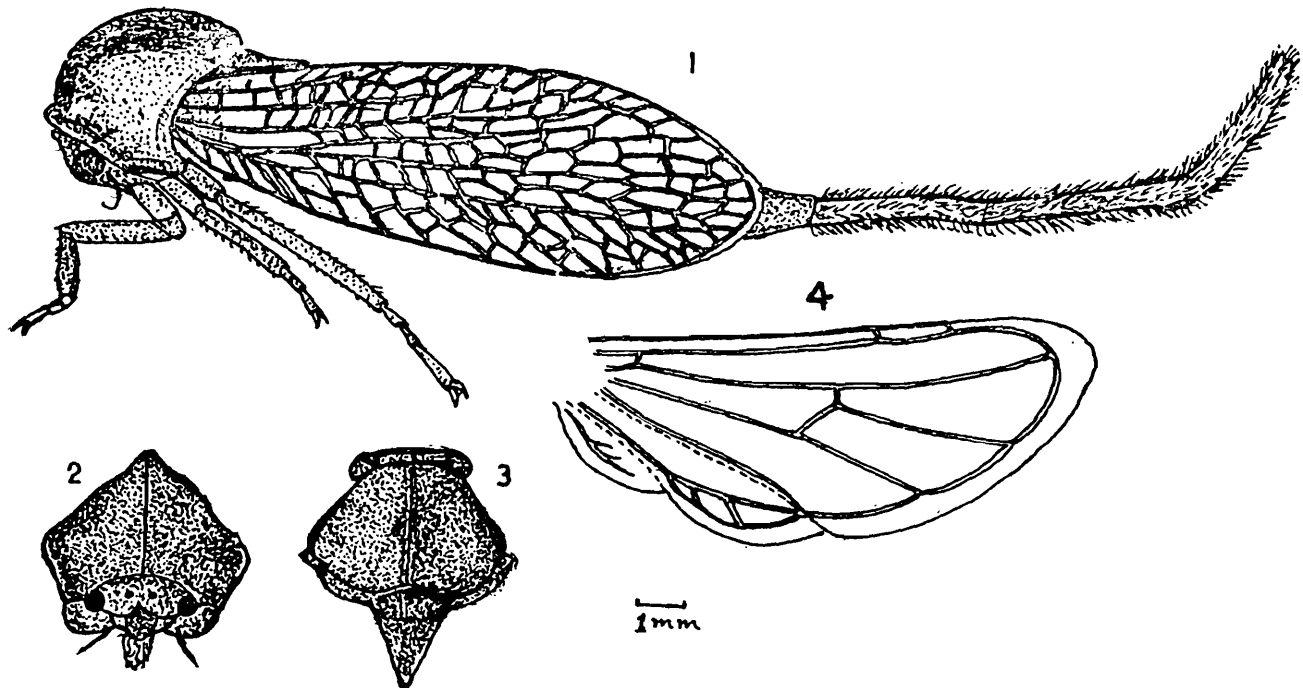


Fig. 6 : *Darthula hardwickii* (Gray) Female : 1. Lateral view ; 2. Head and pronotum from front ; 3. Dorsal view ; 4. Hind wing.

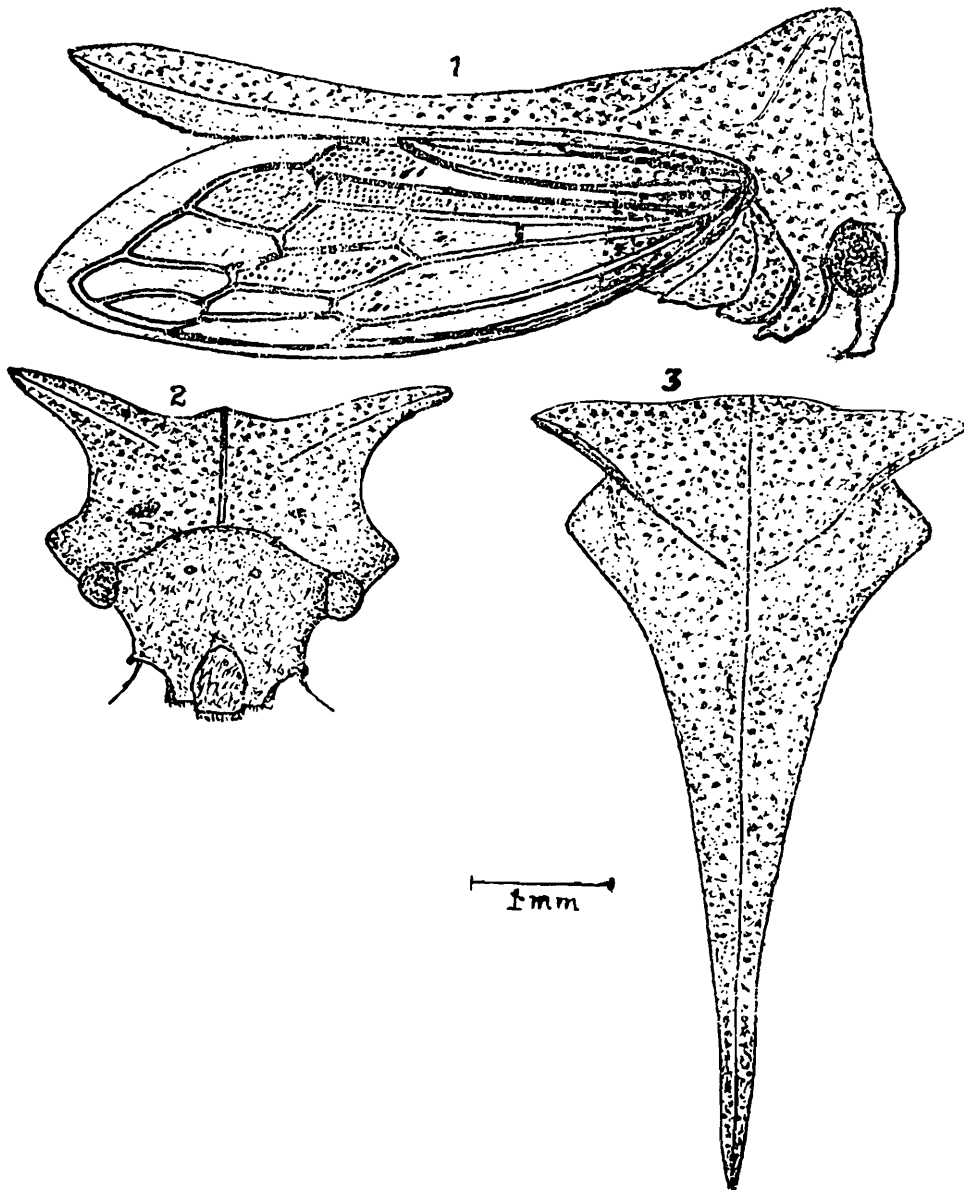


Fig. 7 : *Oxyrhachis apicalis* Ananthasubramanian. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

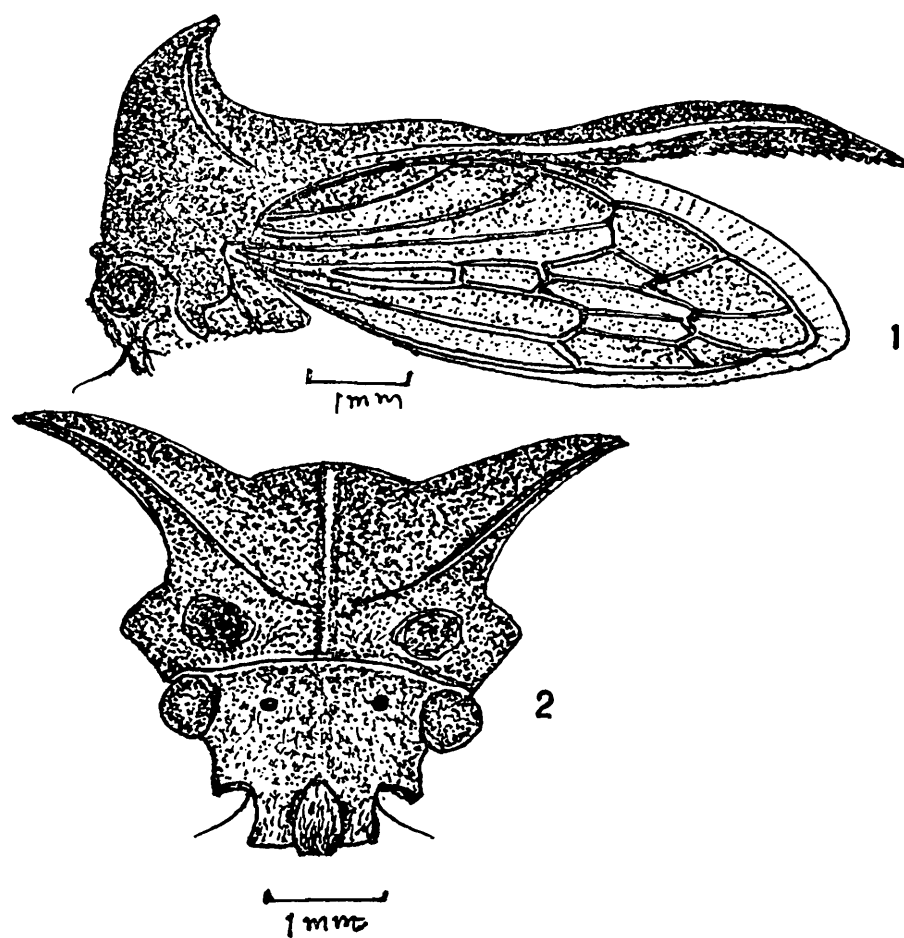


Fig. 8 : *Oxyrhachis binsarus* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum.

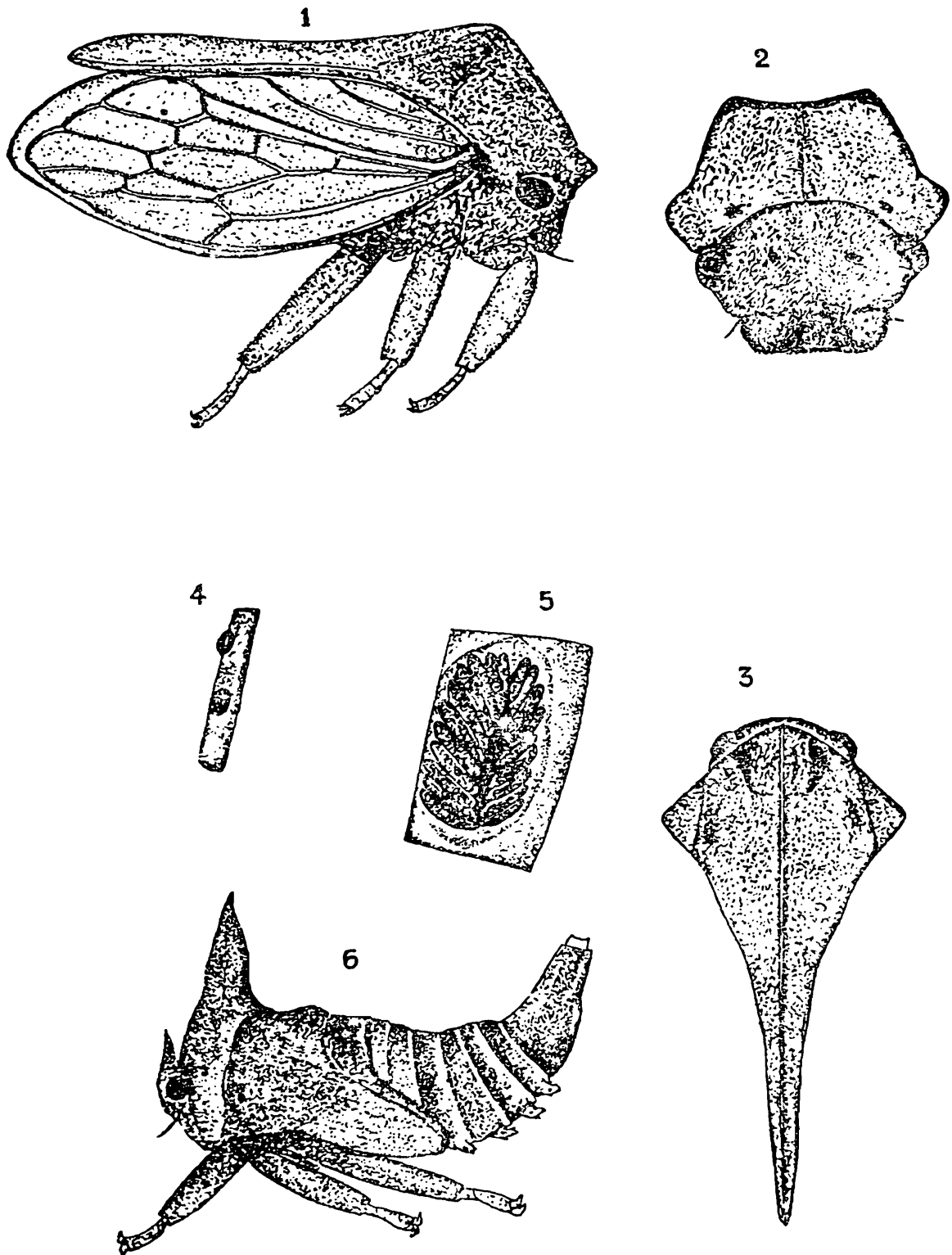


Fig. 9 : *Oxyrhachis brevicornutus* Ananthasubramanian & Ananthakrishnan. Female.
 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum ; 4. Egg mass ; 5. Arrangement of egg ; 6. Fifth instar of nymph.

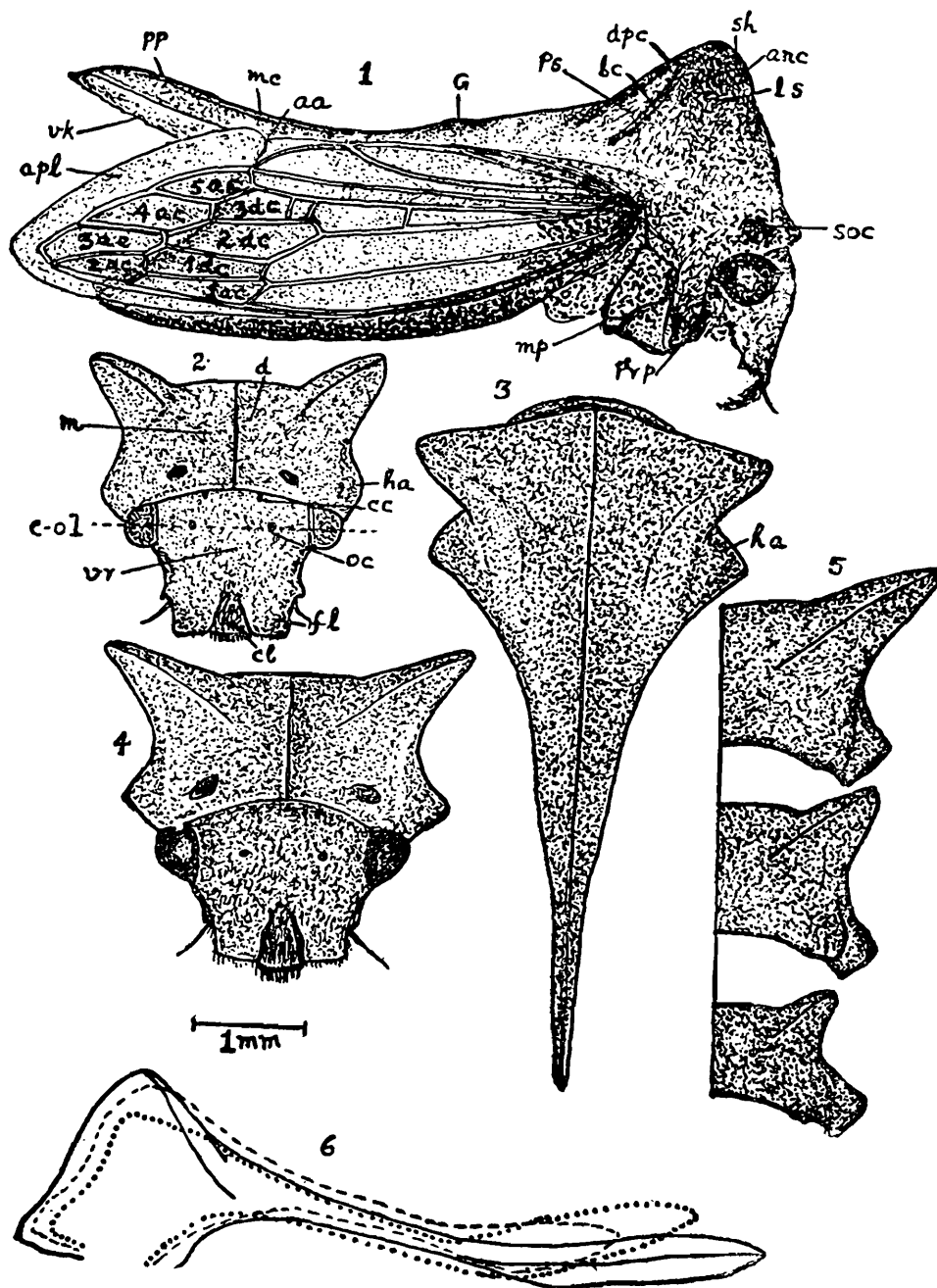


Fig. 10. *Oxyrhachis geniculata* Ananthasubramanian. 1. Female, lateral view ; 2. Male, frontal view of head and pronotum ; 3. Female, dorsal view of pronotum ; 4. Female, frontal view head and pronotum ; 5. Variations in suprahumeral horns in female ; 6. Variations in the posterior process in female.

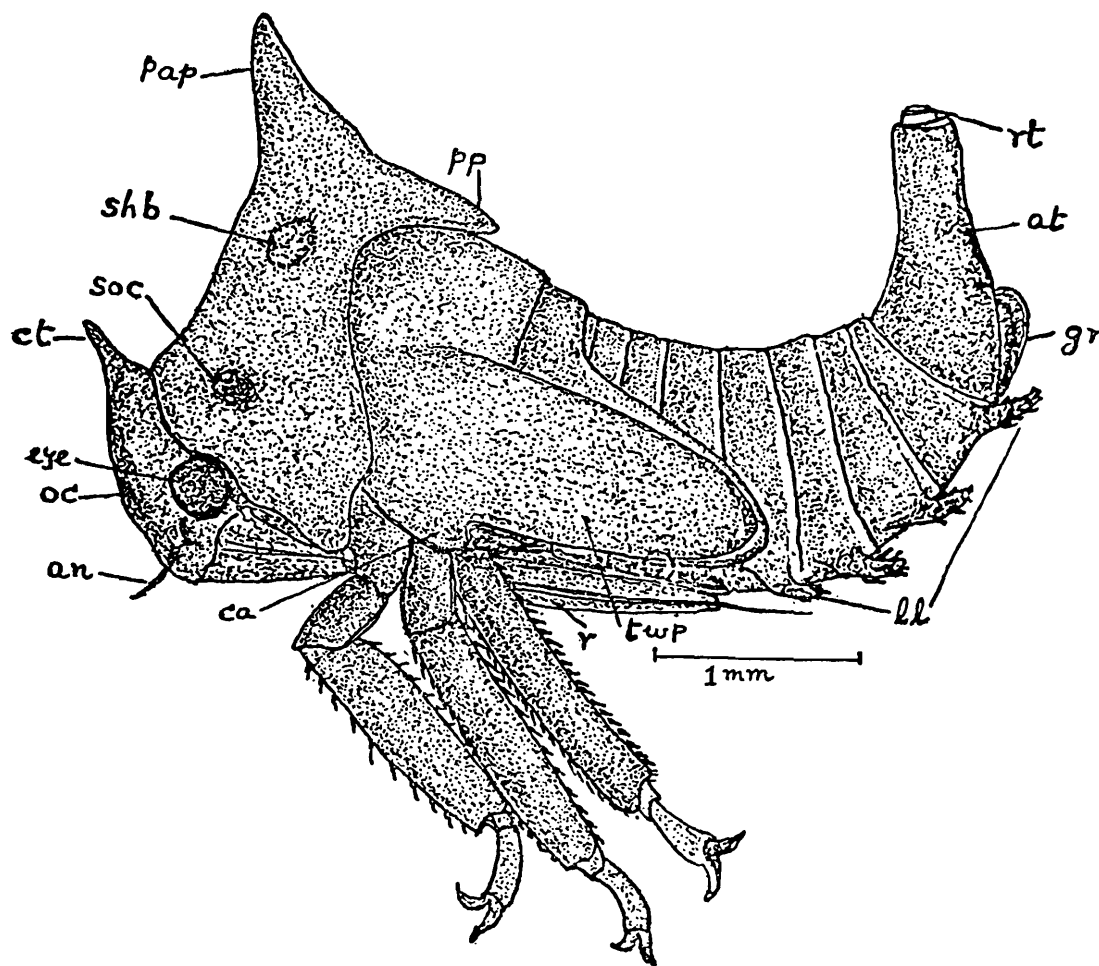


Fig. 10a : *Oxyrhachis geniculata*. Fifth inster nymph.

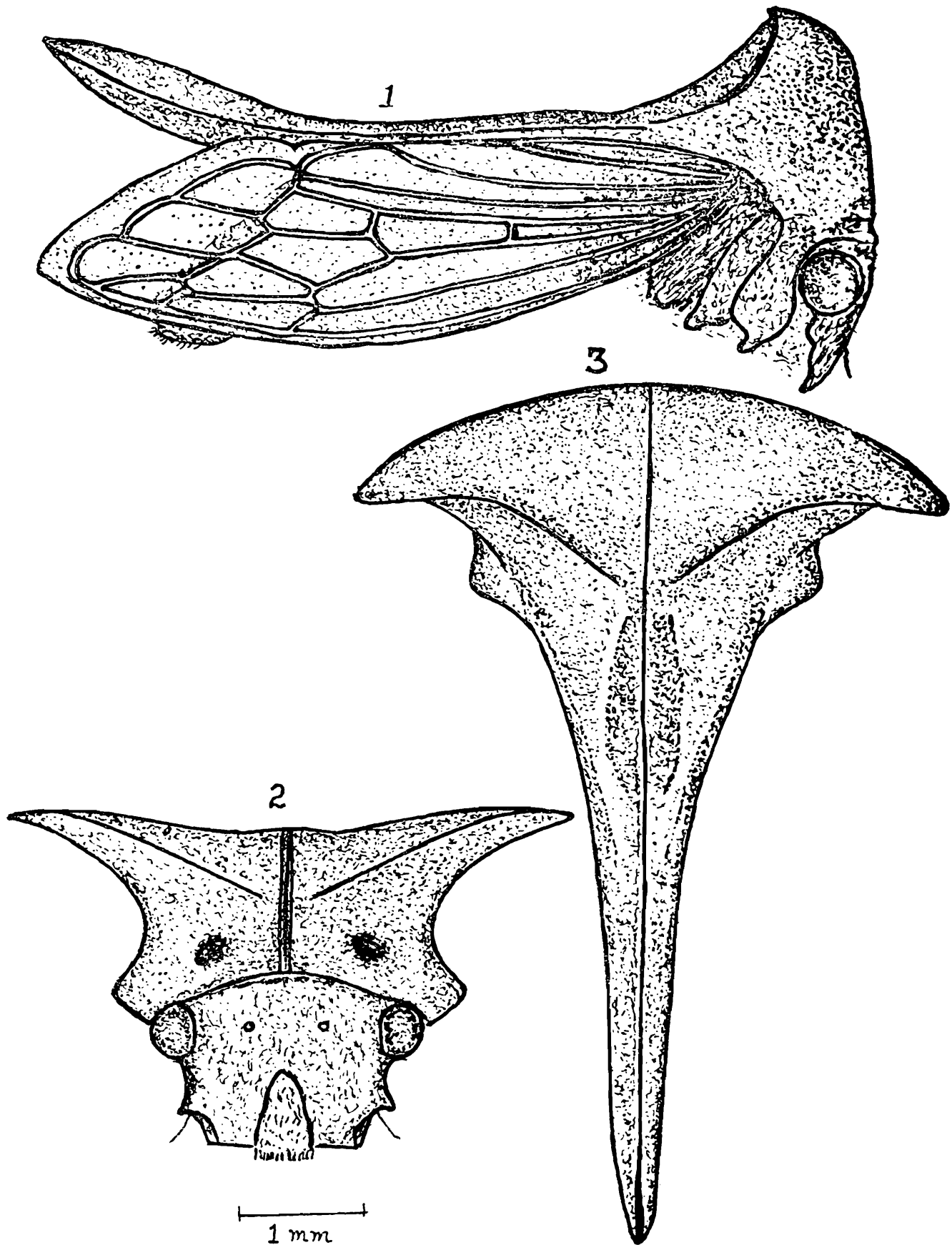


Fig. 11 : *Oxyrhachis grandis* Ananthasubramanian. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

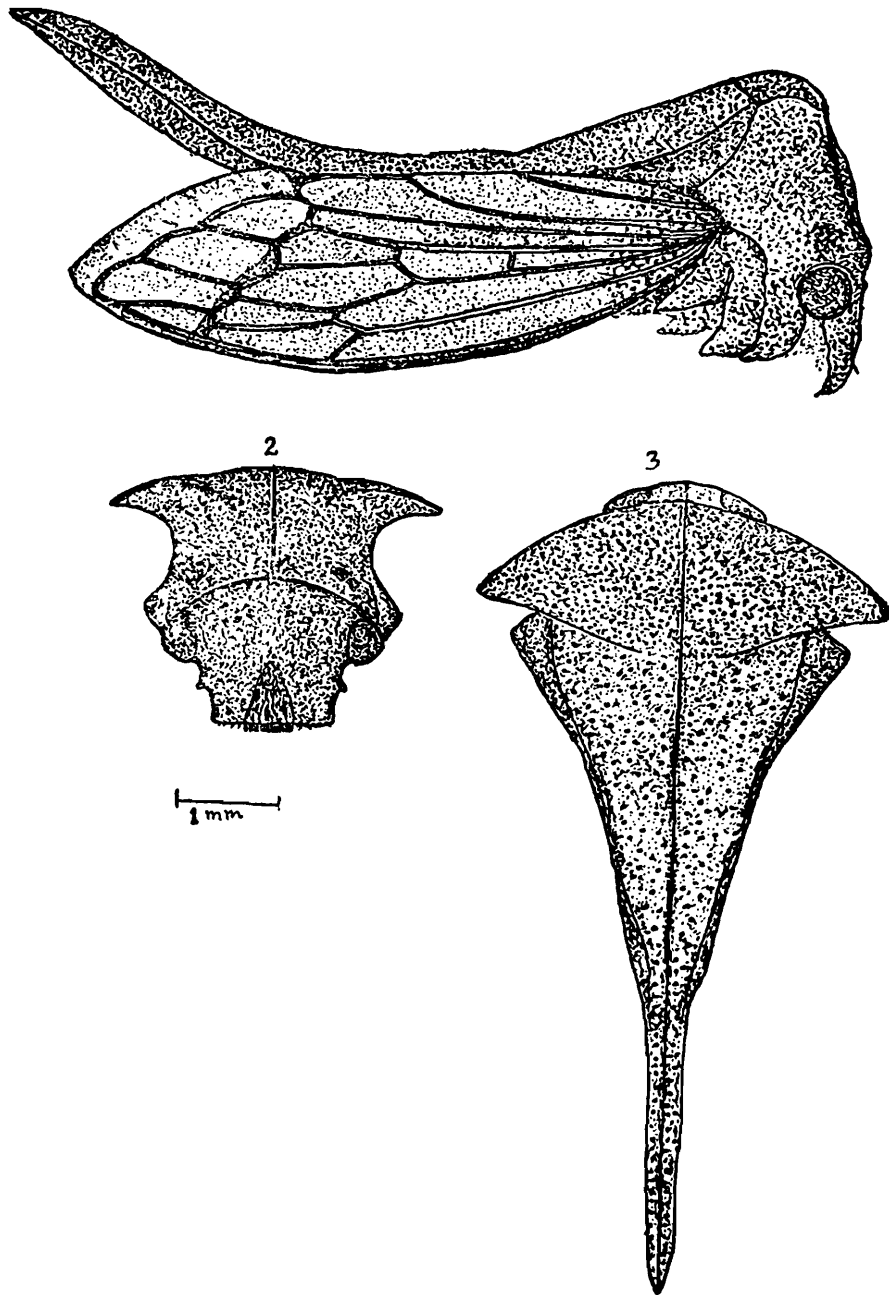


Fig. 12 : *Oxyrhachis haldari* Ananthasubramanian. Female. 1. Lateral view ; 2. Frontal view of head pronotum ; 3. Dorsal view of pronotum.

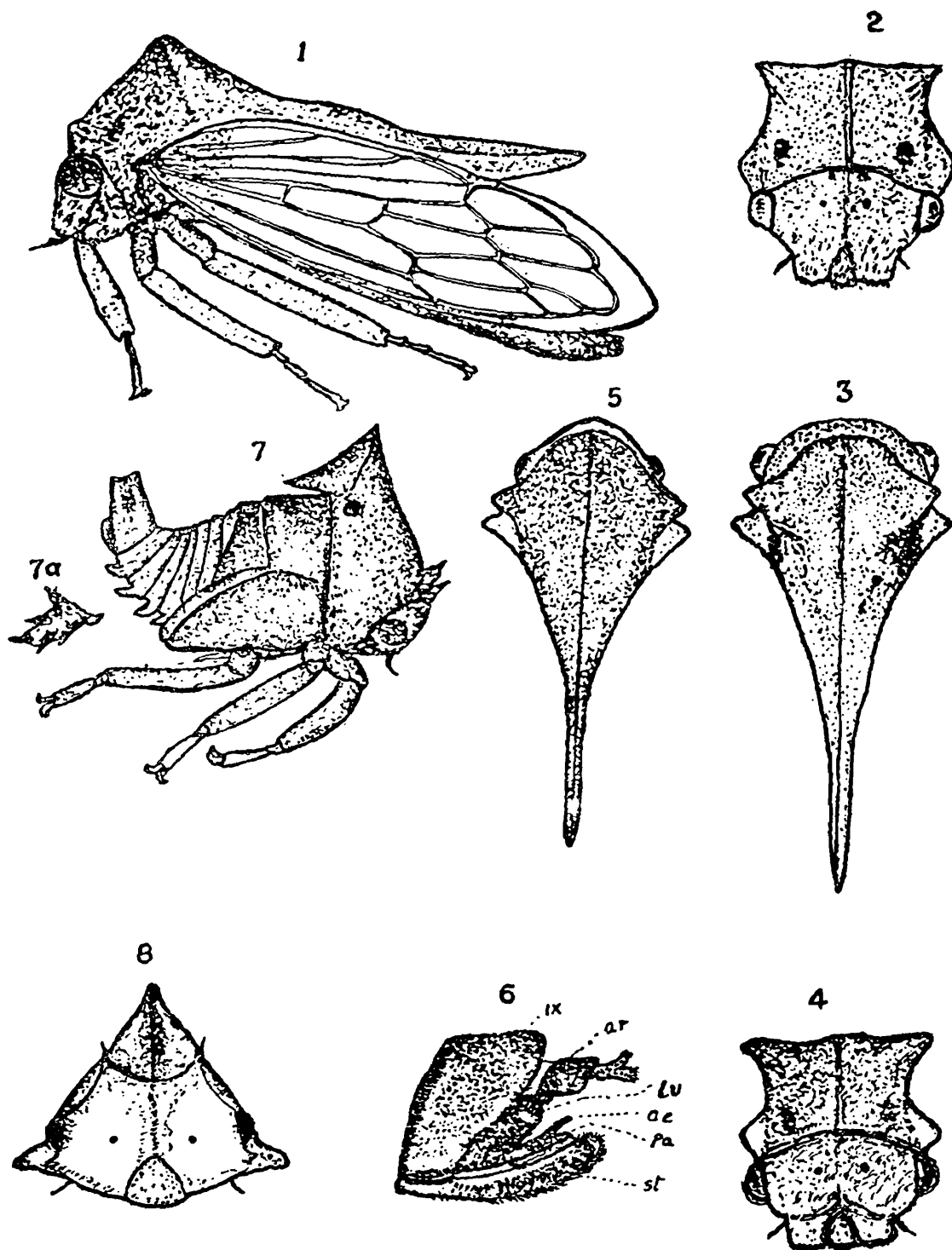


Fig. 13 : *Oxyrhachis krusadiensis* Ananthasubramanian & Ananthakrishnan. Female.
 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum ; Frontal view of head and pronotum of male ; 5. Dorsal view of pronotum and head of male ; 6. Male genitalia, lateral view ; 7. Fifth instar nymph, lateral view ; 7a. Abdominal lateral lamella of 5th instar nymph ; 8. Frontal elevation of 5th instar nymph.

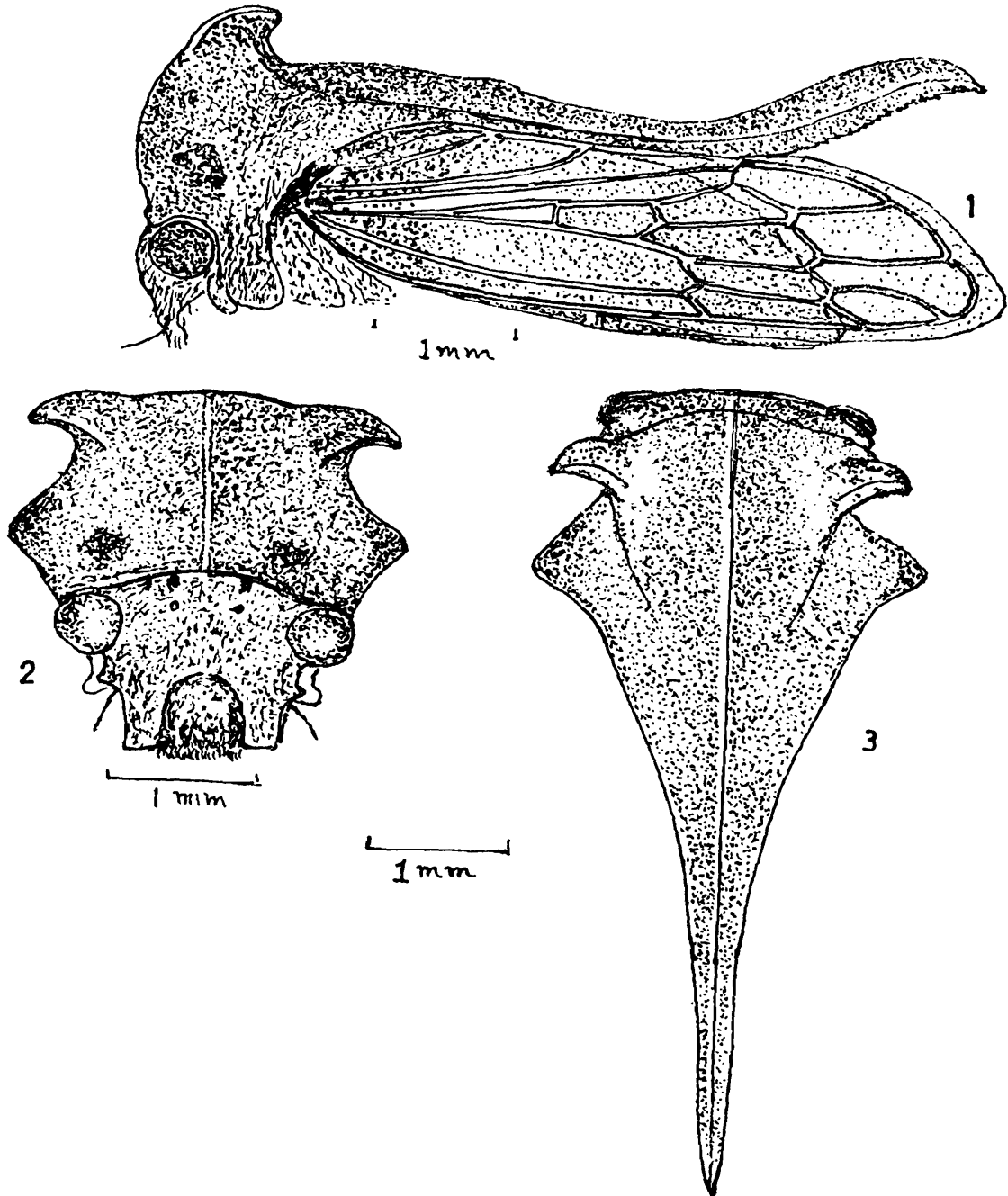


Fig. 14. *Oxyrhachis lefroyi* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

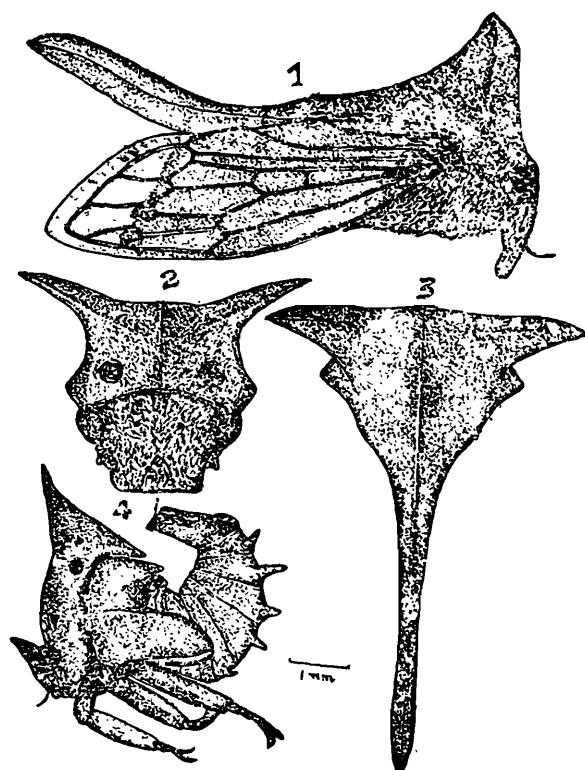


Fig. 15. *Oxyrhachis malabaricus* Ananthasubramanian. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

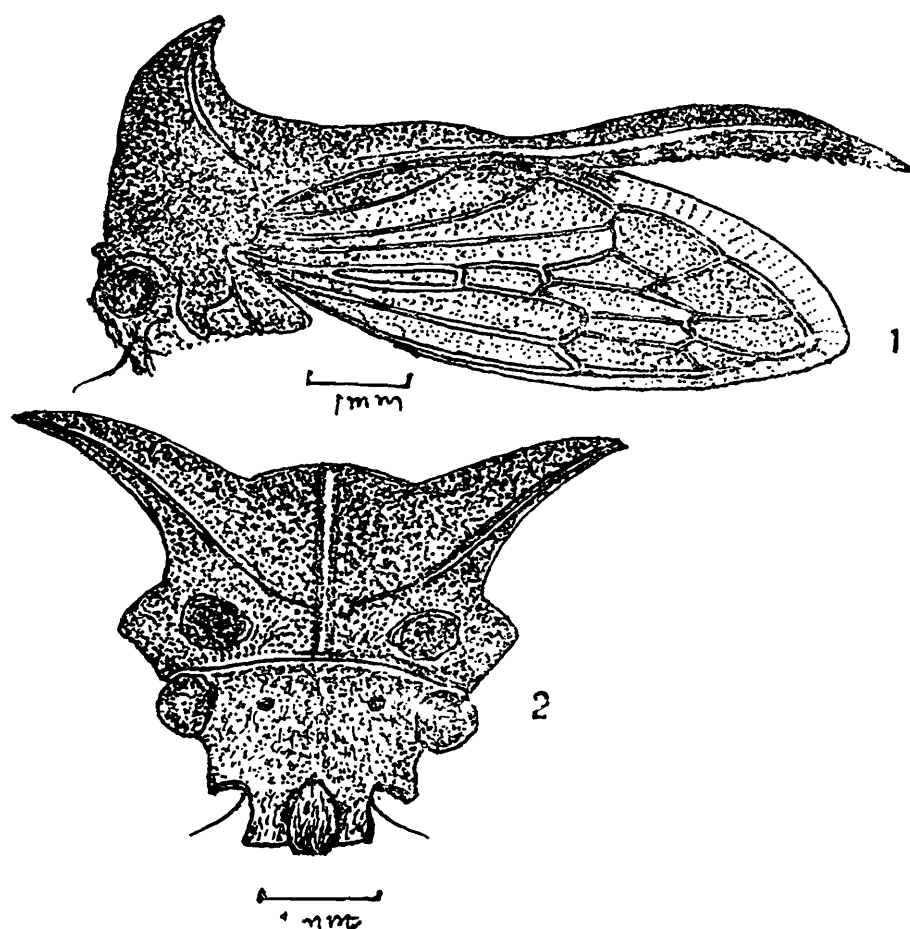


Fig. 16. *Oxyrhachis mangiferana* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum.

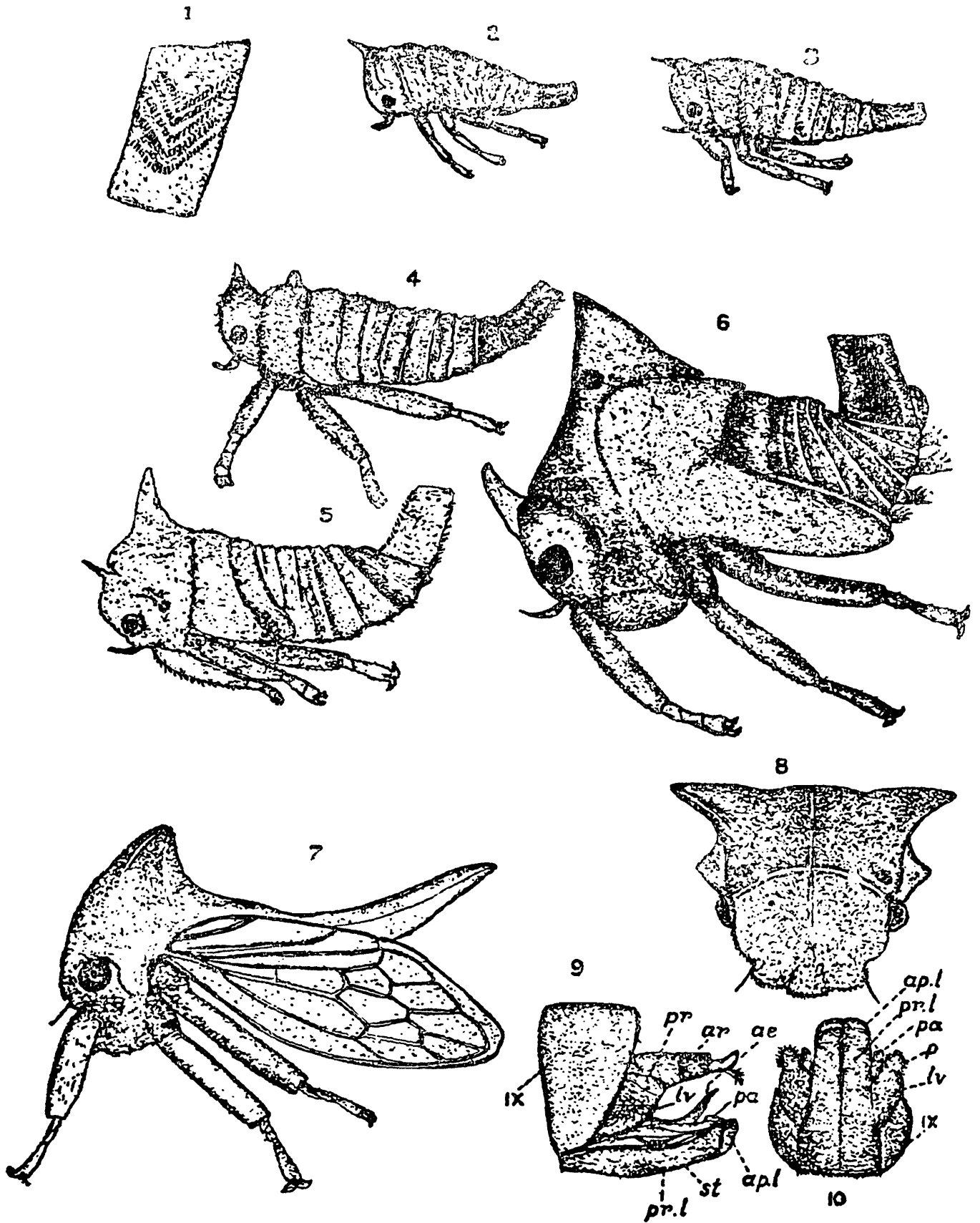


Fig. 17. *Oxyrhachis minusculus* Ananthasubramanian & Ananthakrishnan. Female. 1. Egg mass ; 2—6. First to fifth instars ; 7. Adult female ; 8. Frontal view of head and pronotum ; 9. Male genitalia, lateral view ; 10. Male genitalia, ventral view.

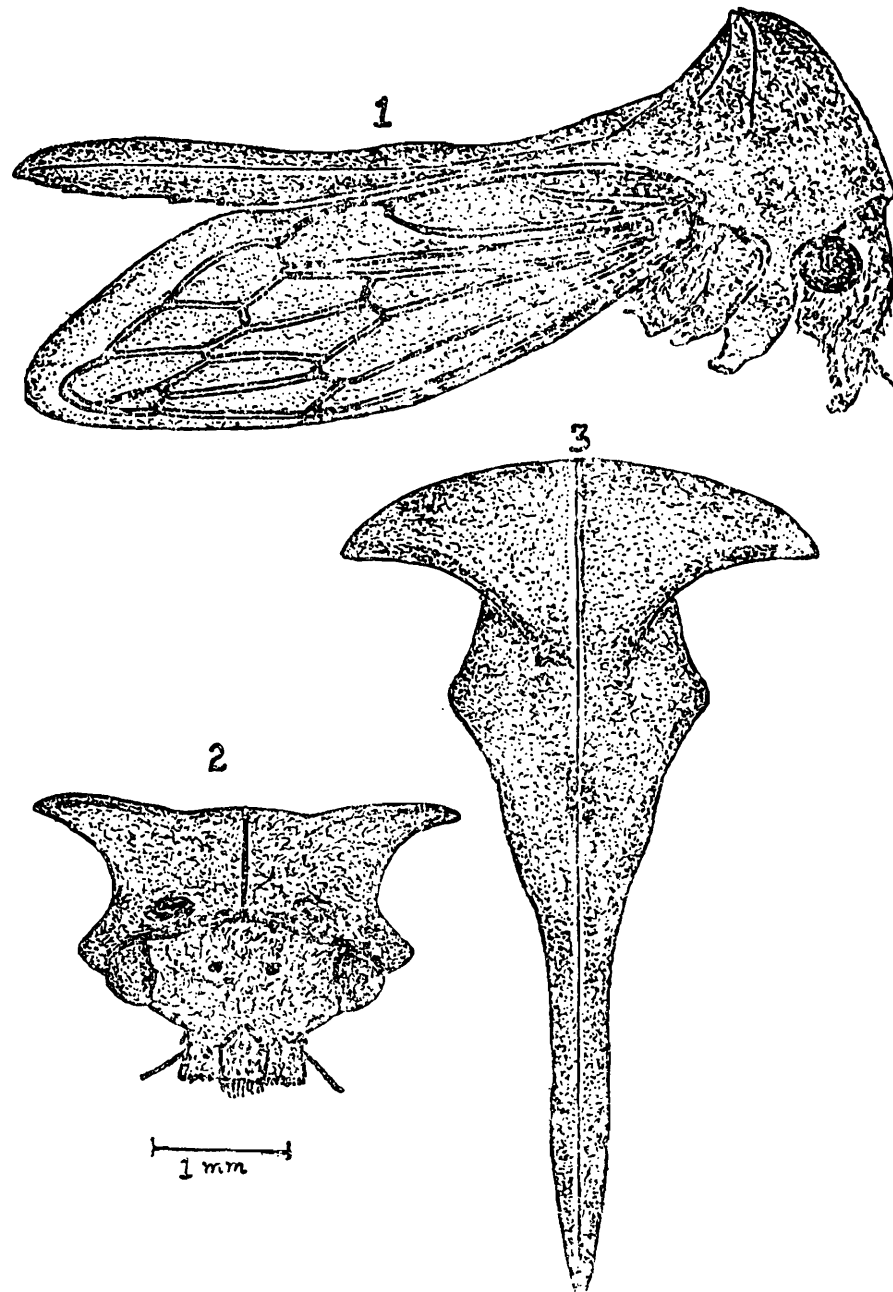


Fig. 18. *Oxyrhachis nigrodorsalis* Ananthasubramanian. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

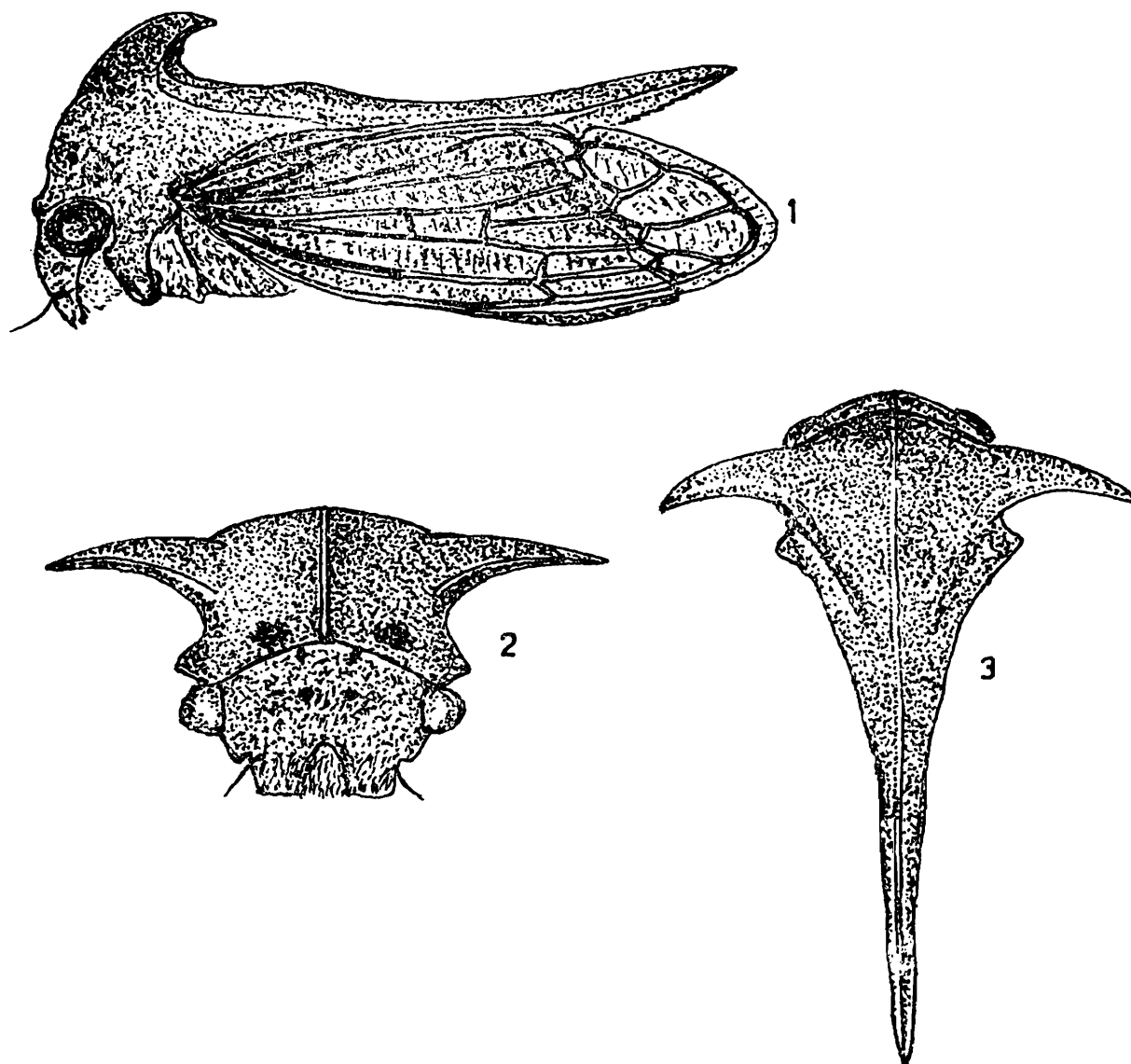


Fig. 19. *Oxyrhachis palus* Buckton. Female. 1. Lateral view. 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

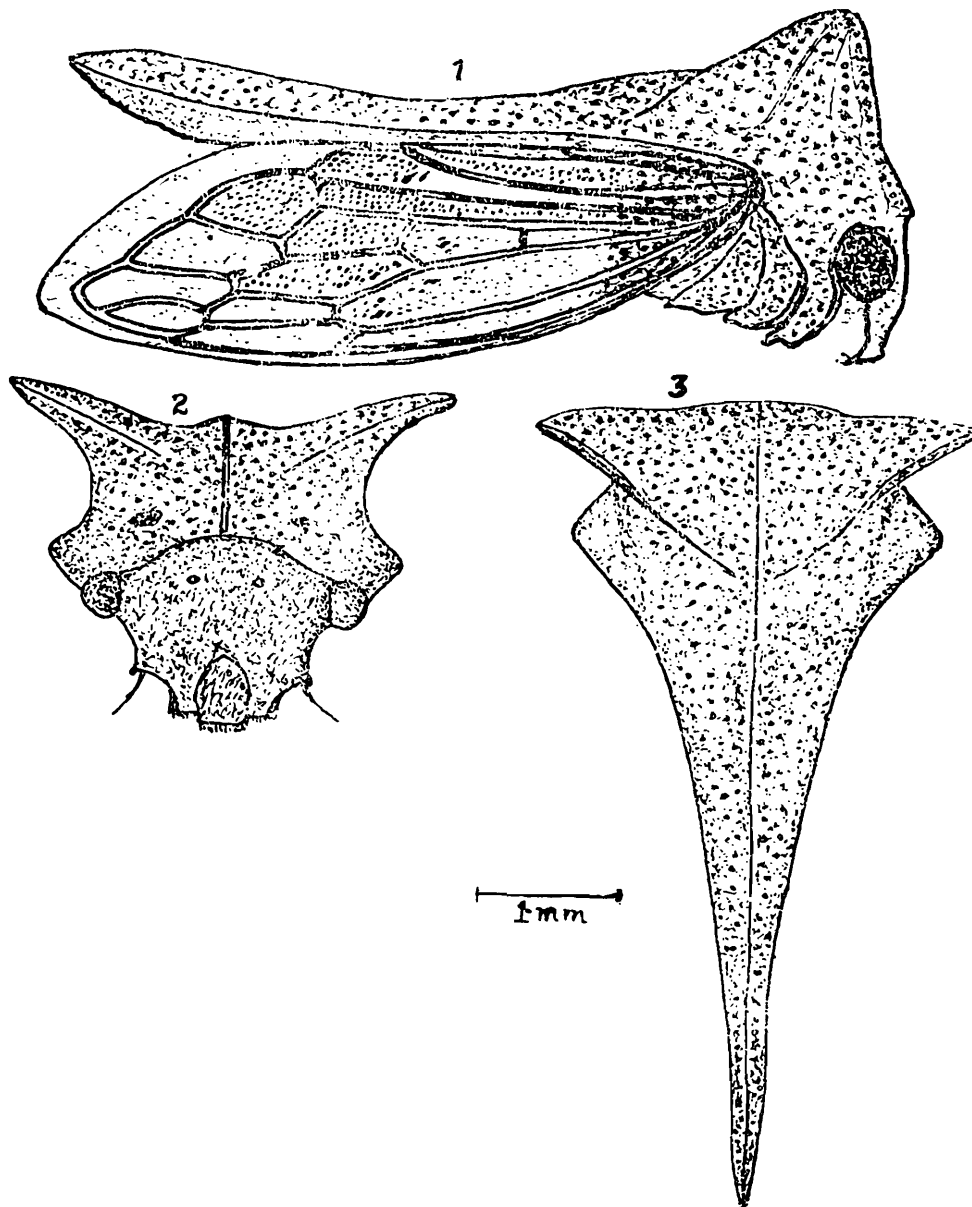


Fig. 20. *Oxyrhachis punctatus* Ananthasubramanian. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

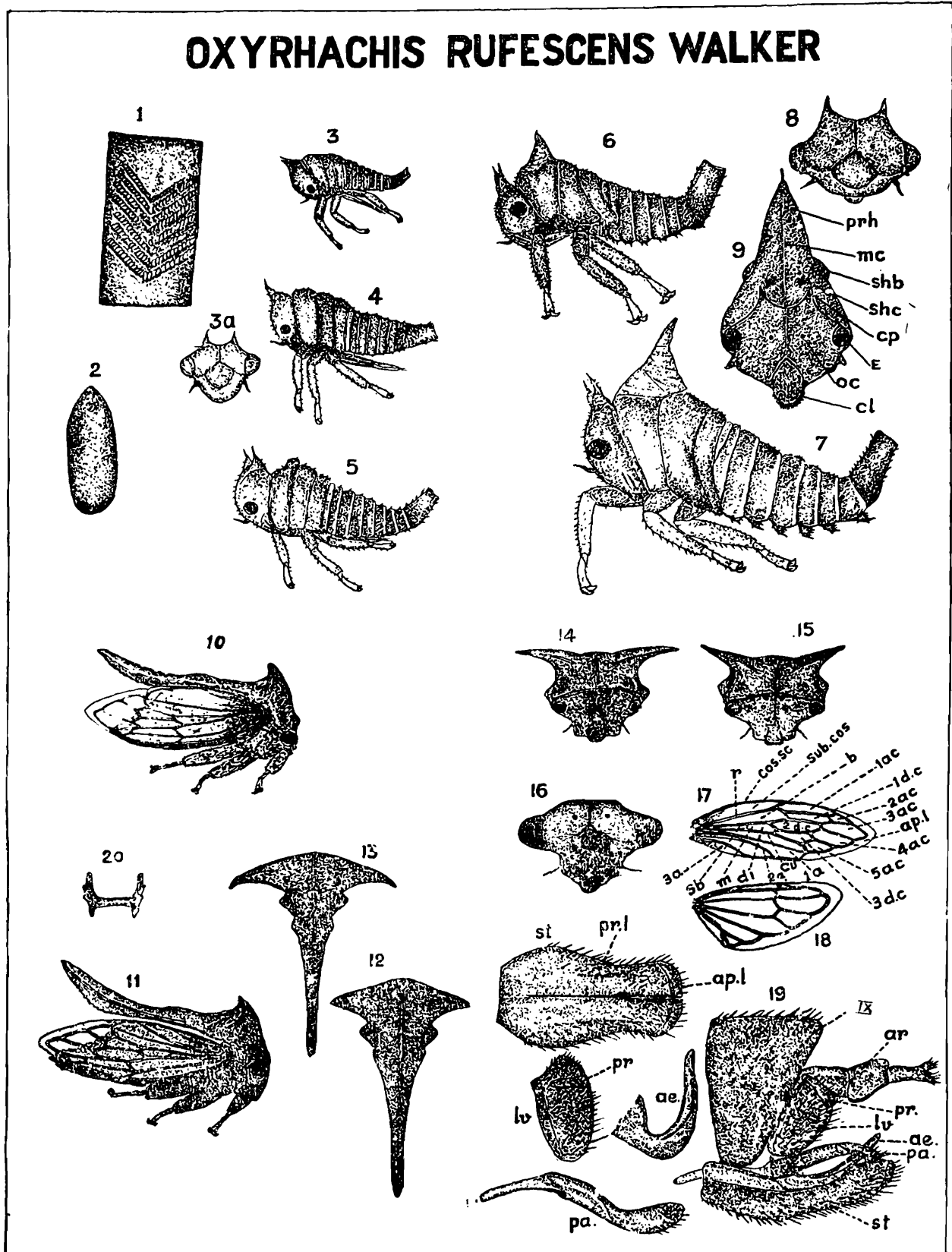


Fig. 21. *Oxyrhachis rufescens* Walker. Female. 1. Egg mass ; 2. Egg ; 3—7. First to fifth instars ; 3a. Frontal view of head and pronotum of first instar nymph ; 8. Frontal view of head of 5th instar ; 9. Frontal view of head and pronotum of 5th instar ; 10. Adult male ; 11. Adult female ; 12. Dorsal view of pronotum of female ; 13. Dorsal view of pronotum of male ; 14. Frontal view of head and pronotum of male ; 15. Frontal view of head and pronotum of female ; 16. Frontal elevation of head ; 17. Tegmina ; 18. Hind wing ; 19. Male terminalia ; 20. Scutellum.

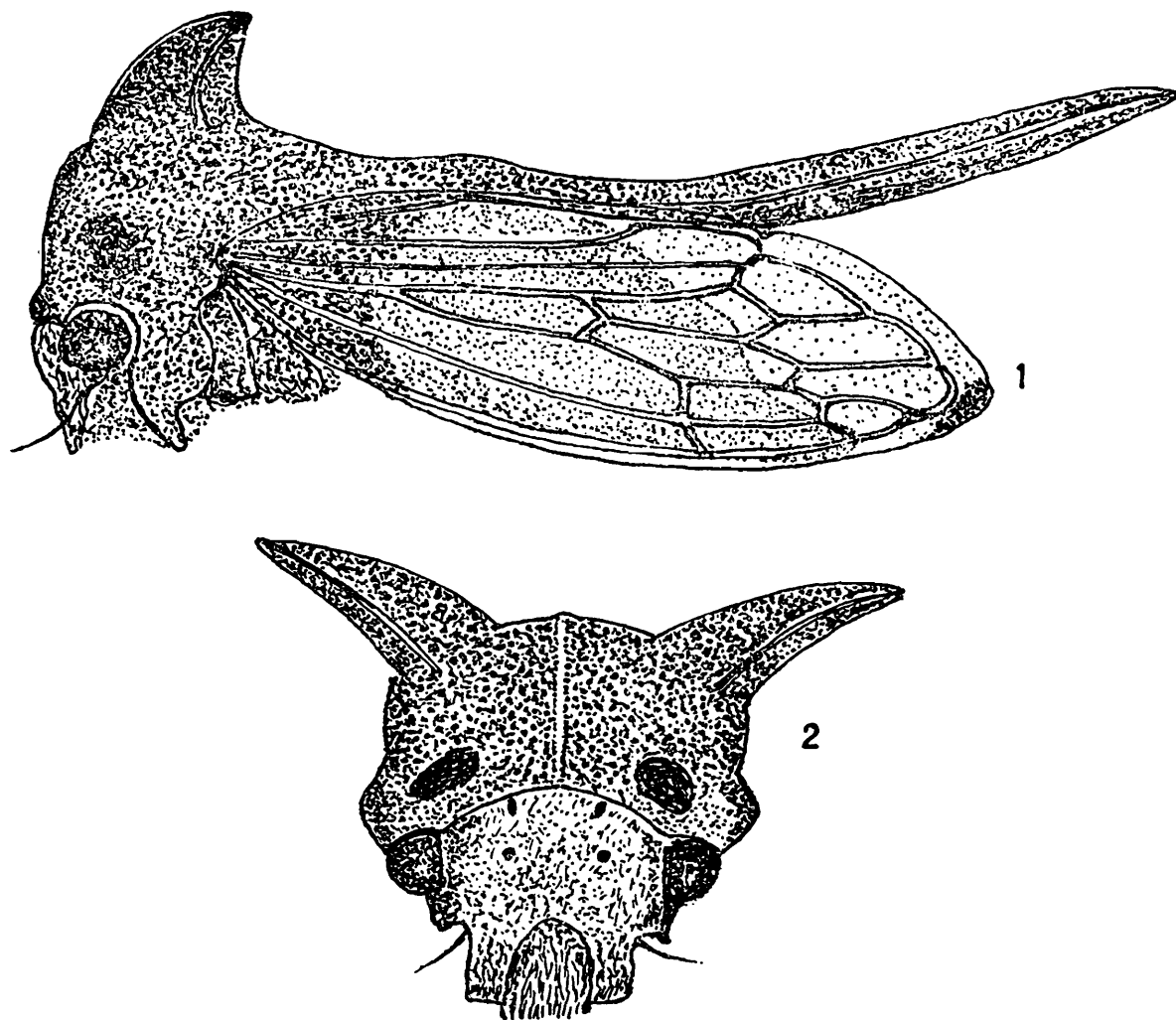


Fig. 22. *Oxyrhachis subjecta* Walker. Female. 1. Lateral view ; 2. Frontal view of head and pronotum.

OXYRHACHIS TARANDA (Fabricius)

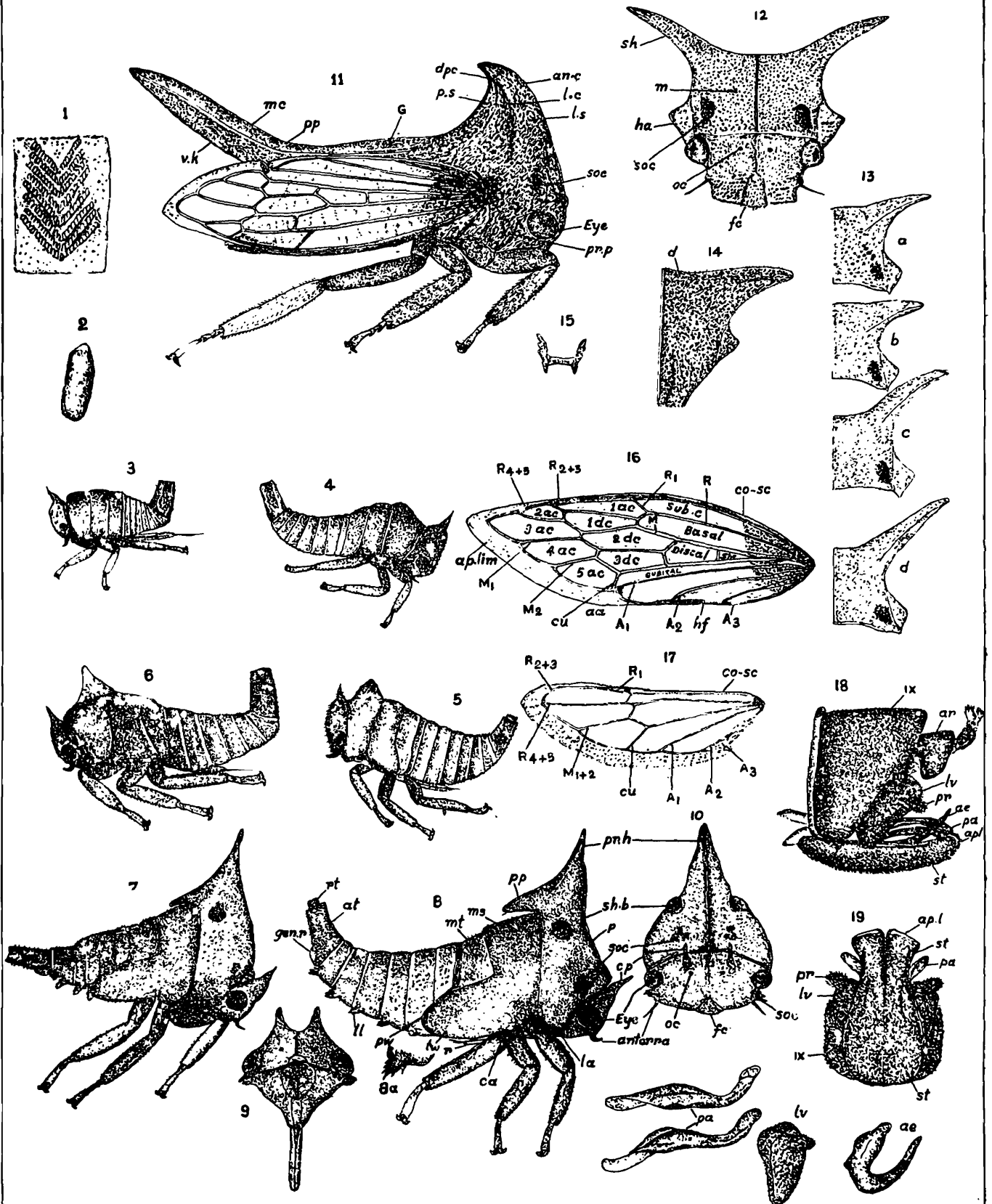


Fig. 23. *Oxyrhachis taranda* (Fabricius). 1. Egg mass ; 2. Egg ; 3—6. First to fourth instar nymphs ; 7. Fifth instar, male ; 8. Fifth instar female ; 8a. Abdominal lateral lamella of 5th instar ; 9. Head of 5th instar, frontal view ; 10. Head and pronotum of 5th instar, frontal view ; 11. Adult female, lateral view ; 12. Frontal view of head and pronotum of female ; 13. a b c, d. Variations in the development of suprahumeral horns in female ; 14. Right half of dorsal view of male ; 15. Scutellum ; 16. Tegmina ; 17. Hind wing ; 18. Male genitalia, lateral view ; 19. Male genitalia, ventral view.

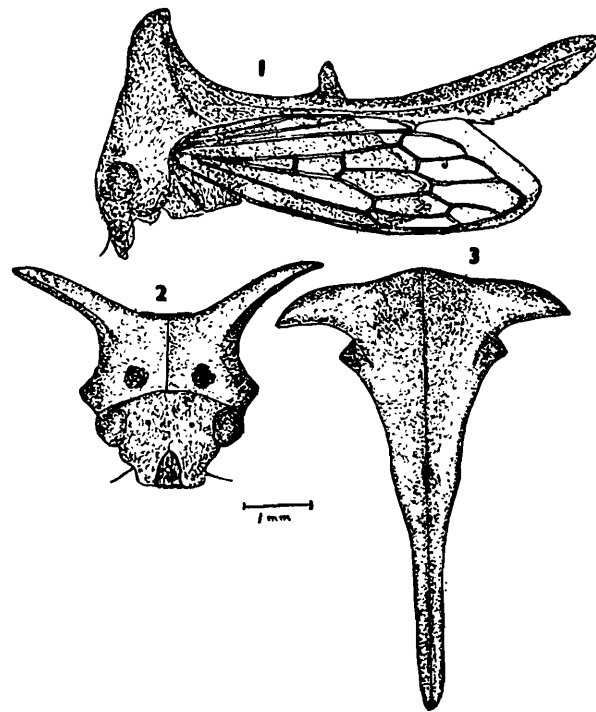


Fig. 24. *Oxyrhachis tuberculus* nom. nov. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

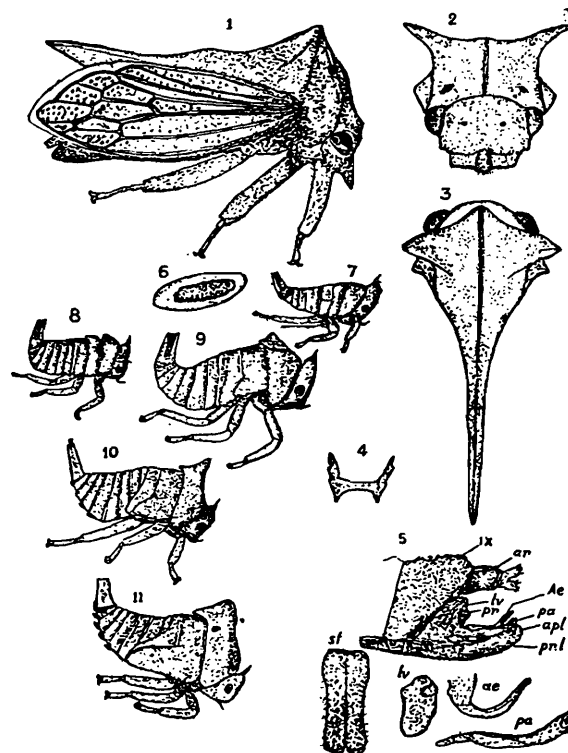


Fig. 25. *Oxyrhachis uncatatus* Melichar. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum ; 4. Scutellum ; 5. Male genitalia, lateral view ; 6. Egg ; 7—11. First to fifth nymphal instars.

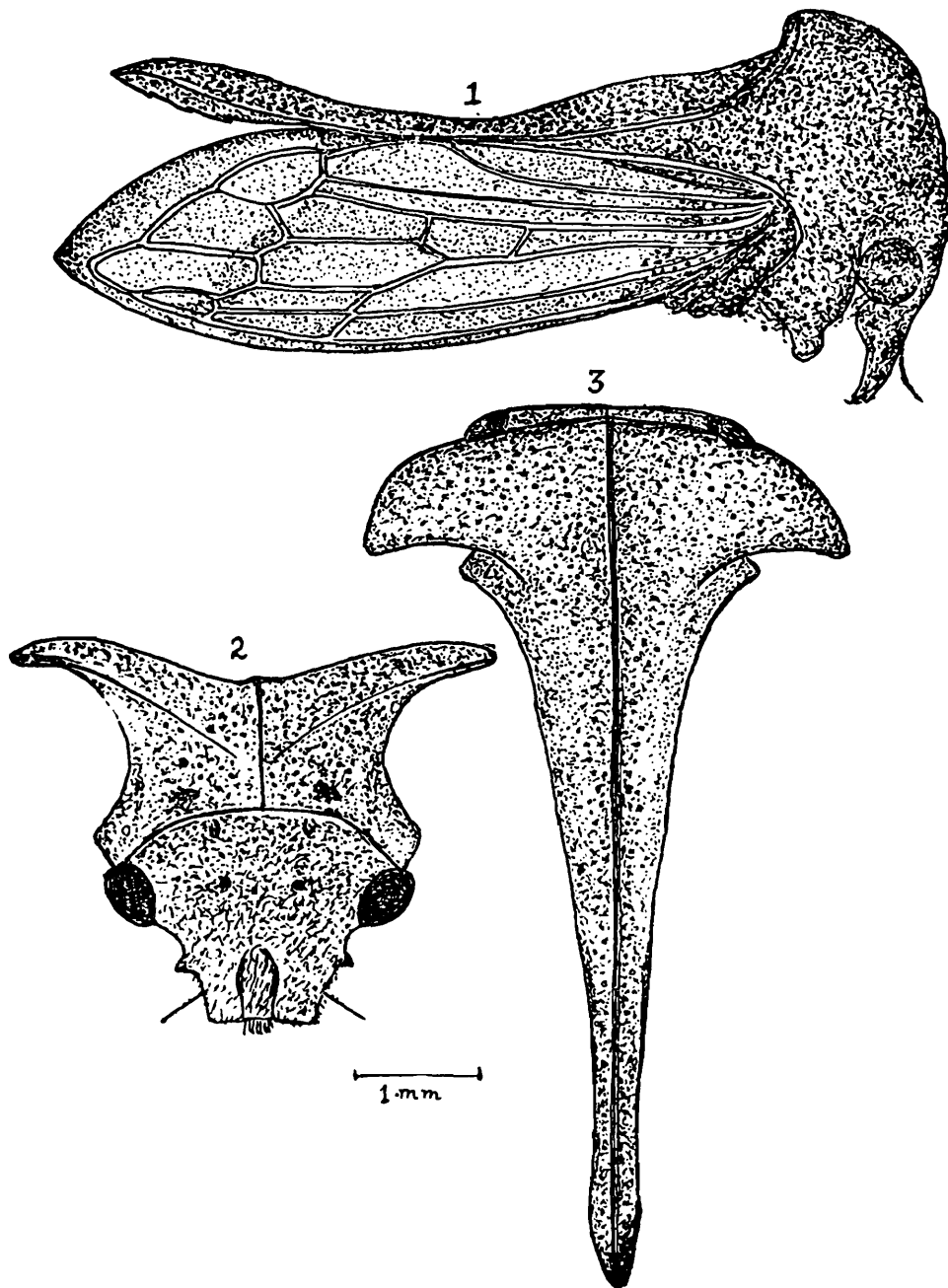


Fig. 26. *Oxyrhachis unicolor* Ananthasubramanian. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

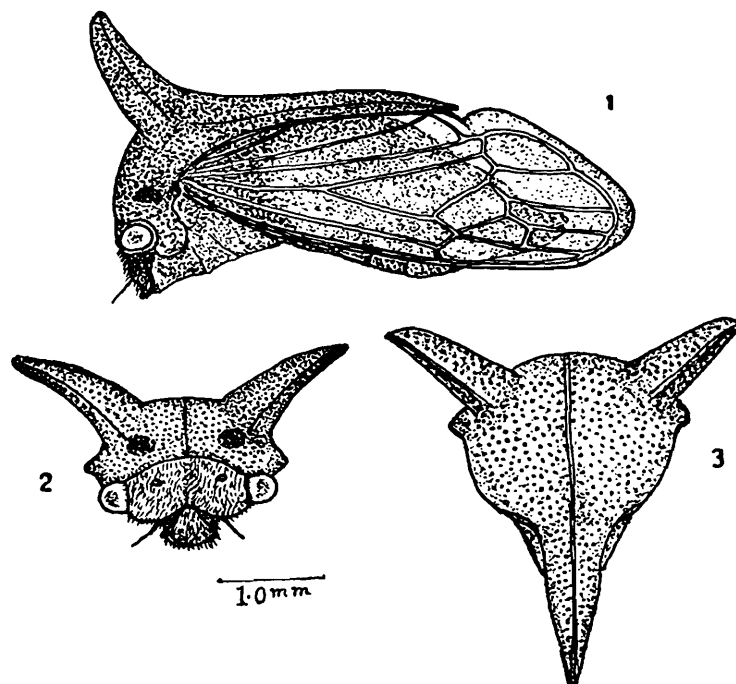


Fig. 27. *Tricentrus aeneus* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

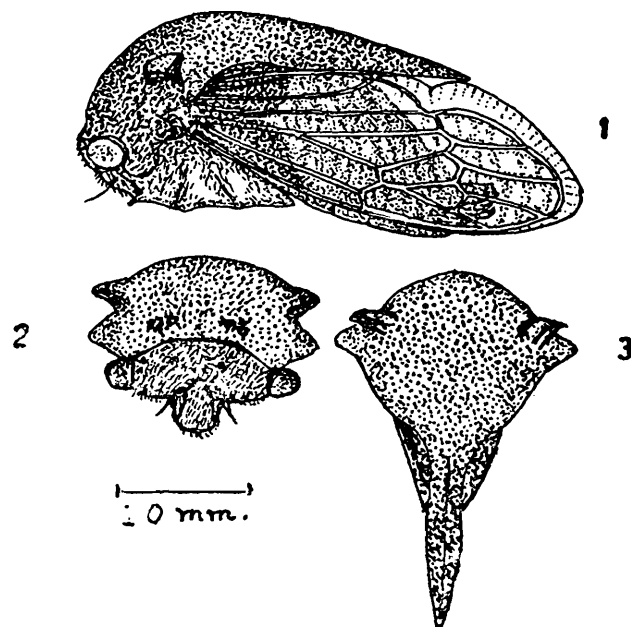


Fig. 28. *Tricentrus aiyuri* Funkhouser. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

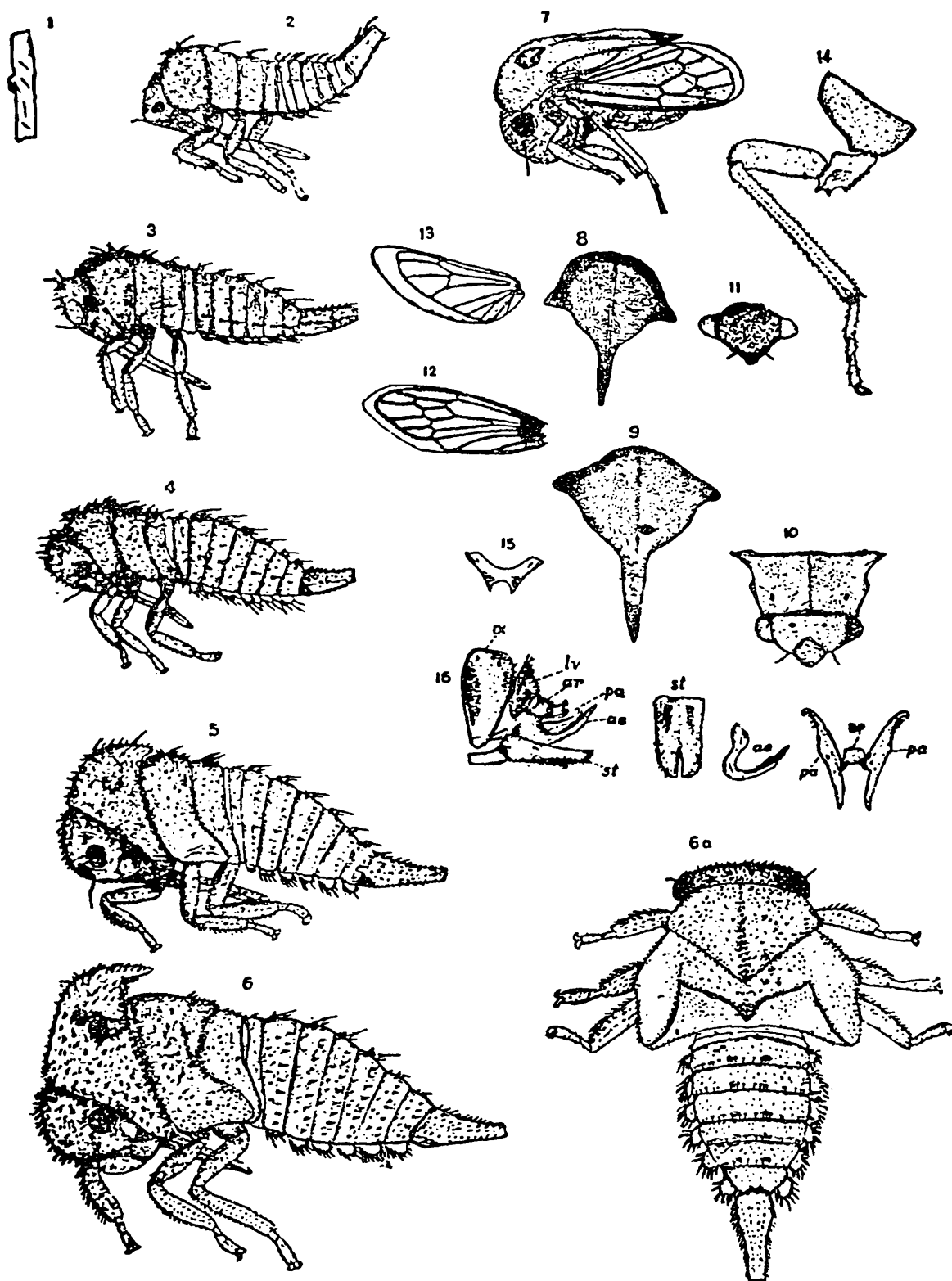


Fig. 29. *Tricentrus albomaculatus* Distant. 1. Egg slits on host plant; 2—6. First to fifth instar nymphs; 7. Female, lateral view; 8. Male, dorsal view of pronotum; 9. Female, dorsal view of pronotum; 10. Female, frontal view of head and pronotum; 11. Head, frontal elevation; 12. Tegmen; 13. Hind wing; 14. Hind leg; 15. Scutellum; 16. Male genitalia, lateral view.

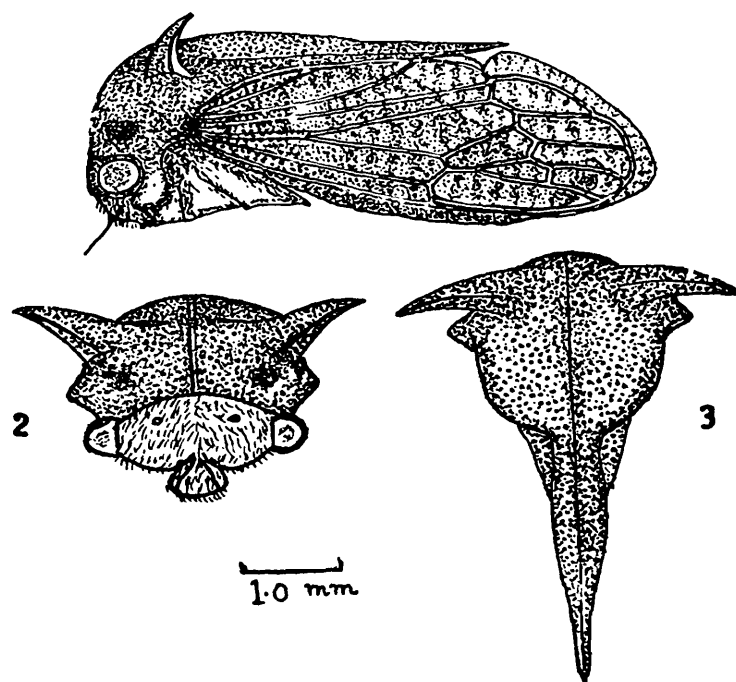


Fig. 30. *Tricentrus allabens* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

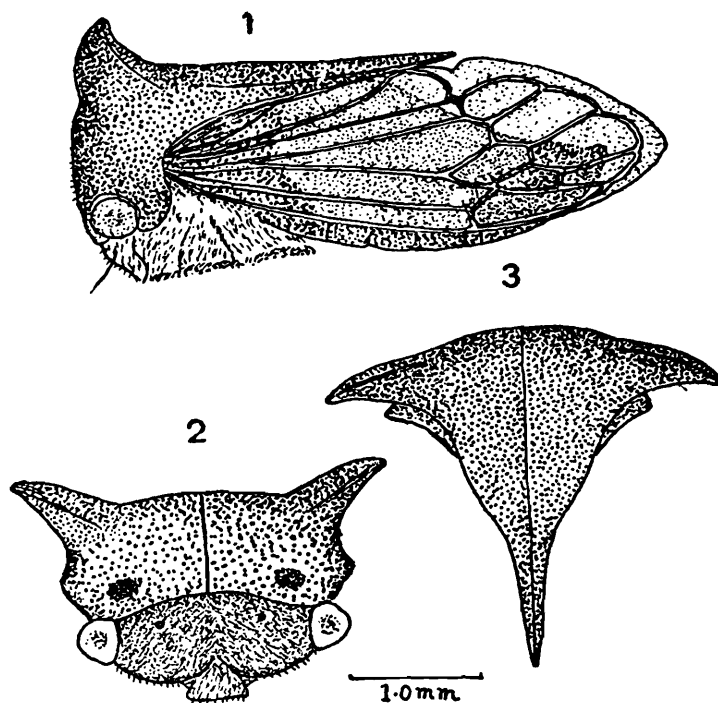


Fig. 31. *Tricentrus ananthasubramaniani* Sharma & Badal. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

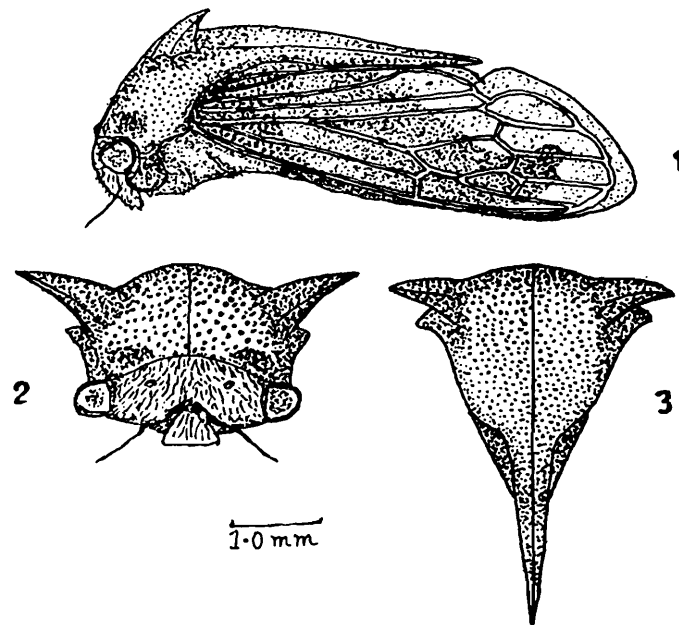


Fig. 32. *Tricentrus assamensis* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

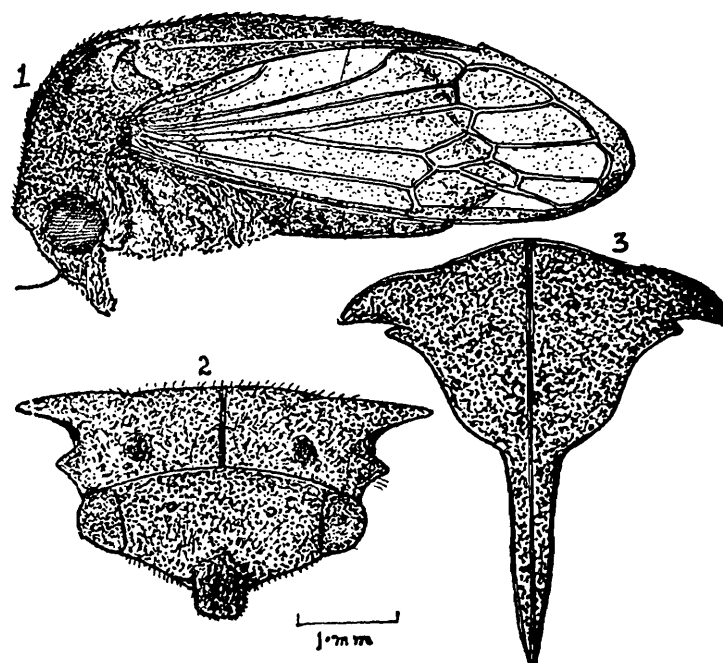


Fig. 33. *Tricentrus atrus* Ananthasubramanian. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

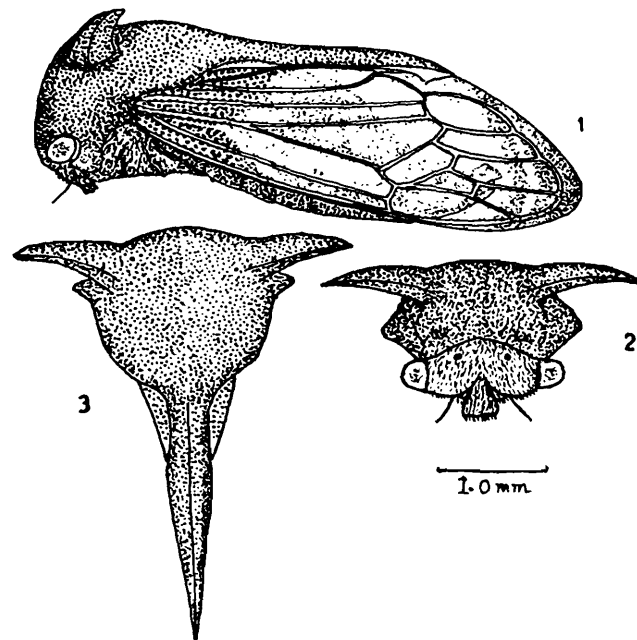


Fig. 34. *Tricentrus banguensis* Funkhouser. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

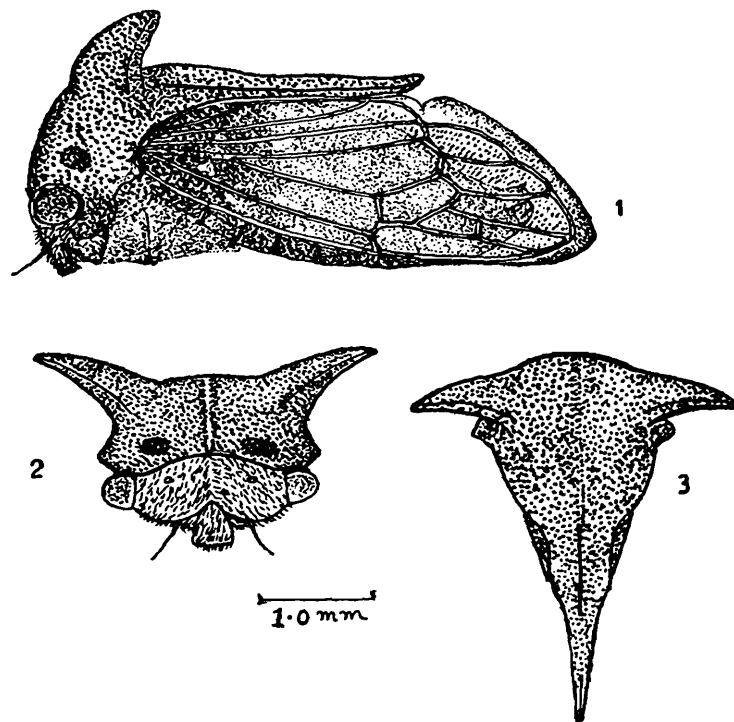


Fig. 35, *Tricentrus bicolor* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

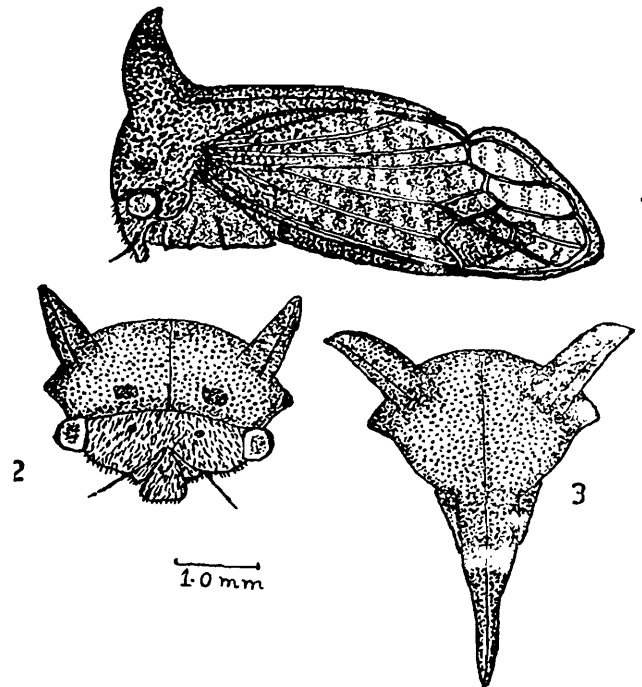


Fig. 36. *Tricentrus bifurcus* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

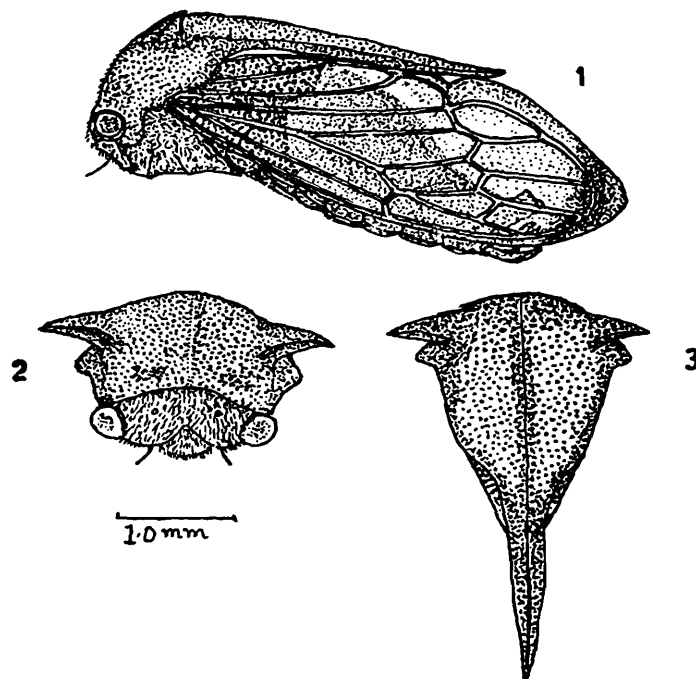


Fig. 37. *Tricentrus brevis* Funkhouser. Female. 1. Lateral view ; 2. Frontal view of head and pronotum.

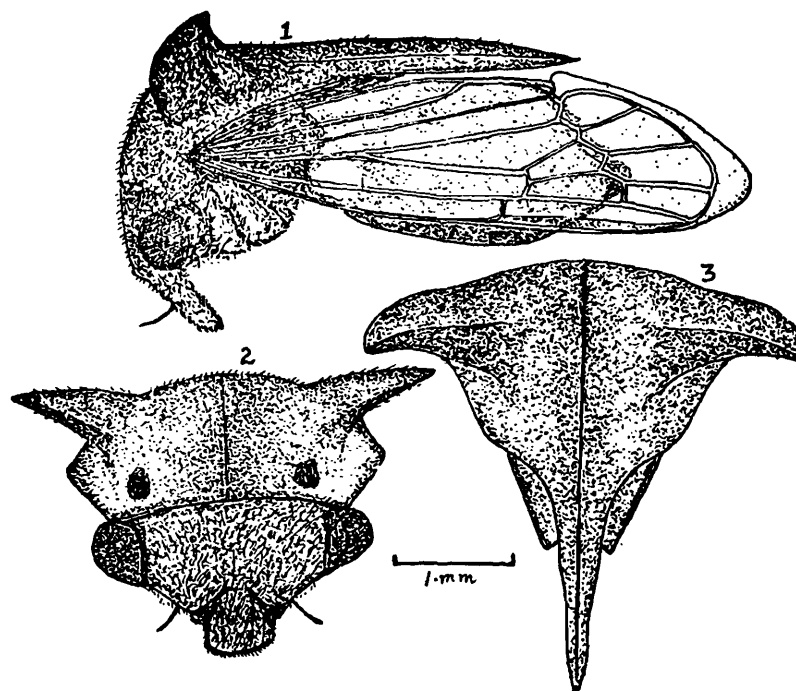


Fig. 38. *Tricentrus cinerens* Ananthasubramanian. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

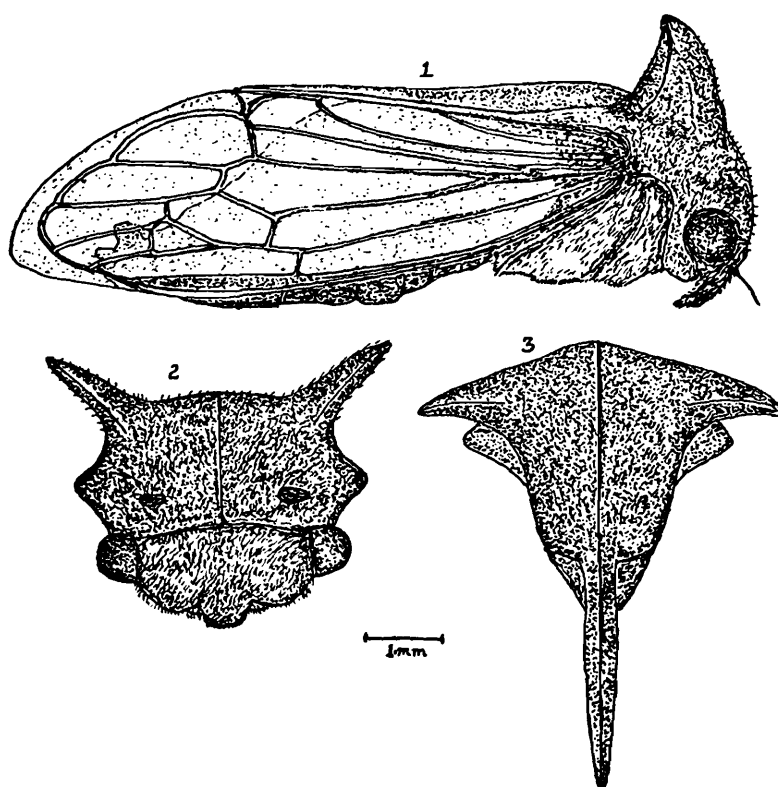


Fig. 39. *Tricentrus compressus* Ananthasubramanian. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

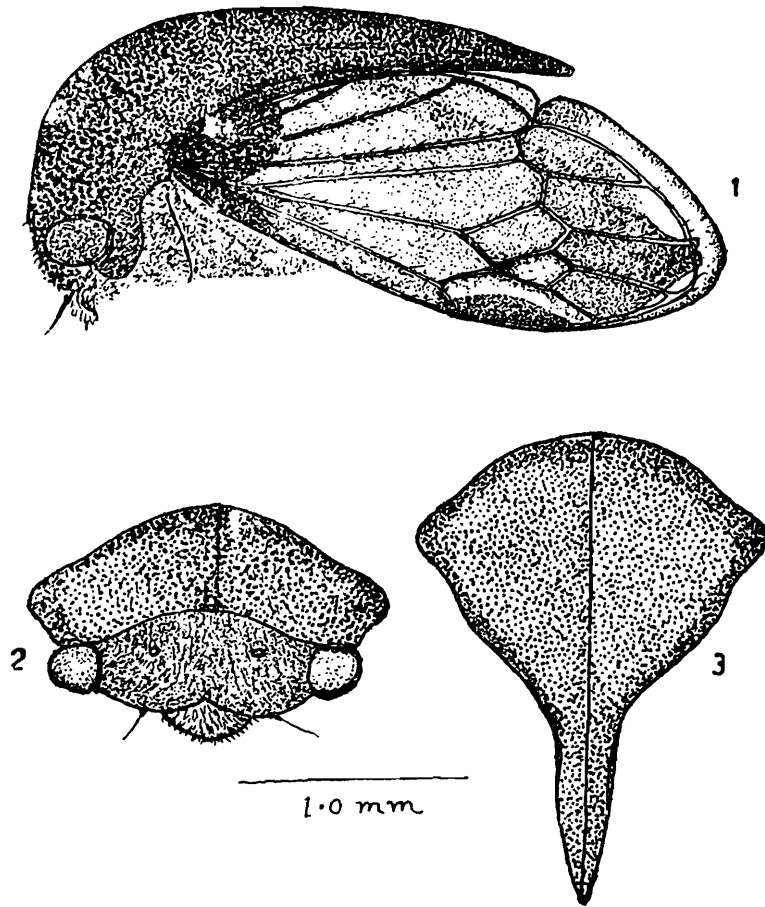


Fig. 40. *Tricentrus concolor* n. sp. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

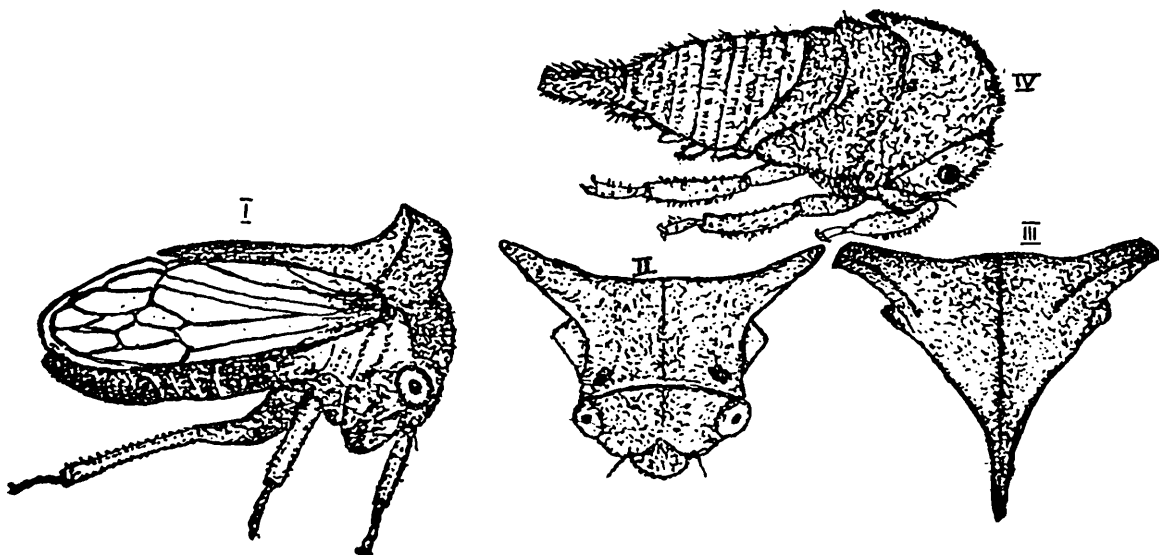


Fig. 41. *Tricentrus congestus* (Walker). Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

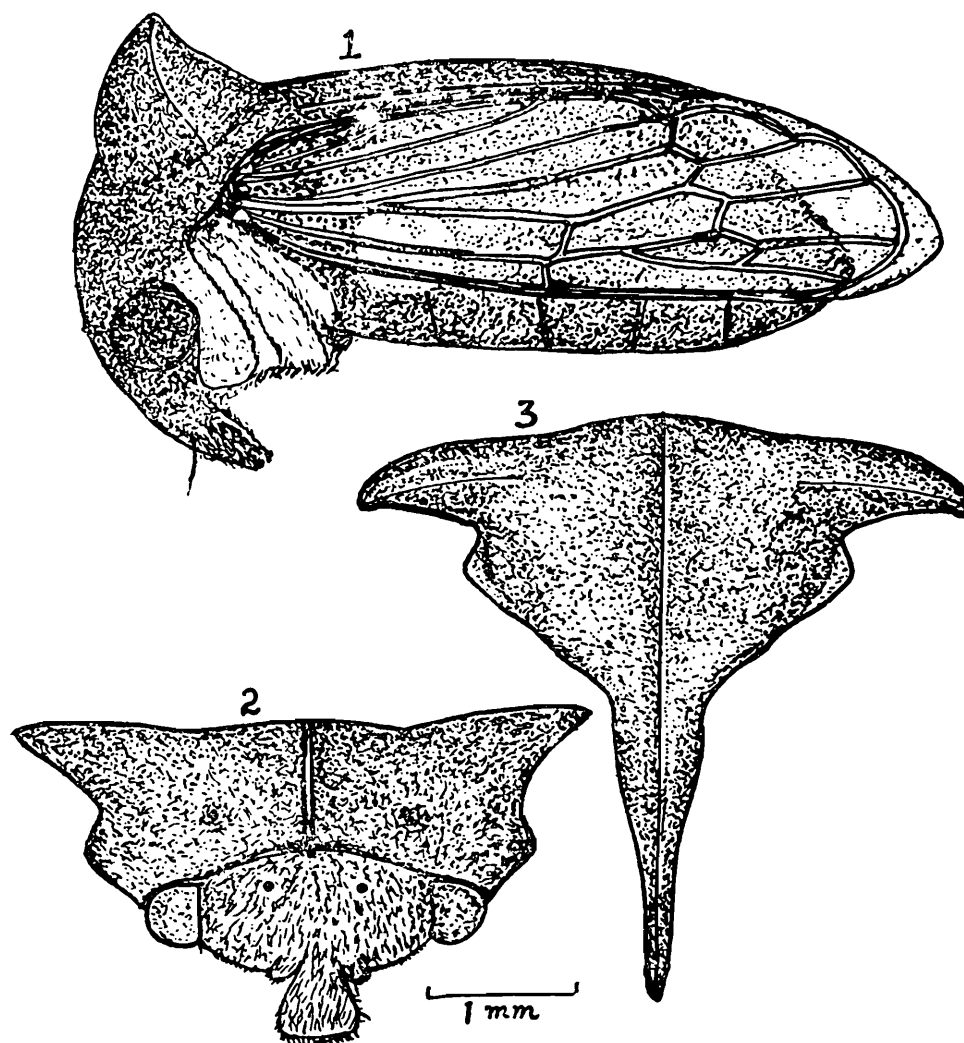


Fig. 42. *Tricentrus decornis* Ananthasubramanian. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

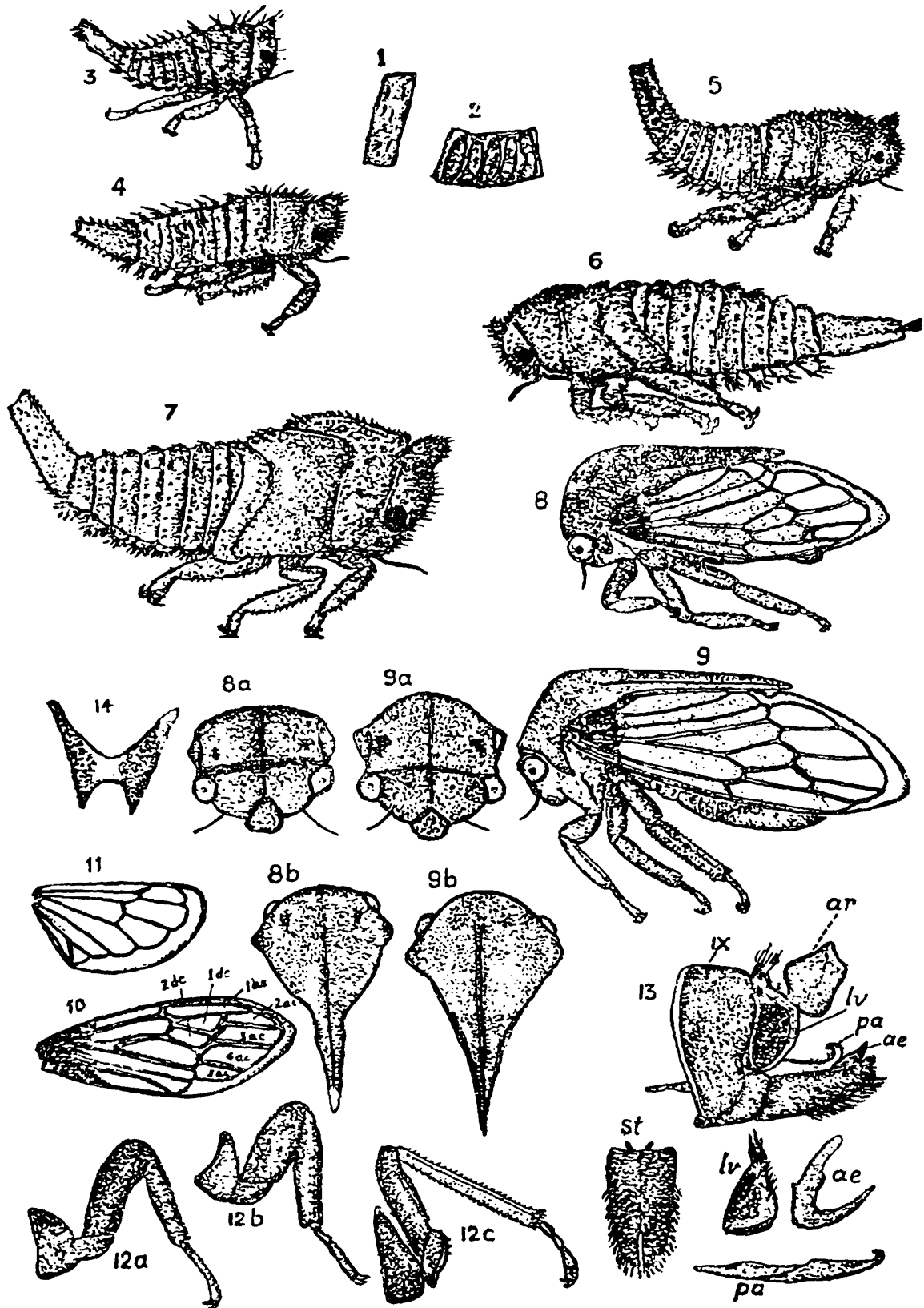


Fig. 43. *Tricentrus decornis* Ananthasubramanian & Ananthakrishnan. 1. Egg slits in host stem ; 2. An egg slit exposed to show the arrangement of egg ; 3—7. First to fifth instar nymphs ; 8. Male, lateral view ; 8a. Frontal view of head and pronotum ; 8b. Dorsal view of male pronotum ; 9. Female, lateral view ; 9a. Frontal view of female head and pronotum ; 9b. Dorsal view of female pronotum ; 10. Tegmina ; 11. Hind wing ; 12. a, b, c. Legs ; 13. Male genitalia ; 14. Scutellum.

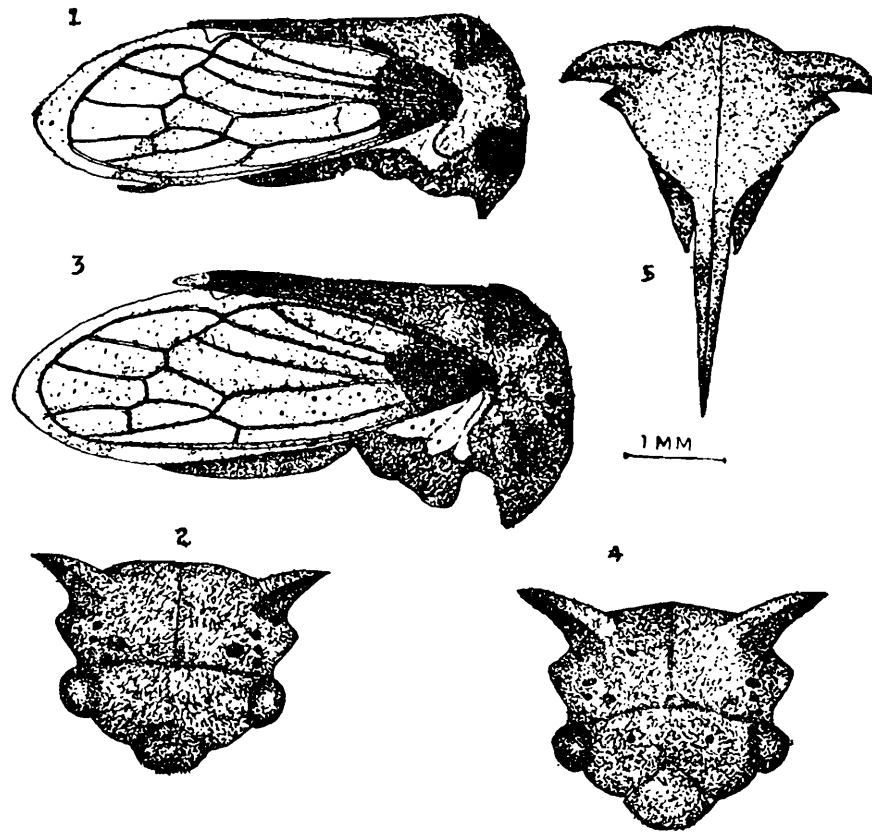


Fig. 44. *Tricentrus distinctus* Thirumalai & Ananthasubramanian. Male. 1. Lateral view; 2. Male, frontal view of head and pronotum; 3. Female, lateral view; 4, Female, frontal view of head and pronotum; 5. Female, dorsal view of pronotum.

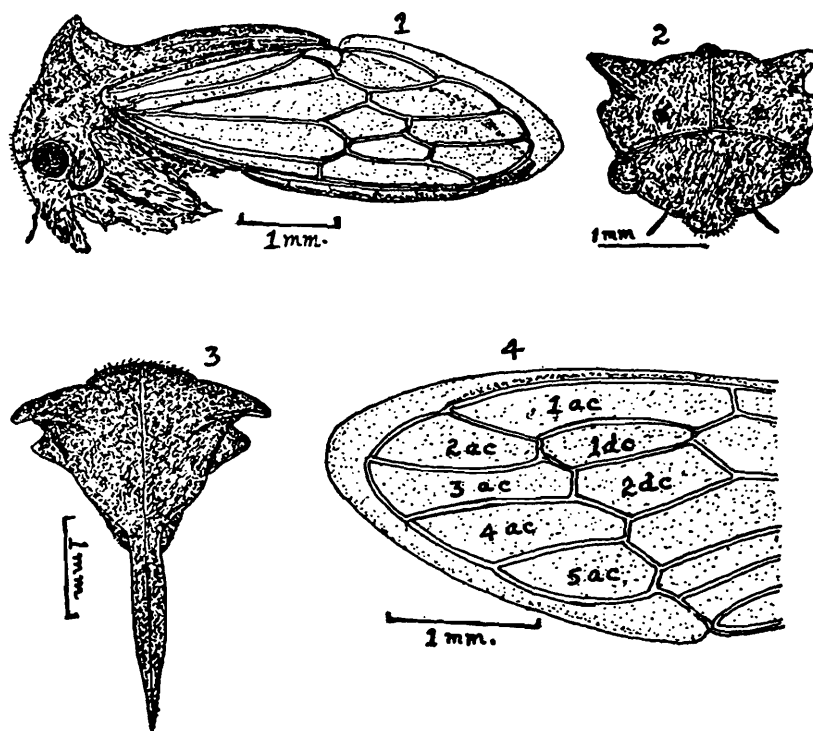


Fig. 45. *Tricentrus elegans* Ananthasubramanian. Male. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum; 4. Tegminal venation.

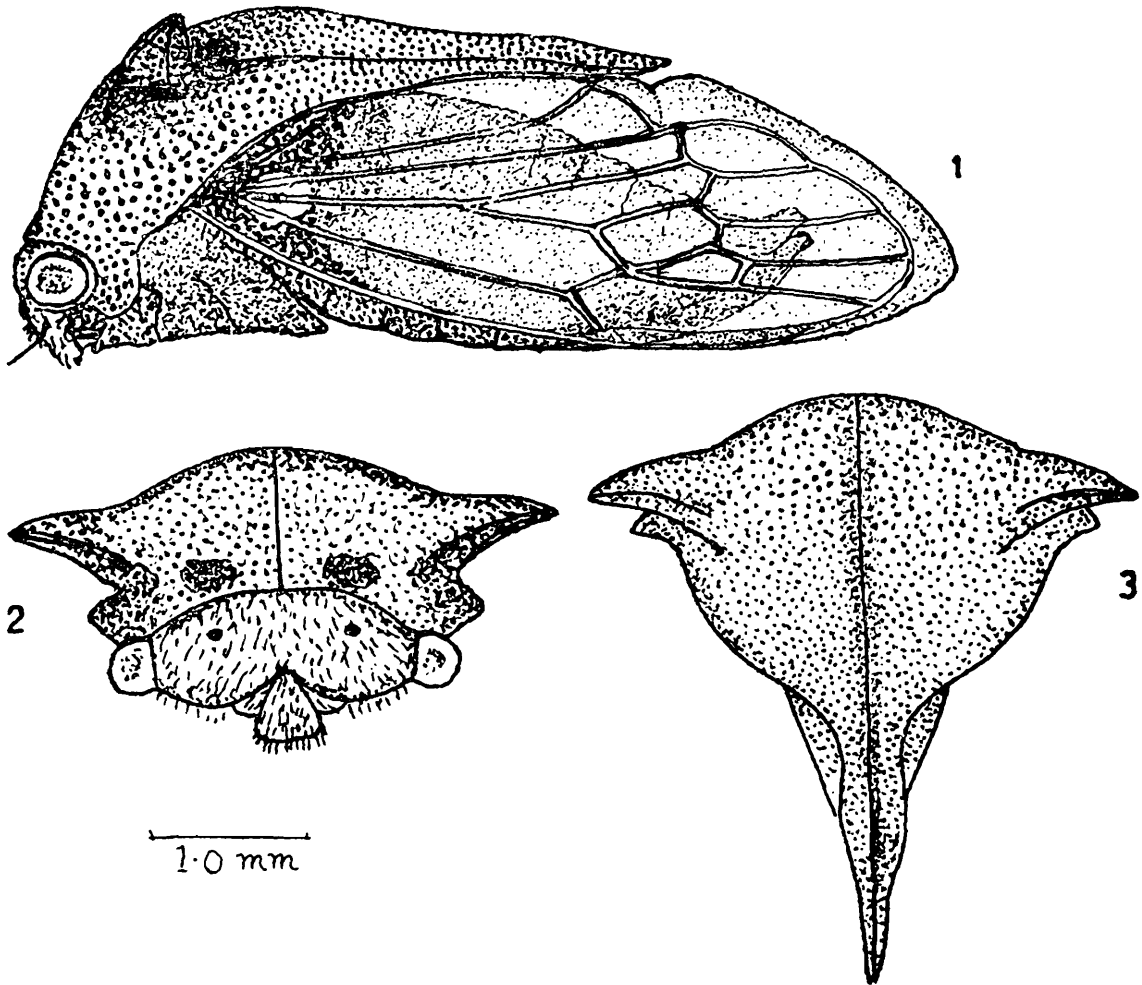


Fig. 46. *Tricentrus fairmairei* (Stal). Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

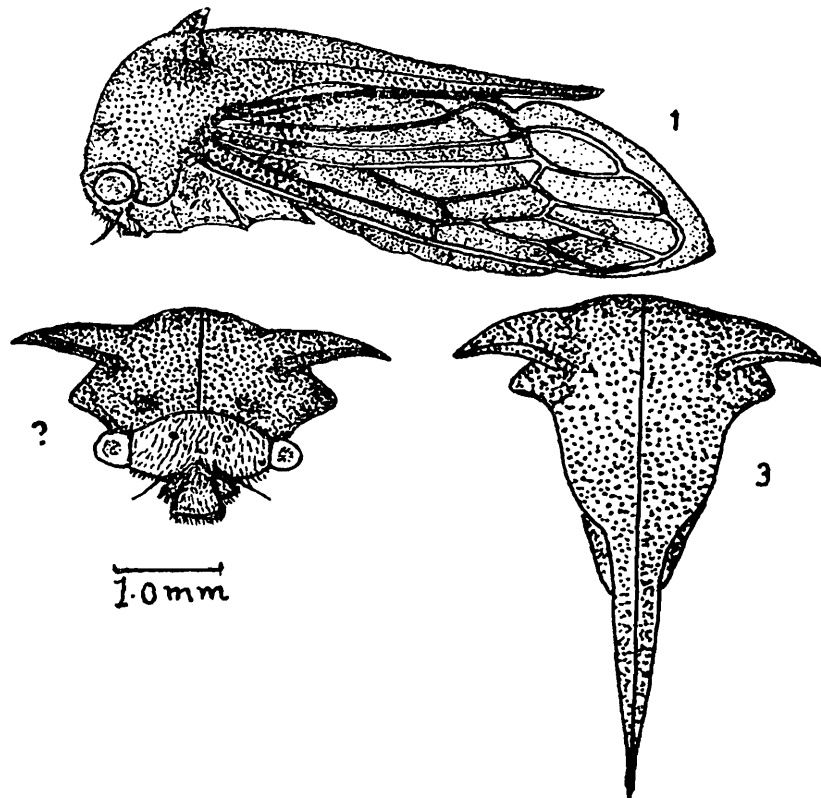


Fig. 47. *Tricentrus ferruginosus* Funkhouser. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

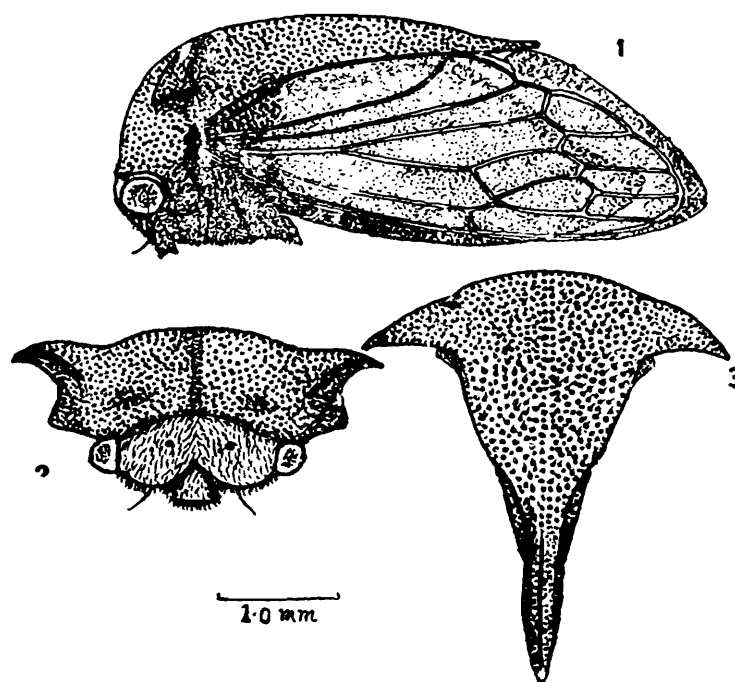


Fig. 48. *Tricentrus gibbosulus* (Walker). Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

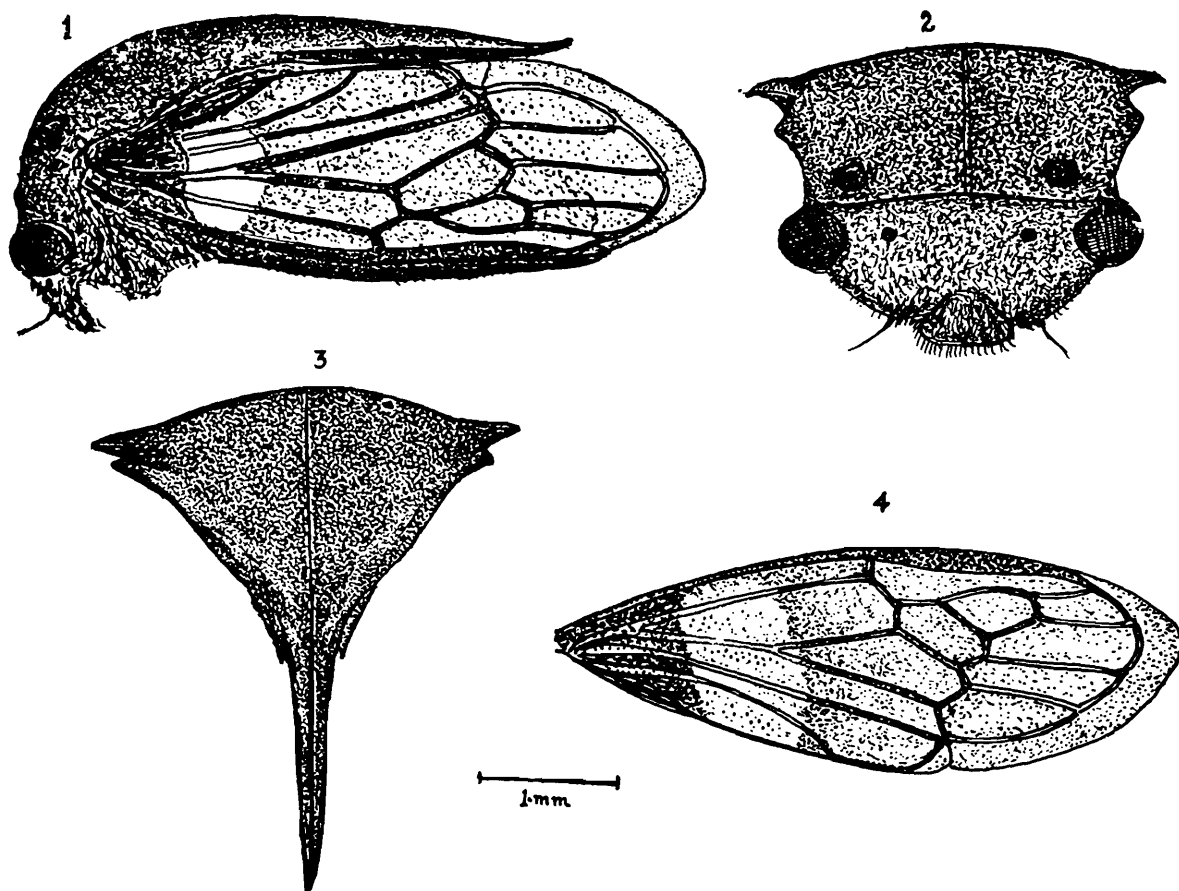


Fig. 49. *Tricentrus hameedi* n. sp. Female. 1. Lateral view : 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum ; 4, Tegmen.

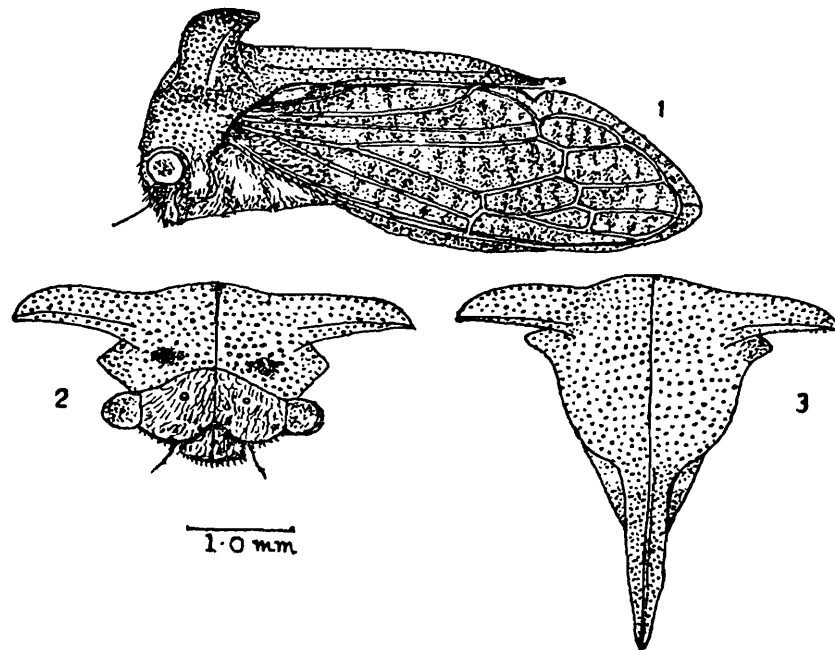


Fig. 50. *Tricentrus horizontalis* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

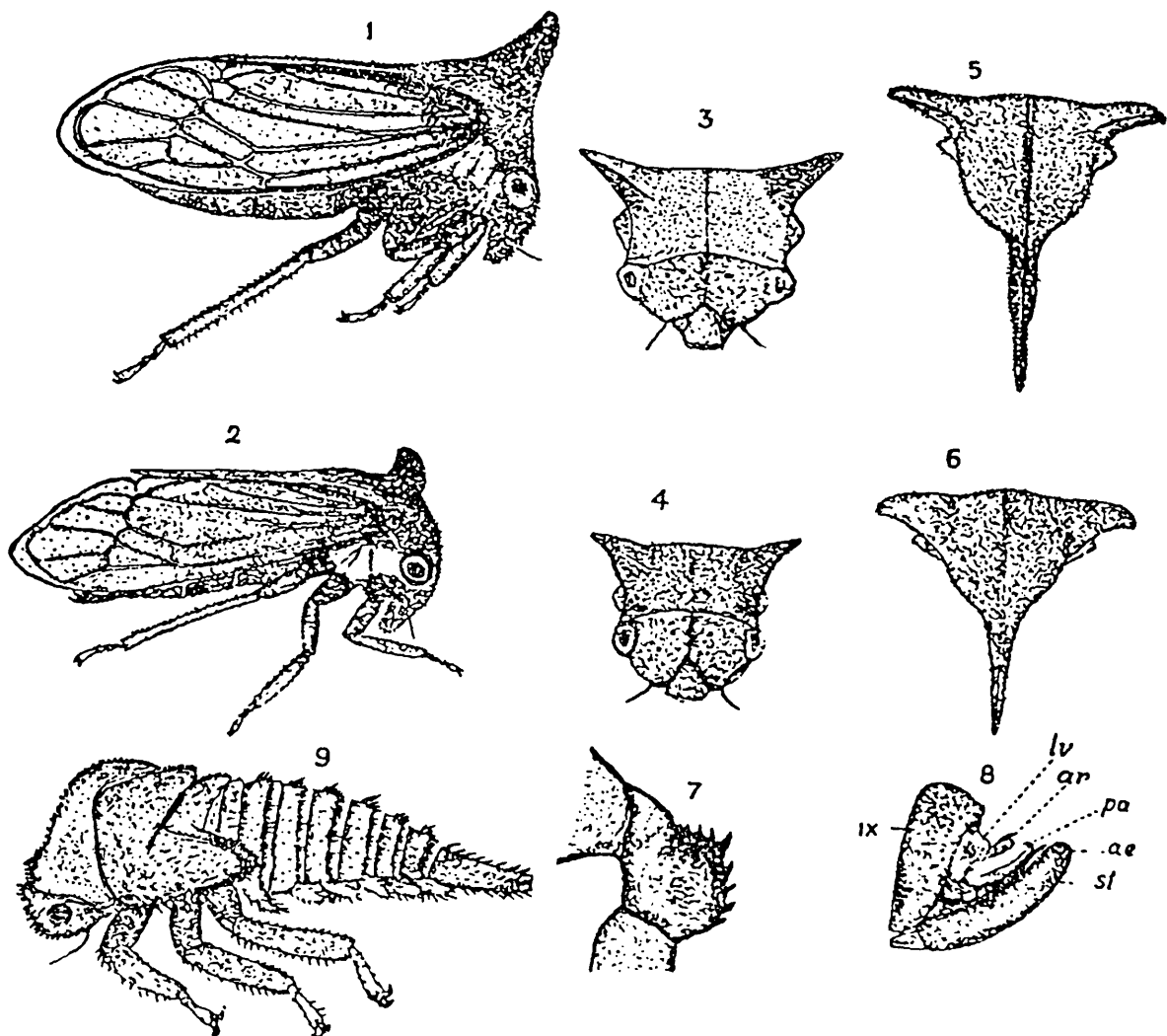


Fig. 51. *Tricentrus indicus* nom. nov. 1. Female, lateral view ; 2. Male, lateral view ; 3. Female, frontal view of head and pronotum ; 4. Male, frontal view of head and pronotum ; 5. Female dorsal view of pronotum ; 6. Male, dorsal view of pronotum ; 7. Hind trochanter ; 8. Male terminalia, lateral view. 9. Dorsal view of male.

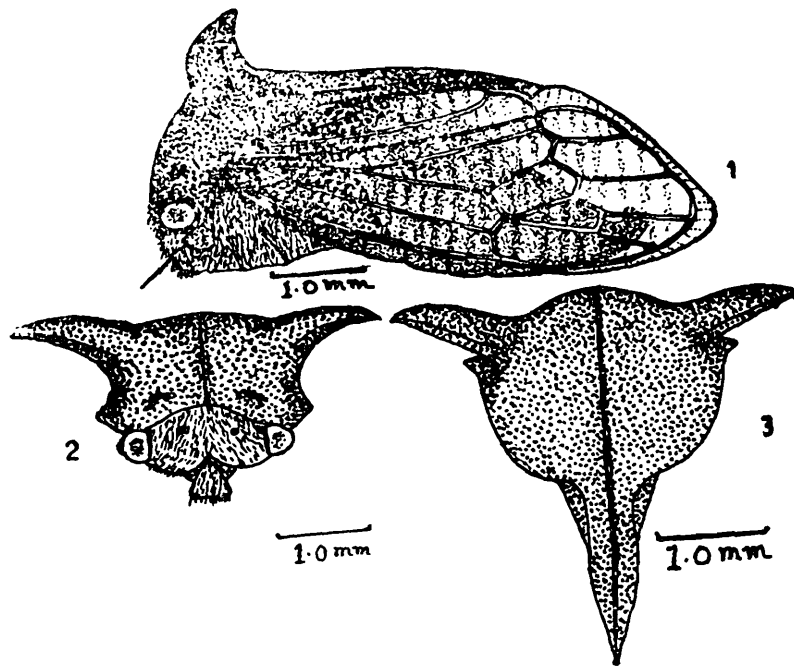


Fig. 52. *Tricentrus kamoanensis* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

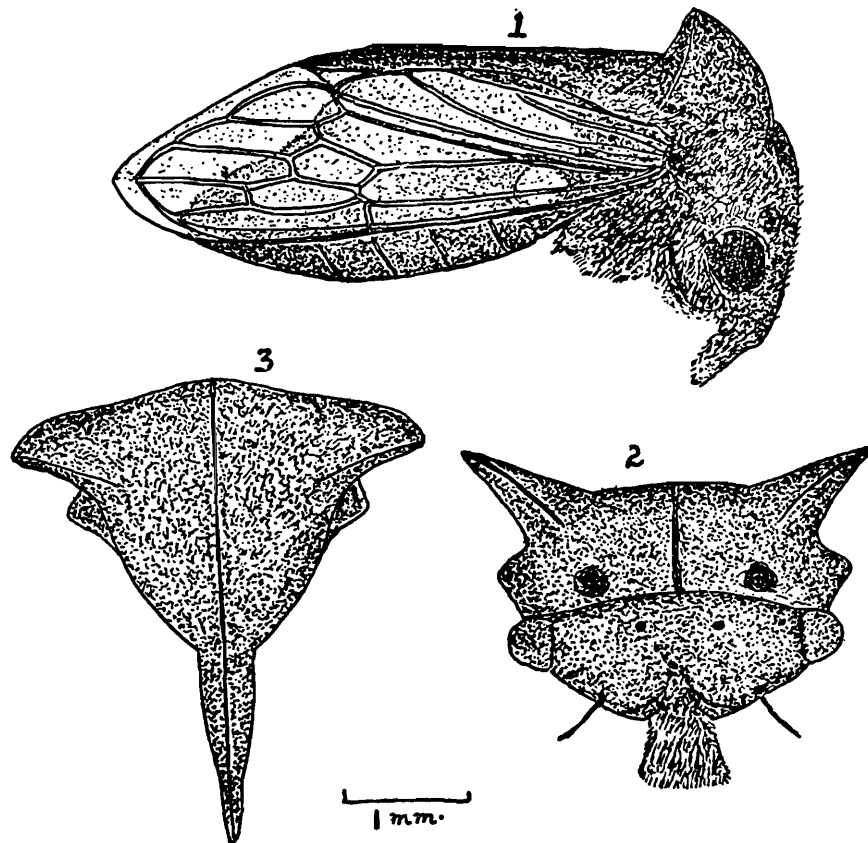


Fig. 53. *Tricentrus longiceps* Ananthasubramanian. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

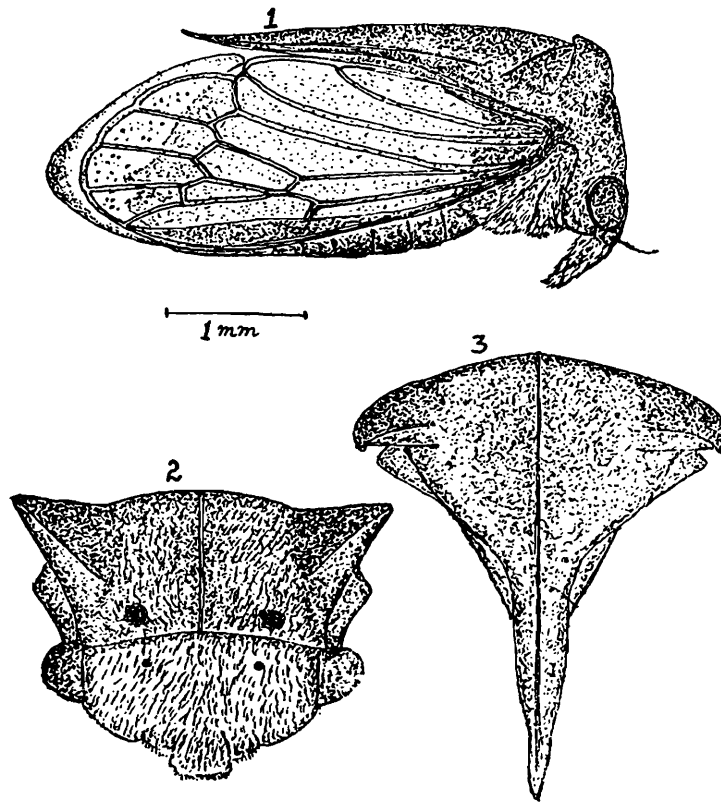


Fig. 54. *Tricentrus longicornis* Ananthasubramanian. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum:

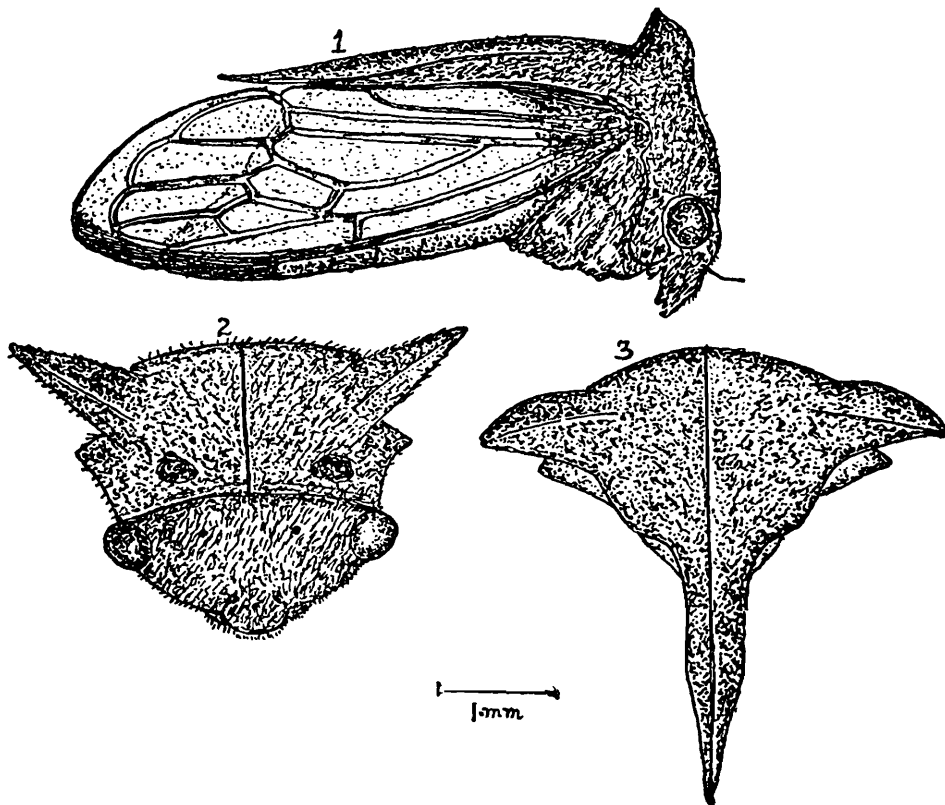


Fig. 55. *Tricentrus minomorii* Ananthasubramanian. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum,

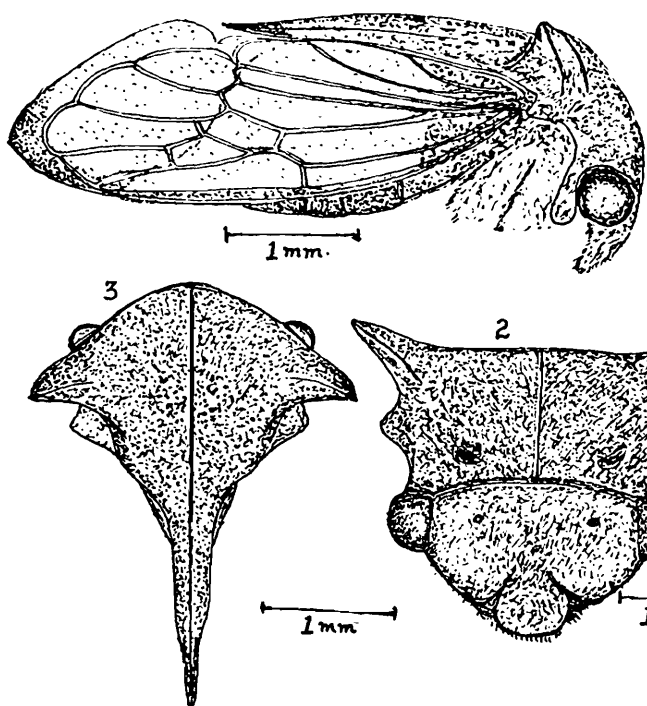


Fig. 56

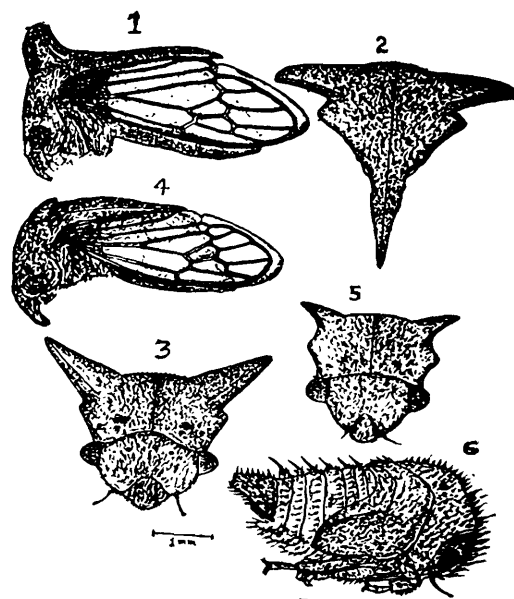


Fig. 58

Fig. 56. *Tricentrus minusculus* Ananthasubramanian. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

Fig. 58. *Tricentrus nobilis* Ananthasubramanian. 5. Female, lateral view ; 2. Female, dorsal view of pronotum ; 3. Female, frontal view of head and pronotum ; 4. Male, lateral view ; 5. Male, frontal view of head and pronotum ; 6. Fifth instar nymph.

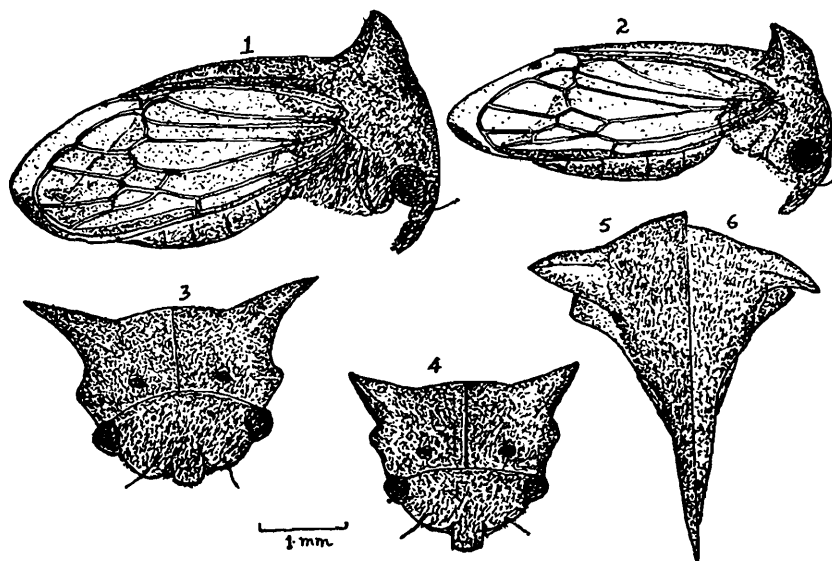


Fig. 57. *Tricentrus mitrai* nom. nov. 1. Female, lateral view ; 2. Male, lateral view ; 3. Female, frontal view of head and pronotum ; 4. Male, frontal view of head and pronotum ; 5. Female, dorsal view of pronotum (left half) ; 6. Male, dorsal view of pronotum (right half).

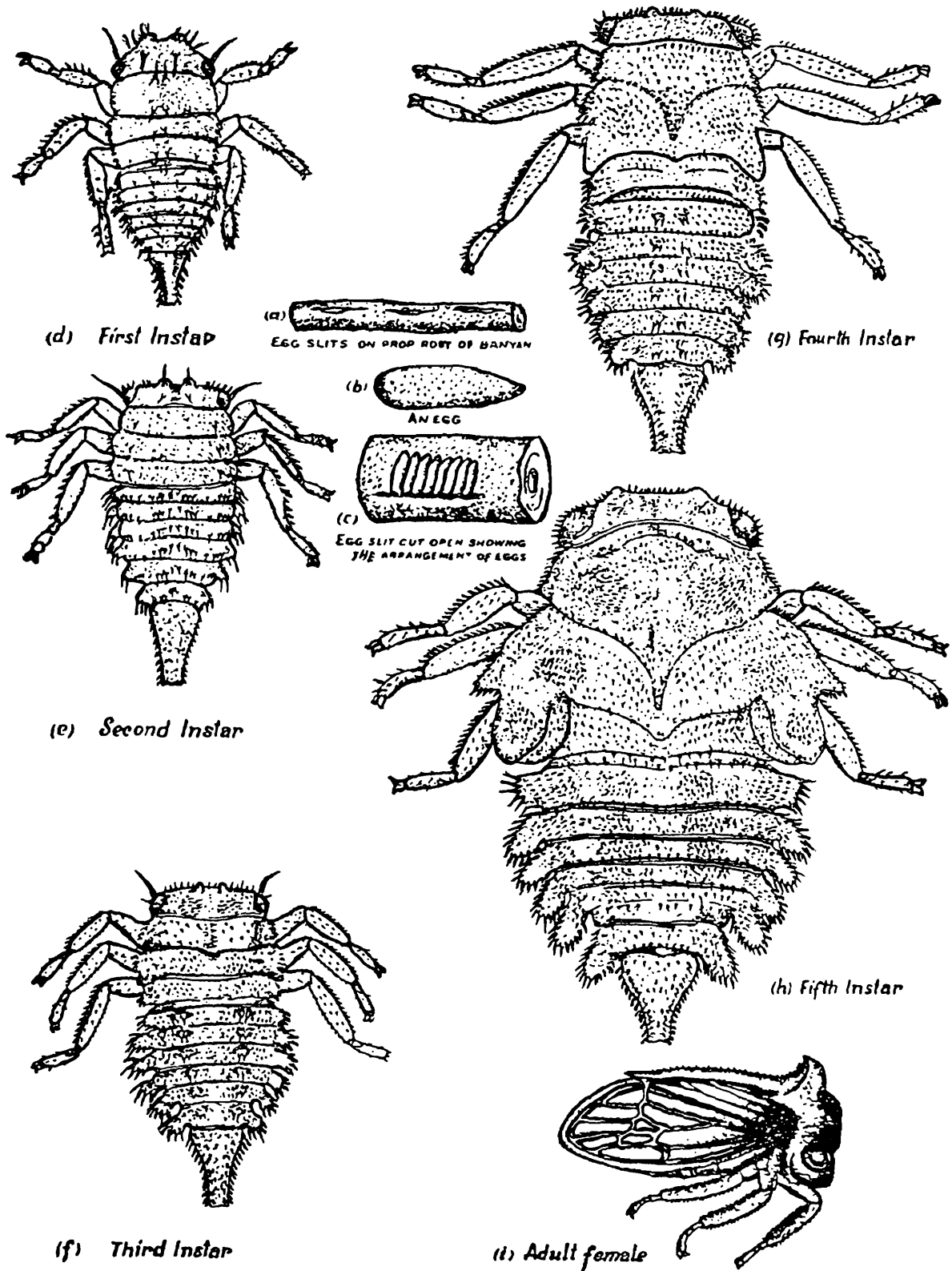


Fig. 59. *Tricentrus pilosus* Ananthasubramanian & Ananthakrishnan.

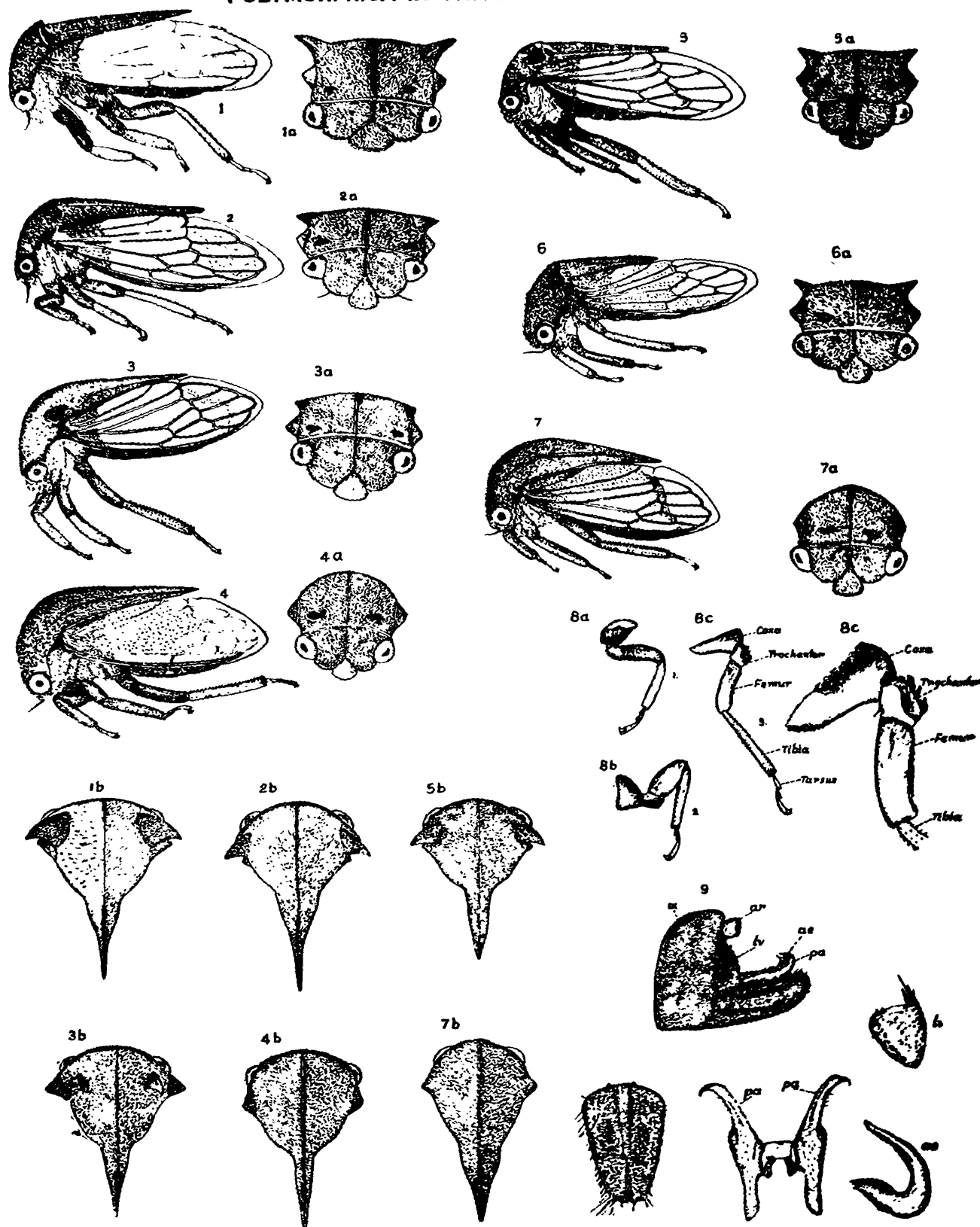
POLYMORPHISM IN *TRICENTRUS PILOSUS*

Fig. 60. *Tricentrus pilosus* : Polymorphic forms. 1. Female with normal horns ; 1a. the frontal view of its head and pronotum ; 1b. the dorsal view of its pronotum ; 2. Female with reduced horns ; 2a. the frontal view of its head and pronotum ; 2b. dorsal view of its pronotum ; 3. Female with aborted horns ; 3a. the dorsal view of its pronotum ; 4. Female with no horns ; 4a. the frontal view of its head and pronotum ; 4b. the dorsal view of its pronotum ; 5. Male with reduced horns ; 5a. the frontal view of its head and pronotum ; 5b. the dorsal view of its head and pronotum ; 6. Male with aborted horns ; 6a. the frontal view of its head and pronotum ; 7. Male with no horns ; 7a. the frontal view of its head and pronotum , 7b. the dorsal view of its pronotum ; 8a. Foreleg ; 8b. midleg ; 8c. hind leg ; 9. Male genitalia.

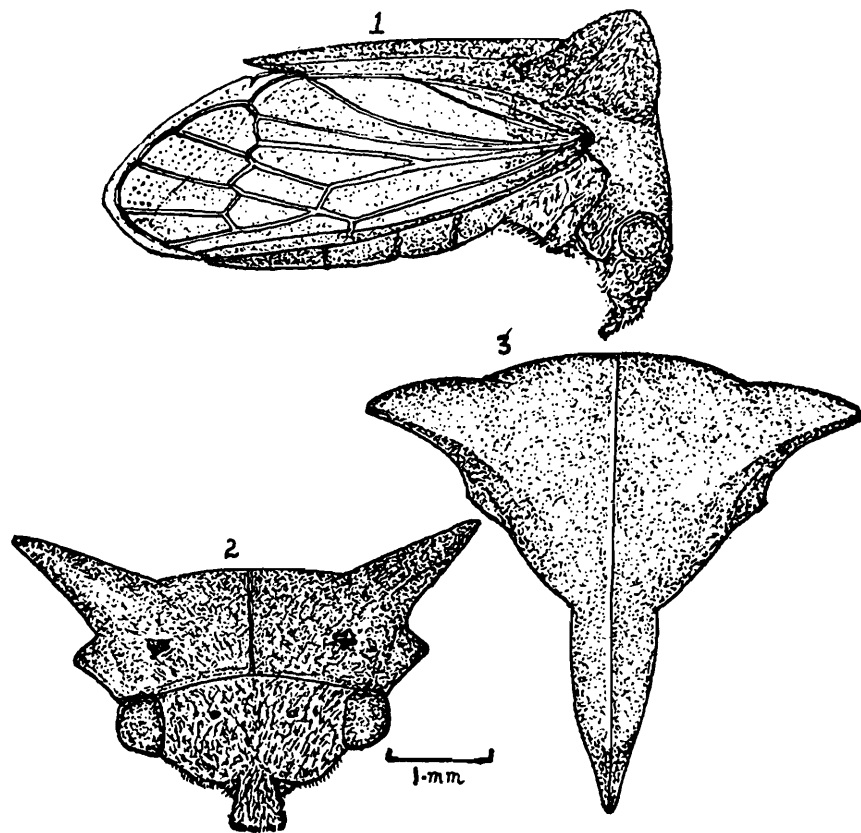


Fig. 61. *Tricentrus platycornis* Ananthasubramanian. Female. 1. Lateral view ; 2 Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

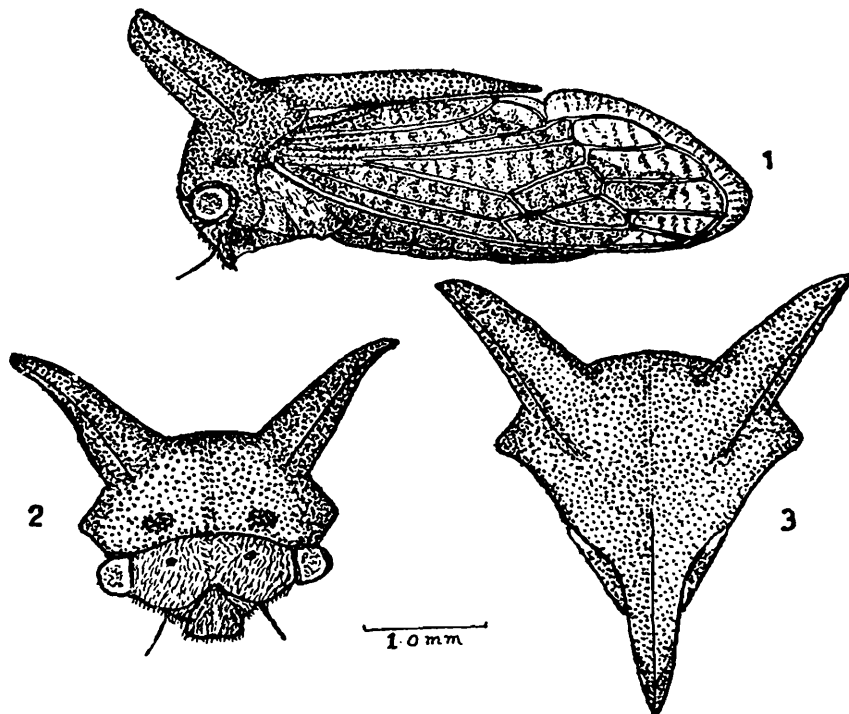


Fig. 62. *Tricentrus projectus* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

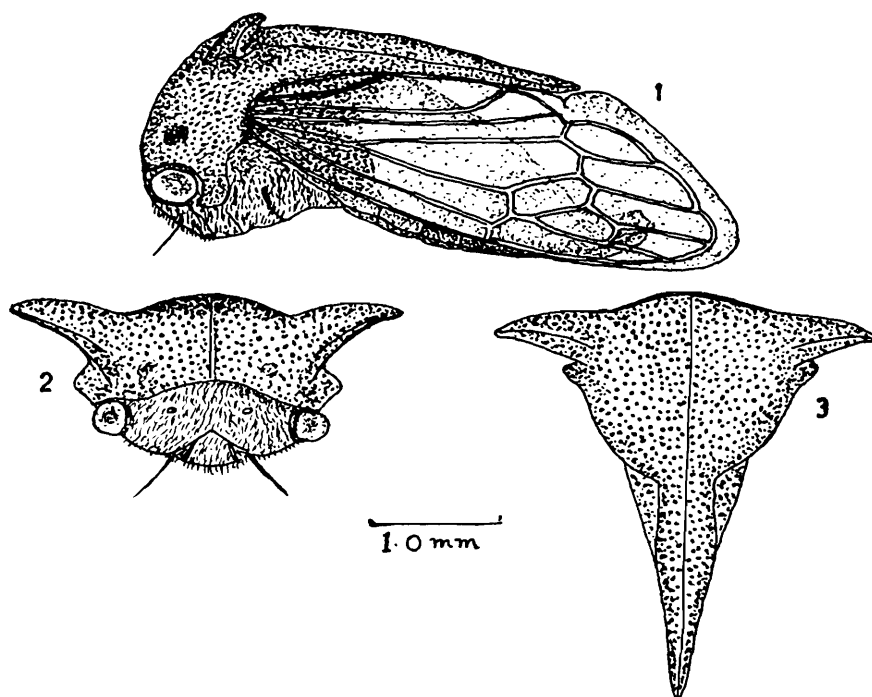


Fig. 63. *Tricentrus pronus* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

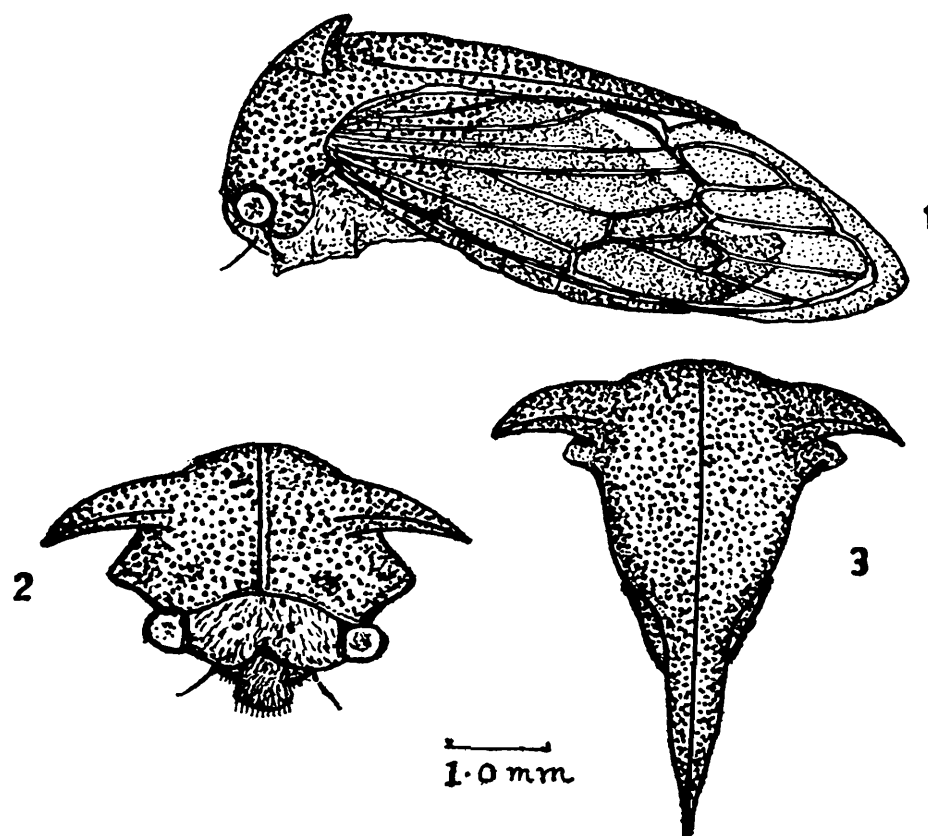


Fig. 64. *Tricentrus pubescens* Funkhouser. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

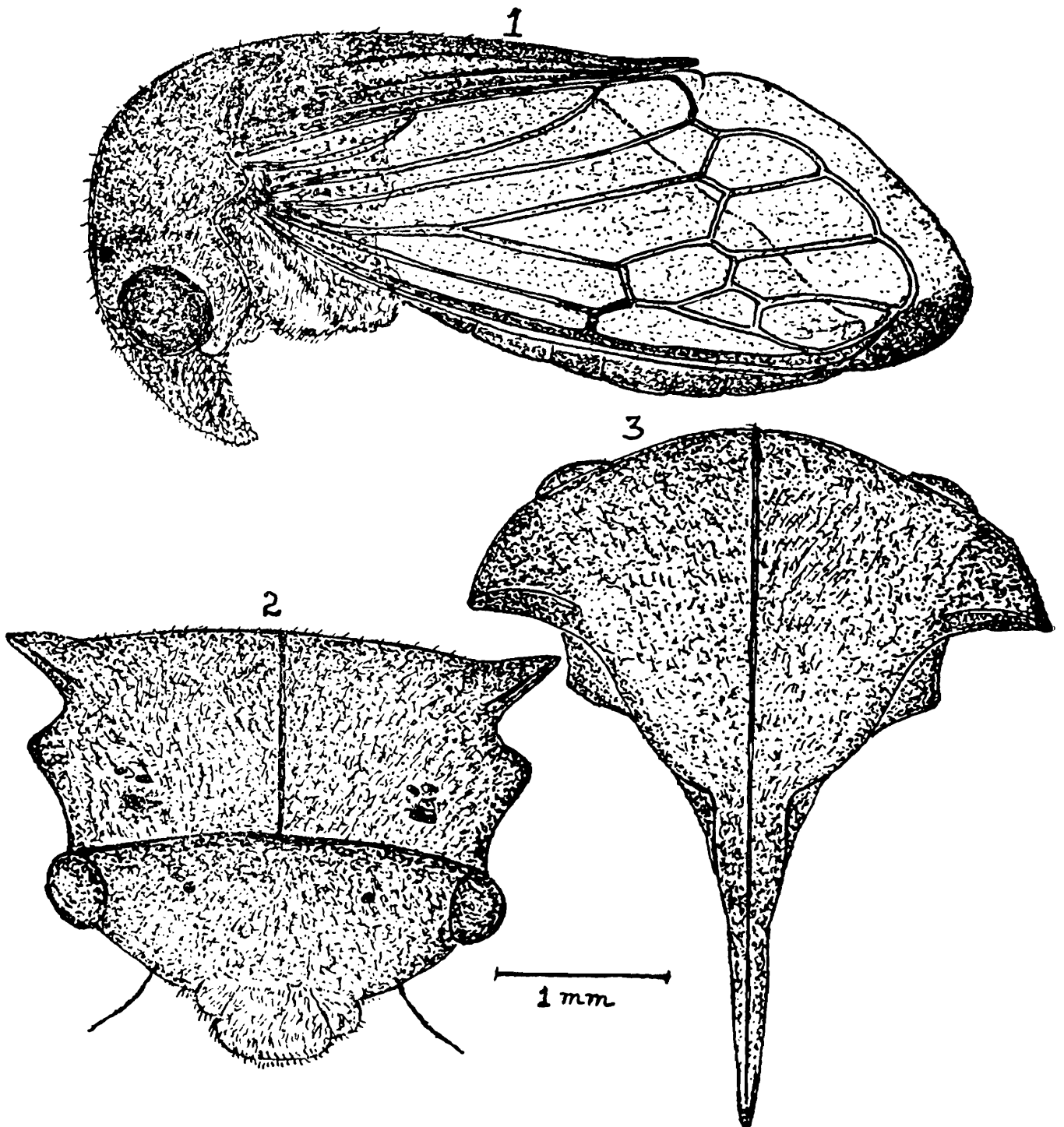


Fig. 65. *Tricentrus recurvicornis* Ananthasubramanian. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

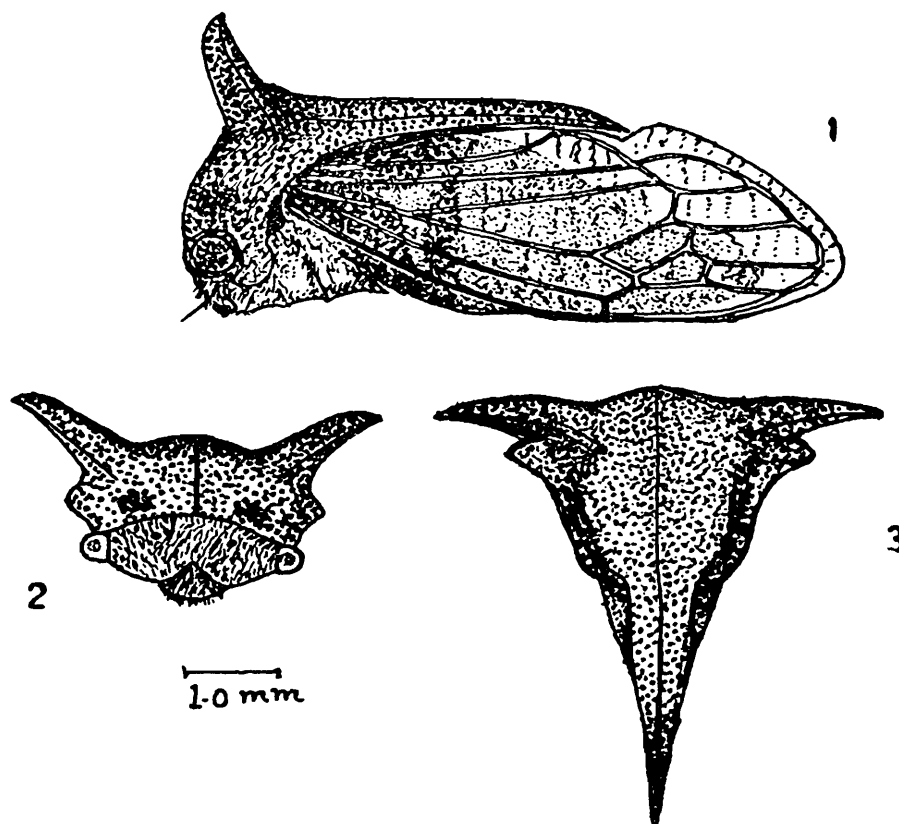


Fig. 66. *Tricentrus repandus* Distant, Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

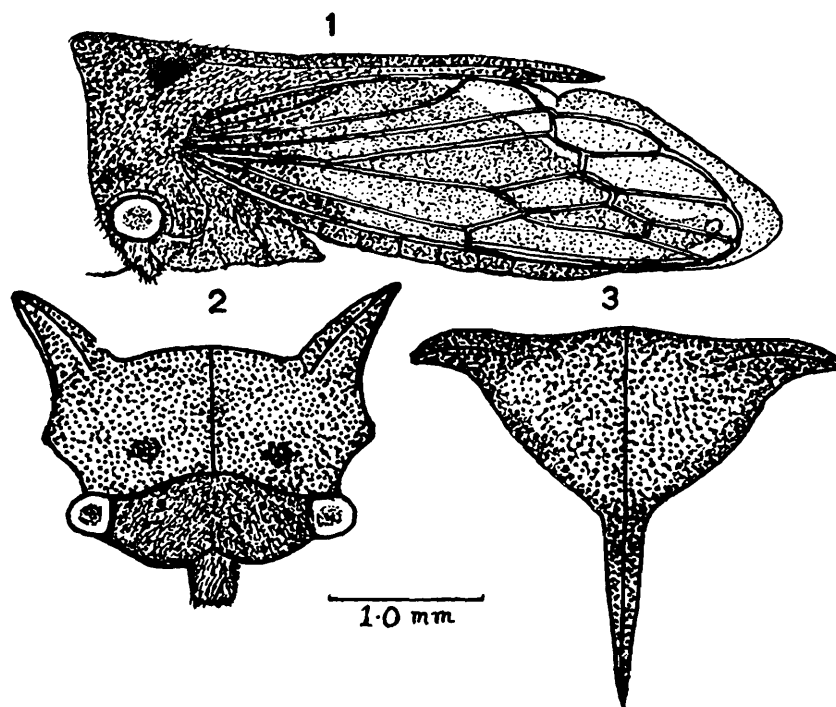


Fig. 67. *Tricentrus sissoo* Sharma & Badal, Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

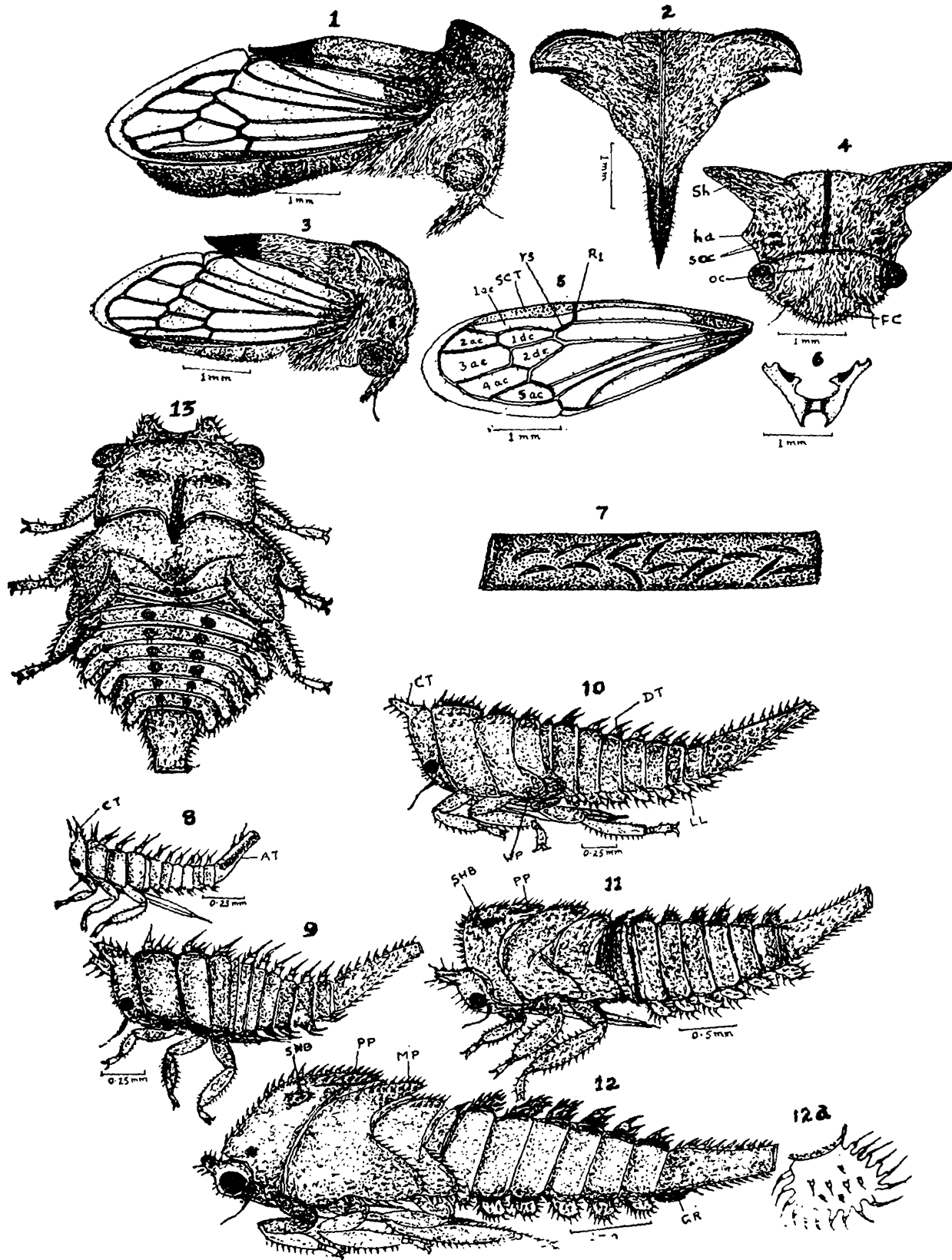


Fig. 68 : *Tricentrus spathodei* Ananthasubramanian. 1. Female, lateral view; 2. Female, Dorsal view of pronotum; 3. Male, lateral view; 4. Female, frontal view of head and pronotum; 5. Tegmen; 6. Scutellum; 7. Egg slits on host plant; 8-12. First to fifth instar nymphs; 12a. Abdominal lateral lamella of 5th instar nymph.

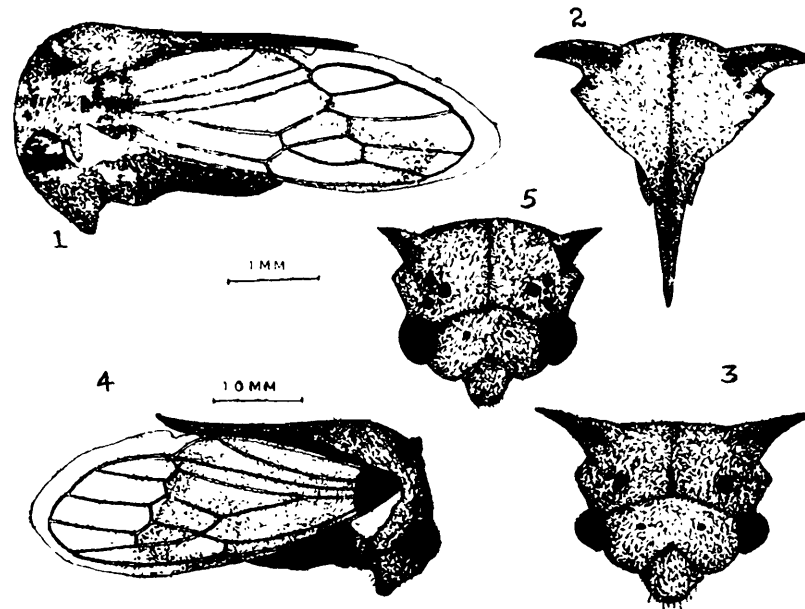


Fig. 69 : *Tricentrus speciosus* Thirumalai & Ananthasubramanian. 1. Female, lateral view; 2. Female, dorsal view of pronotum; 3. Female, Frontal view of head and pronotum; 4. Male, lateral view; 5. Male, frontal view of head and pronotum.

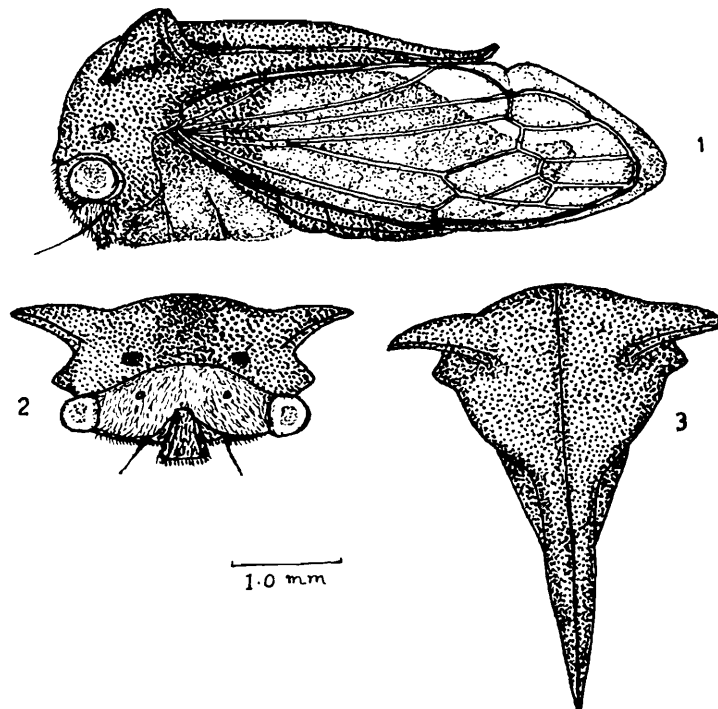


Fig. 70 : *Tricentrus subangulatus* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

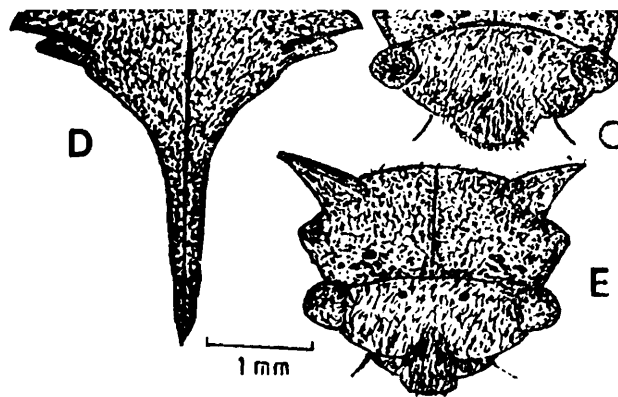


Fig. 71 : *Tricentrus syrandrikae* Thirumalai & Ananthasubramanian. A. Female, lateral view; B. Male, lateral view; C. Female, frontal view of head and pronotum; D. Female, dorsal view of head and pronotum; E. Male, frontal view of head and pronotum.

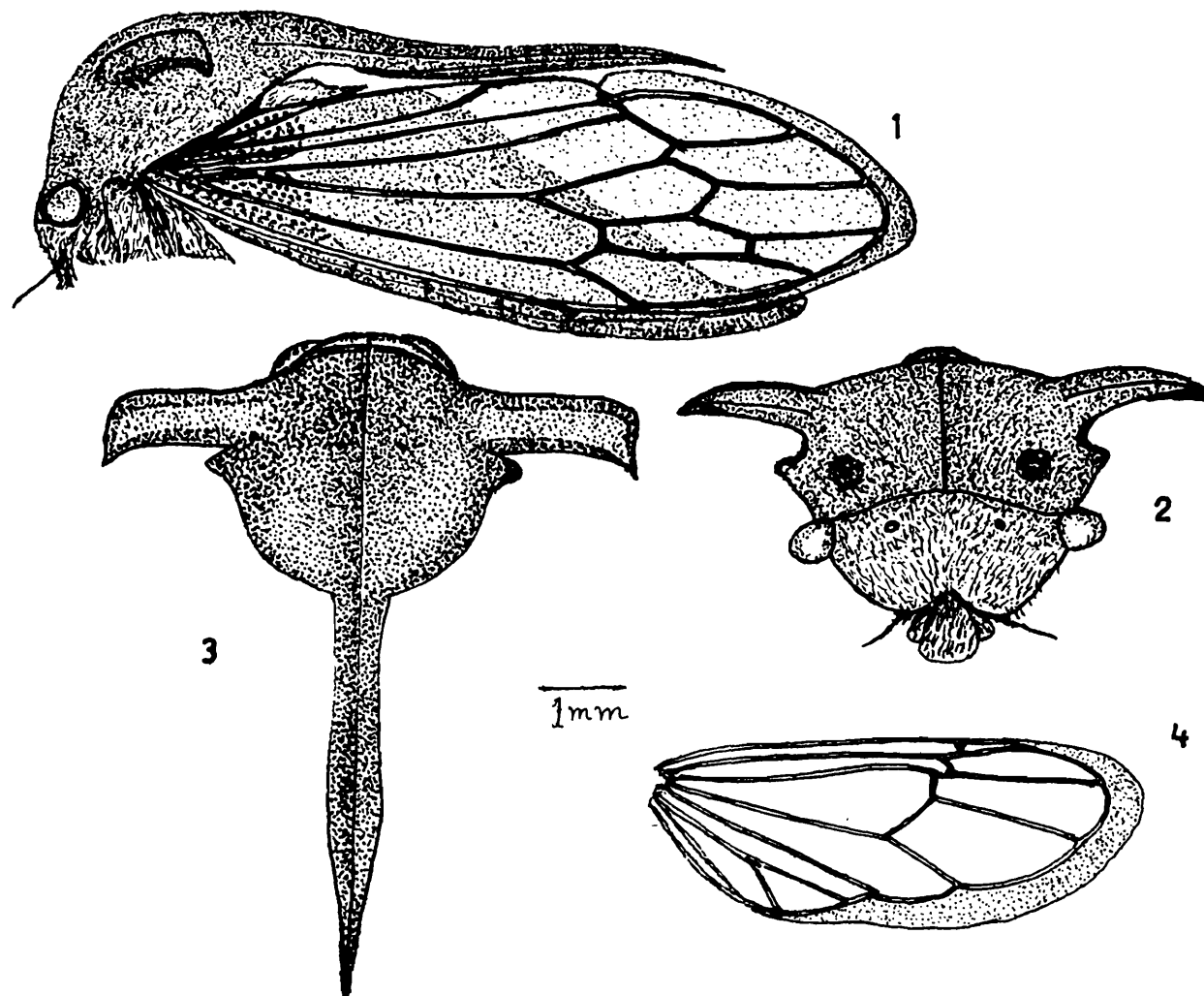


Fig. 72 : *Tricentrus transversus* (Distant). Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum; 4. Hind wing.

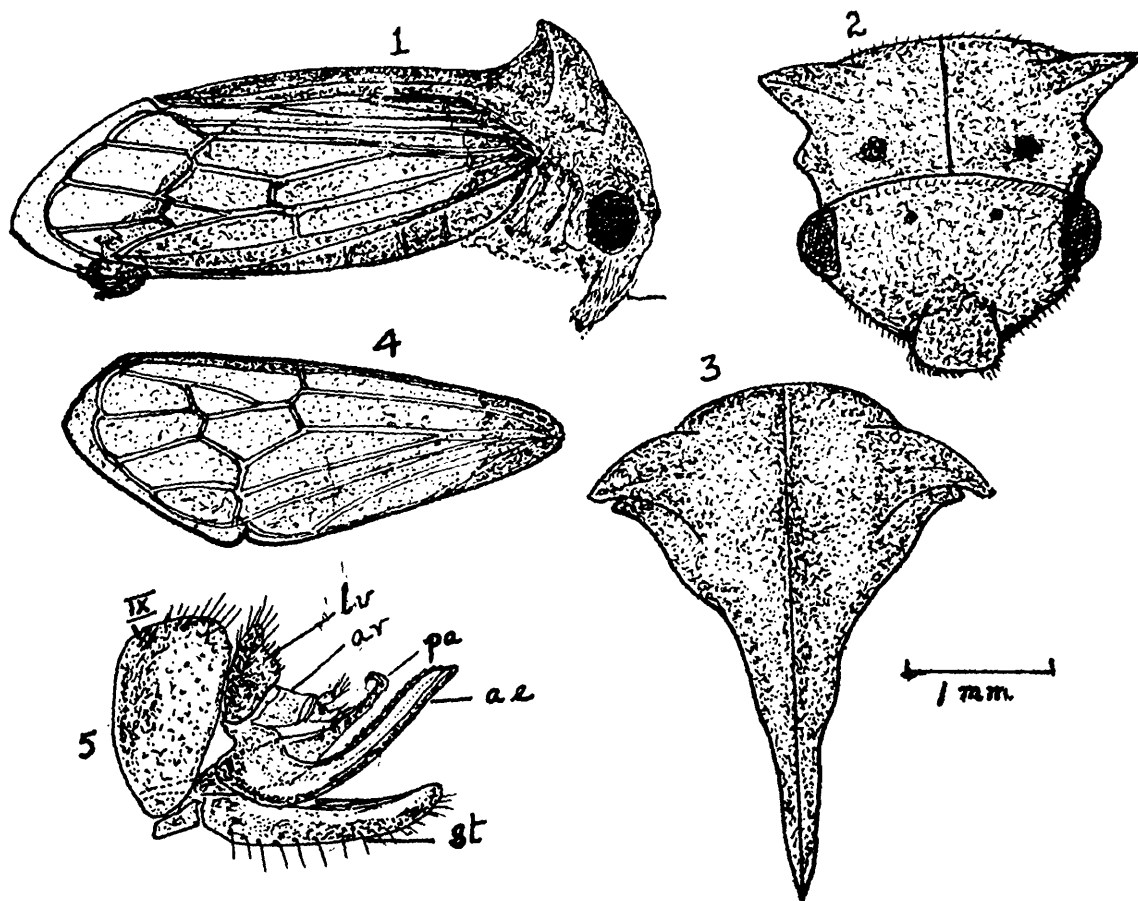


Fig. 73 : *Tricentrus unicolor* Anahthasubramanian. Male. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum; 4. Tegmina; 5. Genitalia, lateral view.

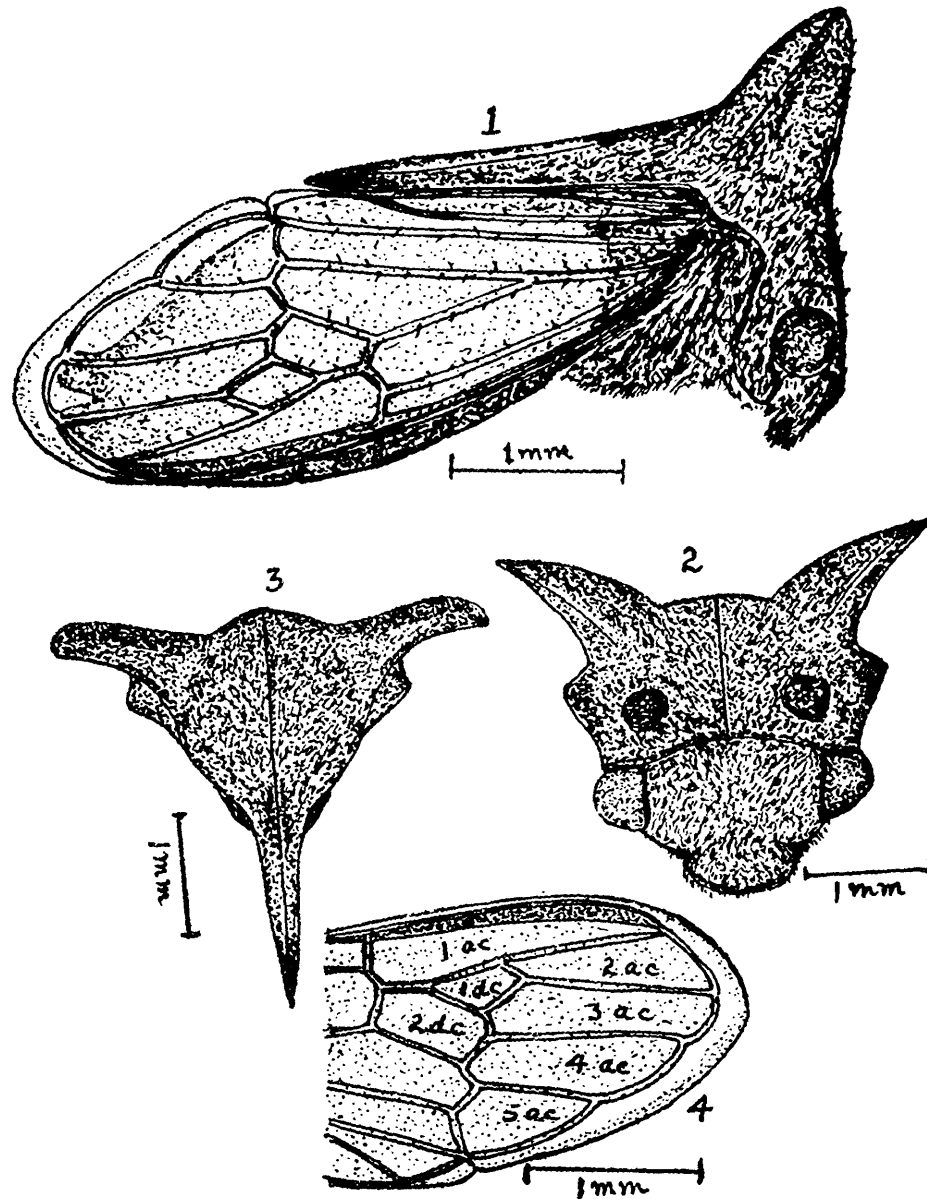


Fig. 74 *Tricentrus varicornis* Ananthasubramanian. Female. 1. Lateral view; 2. Frontal of head and pronotum; 3. Dorsal view of pronotum; 4. Tegminal venation.

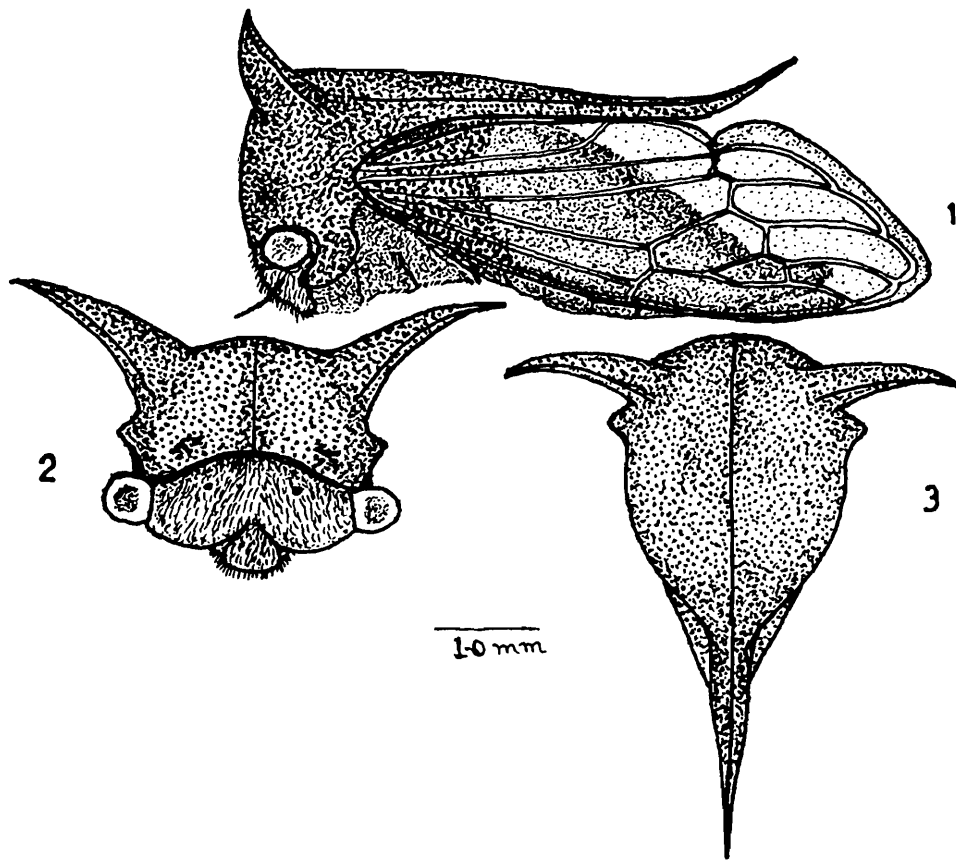


Fig. 75 : *Tricentroides propria* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

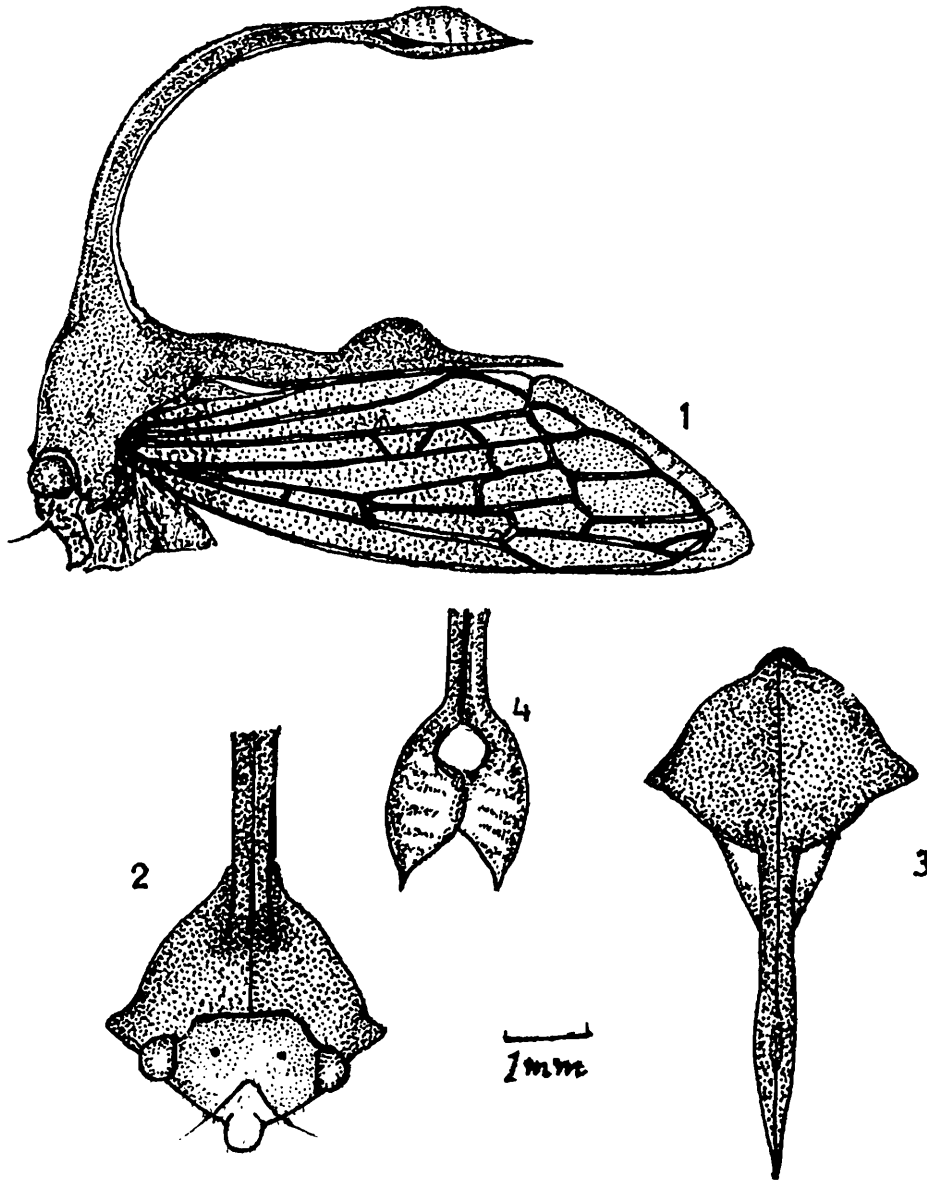


Fig. 76 : *Hypsauchenia ananthakrishnani* n. sp. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum; 4. Apical lobes of discal pronotal process.

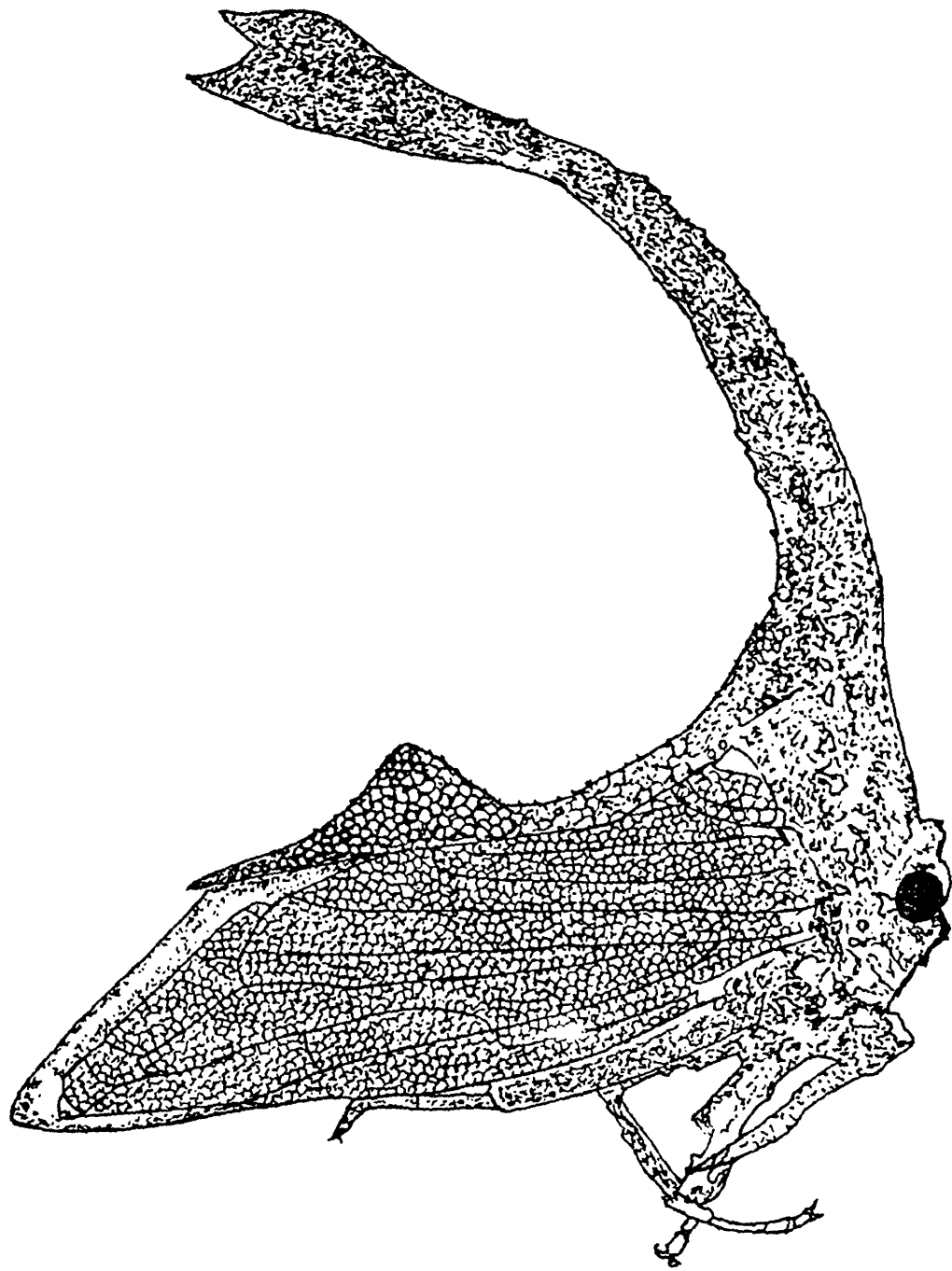


Fig. 77 : *Hypsauchenia hardwickii*

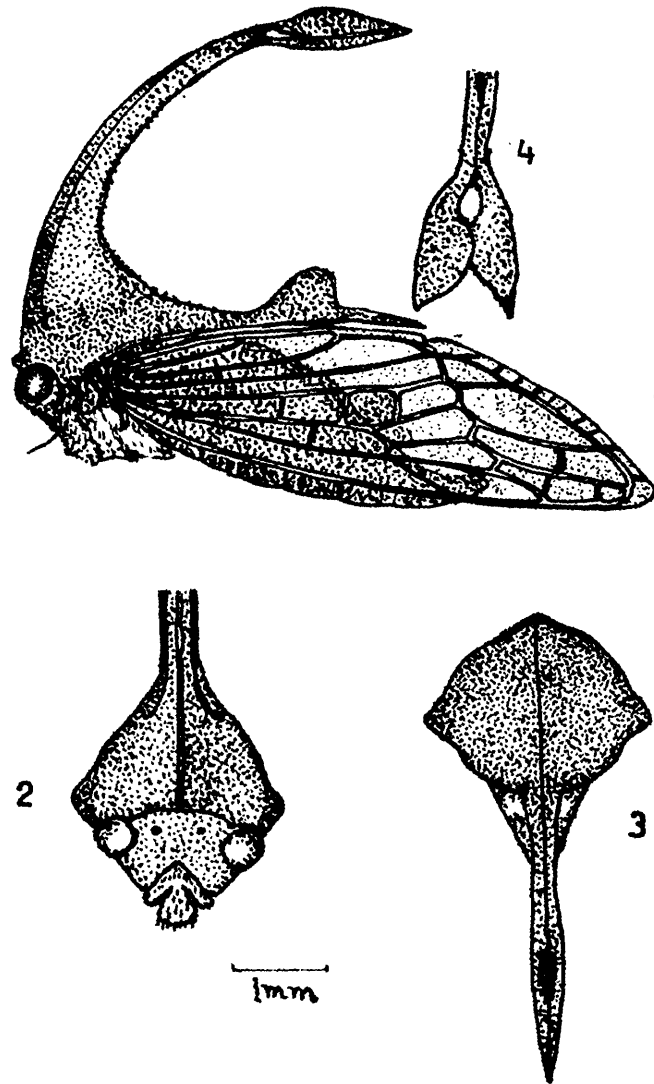


Fig. 78 : *Hypsauchenia subfusca* Buckton. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum; 4. Apical lobes of discal pronotal process.

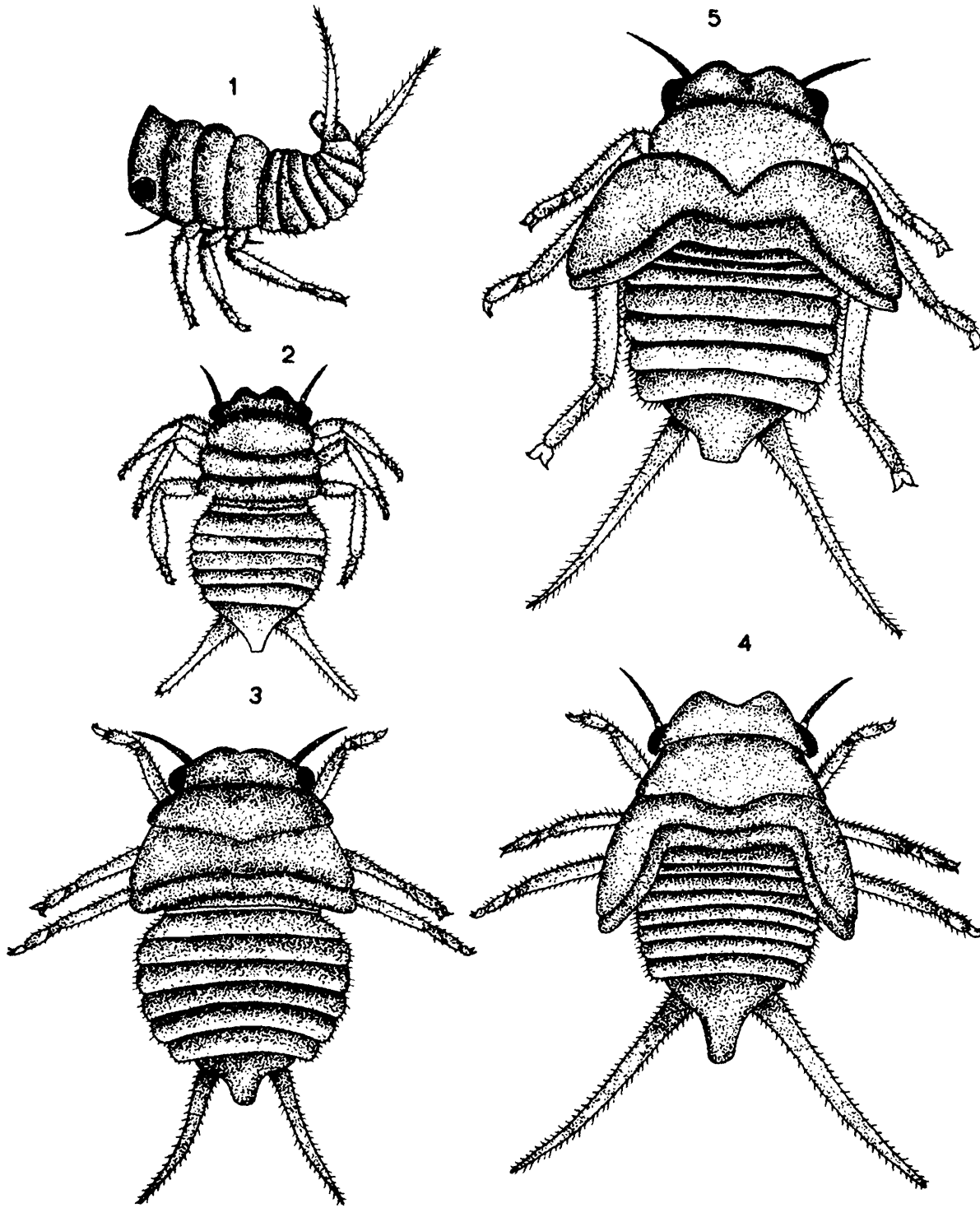


Fig. 79 : *Hypsauchenia subfusca*. 1-5 First to fifth nymphal instars.

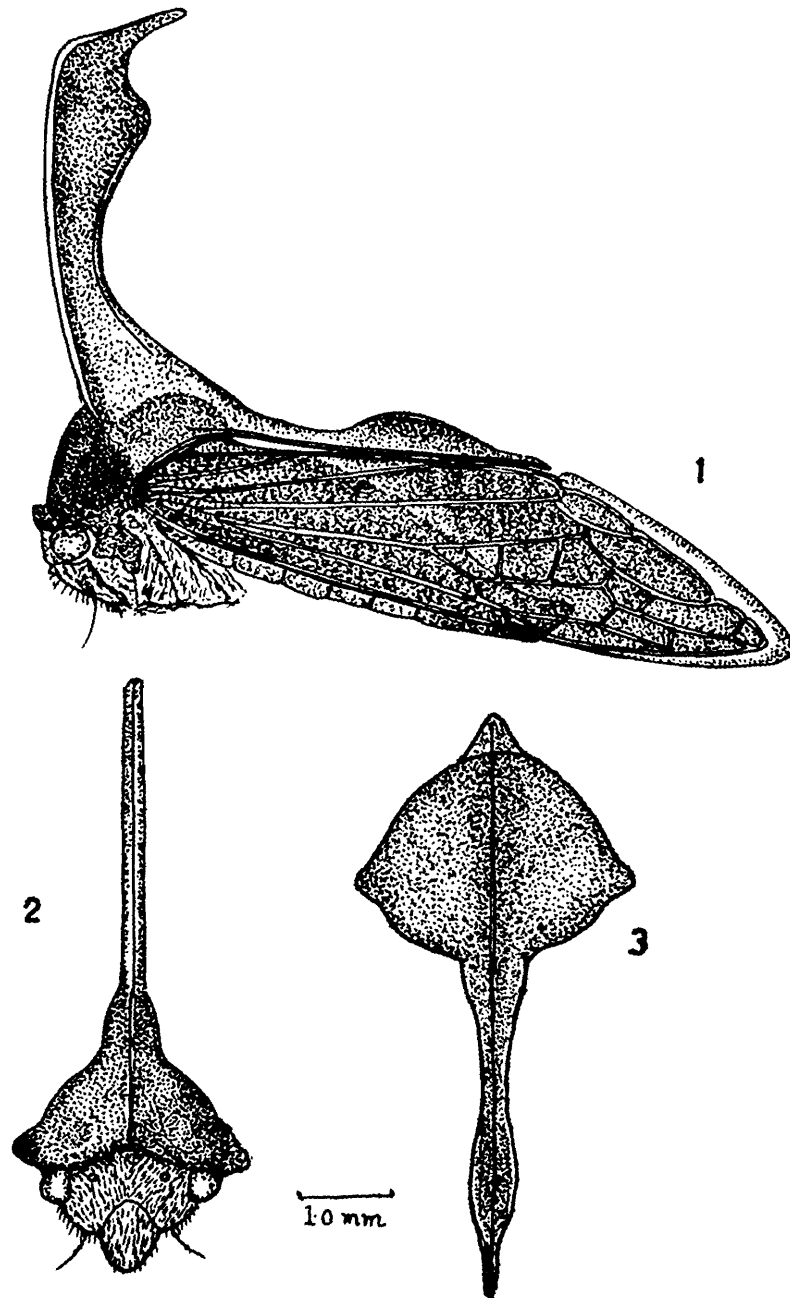


Fig. 80 : *Hypsorylium kempii* (Distant). Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

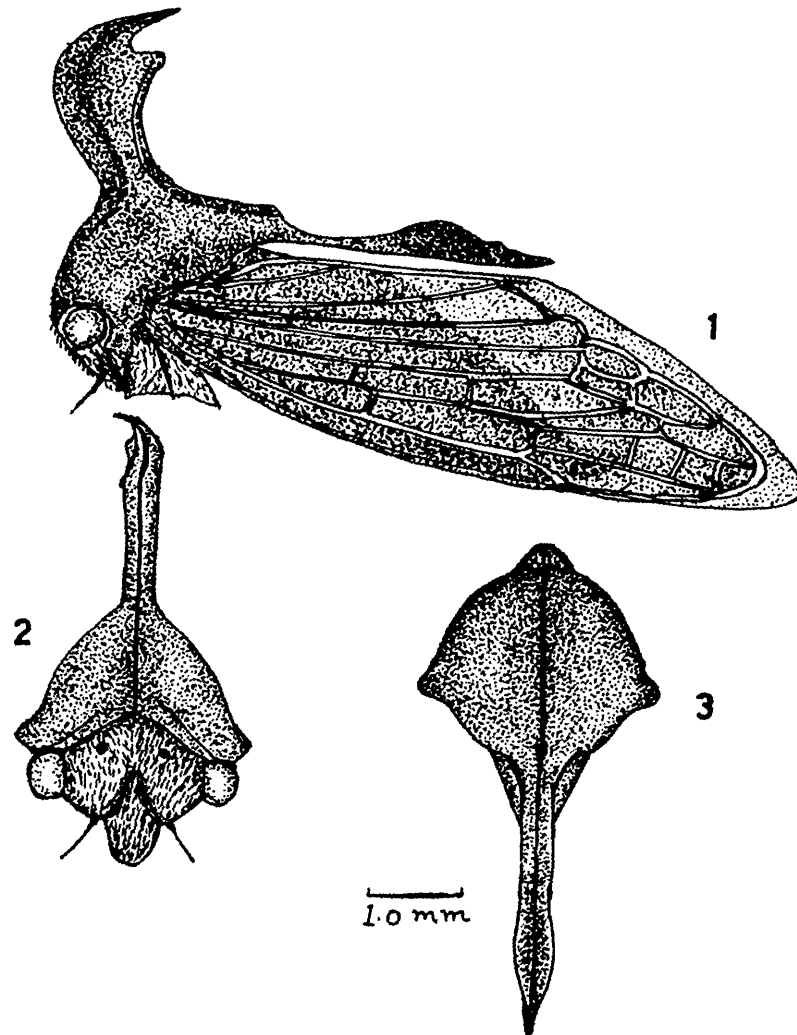


Fig. 81 : *Hypsorylium uncinatum* (stal). Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

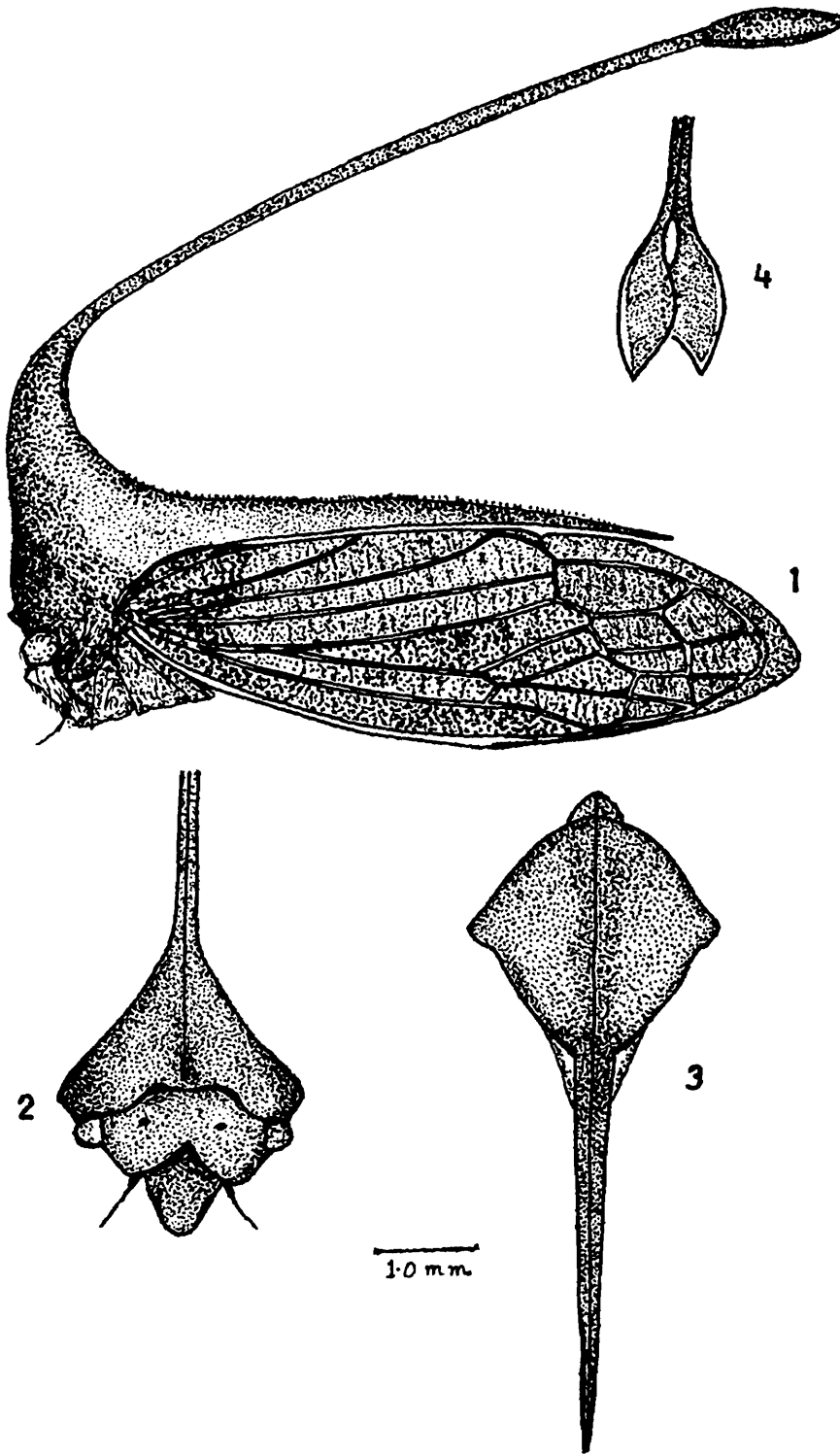


Fig. 82 : *Hybanda anodonta* (Buckton). Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum; 4. Apical lobes of discal pronotum process.

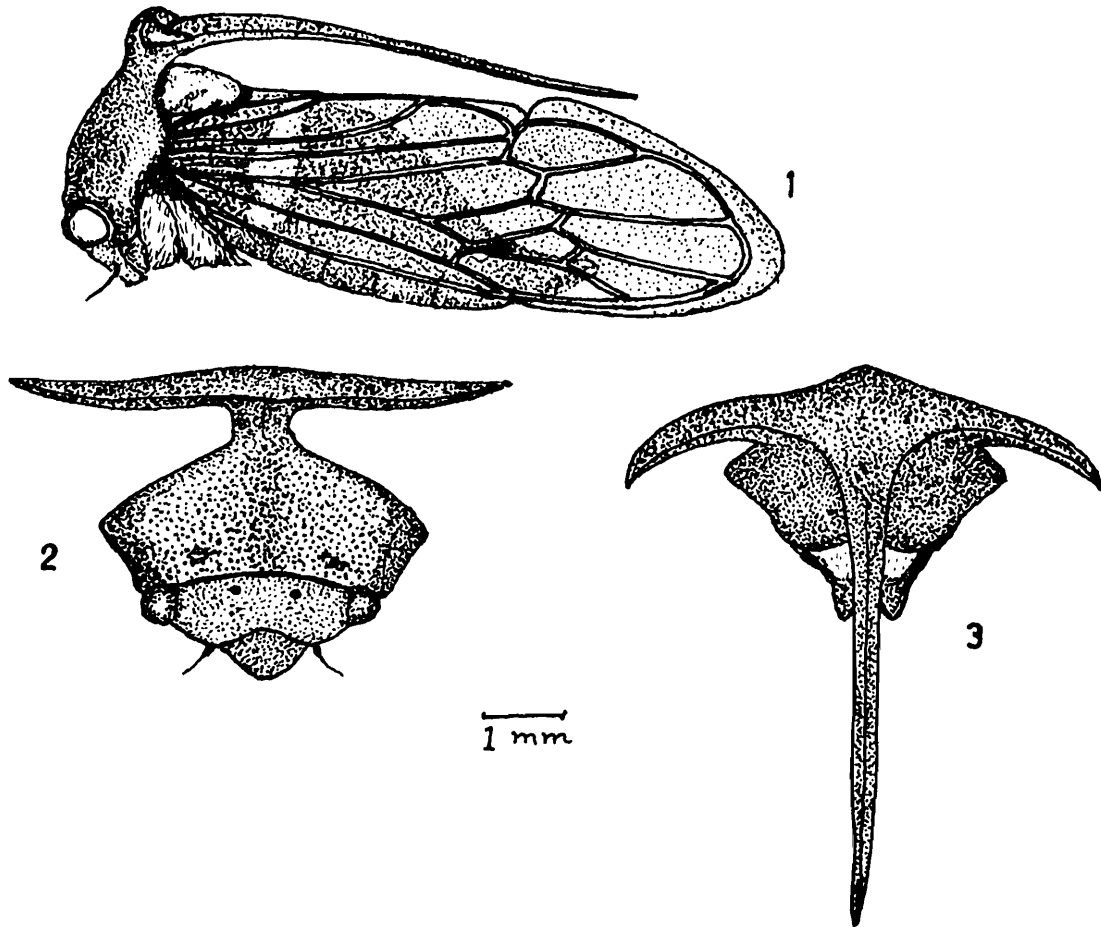


Fig. 83 : *Leptobelus dama* (Germar). Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

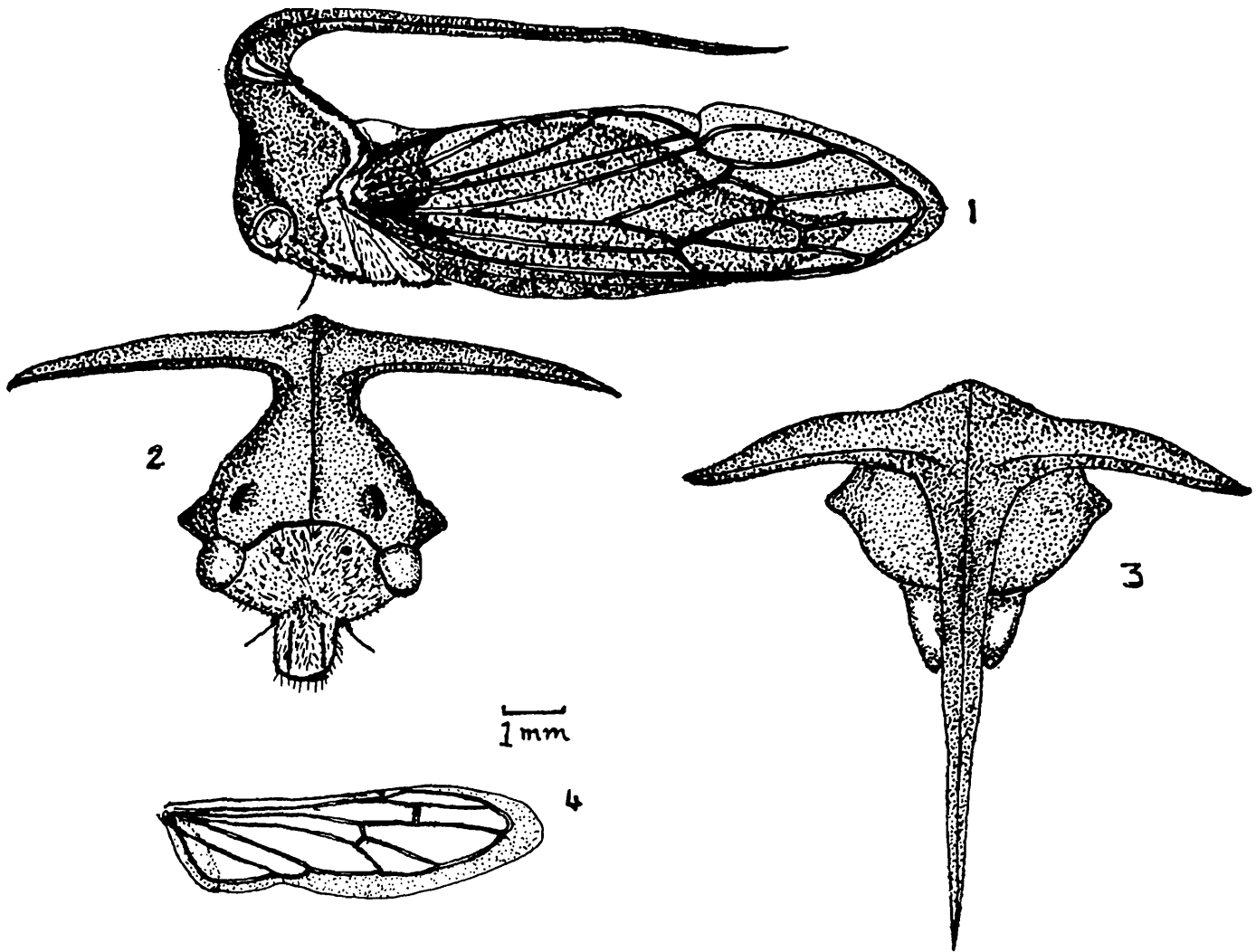


Fig. 84 : *Leptobelus gazella* (Fairmaire). Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum; 4. Hind wing.

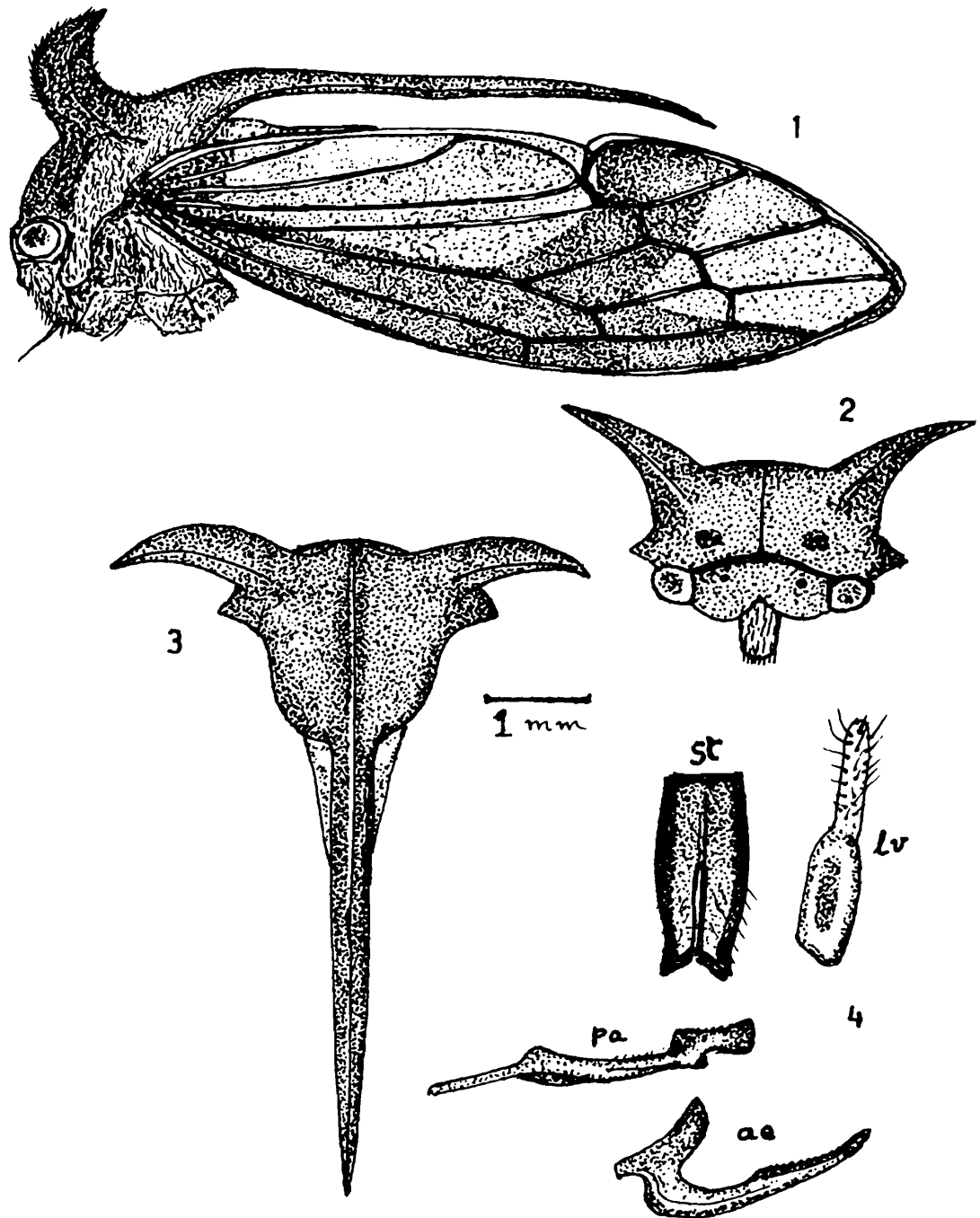


Fig. 85 : *Telingana balteata* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum; 4. Male genitalia.

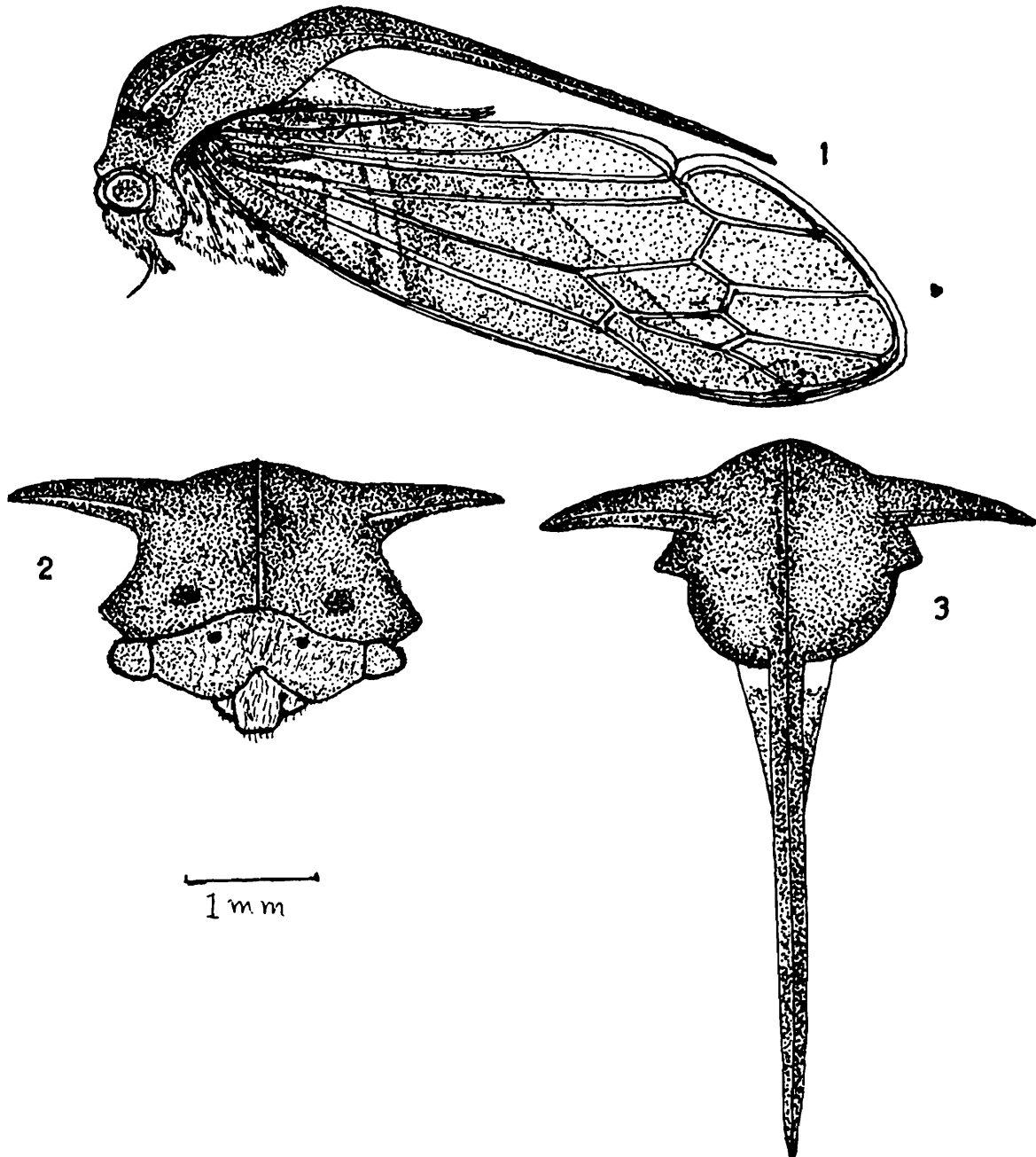


Fig. 86 : *Telingana campbelli* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

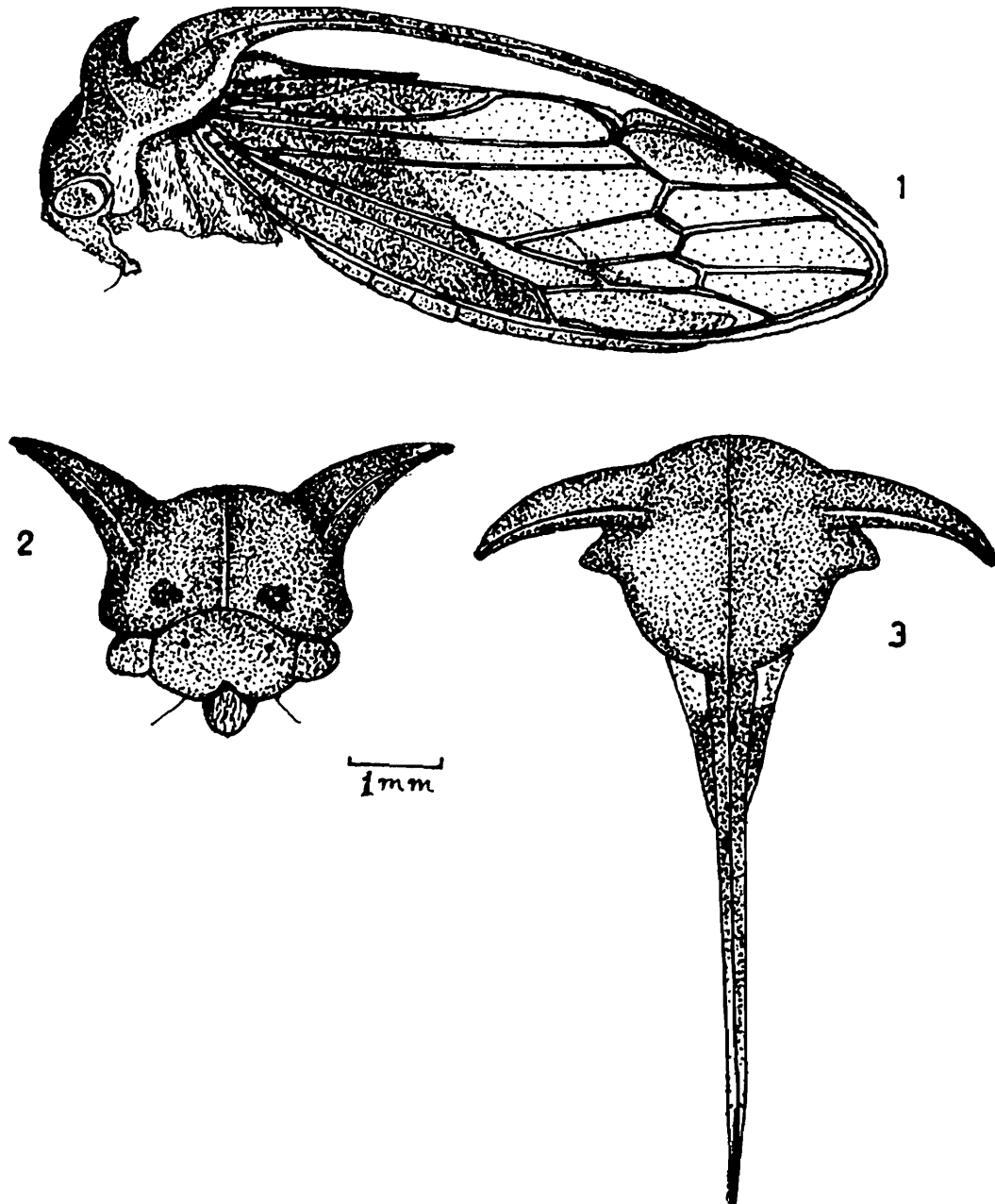


Fig. 87 : *Telingana canescens* (Buckton). Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

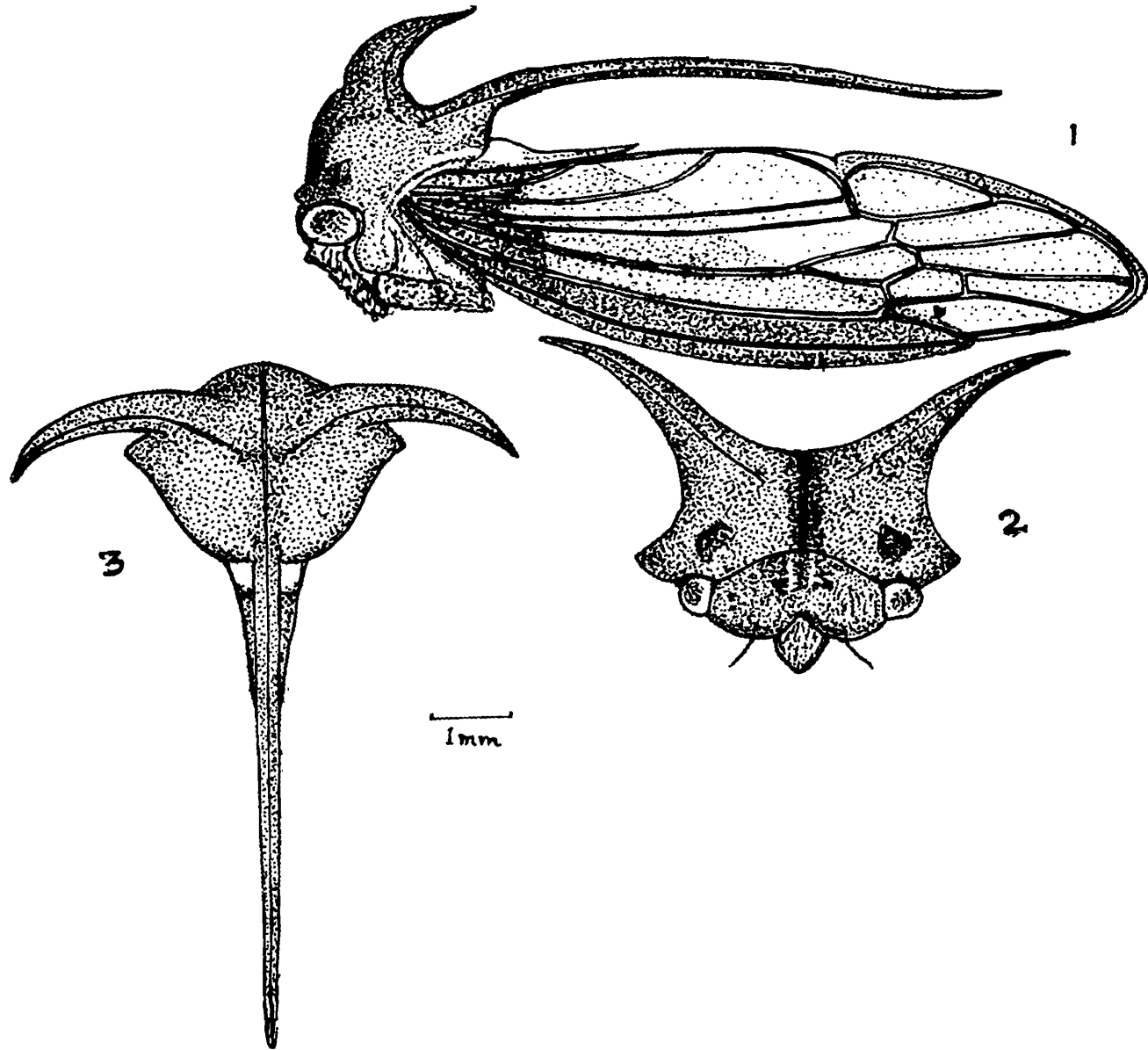


Fig. 88 : *Telingana capistrata* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

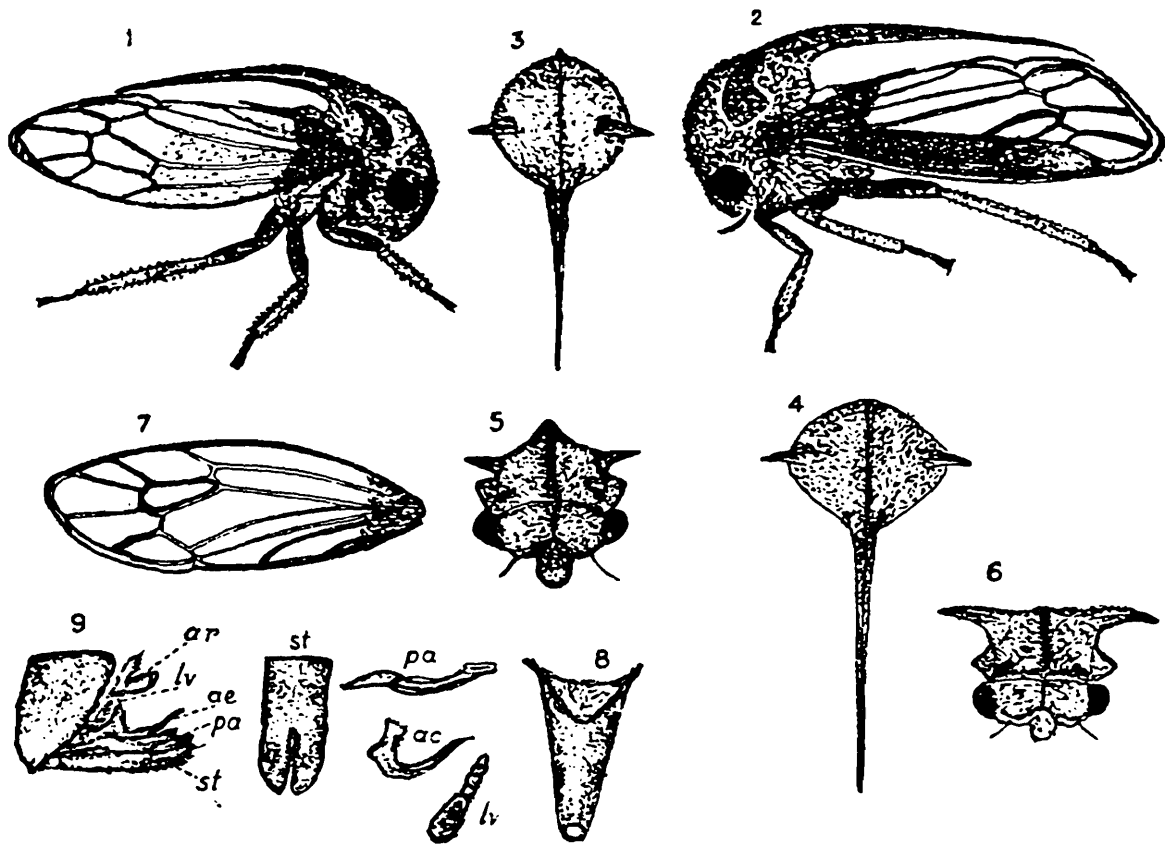


Fig. 89 : *Telingana consobrina* Distant. 1. Male, lateral view; 2. Female, lateral view; 3. Male, dorsal view of pronotum; 4. Female, dorsal view of pronotum; 5. Male, Frontal view of head and pronotum; 6. Female, frontal view of head and pronotum; 7. Male, tegmen; 8. Scutellum; 9. Male genitalia.

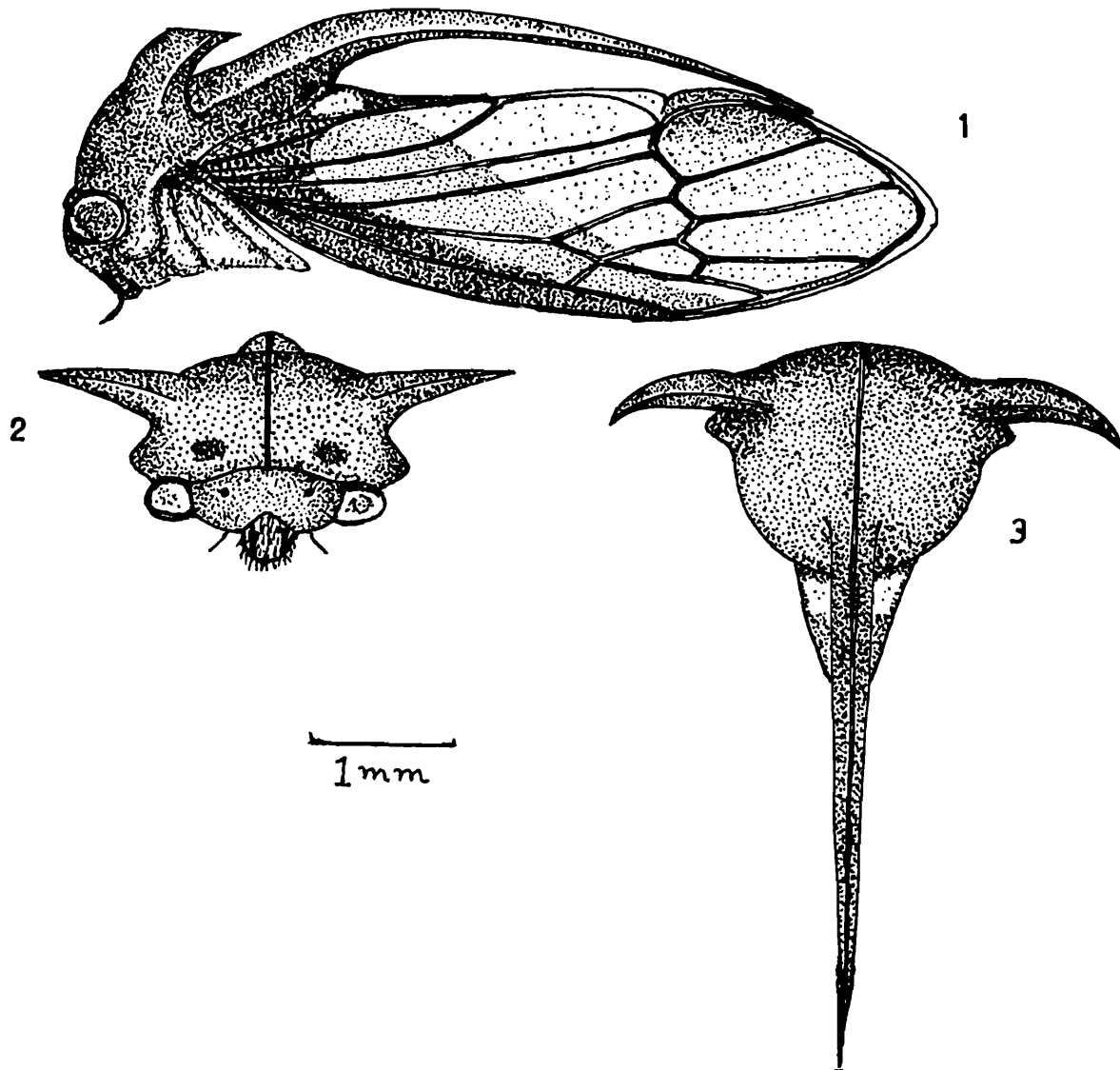


Fig. 90 : *Telingana curvispina* (stal). Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

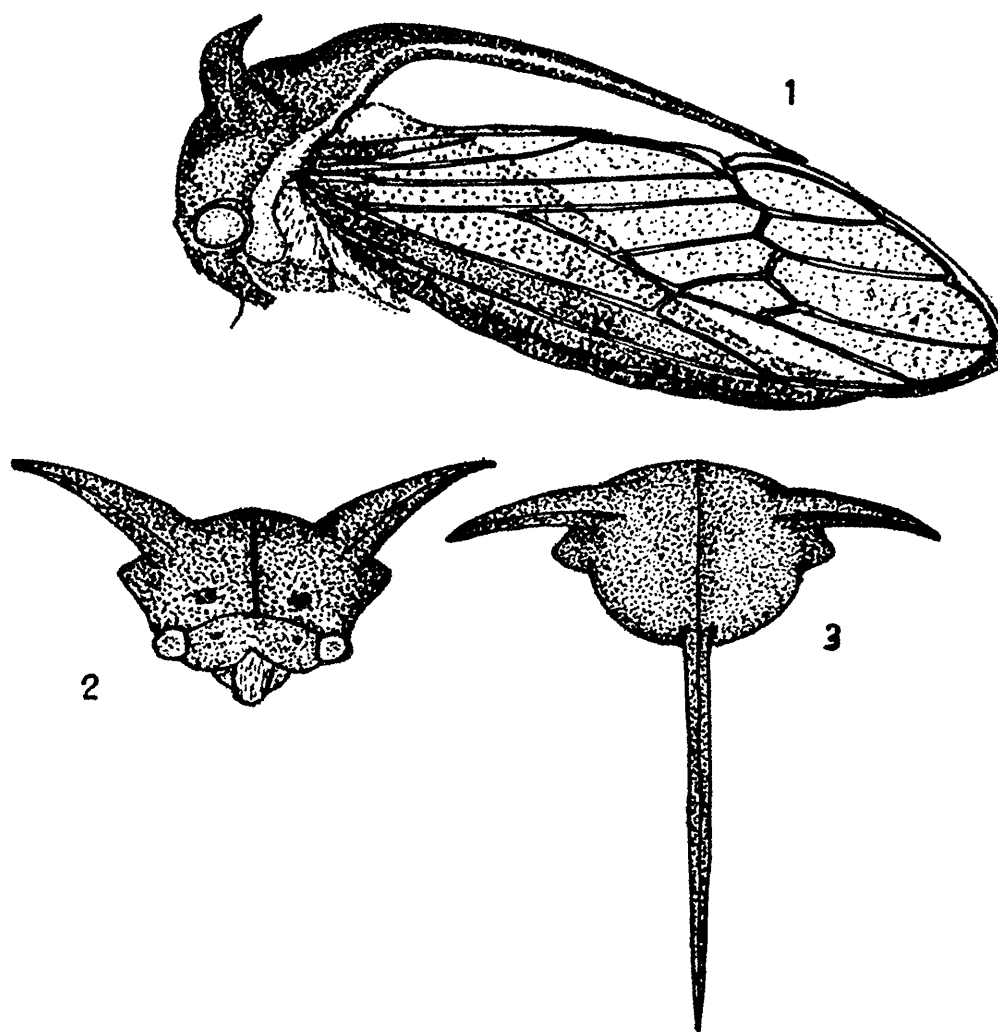


Fig. 91 : *Telingana flavipes* (Kirby). Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

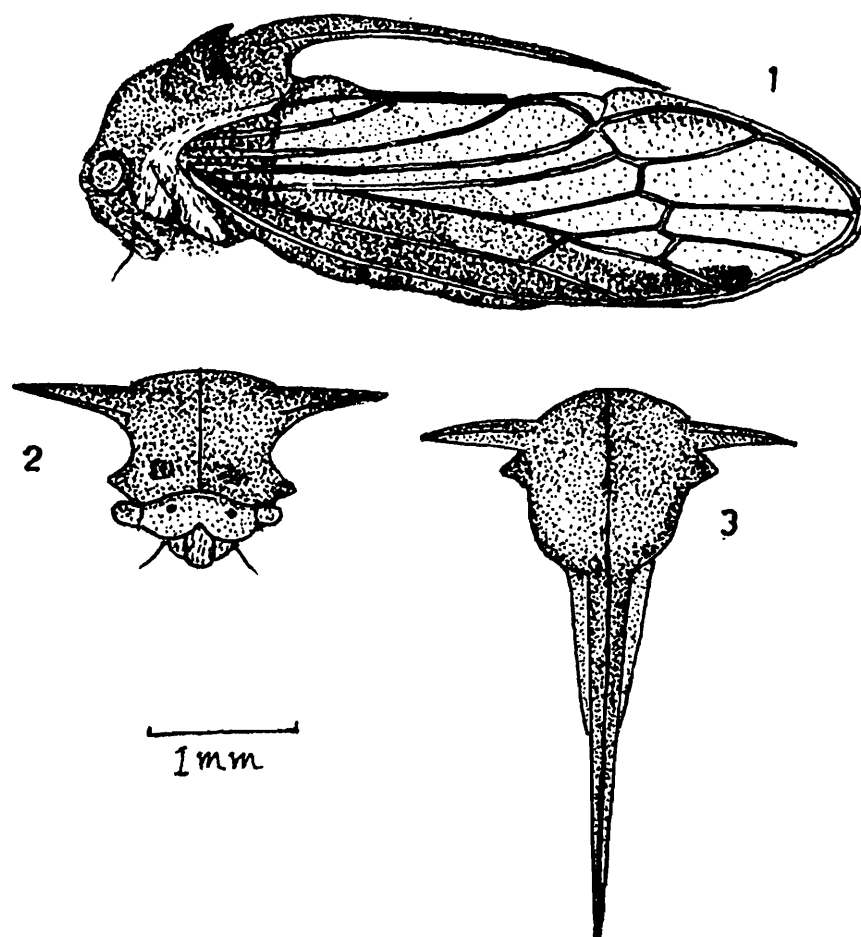


Fig. 92 : *Telingana imitator* (Kirby). Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

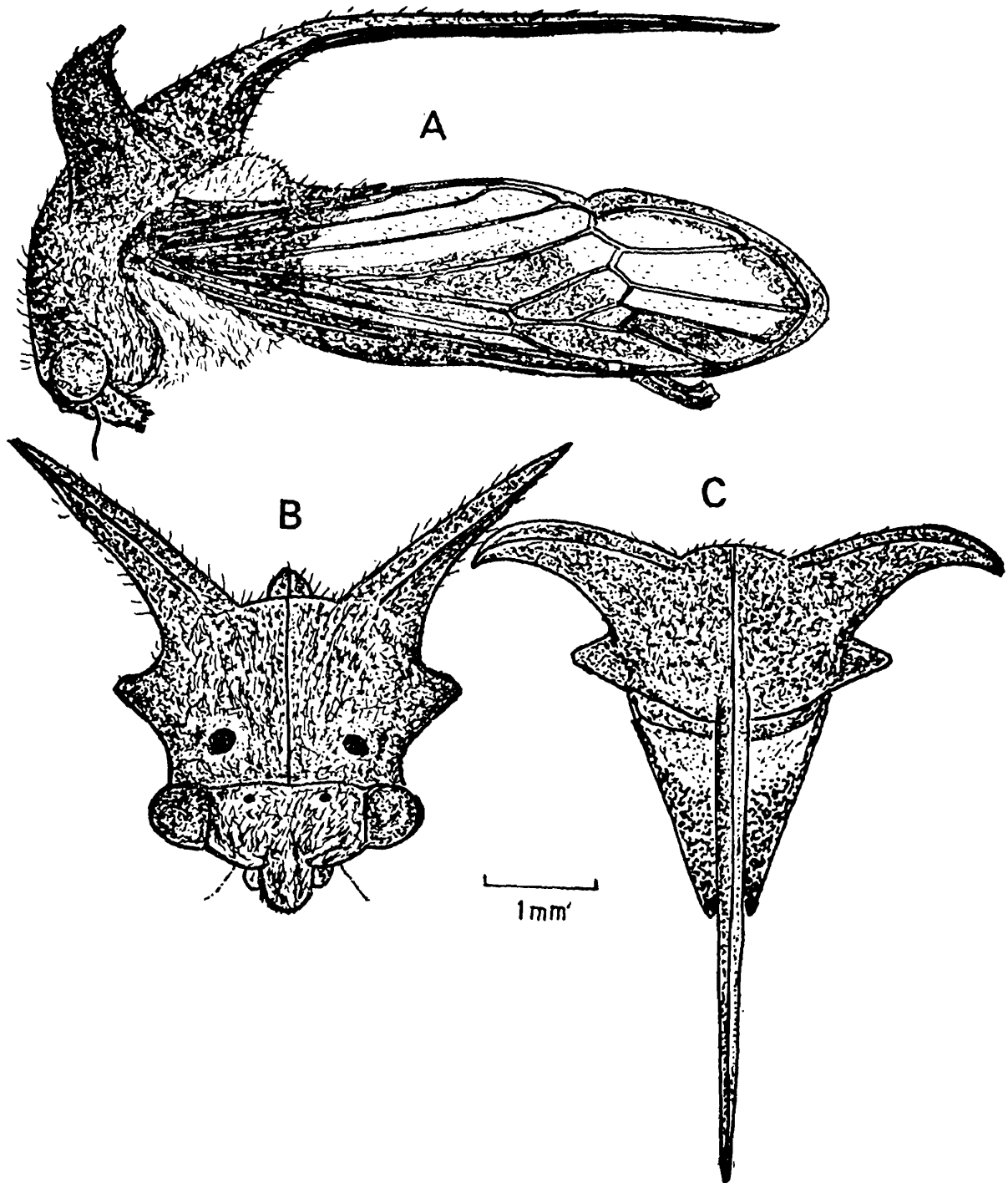


Fig. 93 : *Telingana majuscula* Thirumalai & Ananthasubramanian. Male. A. Lateral view; B. Frontal view of head and pronotum; C. Dorsal view of pronotum.

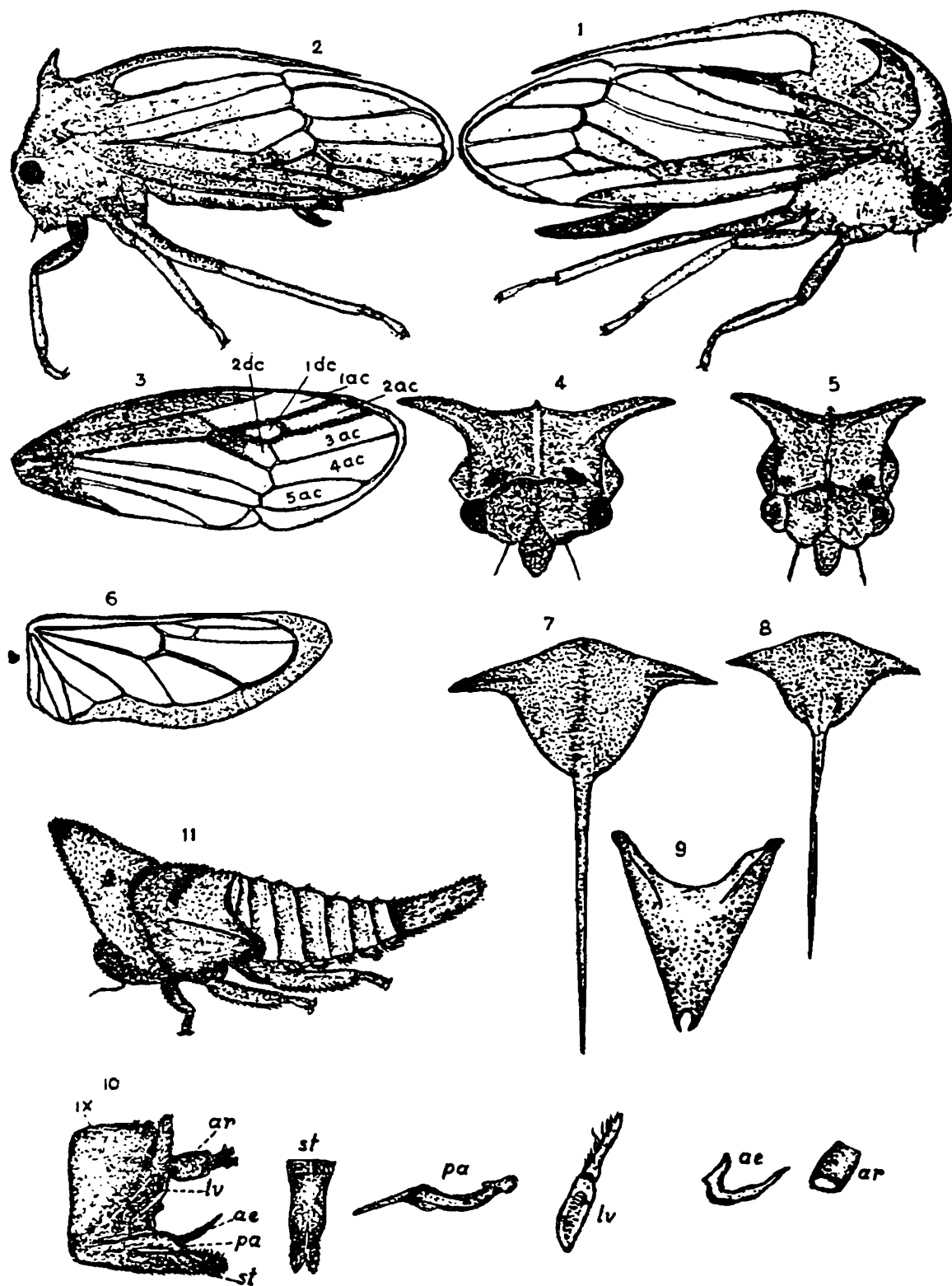


Fig. 94 : *Telingana nigroalata* Ananthasubramanian & Anathakrishnan. 1. Female, lateral view; 2. Male, lateral view; 3. tegmen; 4. Frontal view of female head and pronotum; 5. Frontal view of male head and pronotum; 6. Hind wing; 7. Dorsal view of female pronotum; 8. Dorsal view of male pronotum; 9. Scutellum; 10. Male genitalia.

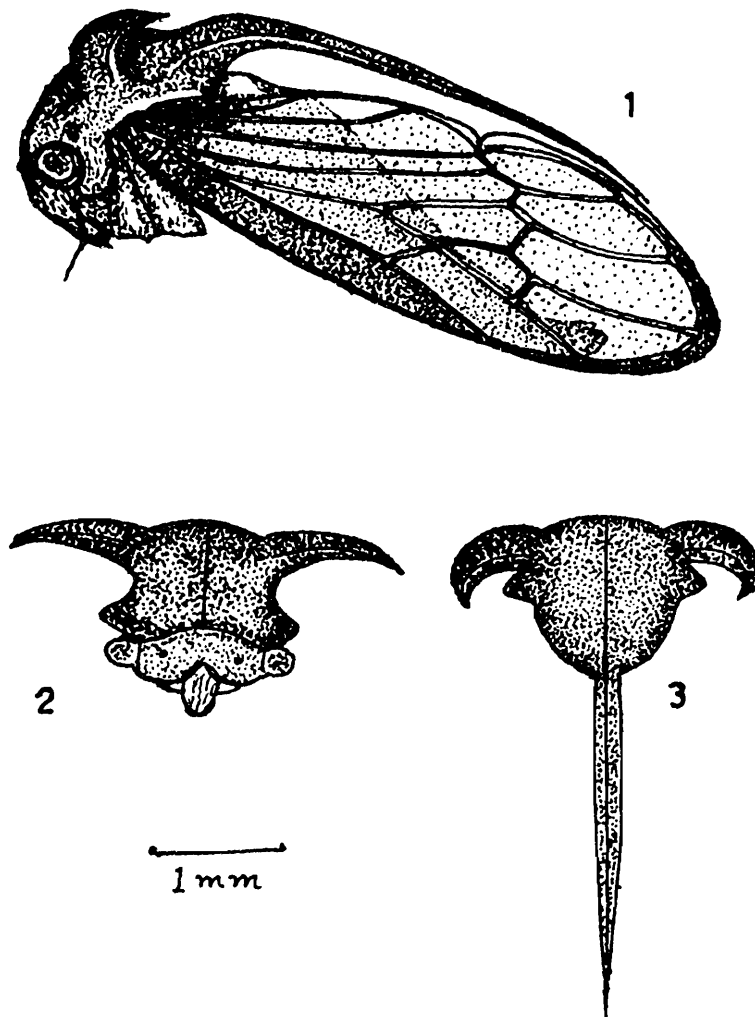


Fig. 95 : *Telingana ornanda* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

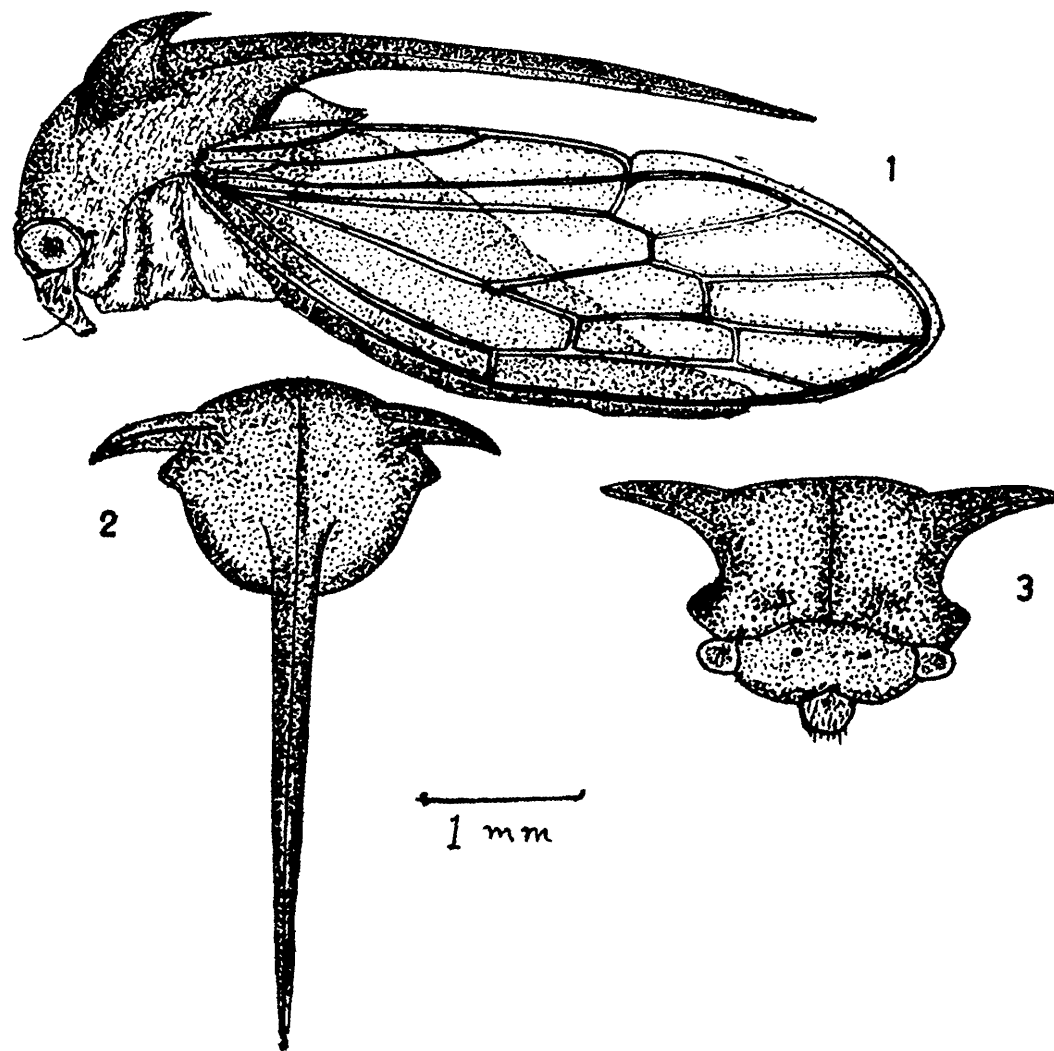


Fig. 96 : *Telingana paria* (Fairmaire). Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

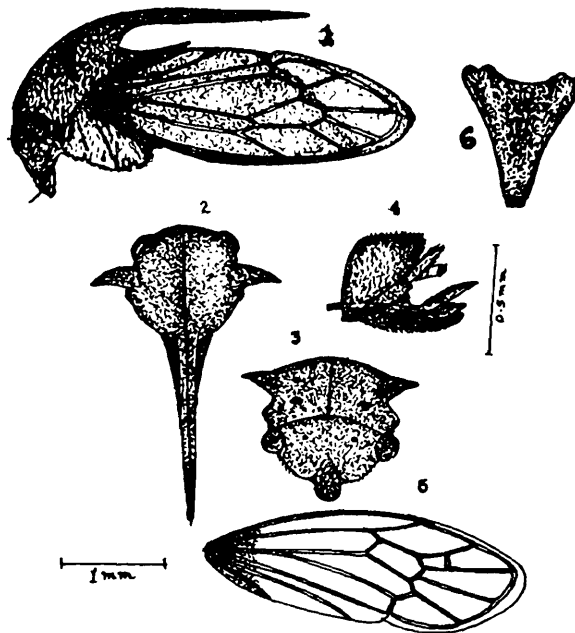


Fig. 97 : *Telingana pulniensis* Ananthasubramanian. Male. 1. Lateral view; 2. Dorsal view of pronotum; 3. Frontal view of head and pronotum; 4. Genitalia, lateral view; 5. Tegmina; 6. Scutellum.

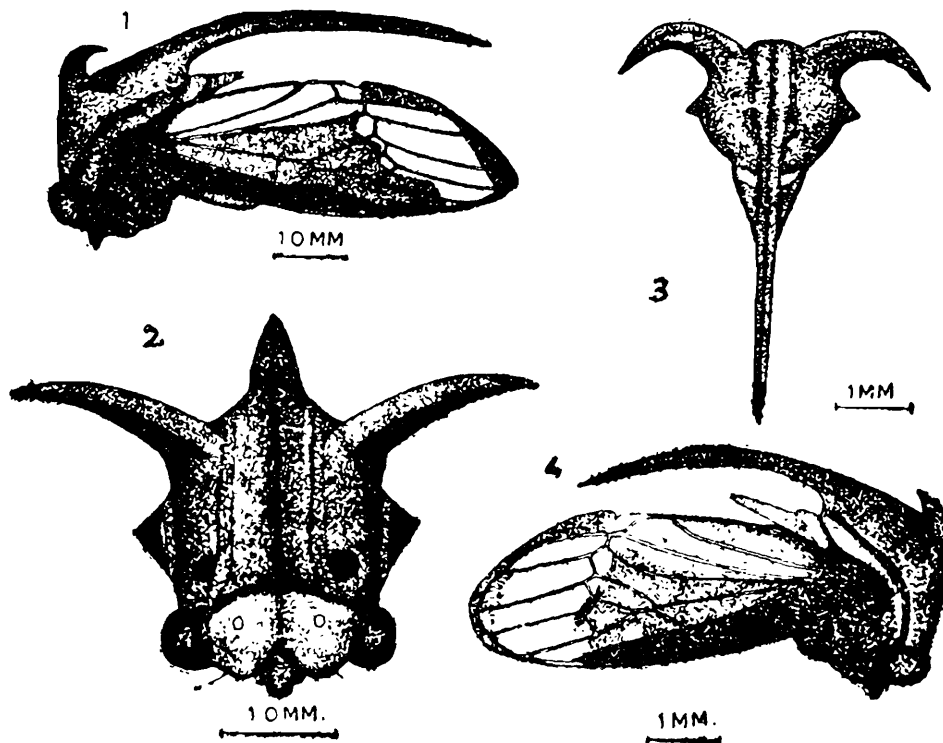


Fig. 98 : *Telingana sabarigiriensis* Thirumalai & Ananthasubramannian. 1. Female, lateral view; 2. Female, frontal view of head and pronotum; 3. Female, dorsal view of pronotum; 4. Male, lateral view.

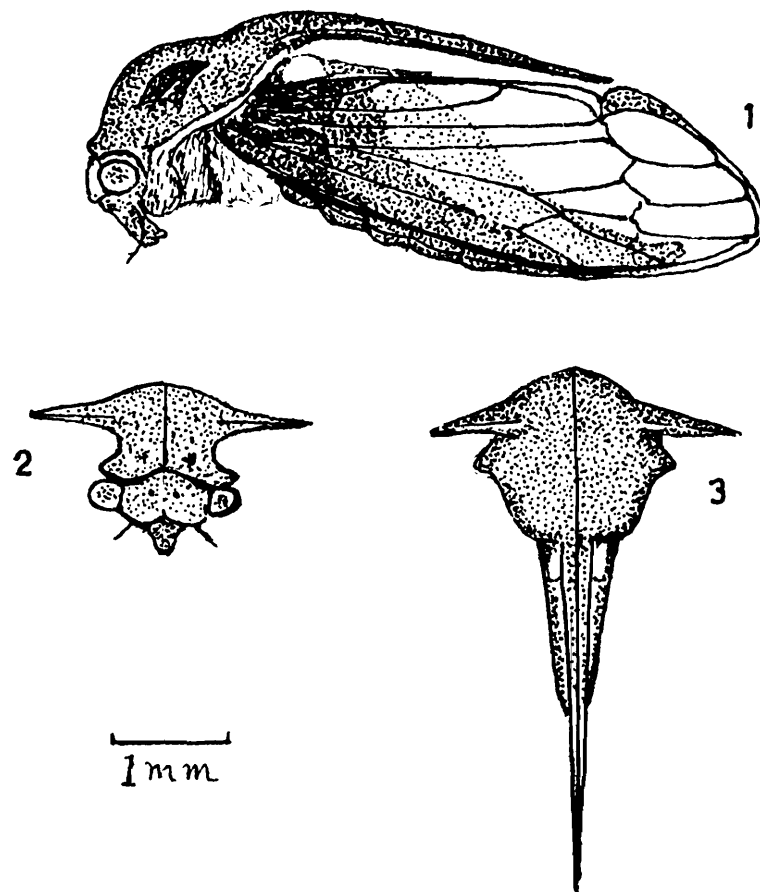


Fig. 99 : *Telingana subsimilis* (Walker). Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

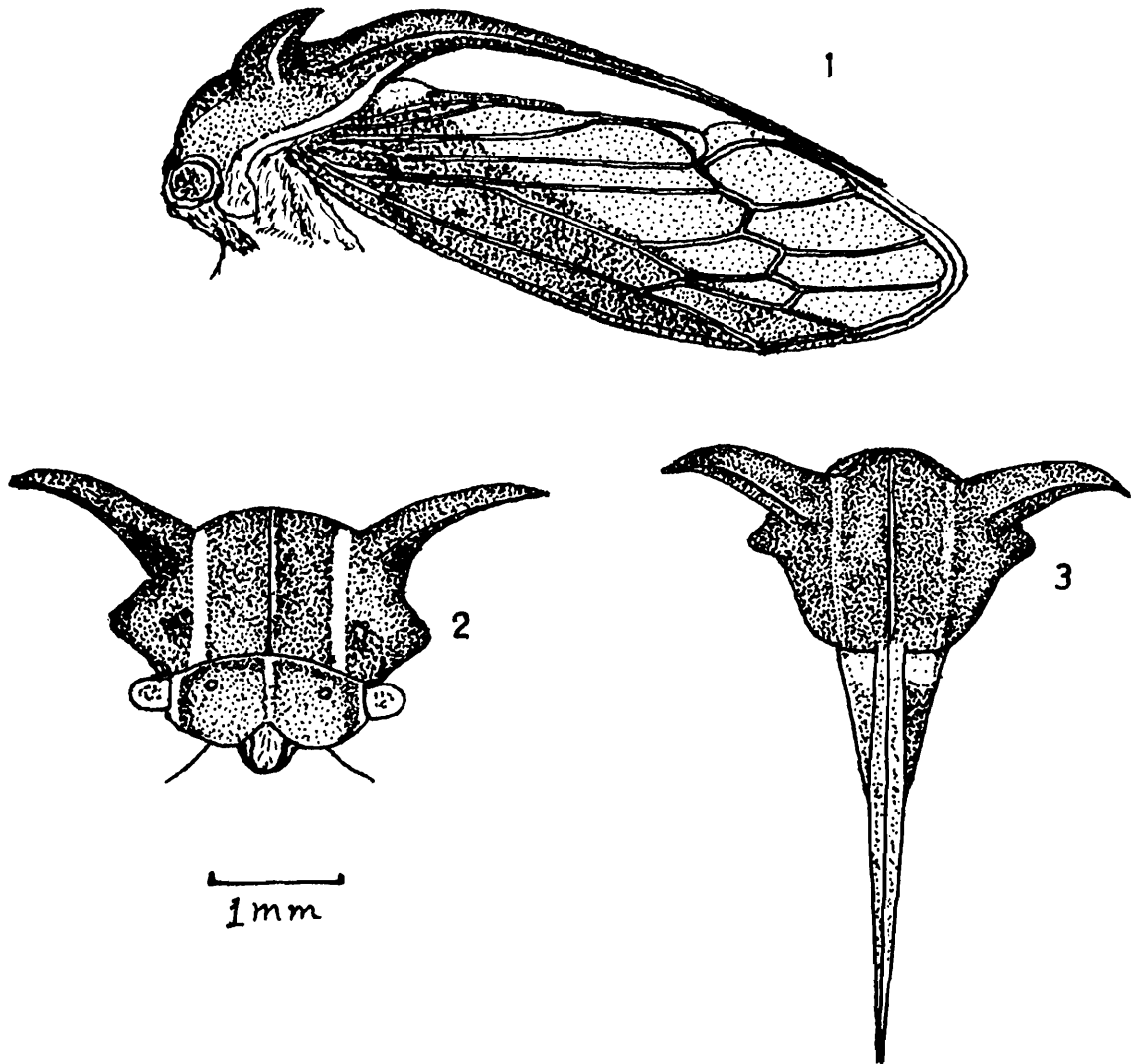


Fig. 100 : *Telingana travancorensis* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

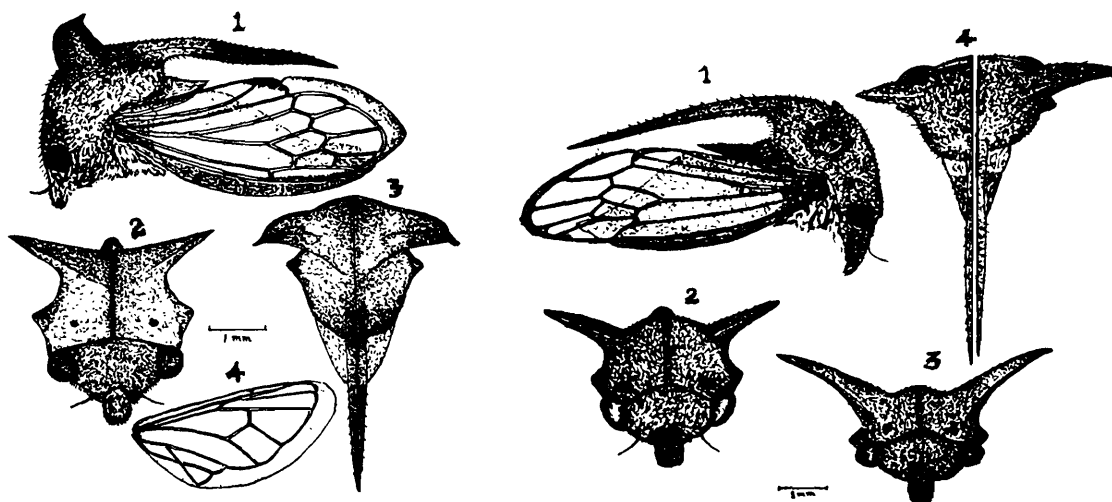


Fig. 101 : *Deitzius tomentosus* comb.nov. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum; 4. Hind wing.

Fig. 102 : *Lanceonotus cinnamomi* Ananthasubramanian. 1. Female, lateral view; 2. Female, frontal view of head and pronotum; 3. Male, frontal view of head and pronotum; 4. Dorsal view of pronotum of female (left half), male (right).

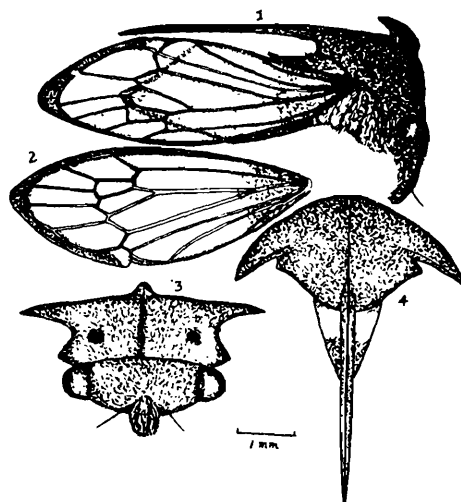


Fig. 103 : *Lanceonotus indicus* Ananthasubramanian. Male. 1. Lateral view; 2. Tegmina; 3. Frontal view of head and pronotum; 4. Dorsal view of pronotum.

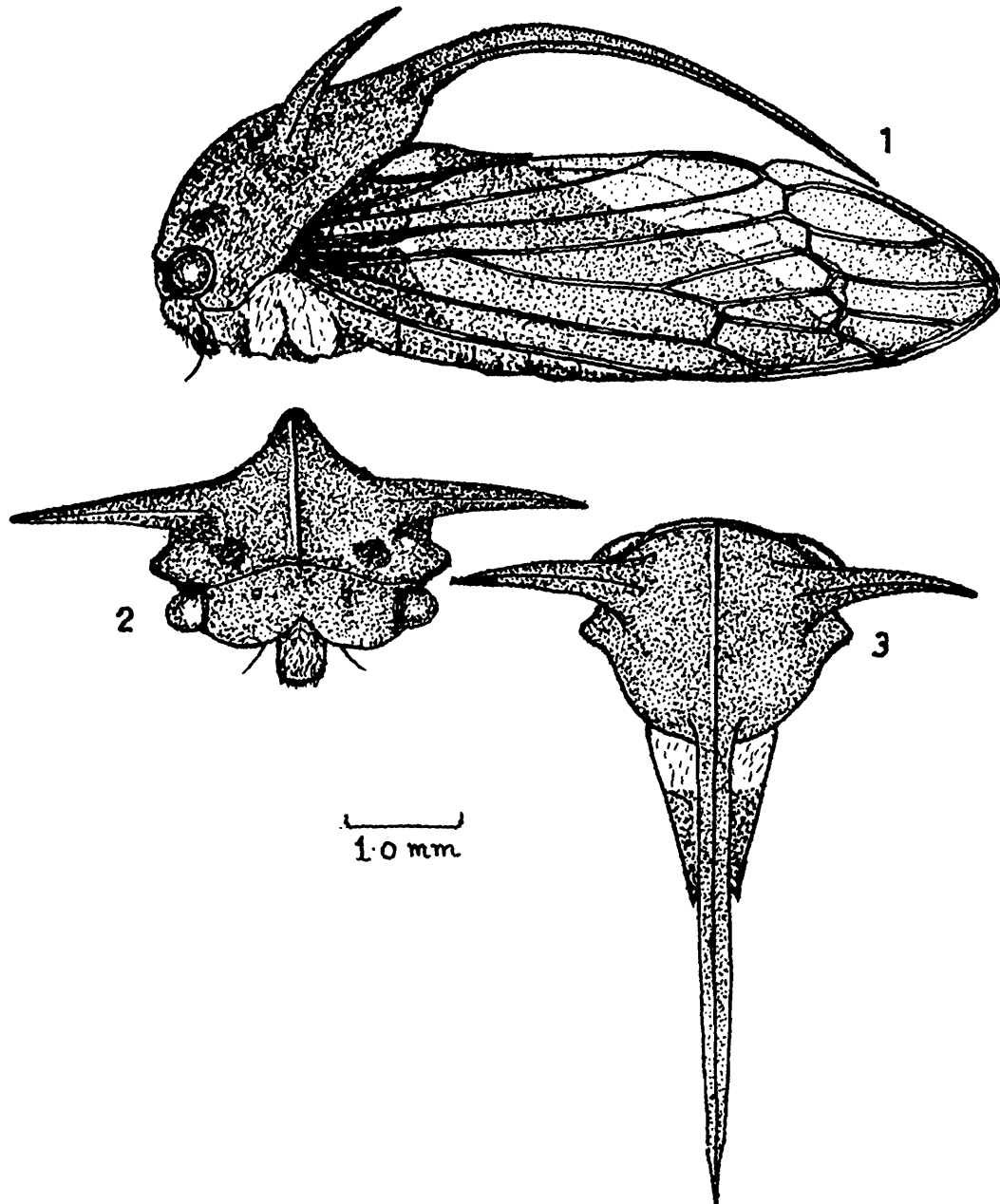


Fig. 104 : *Lanceonotus luteinervis* (Funkhouser). Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

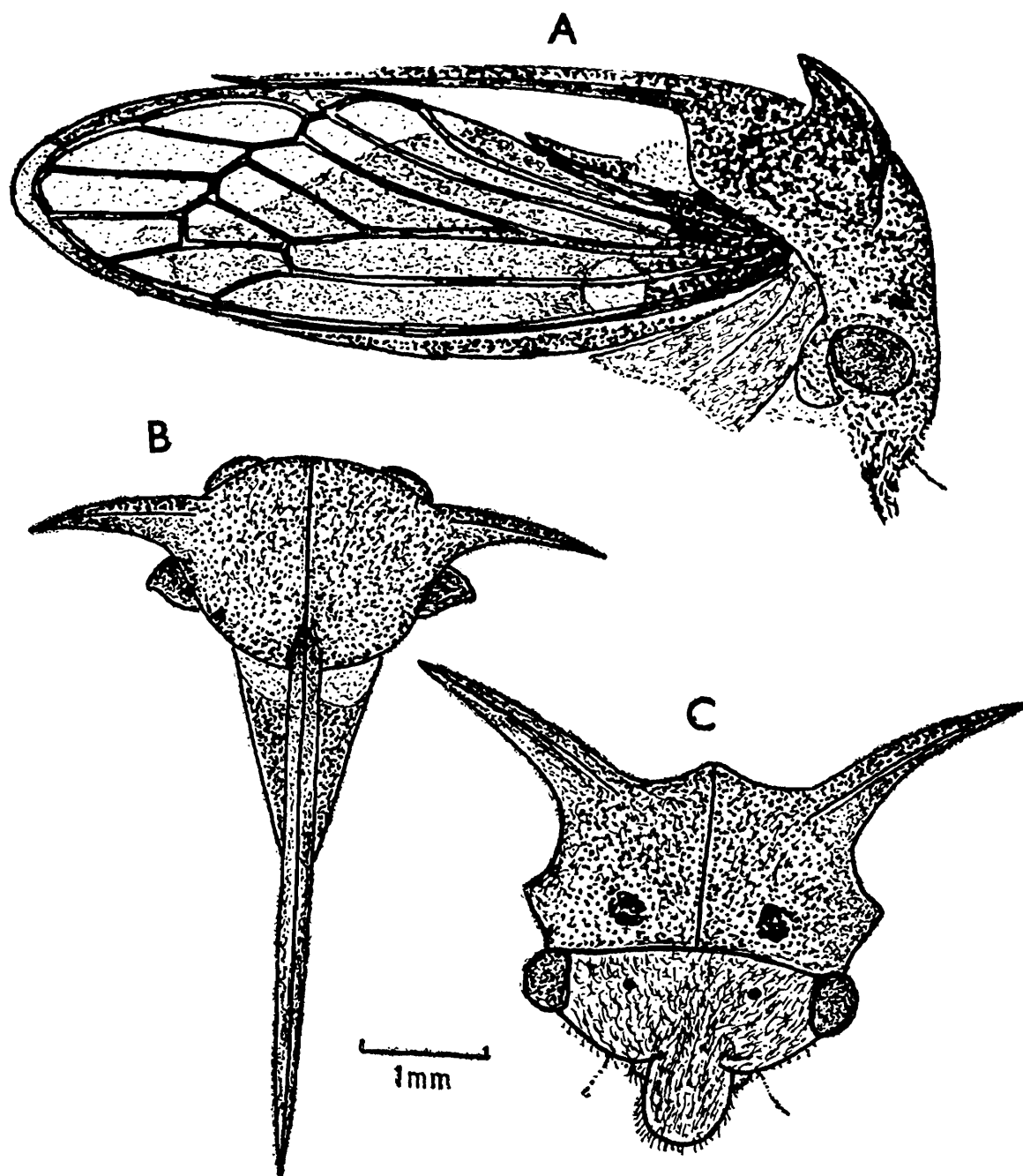


Fig. 105 : *Lanceonotus malabaricus* Thirumalai & Ananthasubramanian. female. A. Lateral view; B. Dorsal view of pronotum; C. Frontal view of head and pronotum.

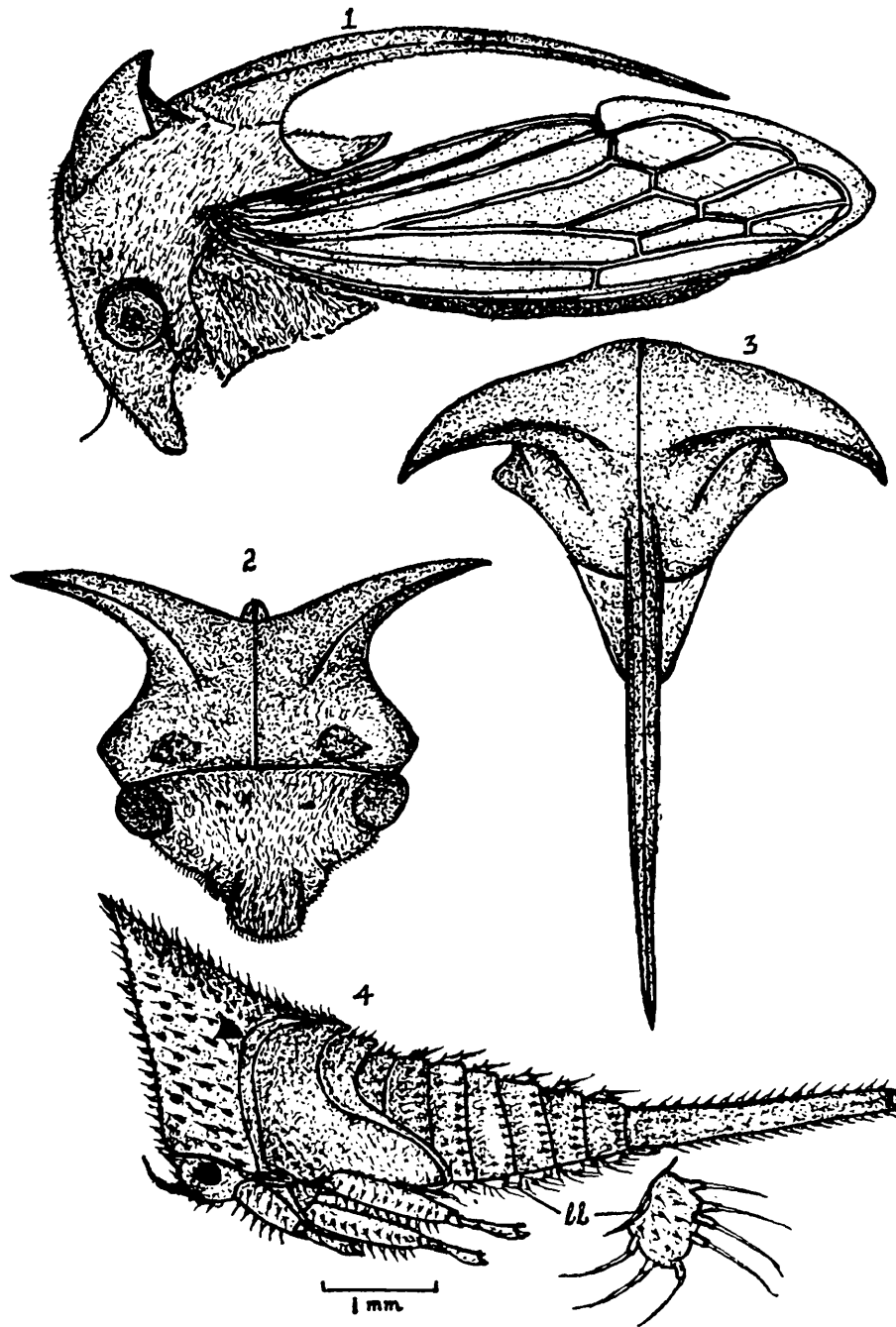


Fig. 106 : *Leptocentrus acuticornis* Ananthasubramanian. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum; 4. Fifth instar nymph.

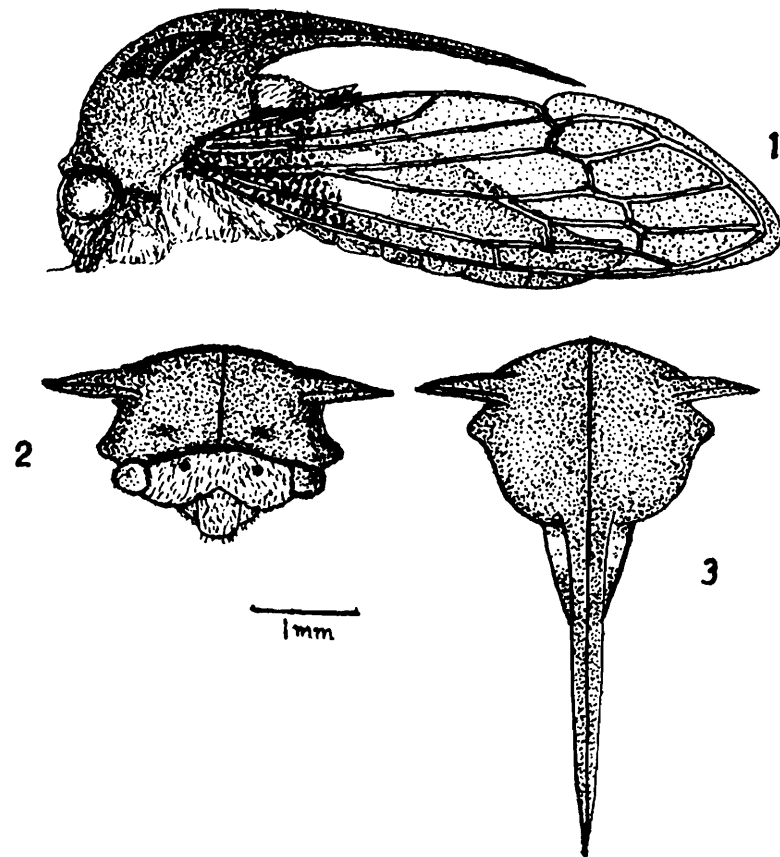


Fig. 107 : *Leptocentrus albonotatus* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal of pronotum.

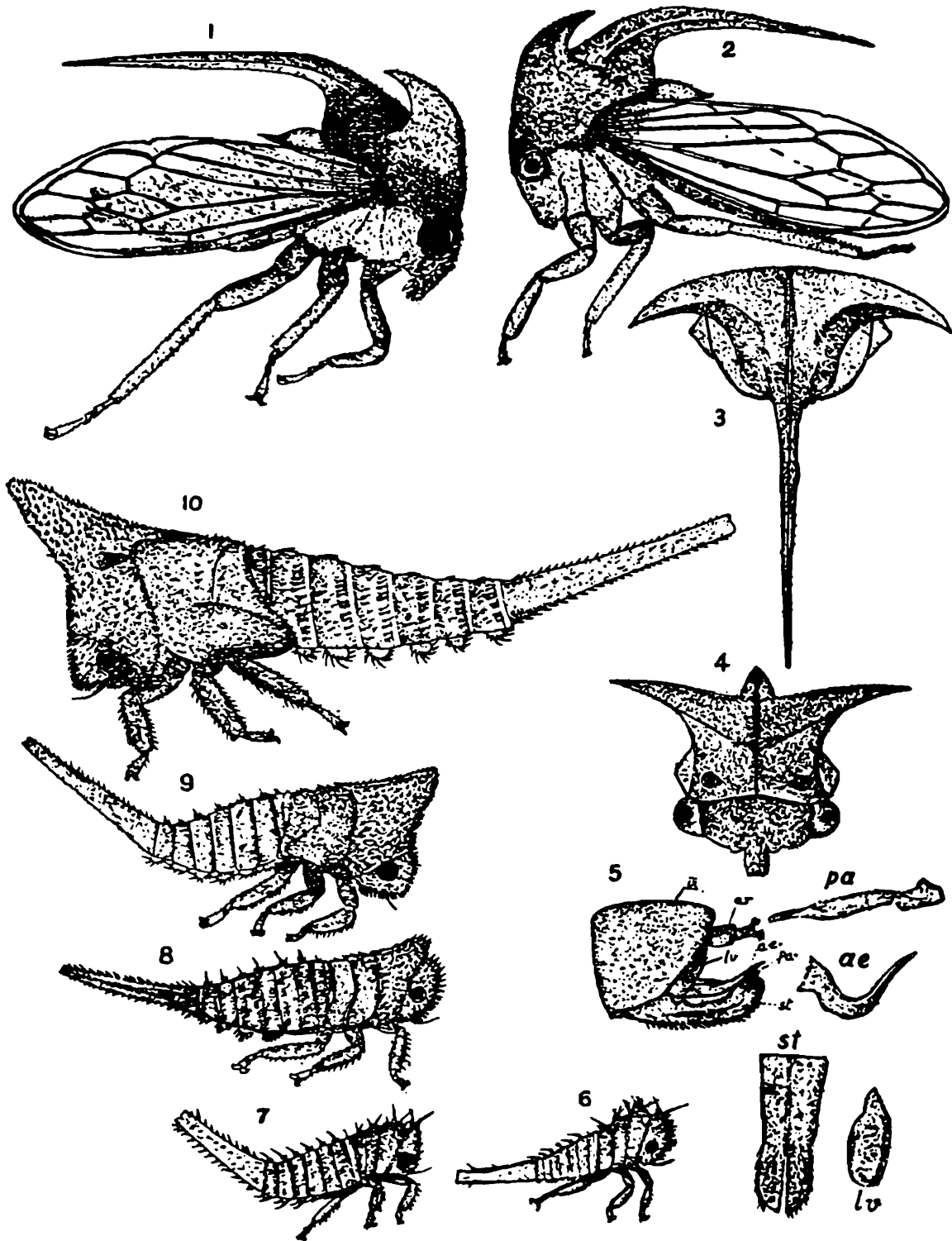


Fig. 108 : *Leptocentrus bajulans* Distant. 1. Male, lateral view; 2. Female, lateral view; 3. Female, dorsal view of pronotum 4. Female, frontal view of head and pronotum; 5. Male genitalia; 6-10. First to fifth nymphal stages.

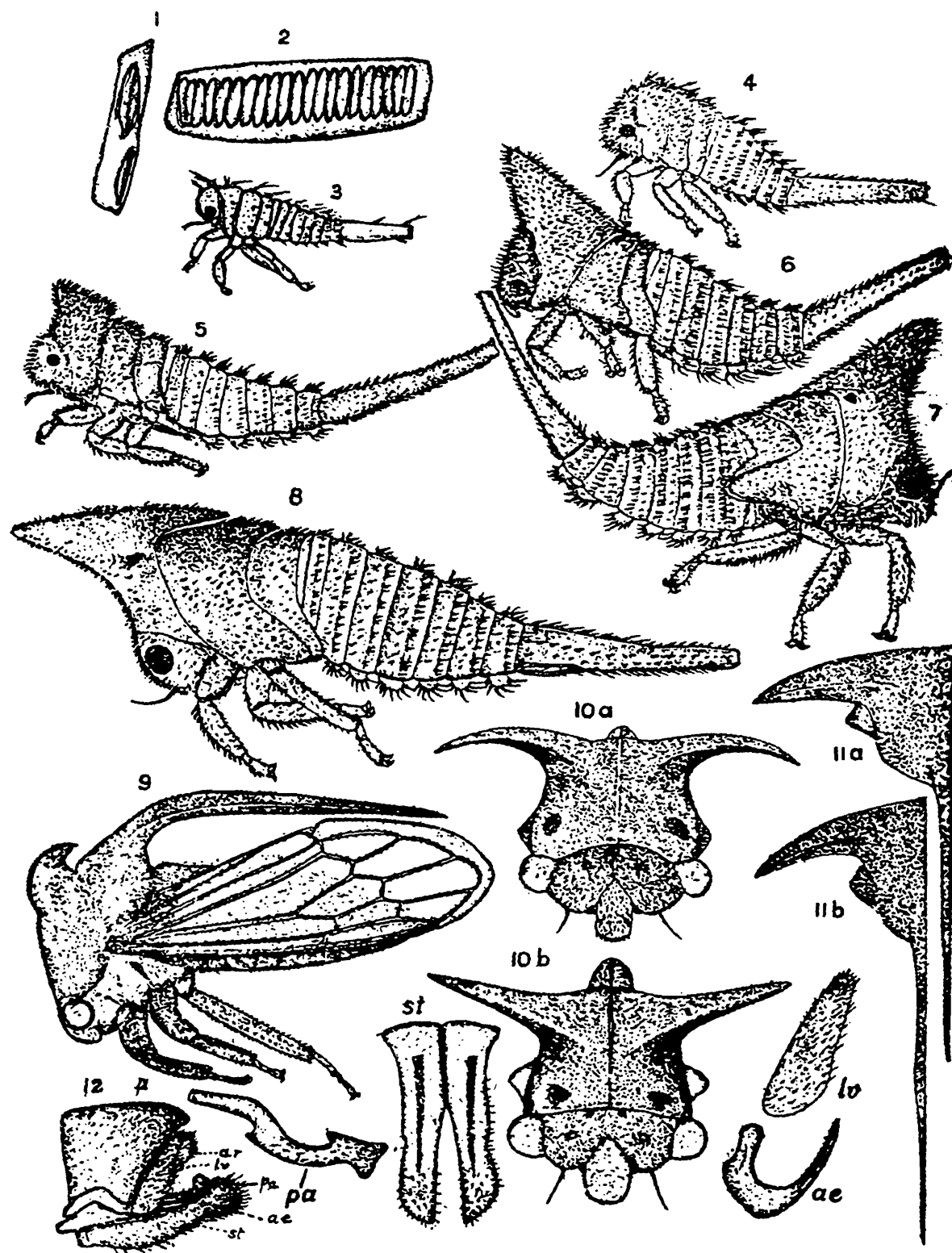


Fig. 109 : *Leptocentrus bauhiniae* Ananthasubramanian & Ananthakrishnan. 1. Egg slits on host stem; 2. Egg slit cut open; 3-6. First to fourth nymphal stages 7. Fifth instar, male; 8. Fifth instar, female; 9. Female, lateral view; 10a, Female, frontal view of head and pronotum; 10b. Male, frontal view of head and pronotum; 11a. Dorsal view (left half) of pronotum of male; 11b. Dorsal view (left half) of the pronotum of female; 12. Male genitalia.

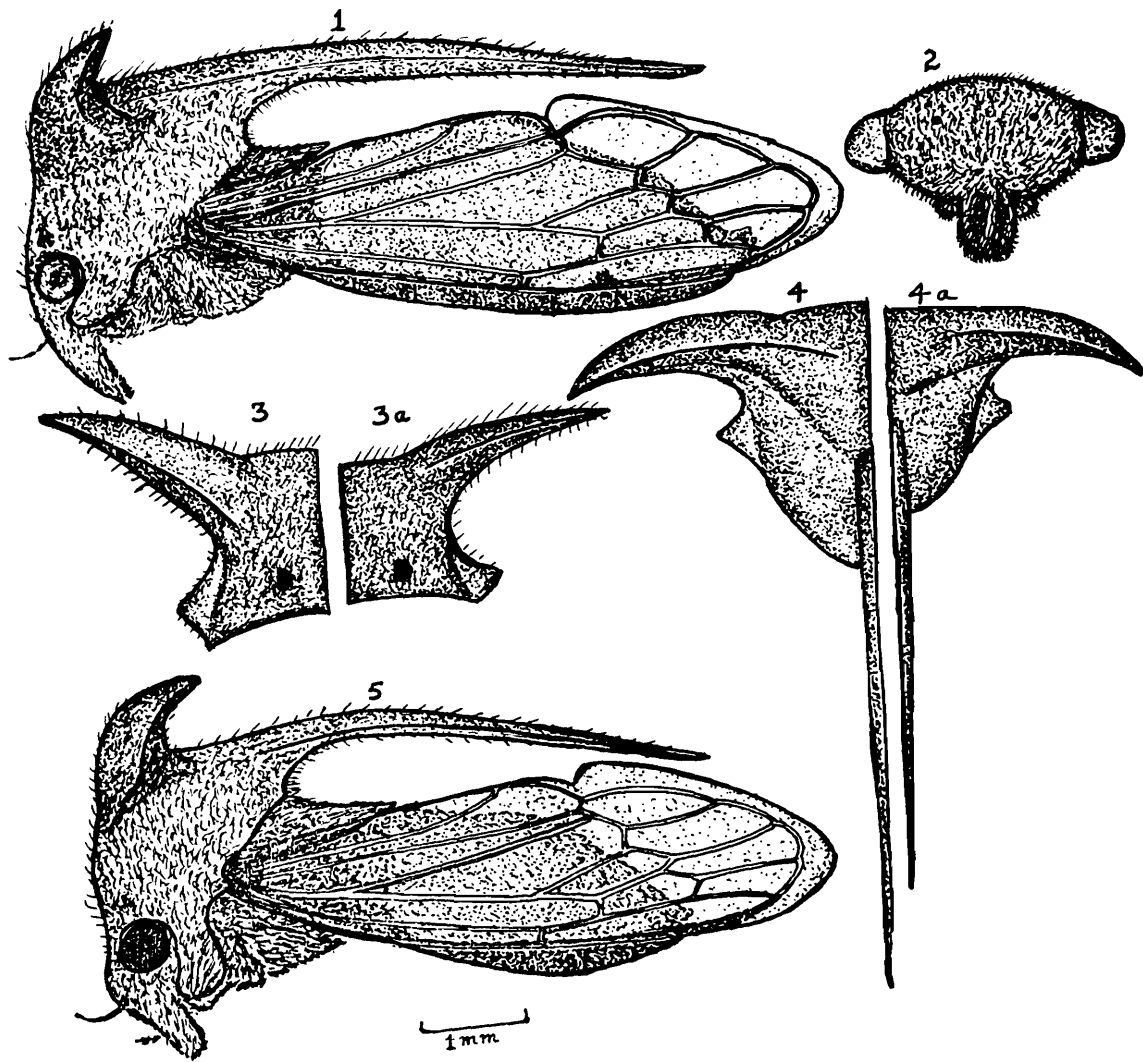


Fig. 110 : *Leptocentrus beluri* Ananthasubramanian. 1. Female, lateral view; 2. Head; 3. Female, frontal view of head and pronotum (right half); 3a. Male, frontal view of head and pronotum (right half); 4. Female, Dorsal view of pronotum (left half); 4a. Male, dorsal view of pronotum (right half); 5. Male, lateral view.

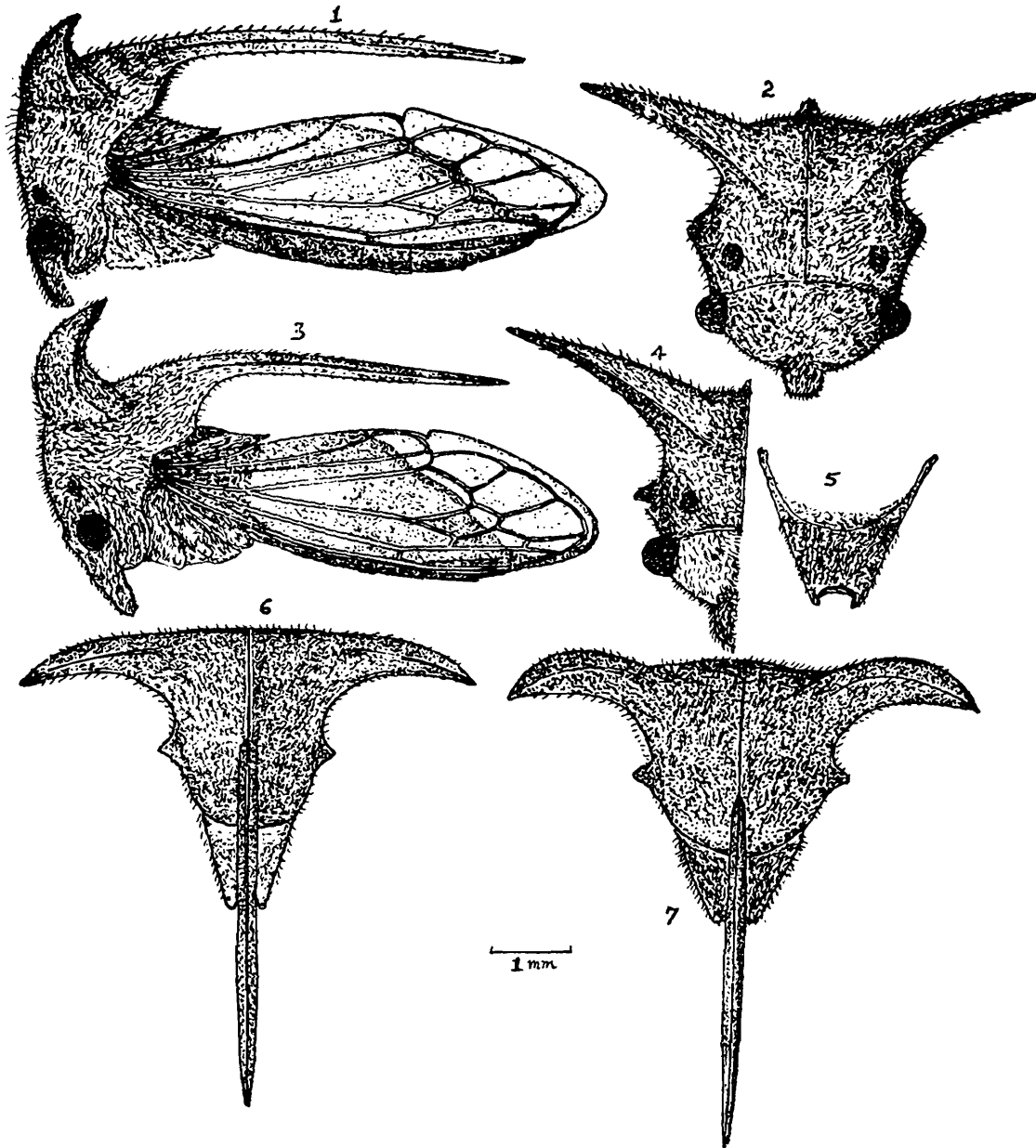


Fig. 111 : *Leptocentrus carinatus* Ananthasubramanian. 1. Female, lateral view; 2. Female, frontal view of head and pronotum; 3. Male, lateral view; 4. Male, frontal view of head and pronotum (left half); 5. Female, scutellum; 6. Female, dorsal view of pronotum; 7. Male, dorsal view of pronotum.

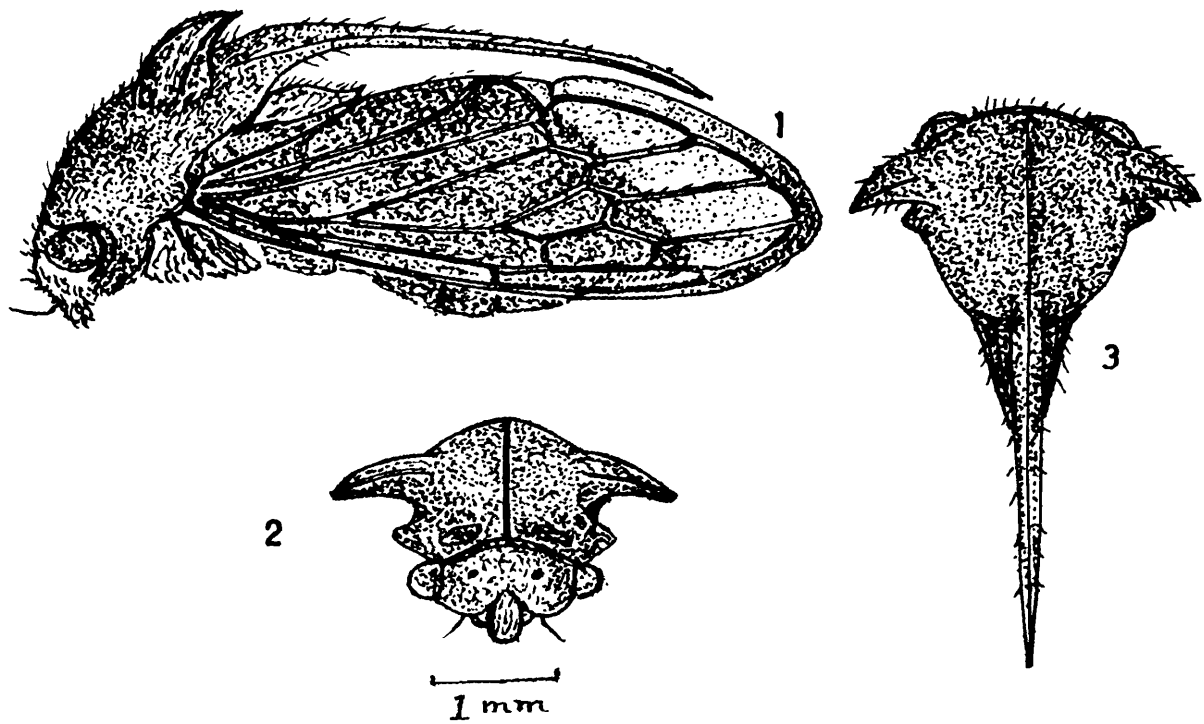


Fig. 112 : *Leptocentrus insignis* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

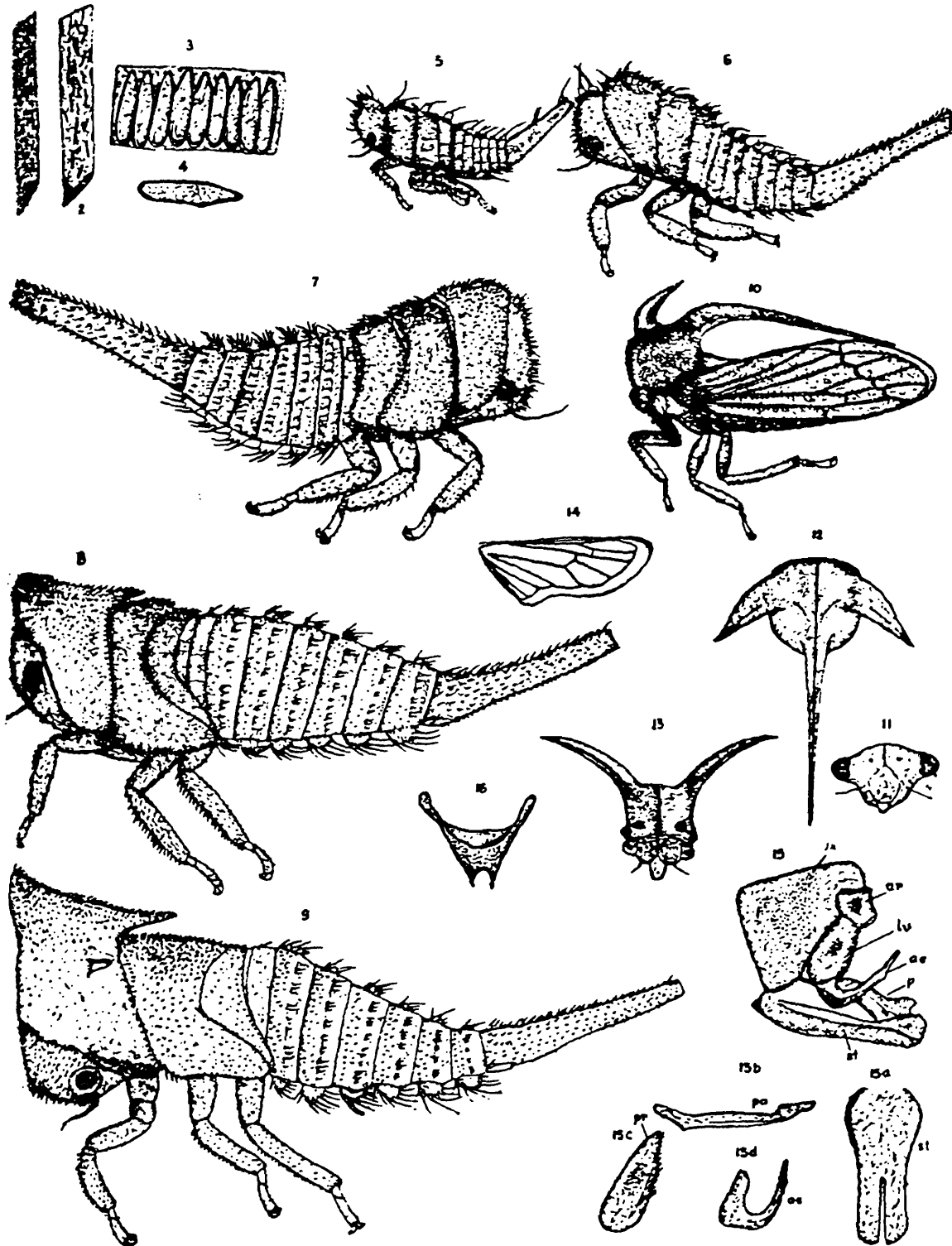


Fig. 113 : *Leptocentrus leucaspis* Walker. 1. Egg slits on hoststem; 2. Bark of twig removed to show eggs in slits; 3. An egg slit cut open; 4. Egg ; 5-9. First to fifth nymphal instars ; 10. Female, lateral view ; 11. Head frontal elevation ; 12. Female, dorsal view of pronotum ; 13. Female, frontal view of pronotum and head ; 14. Hind wing ; 15. Male genitalia ; 16. Scutellum.

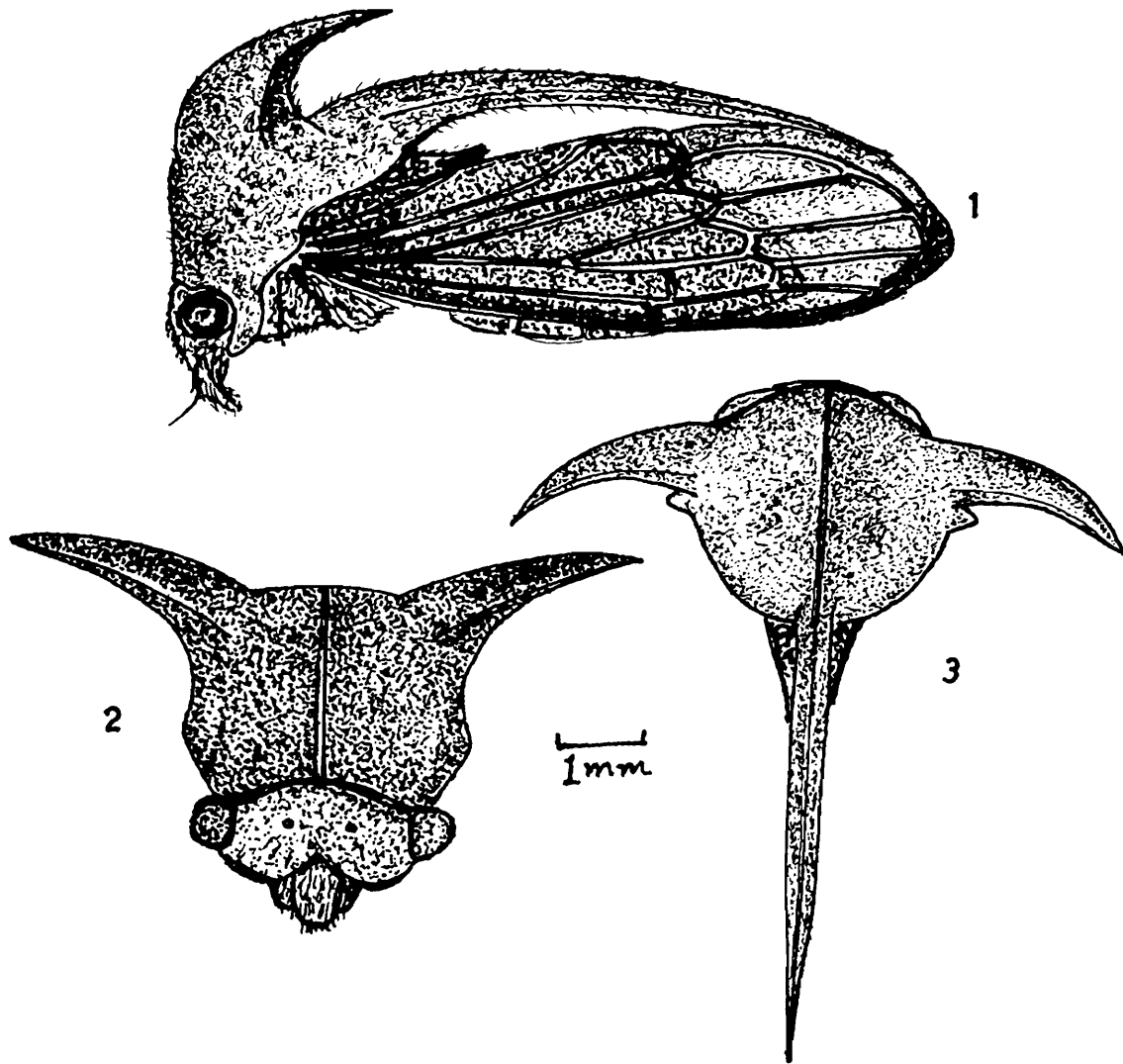


Fig. 114 : *Leptocentrus longispinus* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

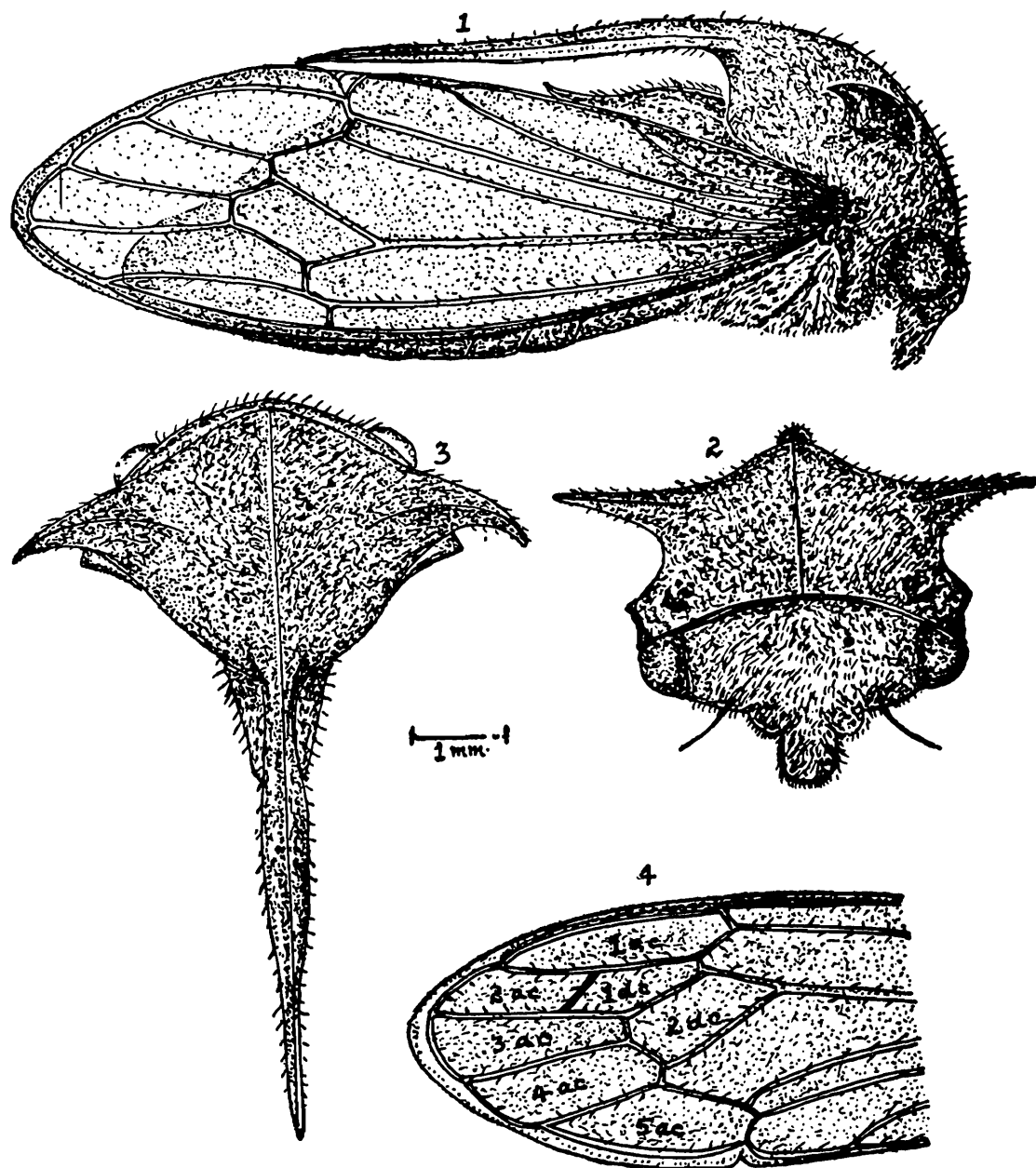


Fig. 115 : *Letocentrus luteus* Ananthasubramanian. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum ; 4. tegminal venation.

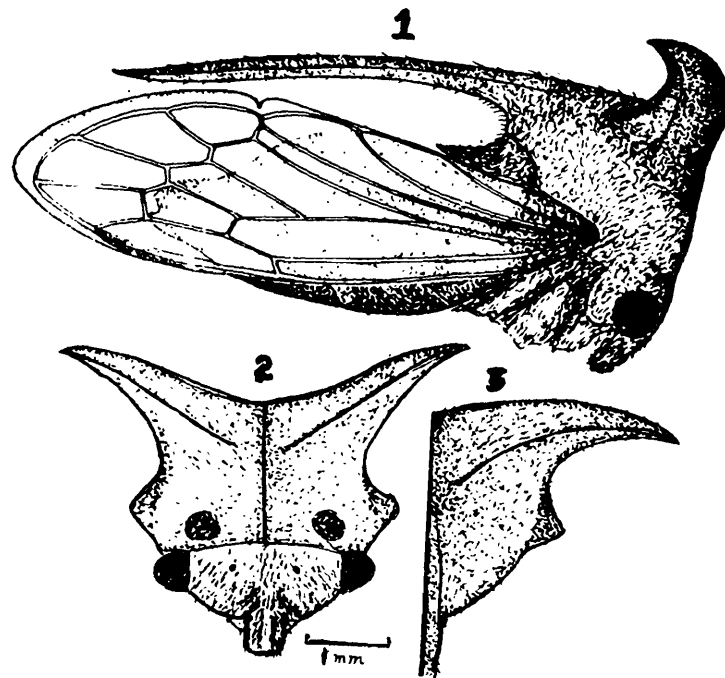


Fig. 116 : *Leptocentrus majesticus* Ananthasubramanian. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3 Dorsal view of pronotum (right half).

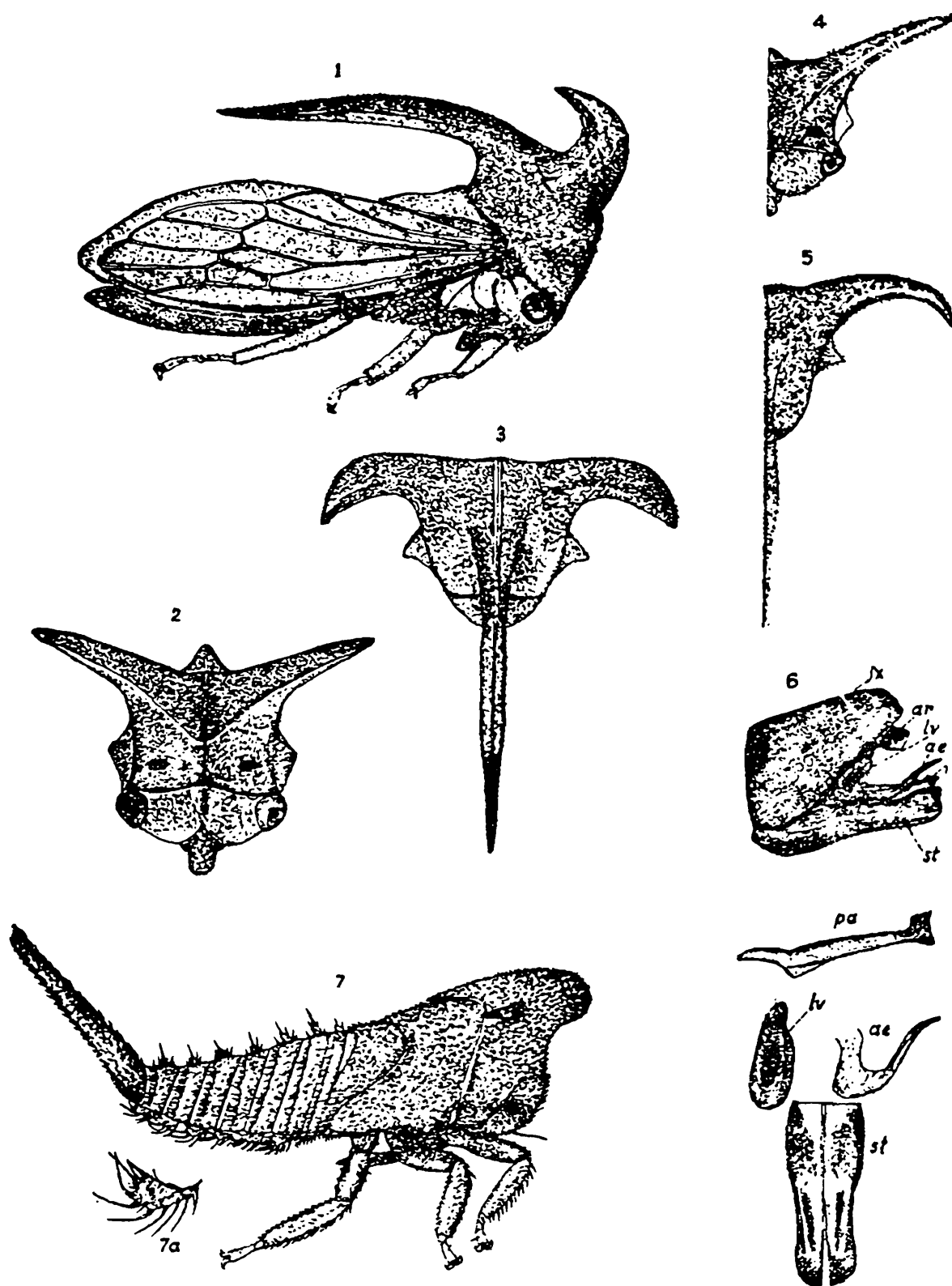


Fig. 117 : *Leptocentrus major* Ananthasubramanian & Ananthakrishnan. 1. Female, lateral view ; 2. Female, frontal view of head and pronotum ; 3. Female, dorsal view of pronotum ; 4. Male, frontal view of head and pronotum (right half) ; 5. Male, dorsal view of pronotum (right half) ; 6. male genitalia ; 7. Fifth instar nymph ; 7a. Abdominal lateral lamella of fifth instar nymph.

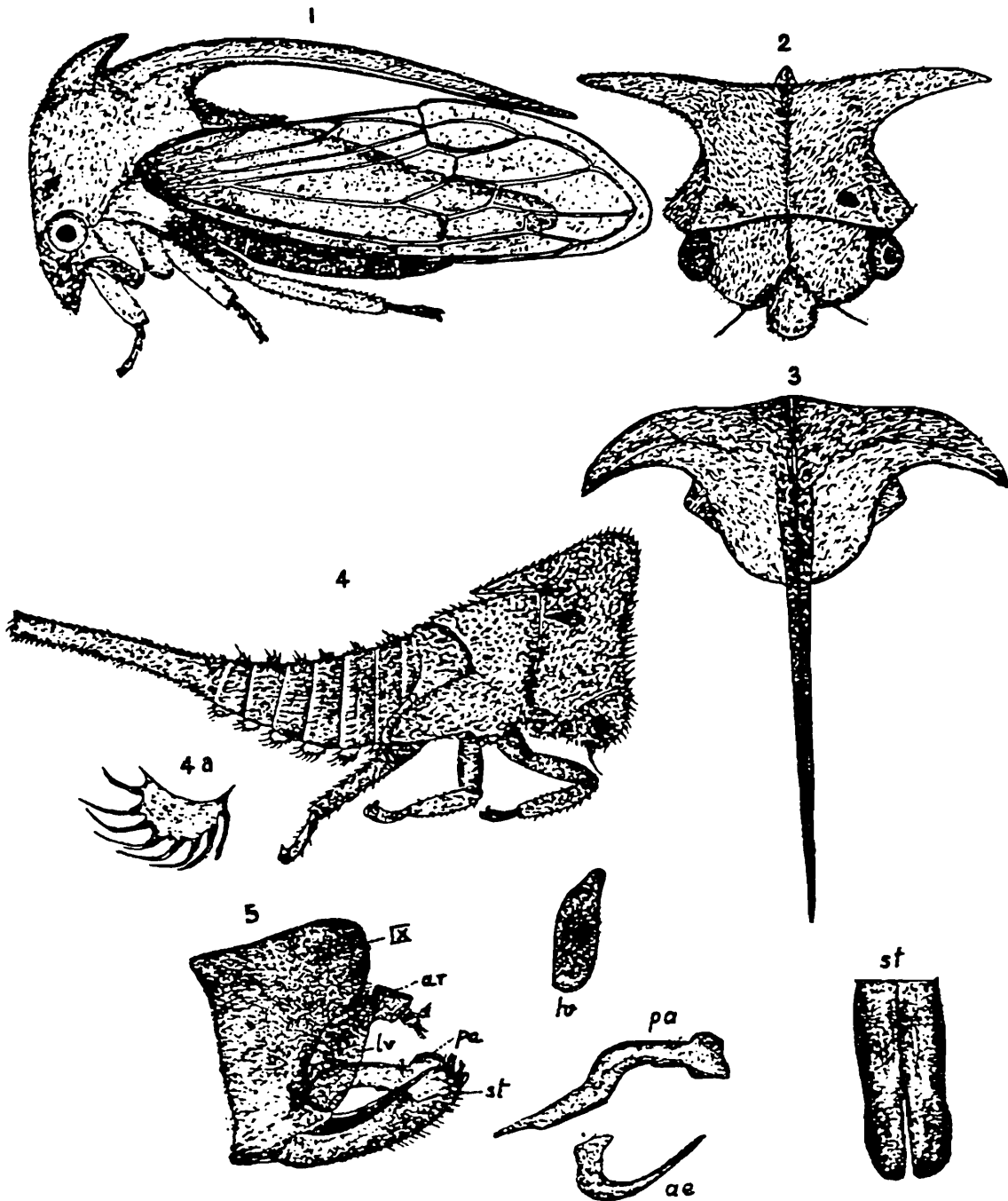


Fig. 118 : *Leptocentrus mangiferae* Ananthasubramanian & Ananthakrishnan. 1. Female, lateral view ; 2. Female, frontal view of head and pronotum ; 3. Female, dorsal view of pronotum ; 4. Fifth instar nymph ; 4a. Abdominal lateral lamella of 5th instar nymph ; 5. Male genitalia.

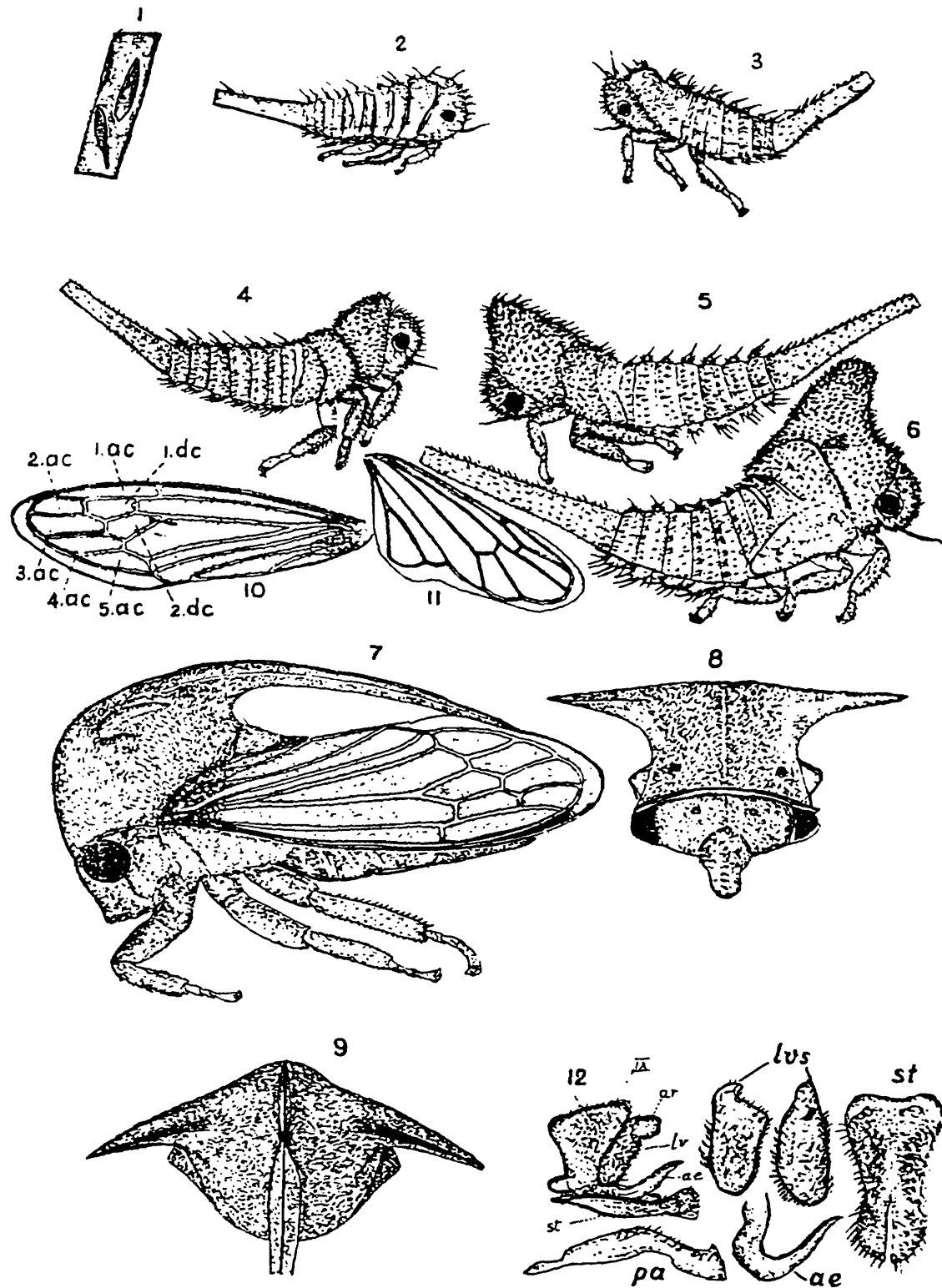


Fig. 119 : *Leptocentrus moringae* Ananthasubramanian & Ananthakrishnan. 1. Egg slits on host plant ; 2-6. First to fifth nymphal instars ; 7. Female, lateral view ; 8. Female, frontal view of head and pronotum ; 9. Dorsal view of pronotum of female ; 10. Tegmen ; 11. Hind wing ; 12. Male genitalia.

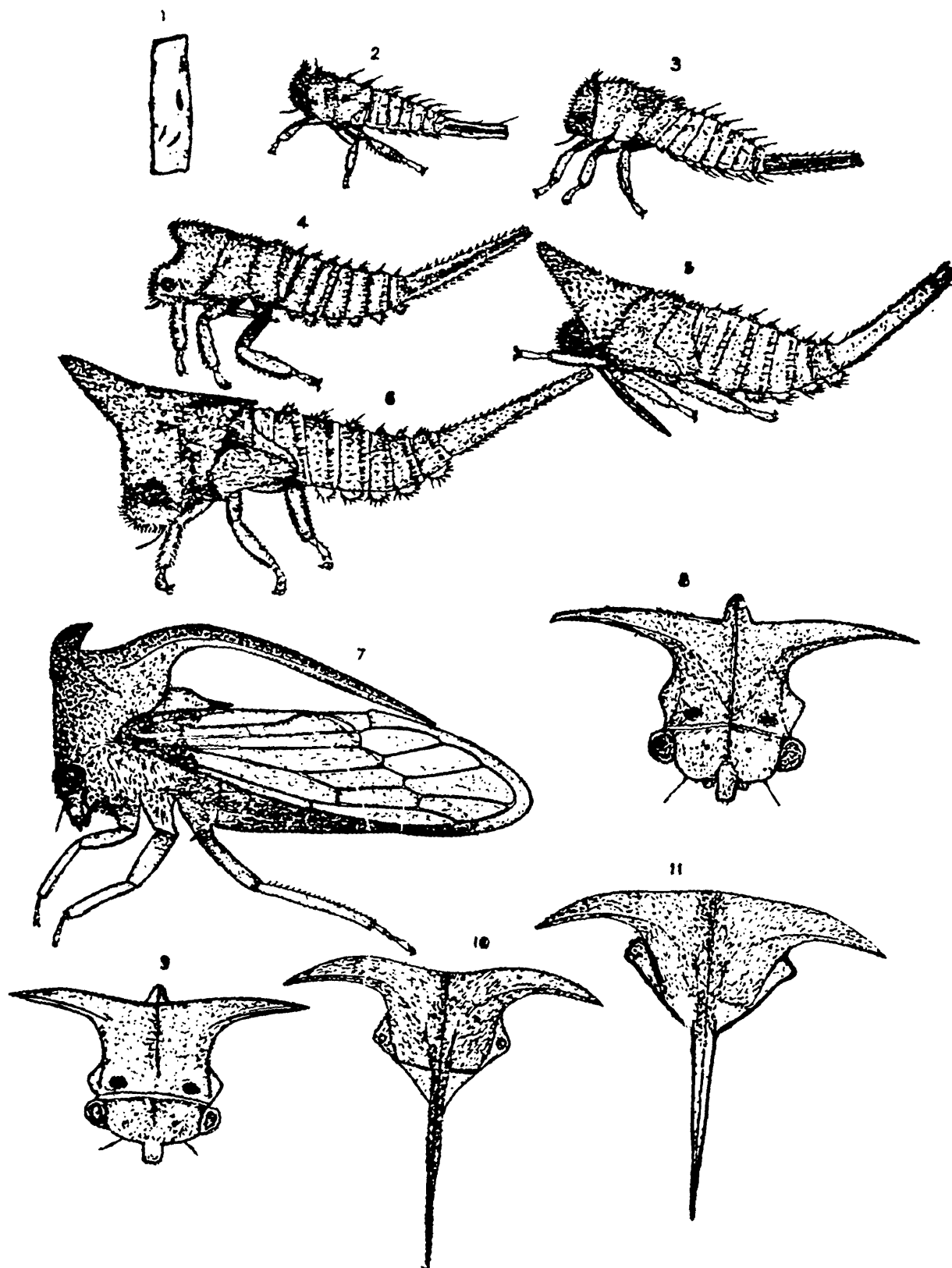


Fig. 120 : *Leptocentrus nigra* Ananthasubramanian & Ananthakrishnan. 1. Twig with egg slit ; 2-6 ; First to fifth instar nymphs ; 7. Female, lateral view ; 8. Female, frontal view of head and pronotum ; 9. Male, frontal view of head and pronotum ; 10. Male, dorsal view of pronotum ; 11. Female, dorsal view of pronotum.

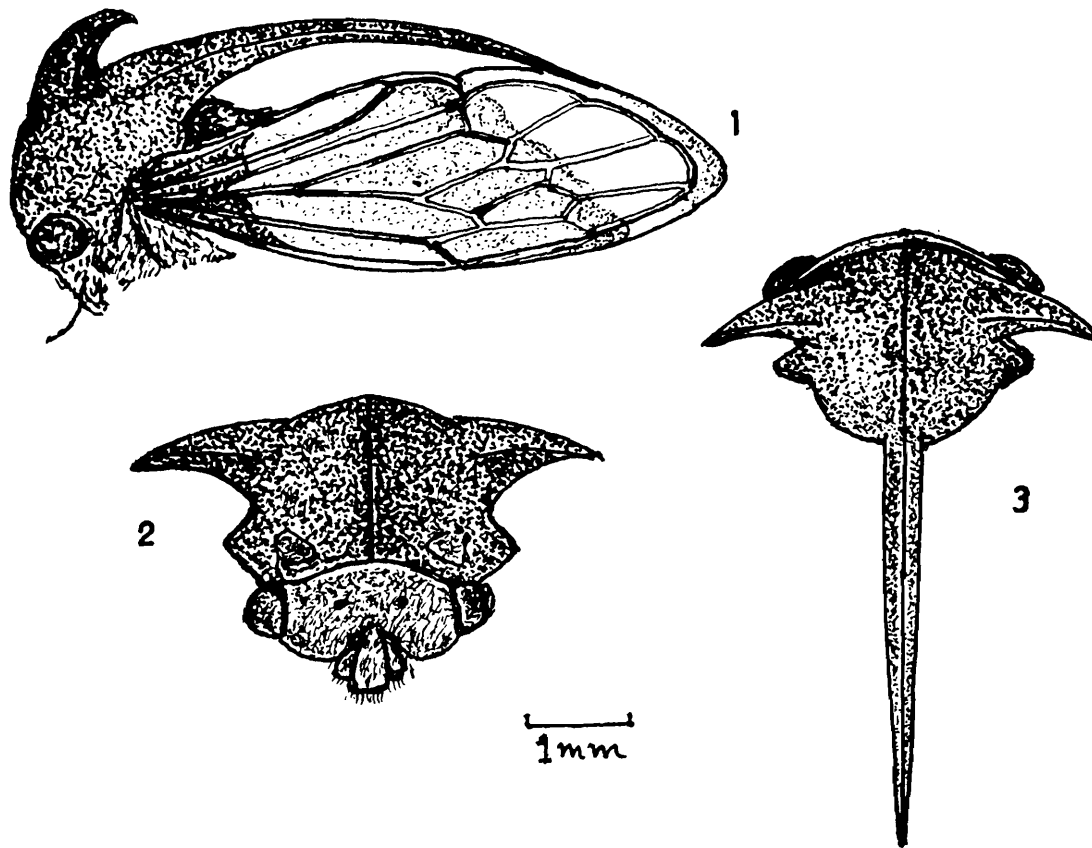


Fig. 121 : *Leptocentrus obliquus* Distant. Female. 1. Lateral view ; 2. Frontal view ; 3. Dorsal view of pronotum.

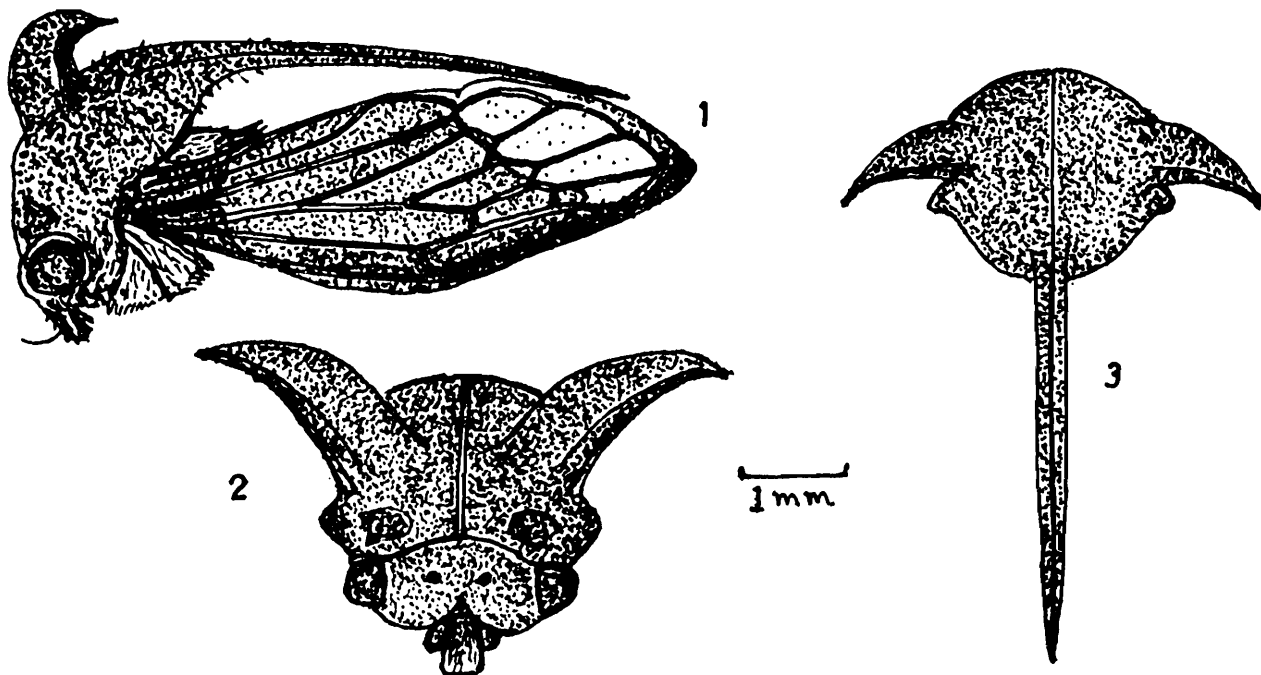


Fig. 122 : *Leptocentrus obortus* Distant. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

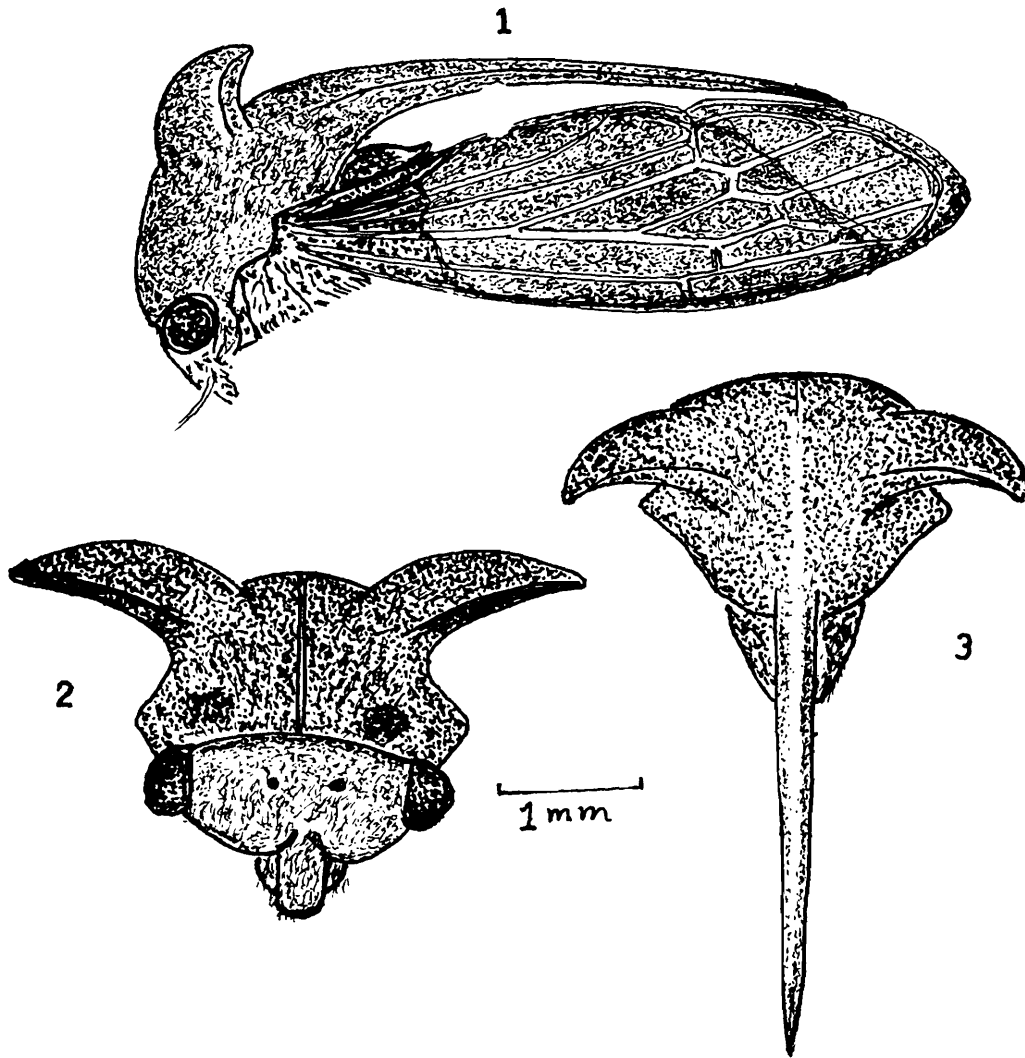


Fig. 123 : *Leptocentrus reponens* (Walker). Female. 1. Lateral view ; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

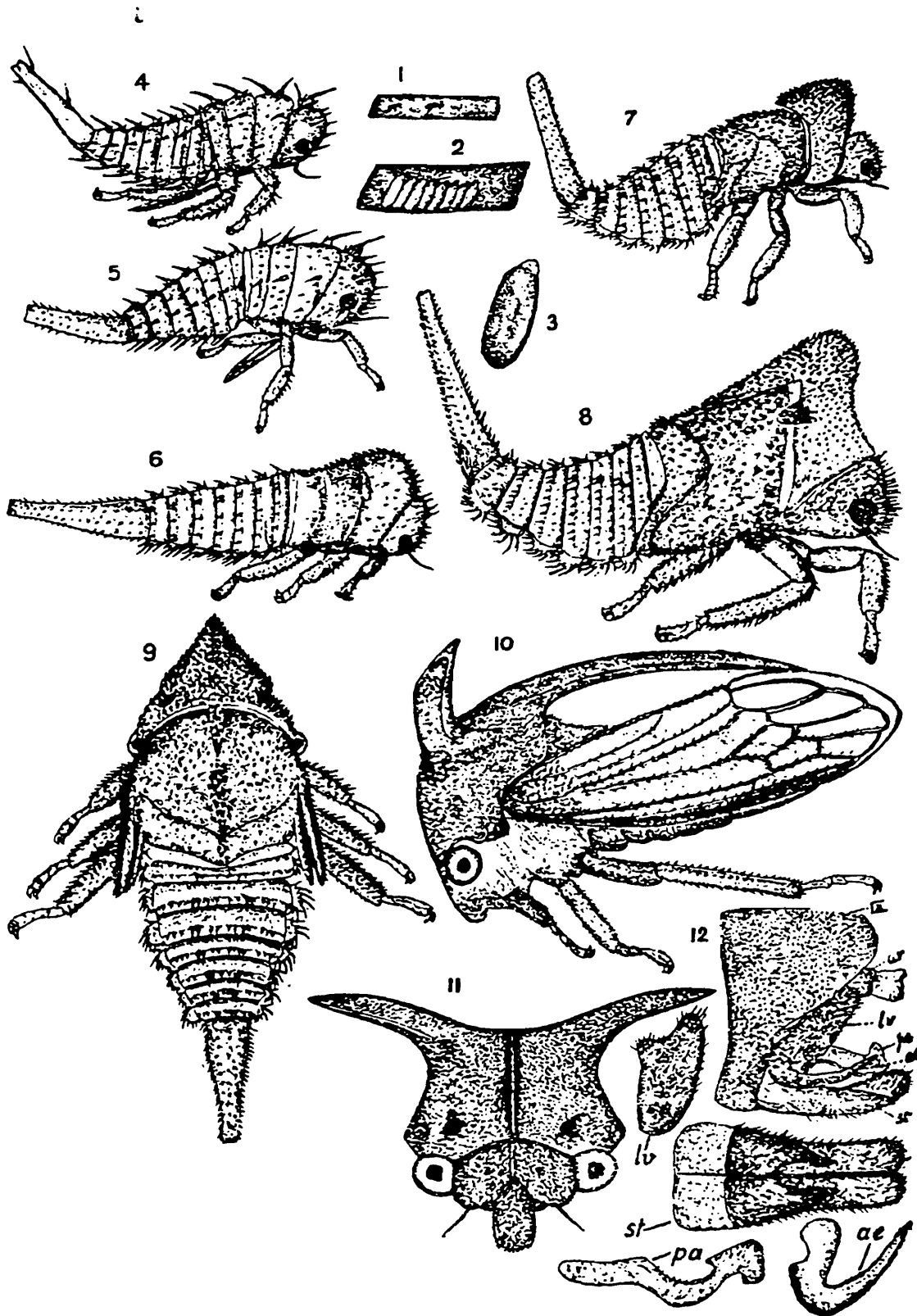


Fig. 124 : *Leptocentrus rhizophagus* Ananthasubramanian & Ananthakrishnan. 1. Prop root containing egg slits ; 2. Egg slits cut open ; 3. A single egg ; 4-8. First to fifth instars nymphs ; 9. Fifth instar nymph, dorsal view ; 10. Female, lateral view ; 11. Female, frontal view of head and pronotum ; 12. Male genitalia.

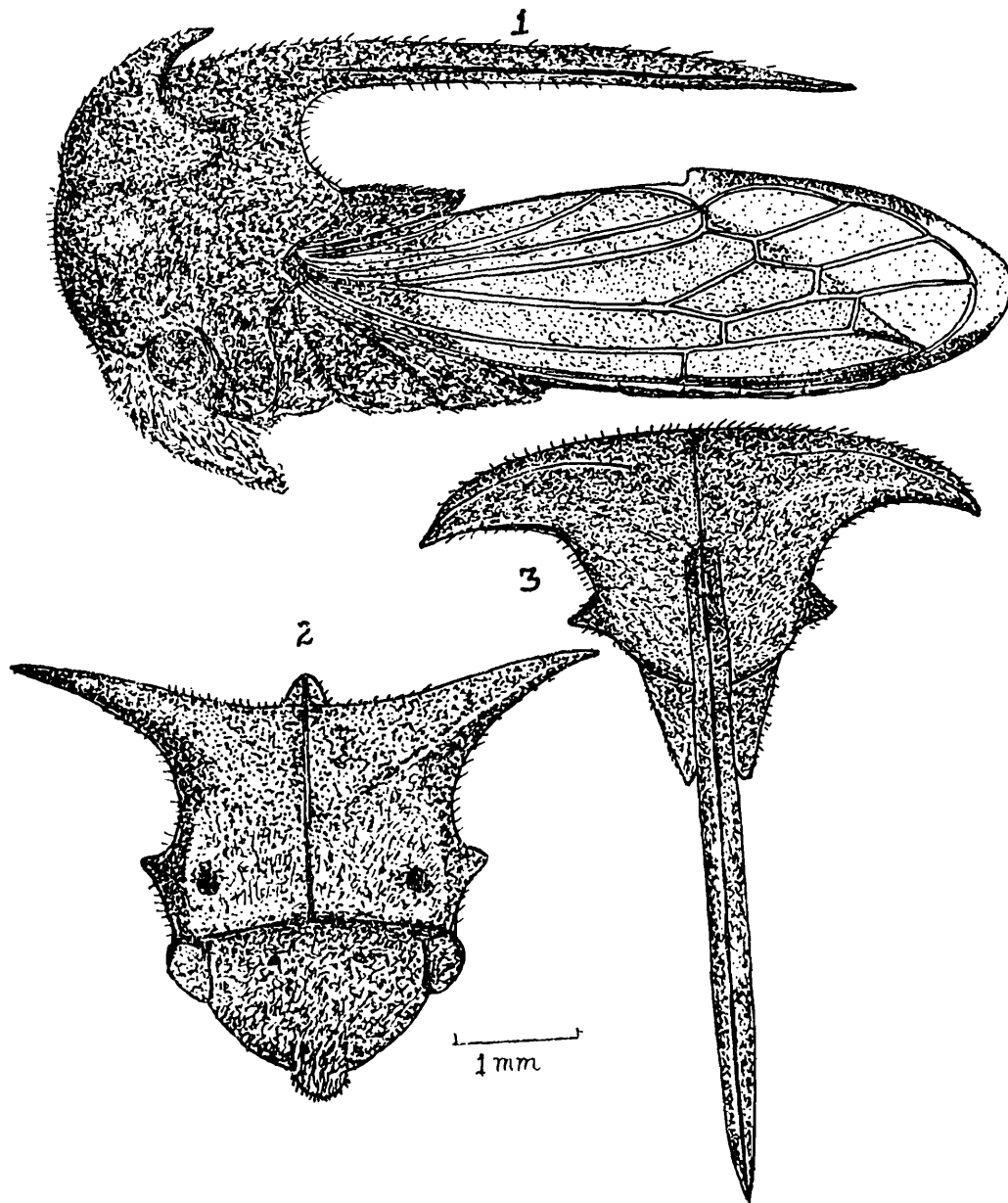


Fig. 125 : *Leptocentrus rubrinigris* Ananthasubramanian. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

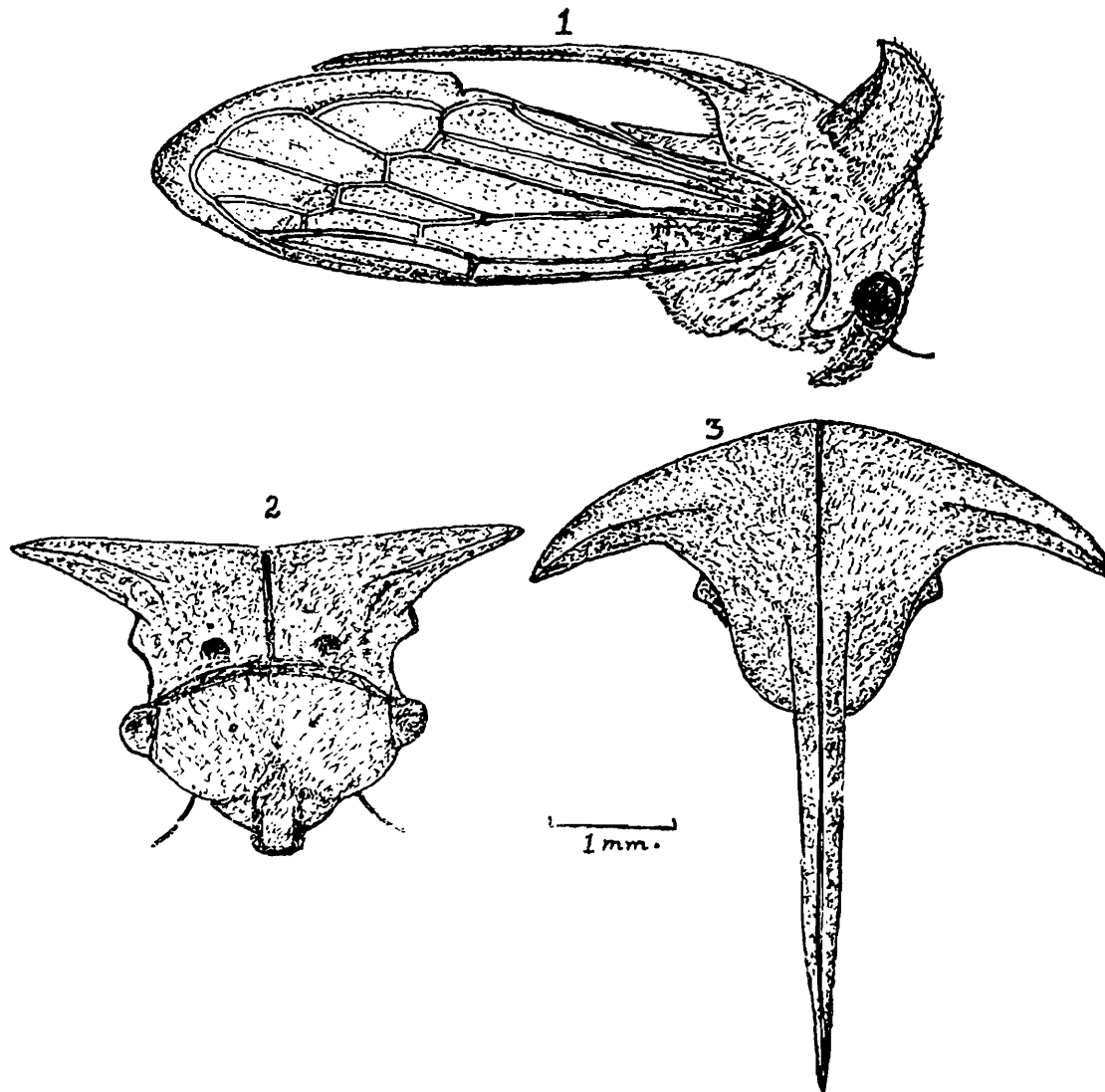


Fig. 126 : *Leptocentrus rufescens* Ananthasubramanian. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

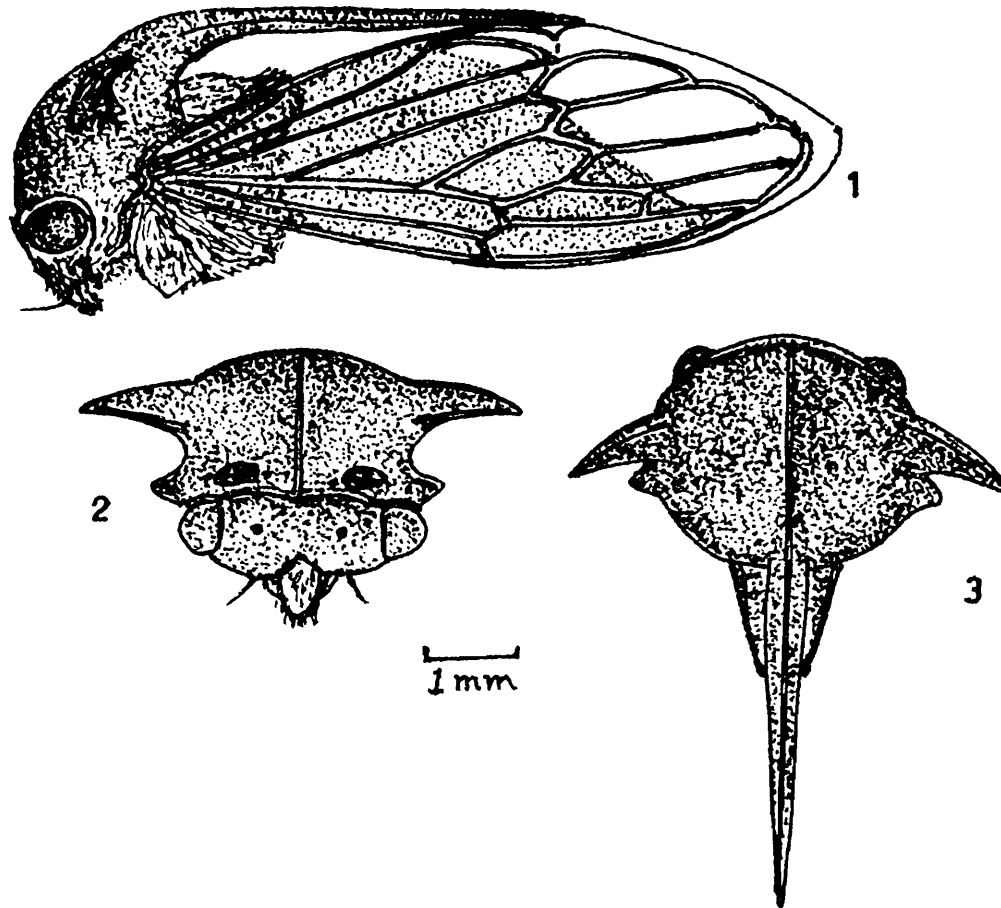


Fig. 127 : *Leptocentrus scutellatus* Distant, Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

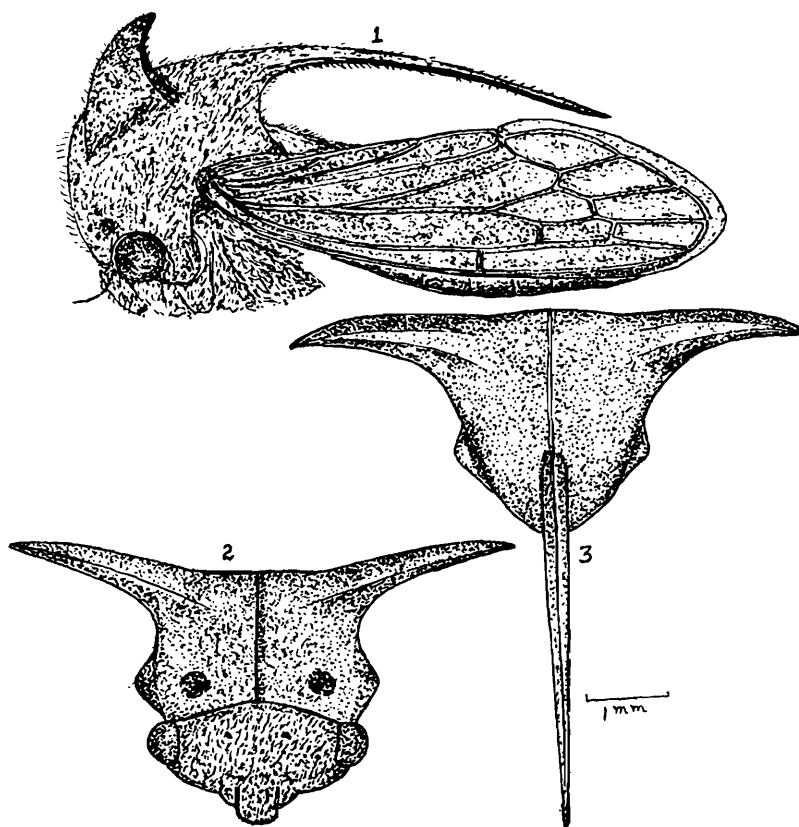


Fig. 128 : *Leptocentrus splendens* Ananthasubramanian. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

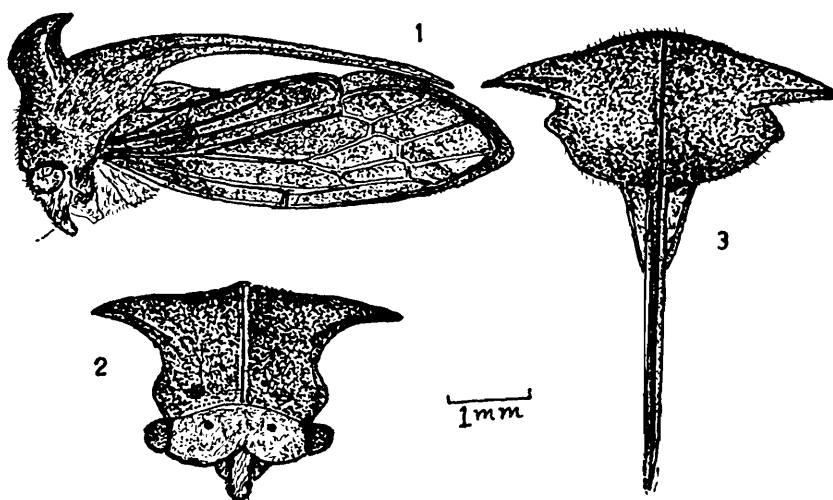


Fig. 129 : *Leptocentrus substitutus* (Walker). Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

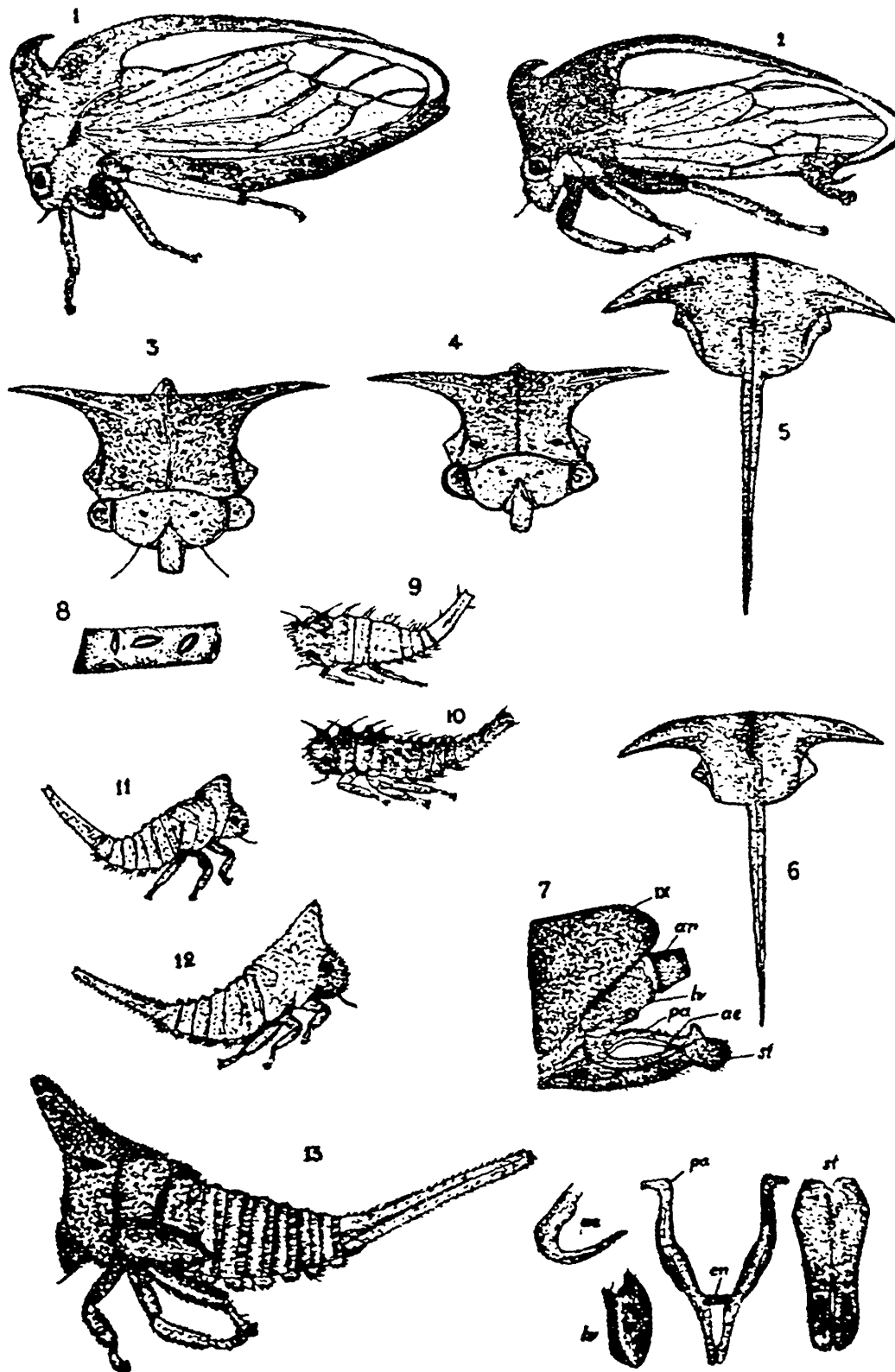


Fig. 130 : *Leptocentrus taurus* (Fabricius). 1. Female, lateral view ; 2. Male, lateral view ; 3. Female, frontal view of head and pronotum ; 4. Male, frontal view of head and pronotum ; 5. Female, dorsal view of pronotum ; 6. Male, dorsal view of pronotum ; 7. Male genitalia ; 8. Twig with egg slits ; 9-13. Nymphal stages.

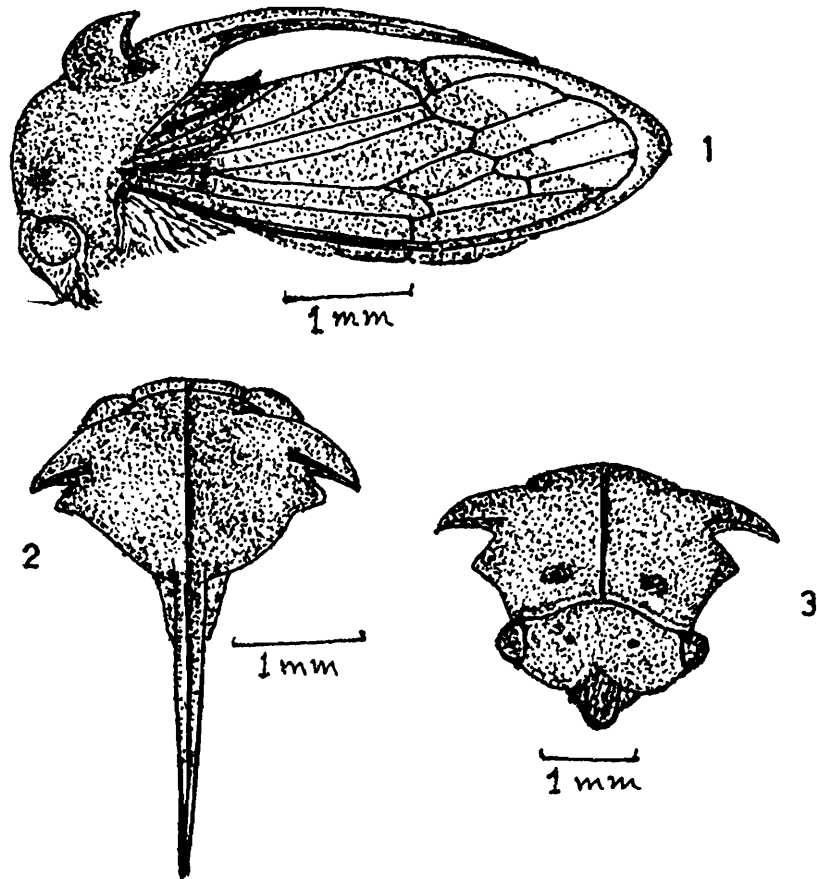


Fig. 131 : *Leptocentrus ustus* Buckton. Female. 1. Lateral view ; 2. Dorsal view of pronotum ; 3. Frontal view of head and pronotum.

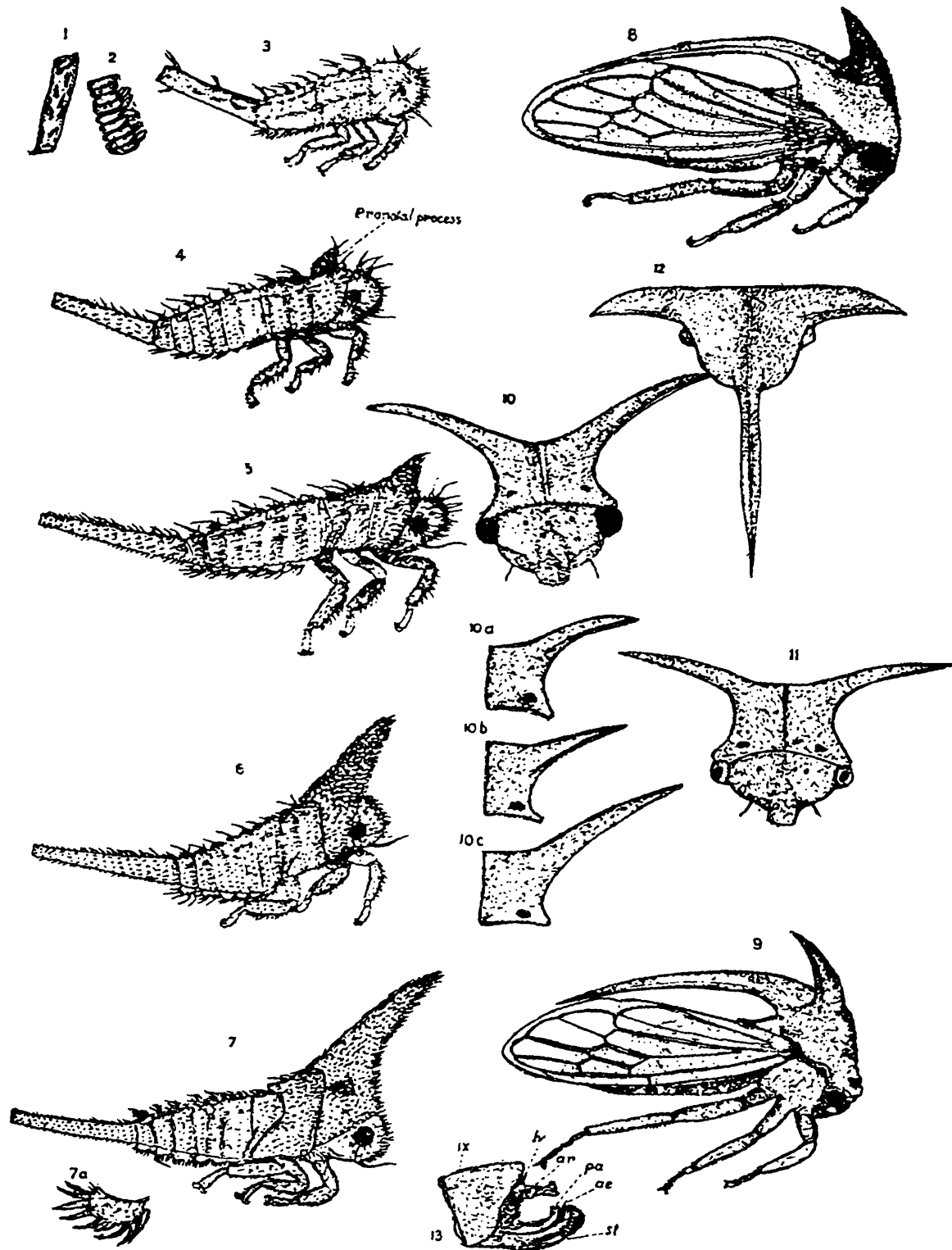


Fig. 132 : *Leptocentrus varicornis* Ananthasubramanian & Ananthakrishnan. 1. Egg slits on host stem ; 2. An egg mass ; 3-7. First to fifth instars nymph ; 8. Female, lateral view ; 9. Male, lateral view ; 10. Female, frontal view of head and pronotum ; 10a, b, c. Variations in suprahumeral ; 11. Male, frontal view of head and pronotum ; 12. Female, dorsal view of pronotum ; 13. Male genitalia.

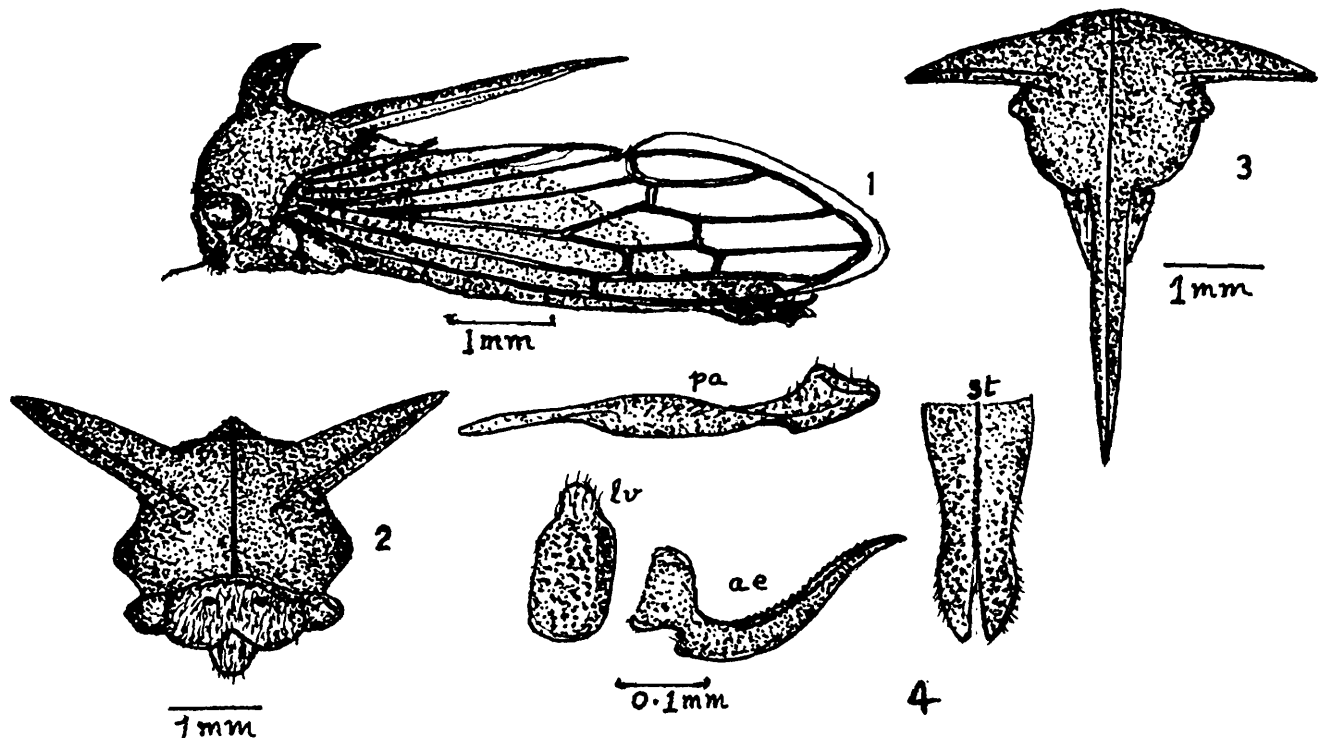


Fig. 133 : *Nilautama typica* Distant. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum ; 4. Male genitalia.

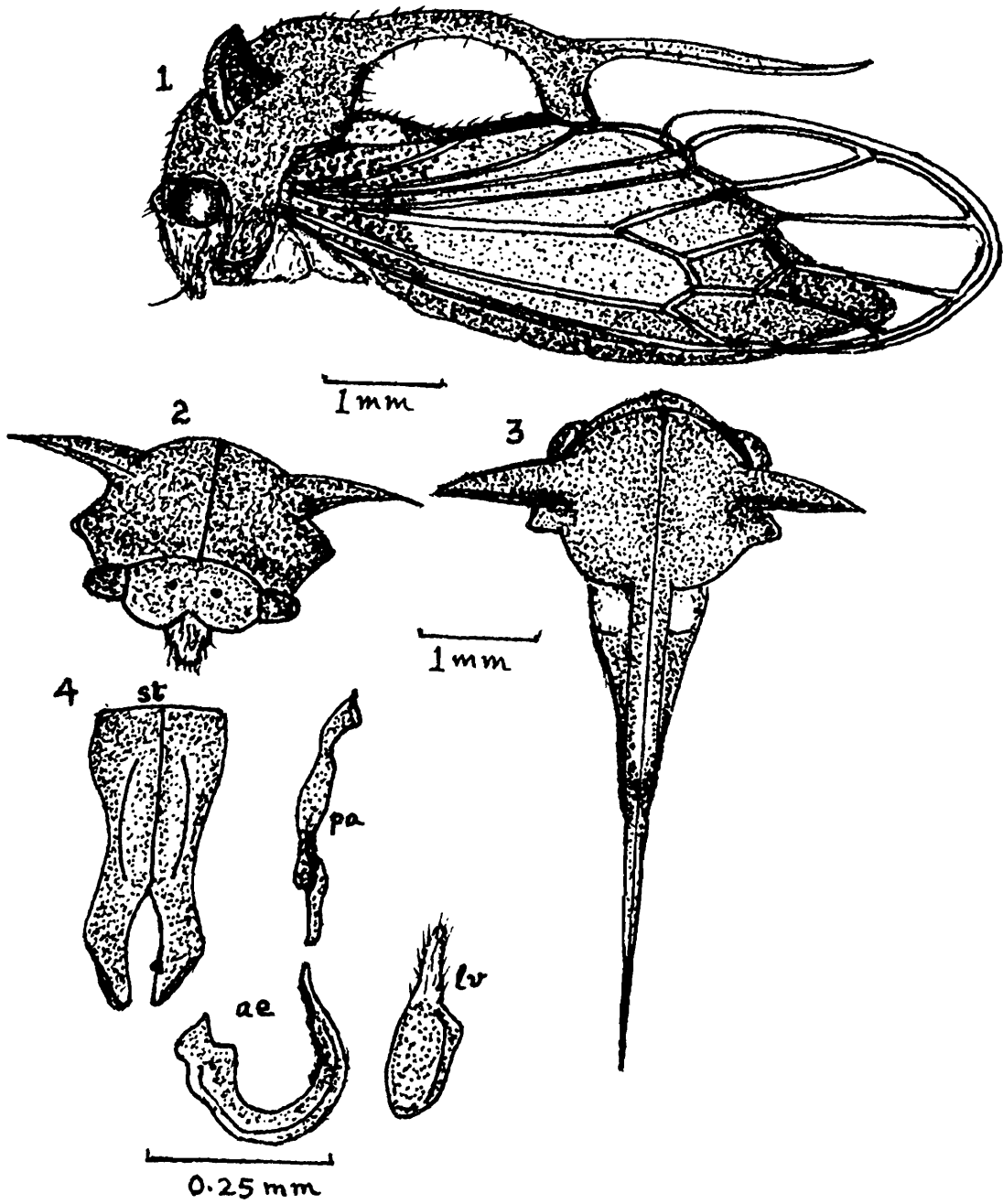


Fig. 134 : *Dograna suffulta* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 4. Genitalia of male.

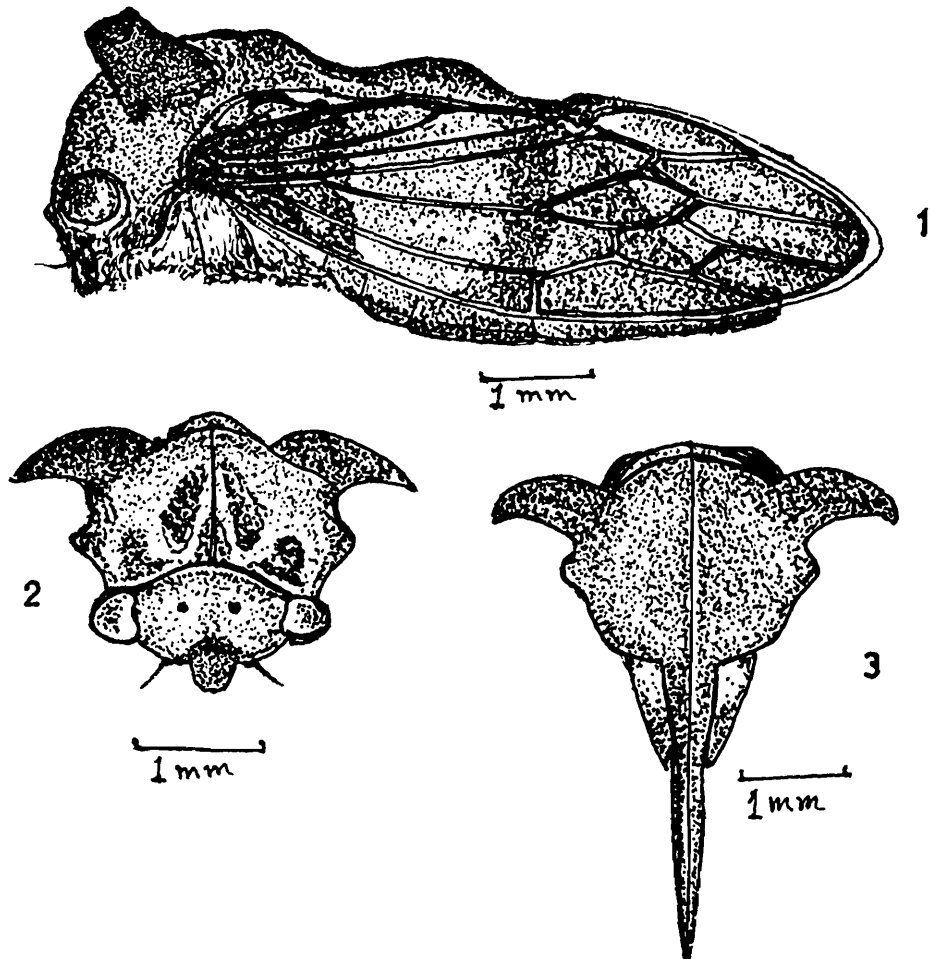


Fig. 135 : *Imporcitor typicus* Distant. Female. 1. Lateral view ; 2. Frontal view ; 3. Dorsal view of pronotum.

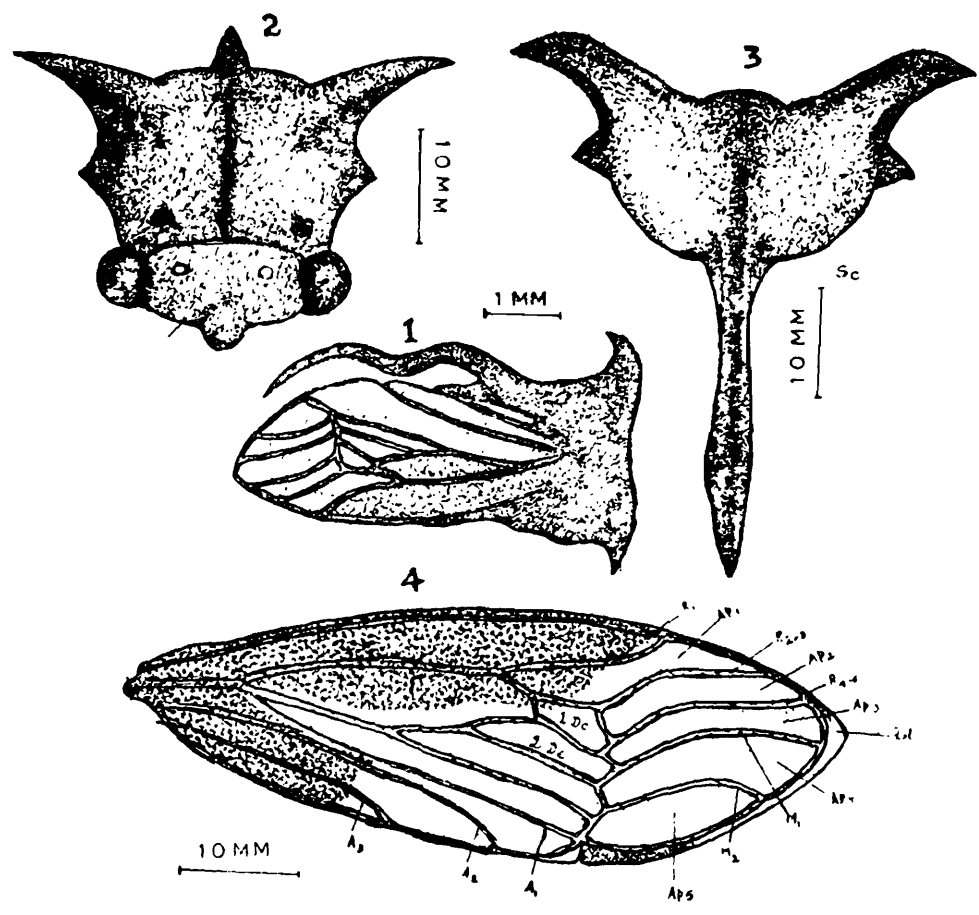


Fig. 136 : *Pogonotus indicus* Thirumalai & Ananthasubramanian. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum ; 4. Tegmen.

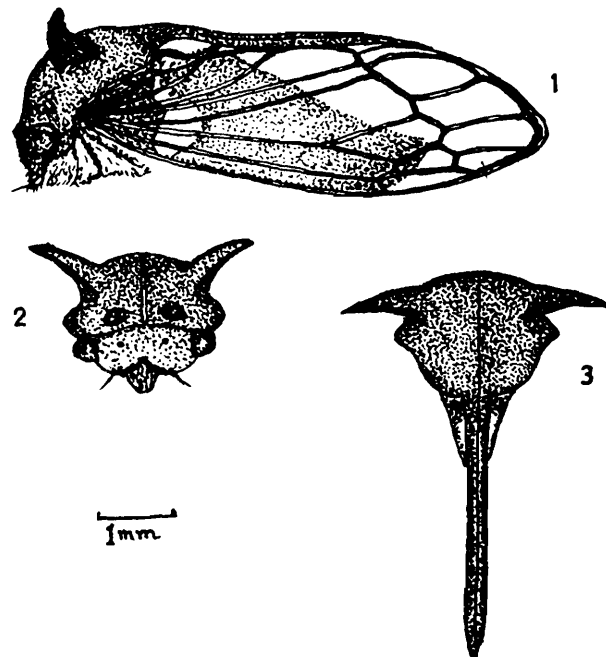


Fig. 137 : *Convector cavendus* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

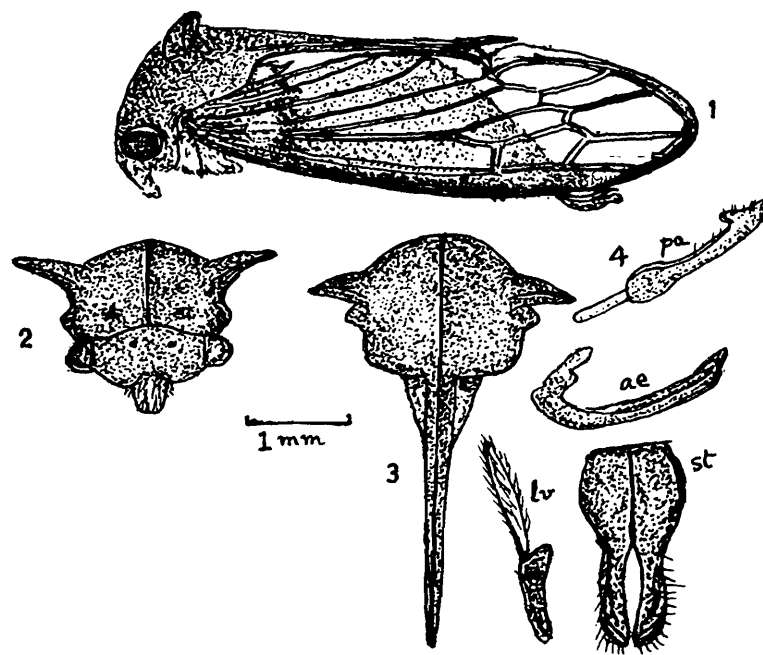


Fig. 138 : *Otinotus albomaculatus* Distant. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum ; 4. Male genitalia.

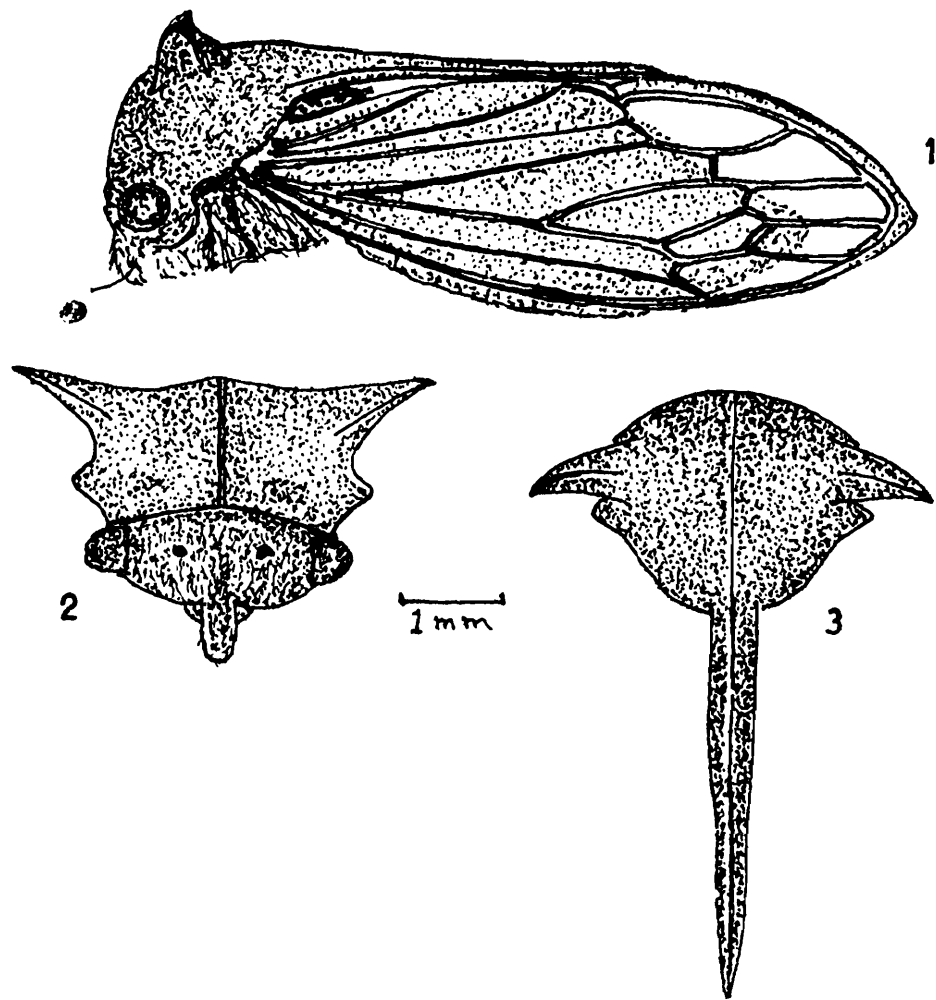


Fig. 139 : *Otinotus ammon* Buckton. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

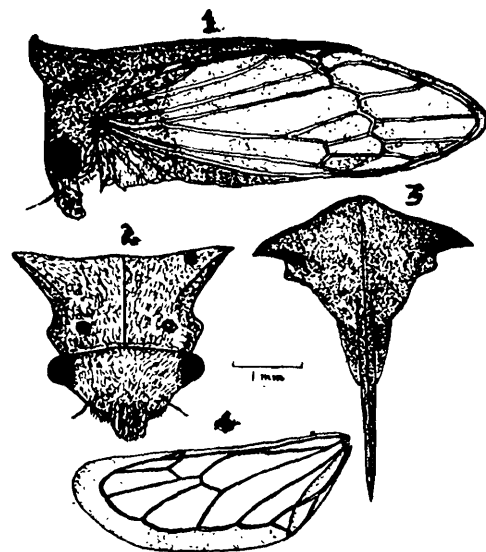


Fig. 140 : *Otinotus aureus* Ananthasubramanian. Female. 1. Lateral view of head and pronotum ; 3. Dorsal view of pronotum ; 4. Hindwing.

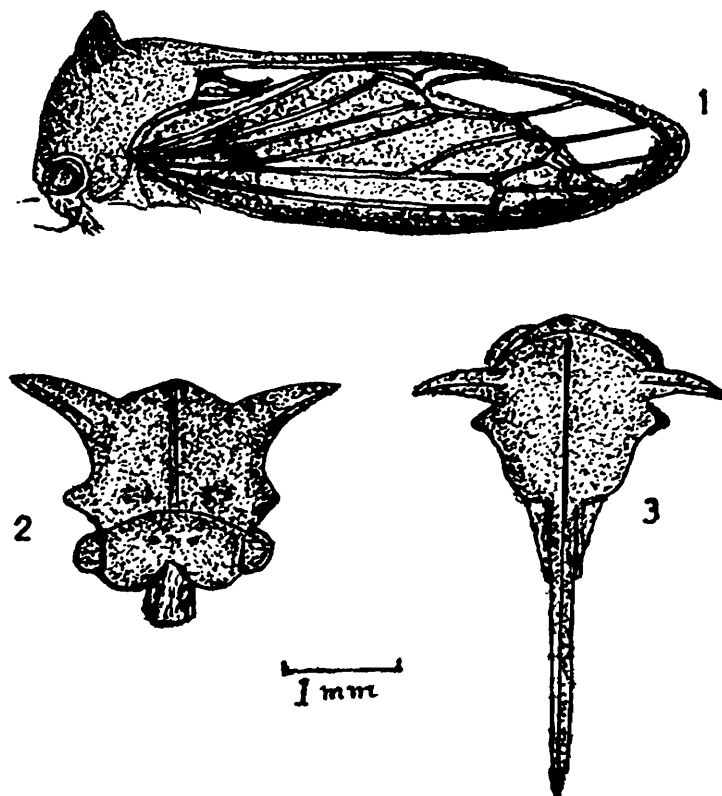


Fig. 141 : *Otinotus badius* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; Dorsal view of pronotum.

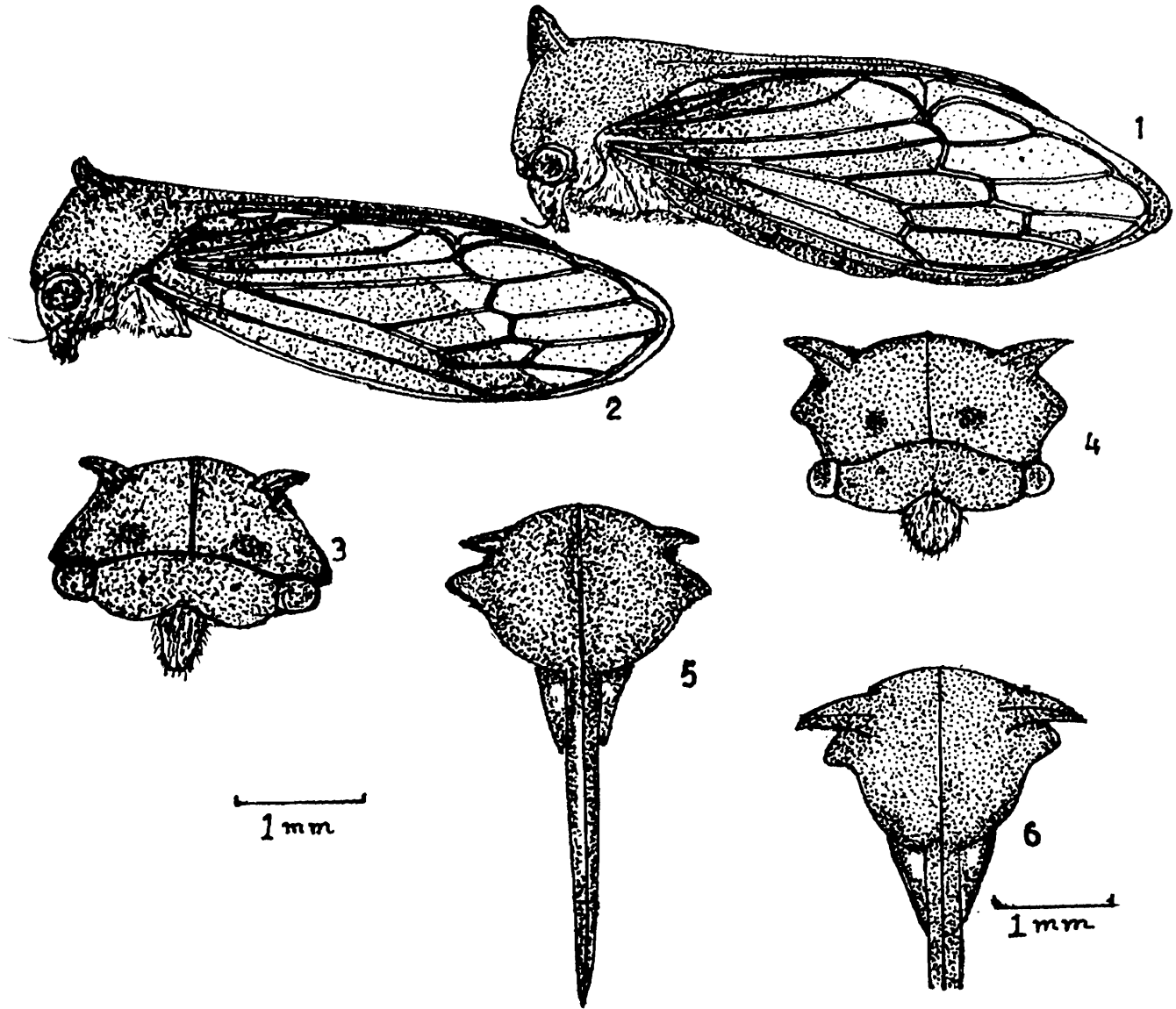


Fig. 142 : *Otinotus brevicornis* Distant. 1. Female, lateral view ; 2. Male, lateral view ; 3. Male, frontal view of head and pronotum ; 4. Female, frontal view of head and pronotum ; 5. Male, Dorsal view of pronotum ; 6. Female, dorsal view of pronotum.

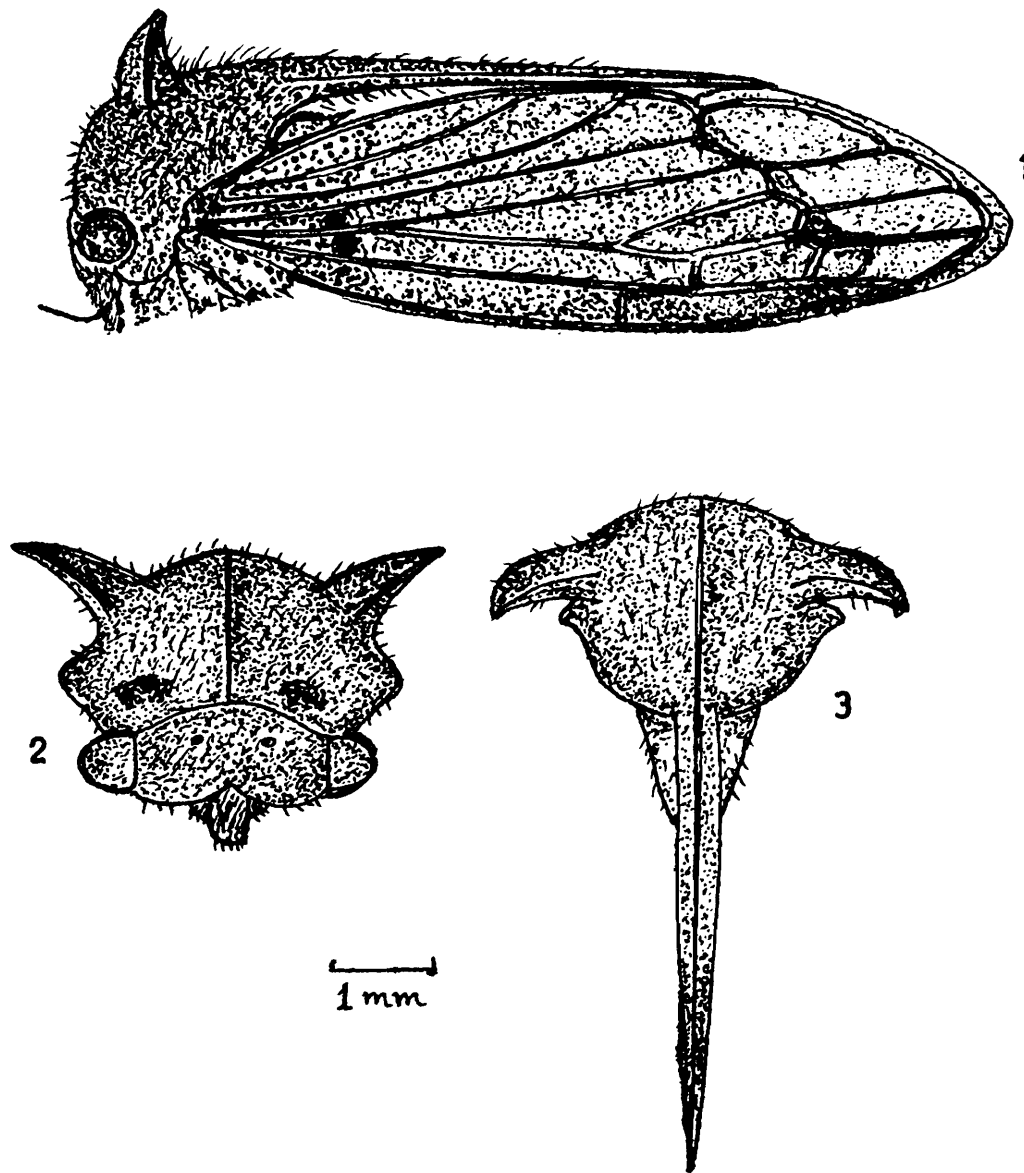


Fig. 143 : *Otinotus campbelli* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dors view of pronotum.

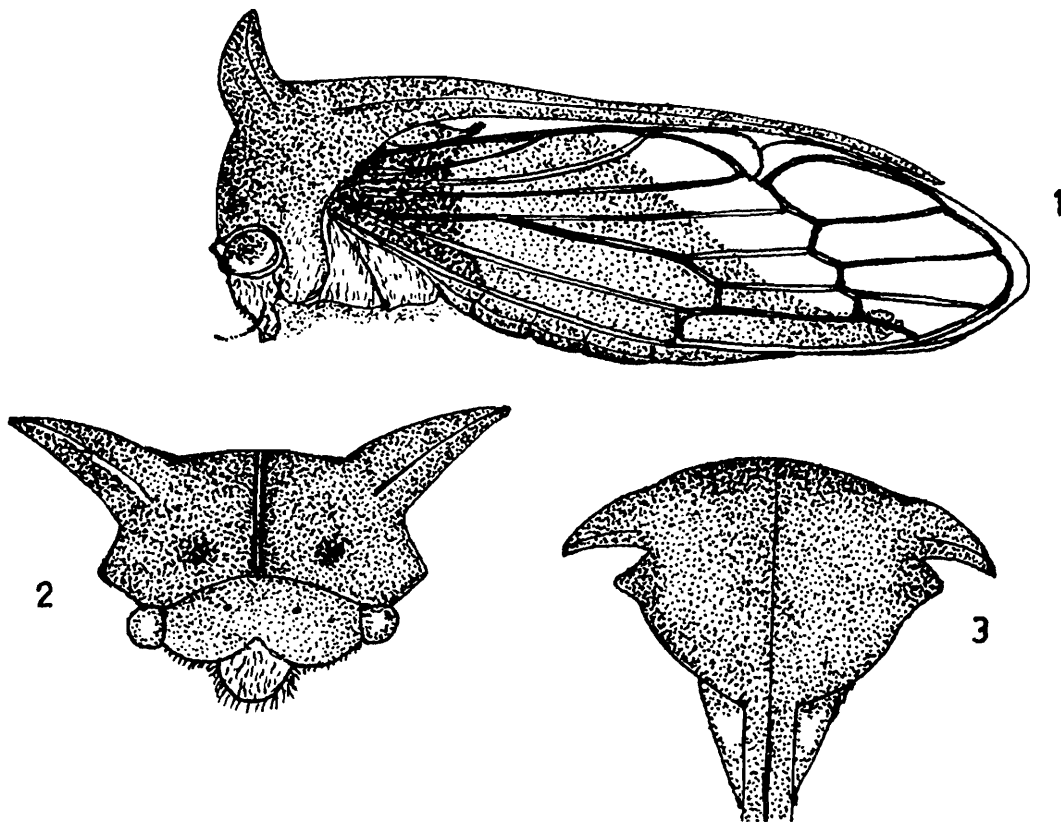


Fig. 144 : *Otinotus elongatus* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

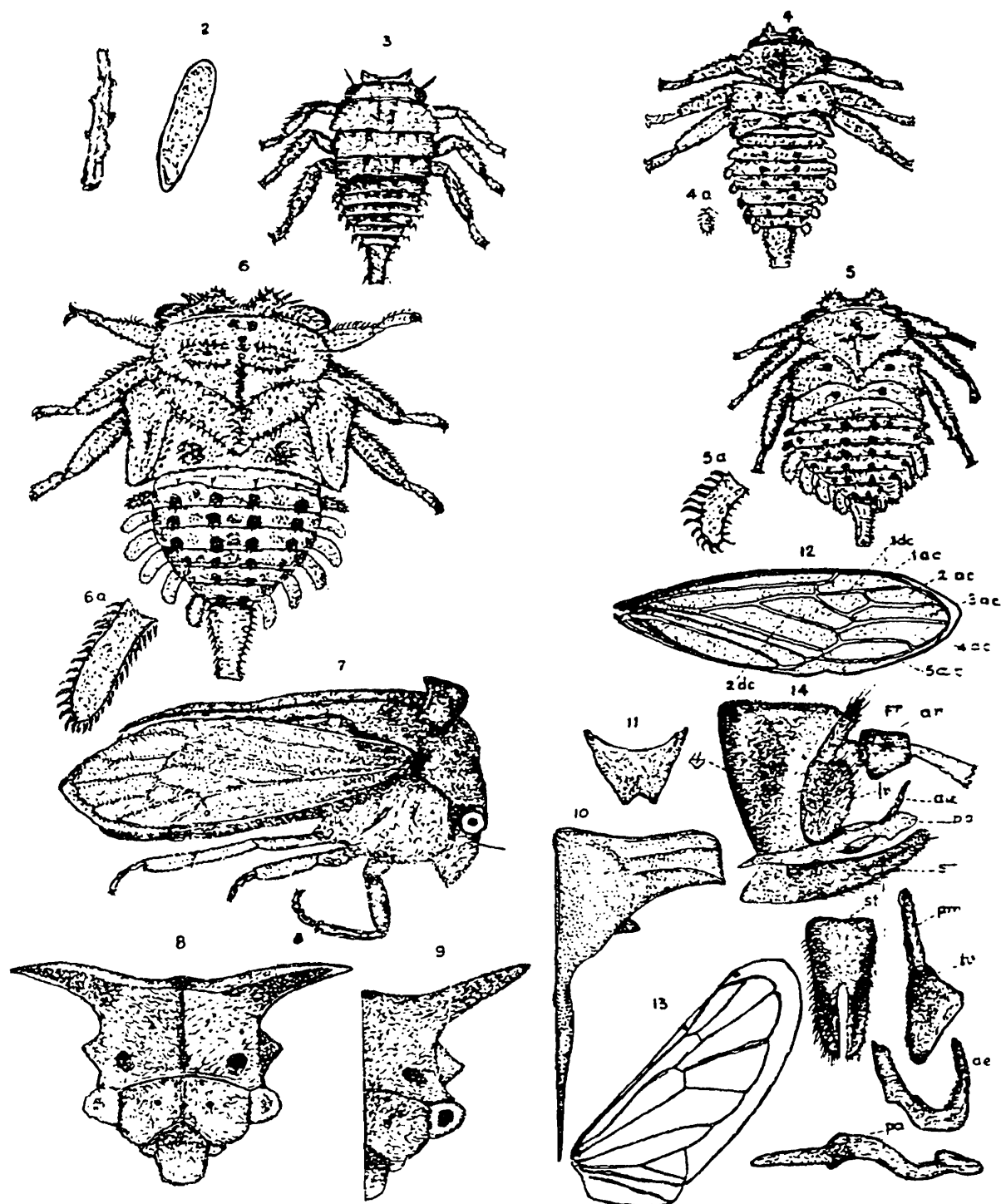


Fig. 145 : *Otinotus indicatus* (Melichar). 1. Egg slits on host stem ; 2. An egg ; 3-6. Frist, second, fourth and fifth instars nymphs ; 7. Female, lateral view ; 8. Female, frontal view of head and pronotum ; 9. Male, frontal view ; 10 Male, dorsal view of pronotum (left half) ; 11. Scutellum ; 12. Tegmina ; 13. Hind wing ; 14. Male genitalia.

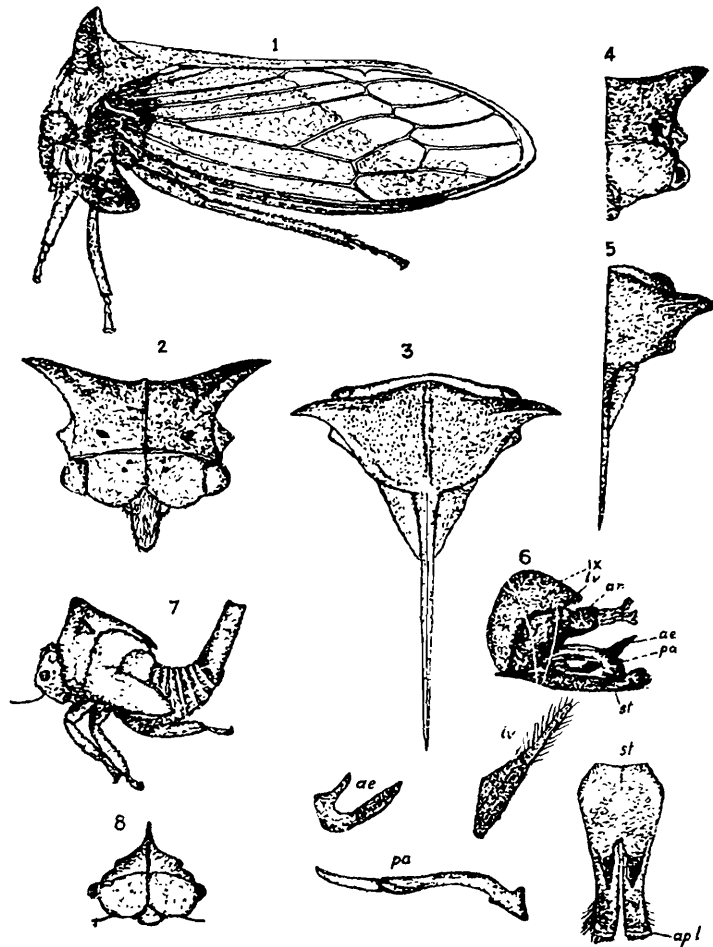


Fig. 146 : *Otinotus mimicus* Distant. 1. Female, lateral view ; 2. Female, frontal view of head and pronotum ; 3. Female, dorsal view of pronotum ; 4. Male, Frontal view of head and pronotum (right half) ; 5. Male, Dorsal view of pronotum (right half) ; 6. Male genitalia ; 7. Fifth instar nymph ; 8. Frontal view of head and pronotum of 5th instar nymph.

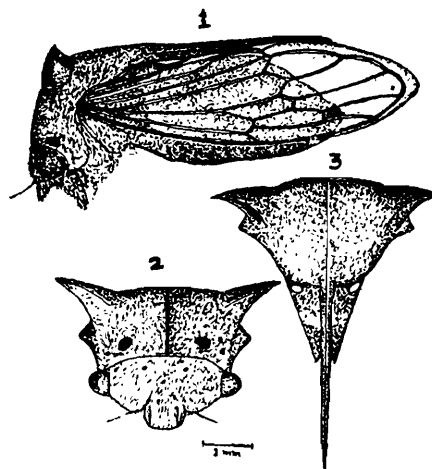


Fig. 147 : *Otinotus mysorensis* Ananthasubramanian. Female. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

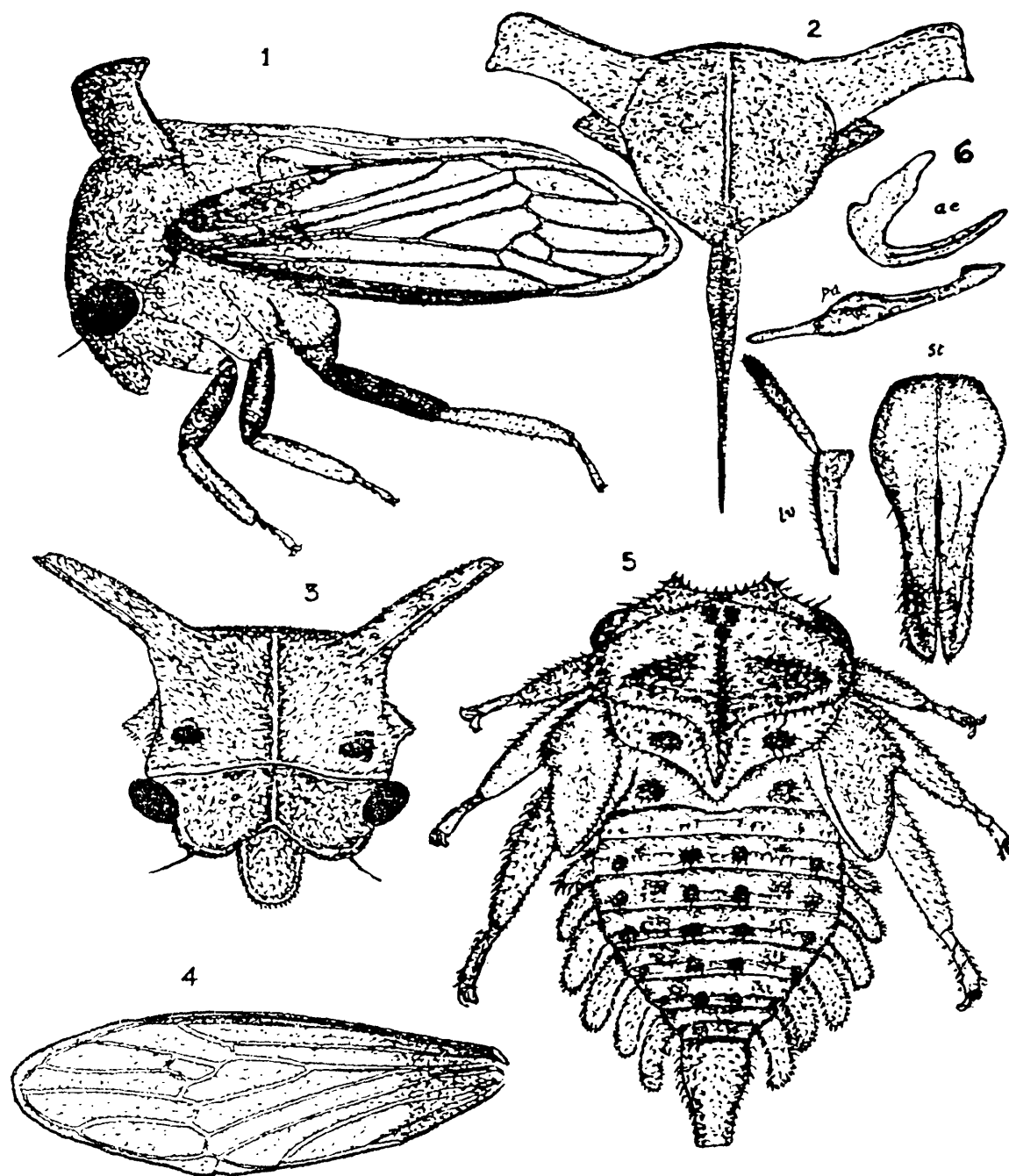


Fig. 148 : *Otinotus obliquus* Ananthasubramanian & Ananthakrishnan. 1. Female, lateral view ; 2. Female, Dorsal view of pronotum ; 3. Female, frontal view of head and pronotum ; 4. Tegmen ; 5. Fifth instar nymph (dorsal view) ; 6. Male genitalia.

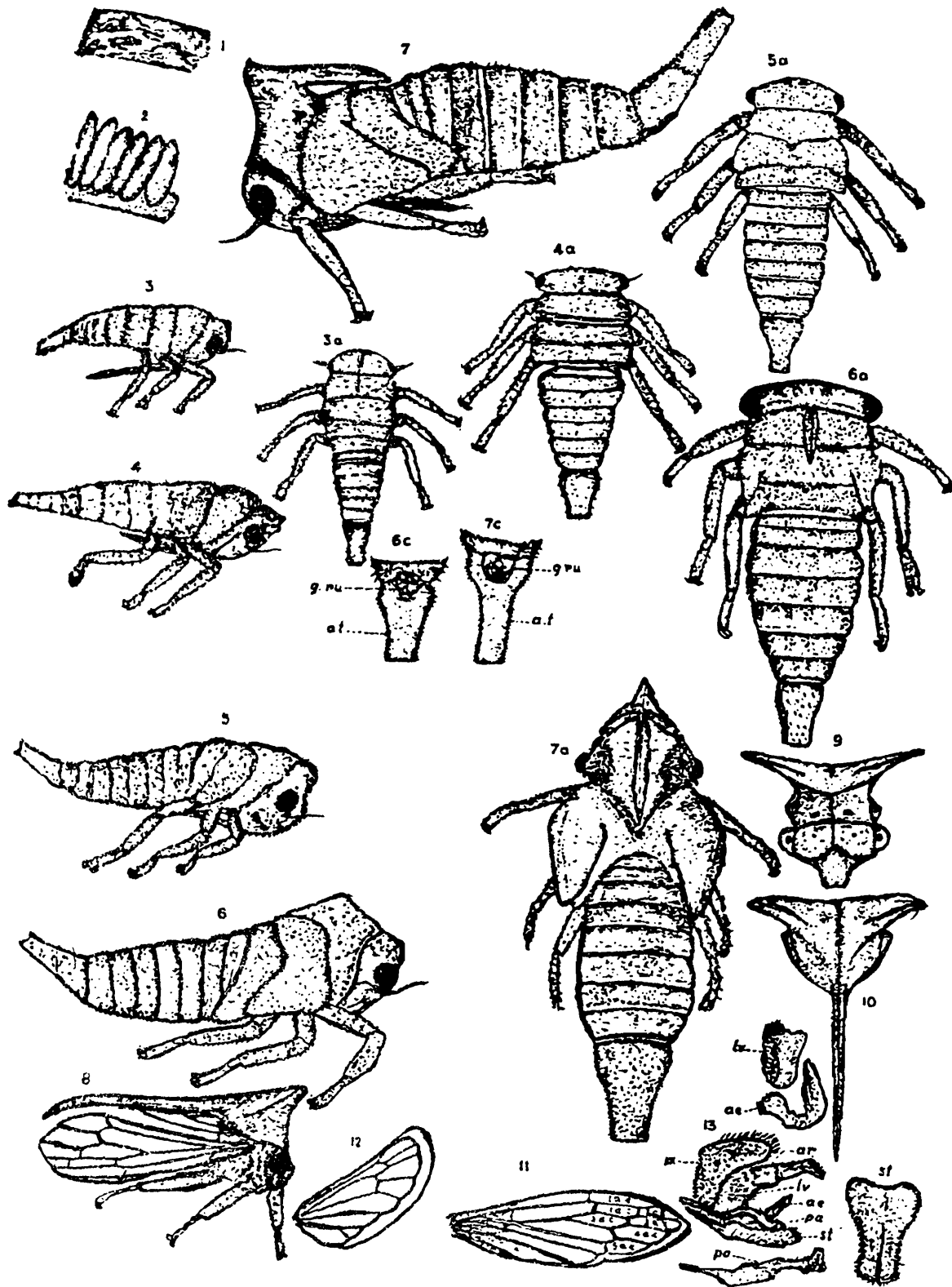


Fig. 149 : *Otinotus oleratus* (Walker). 1. Egg mass on host stem ; 2. An egg mass ; 3-7. First to fifth instar nymphs, lateral view ; 3a-7a. First to fifth instar nymphs, dorsal view ; 8. Female, lateral view ; 9. Female, frontal view of head and pronotum ; 10. Female, Dorsal view of pronotum ; 11. Tegmen ; 12. Hindwing ; 13. Male genitalia.

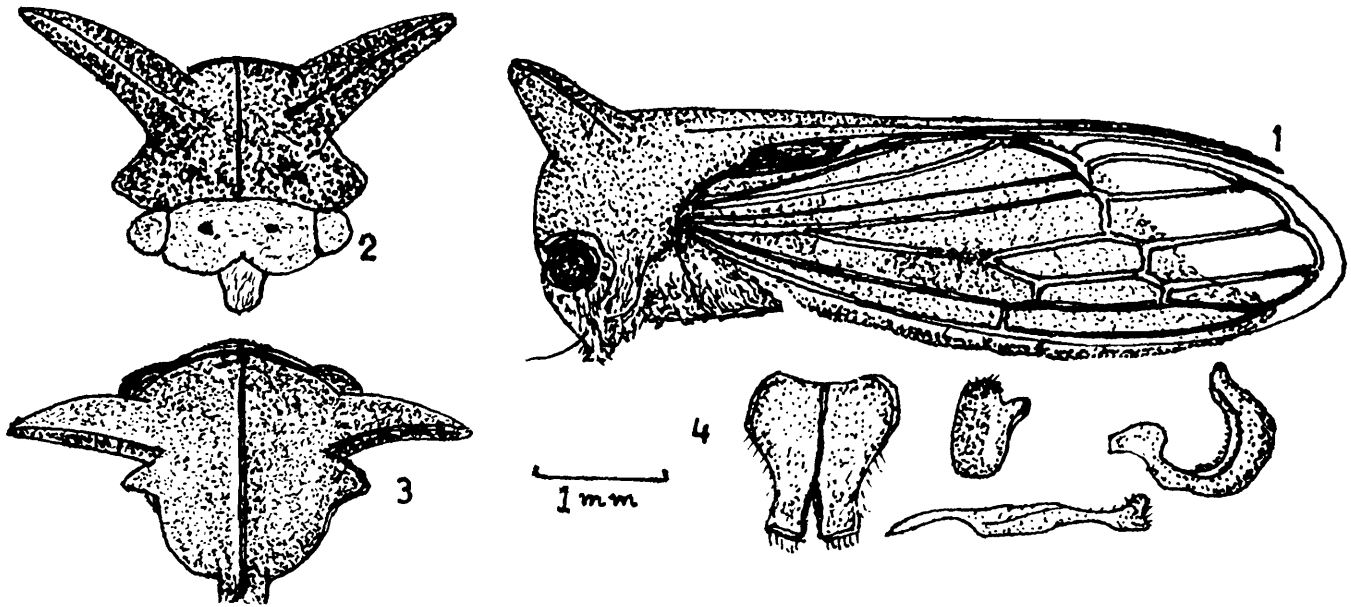


Fig. 150 : *Otinotus pallescens* Distant. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum ; 4. Male genitalia.

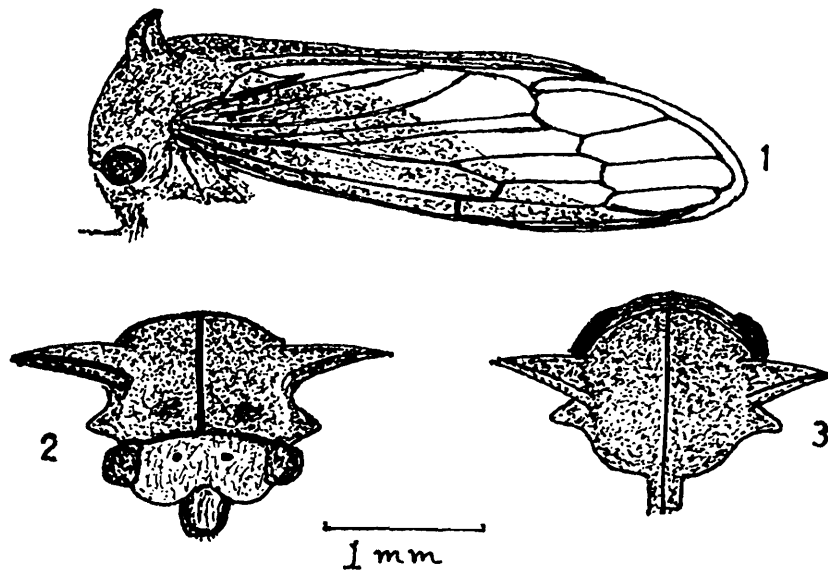


Fig. 151 : *Otinotus transversus* Distant. Msle. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3 Dorsal view of pronotum.

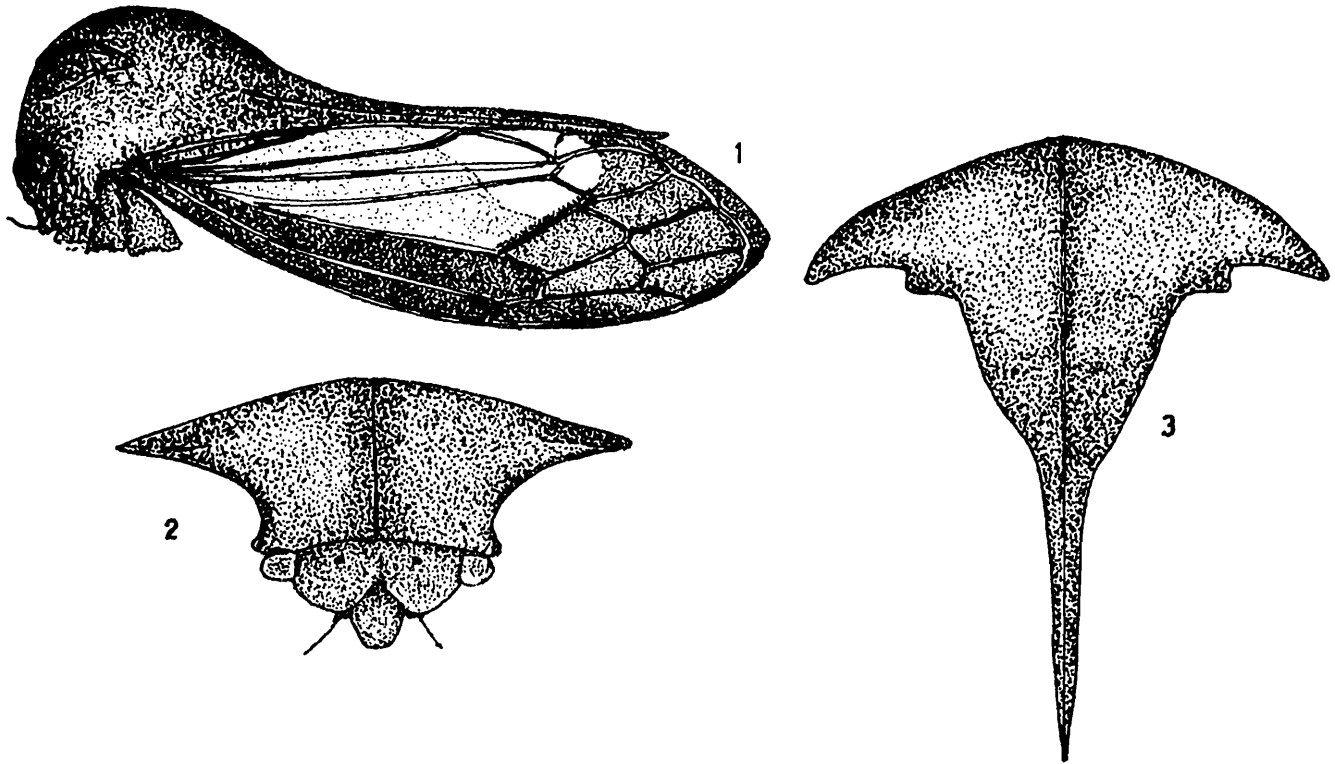


Fig. 152 : *Emphusis malleus* (Walker). Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

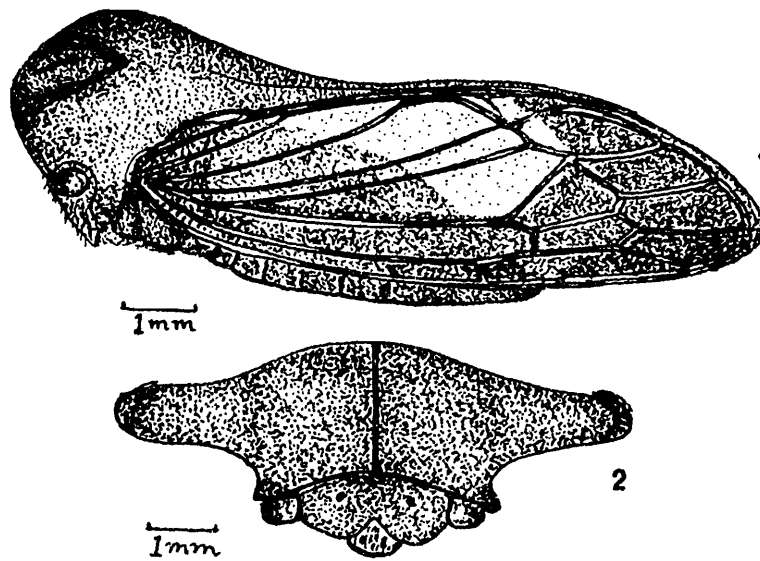


Fig. 153 : *Emphusis perarmata* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum.

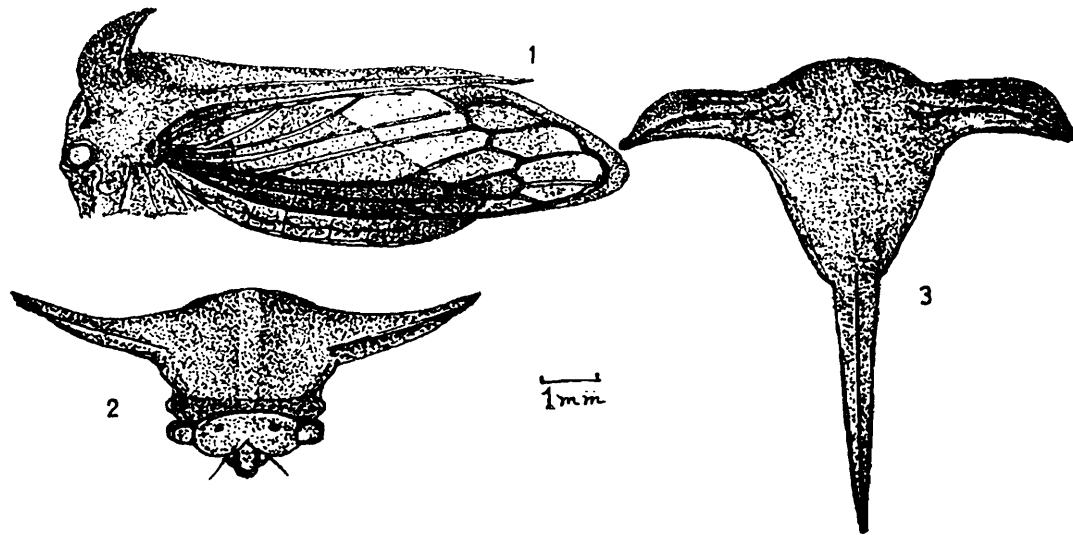


Fig. 154 : *Centrotypus assamensis* (Fairmaire). Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

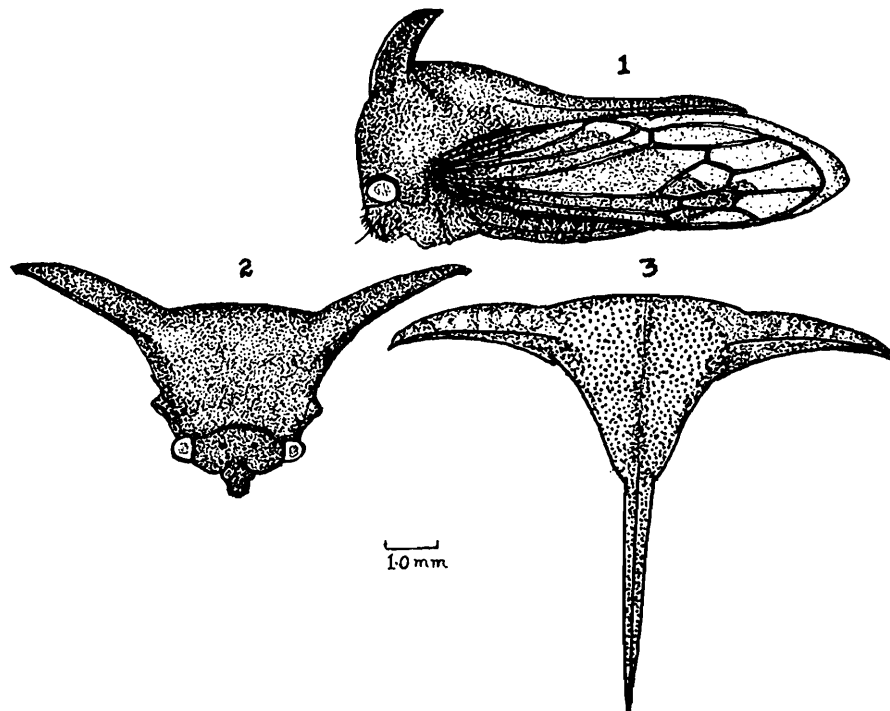


Fig. 155 : *Centrotypus flavescens* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

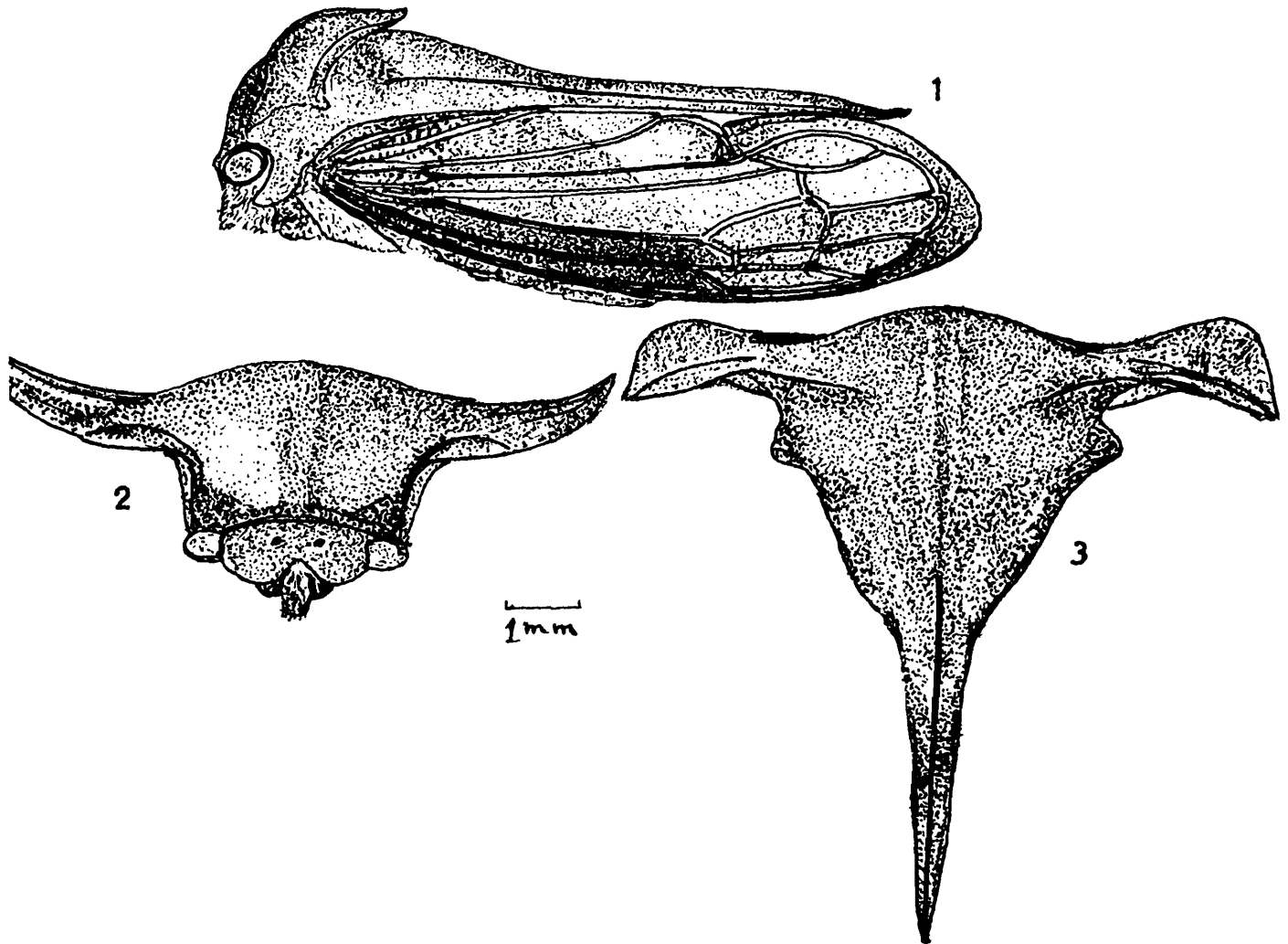


Fig. 156 : *Centrotypus flexuosus* (Fabricius). Female 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

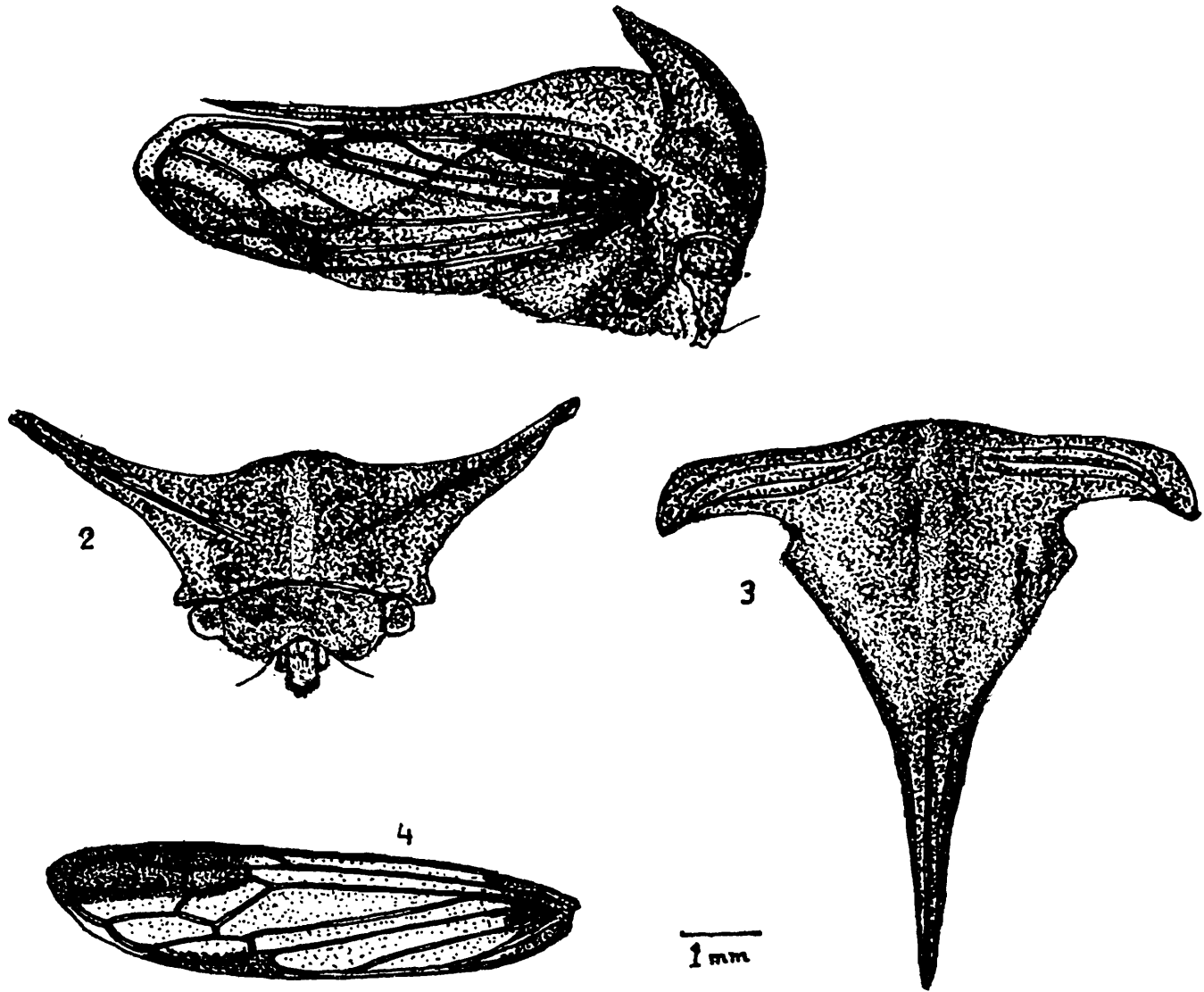


Fig. 157 : *Centrotypus malabaricus* n. sp. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3, Dorsal view of pronotum ; 4. Tegmen.

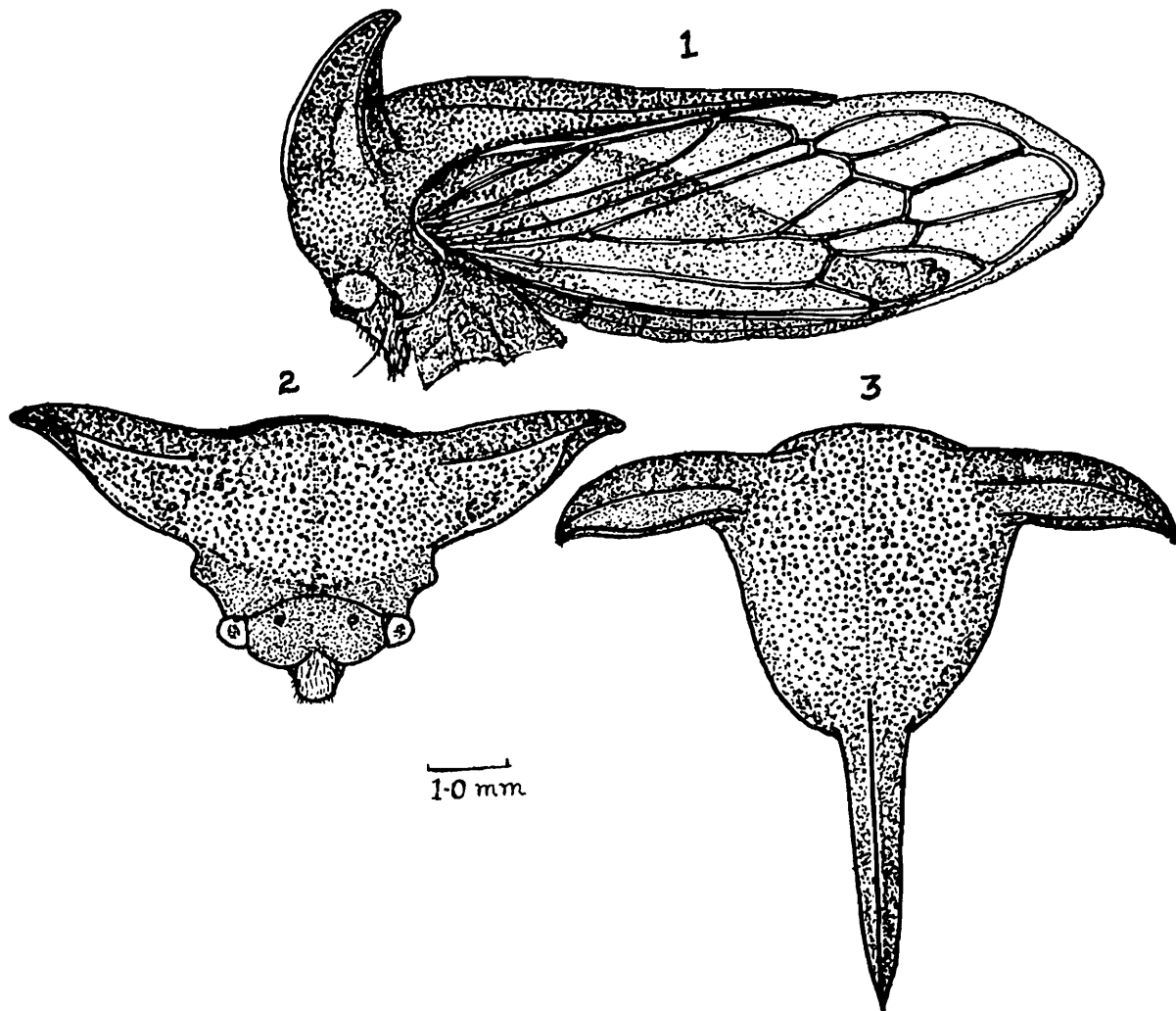


Fig. 158 : *Centrotypus ortus* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum : 3. Dorsal view of pronotum.

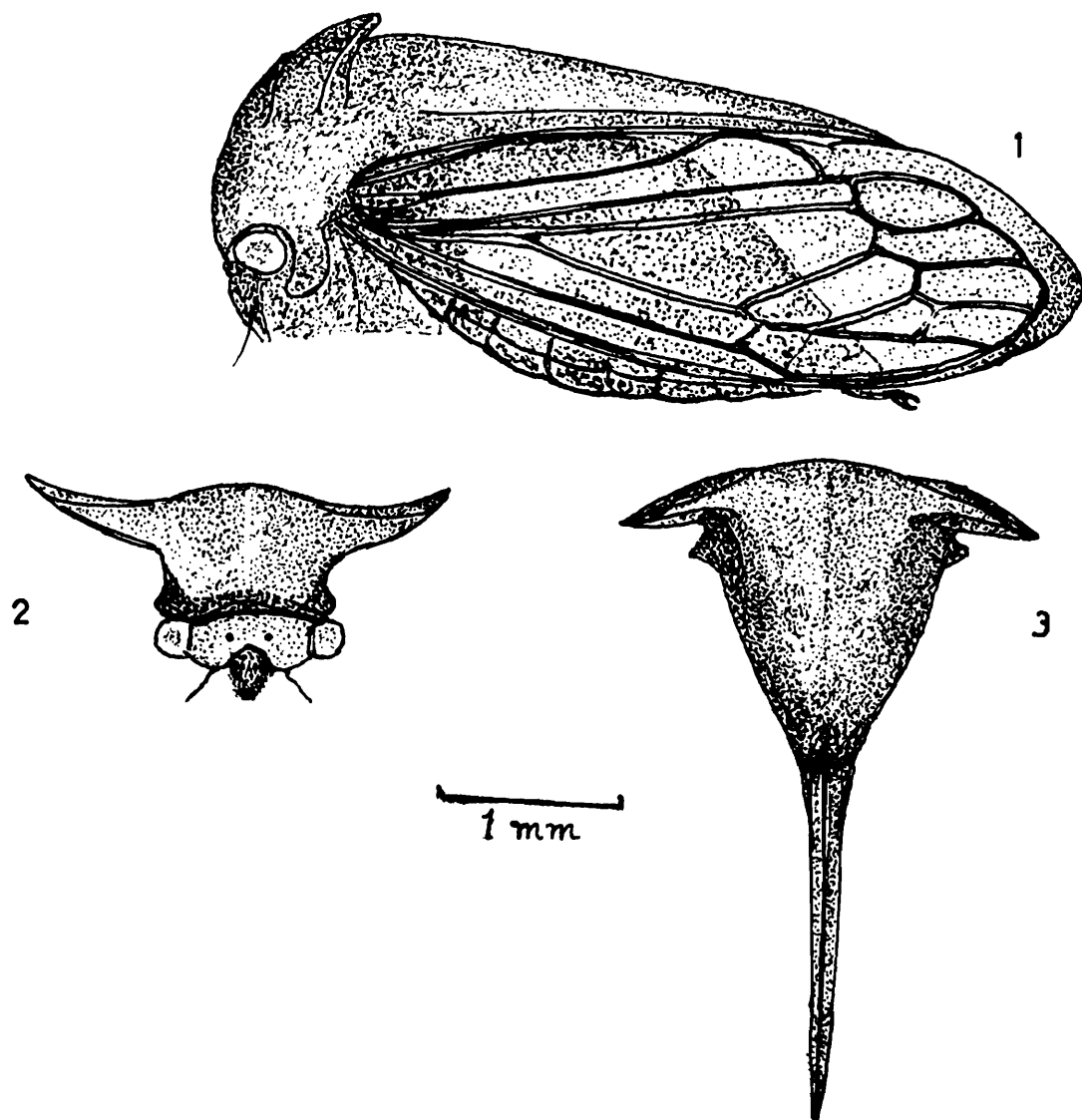


Fig. 159 : *Centrotypus parvus* Funkhouser. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

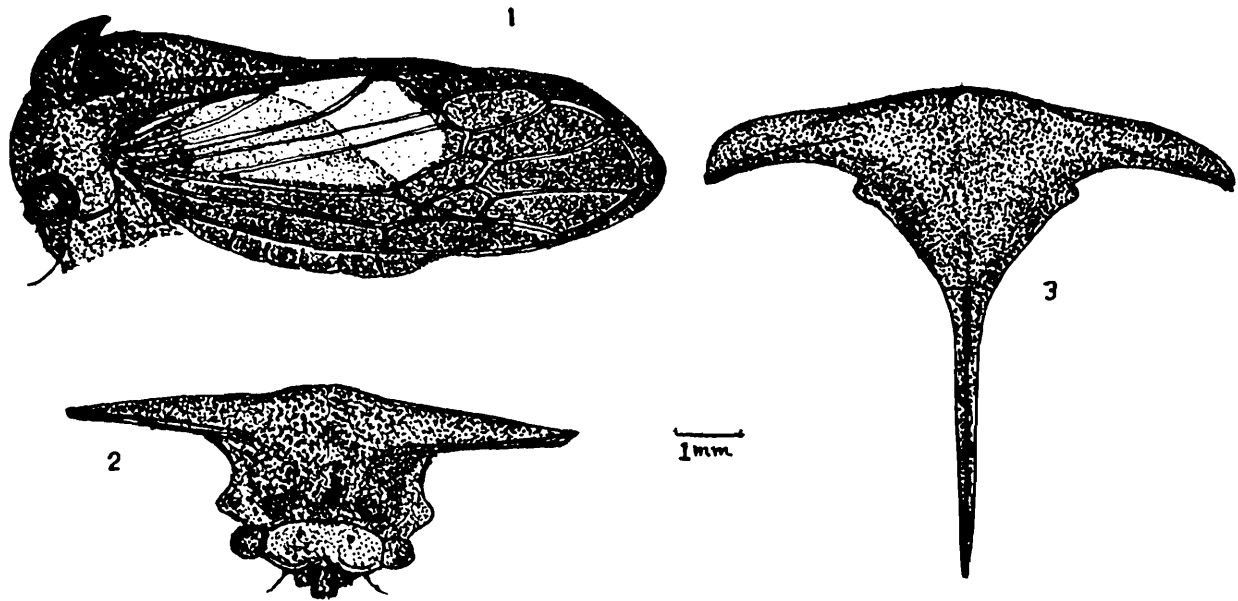


Fig. 160 : *Certrotypus pulniensis* n. sp. Female. 1. Lateral view ; Frontal view of head and pronotum ; 3 Dorsal view of pronotum.

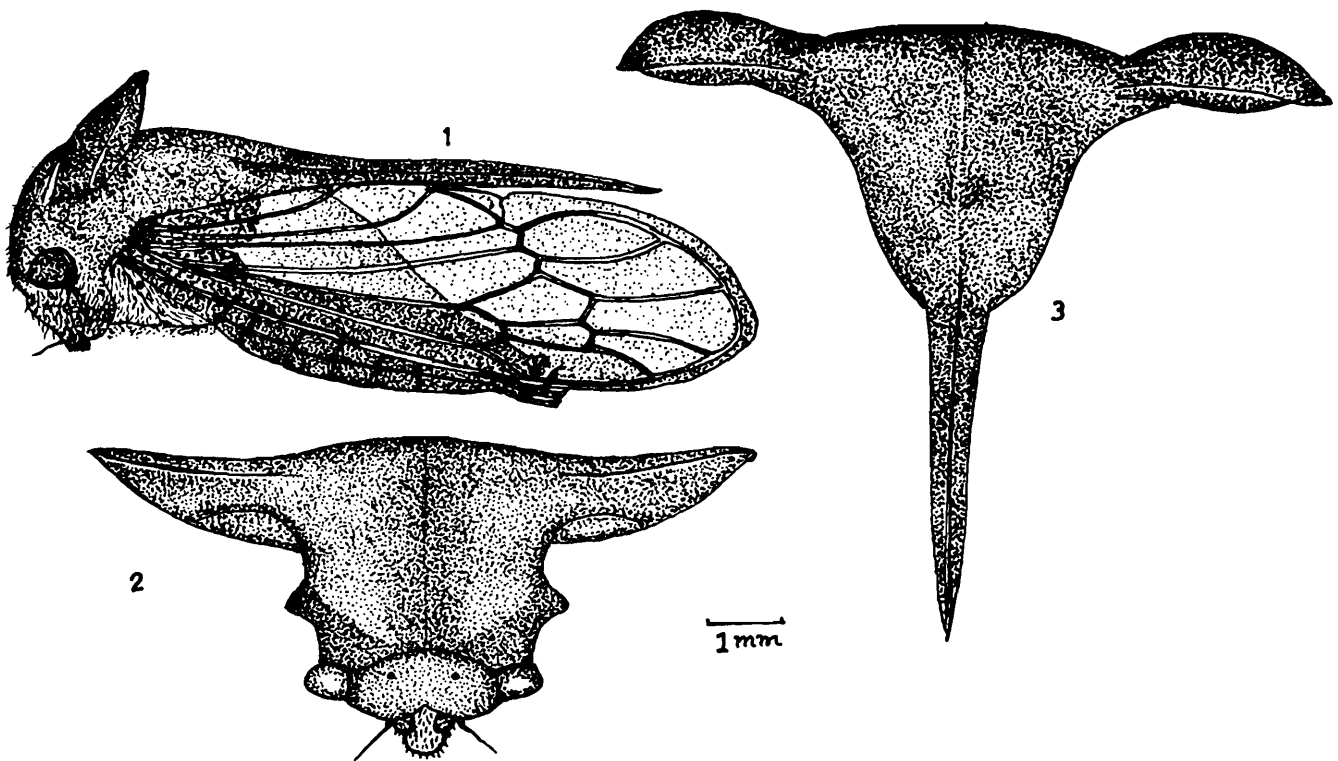


Fig. 161 : *Certrotypus securis* Buckton. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

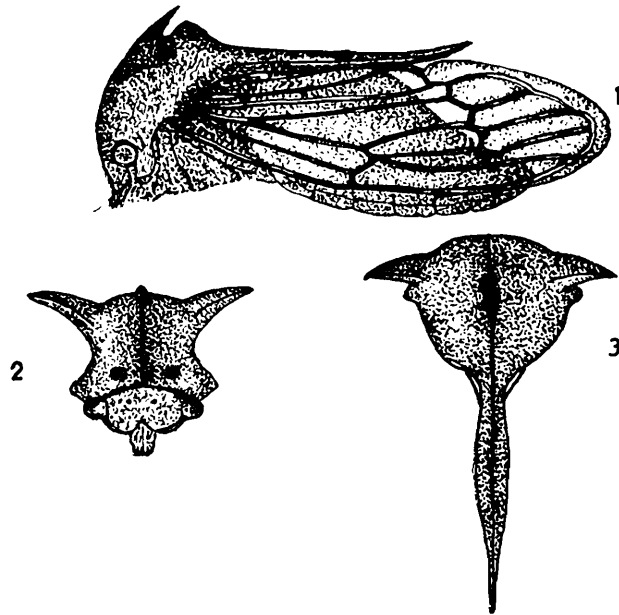


Fig. 162 : *Acanthuchus minutispinus* Funkhouser. Female. 1. Lateral view 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

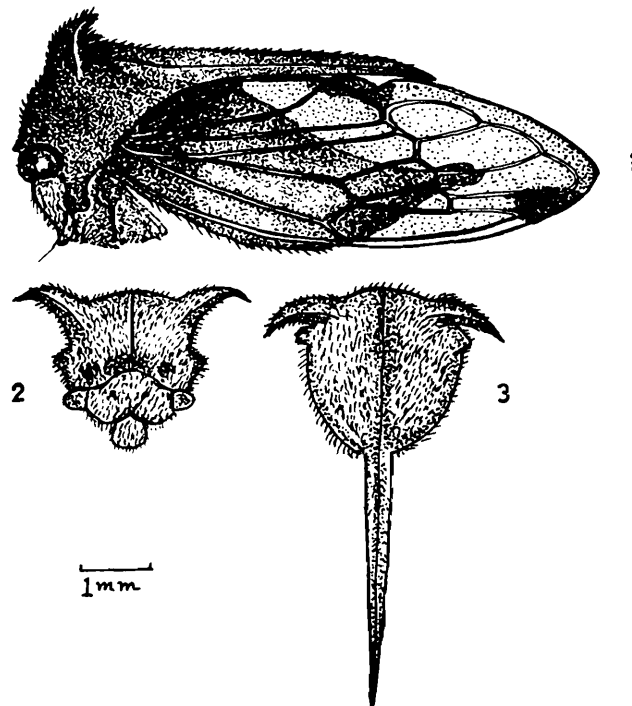


Fig. 163 : *periaman pilosum* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

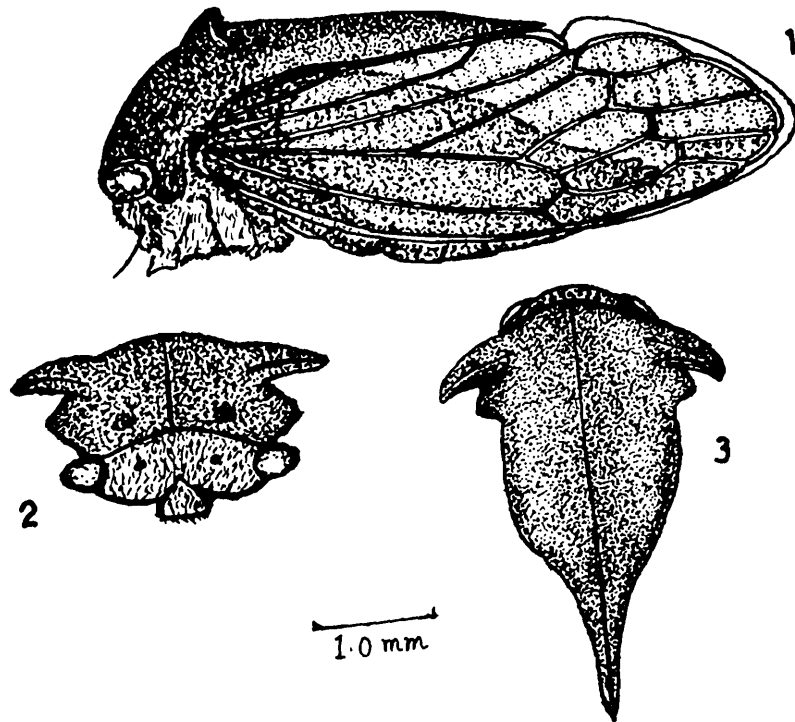


Fig. 164 : *Centruchus brevicornis* Funkhouser. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

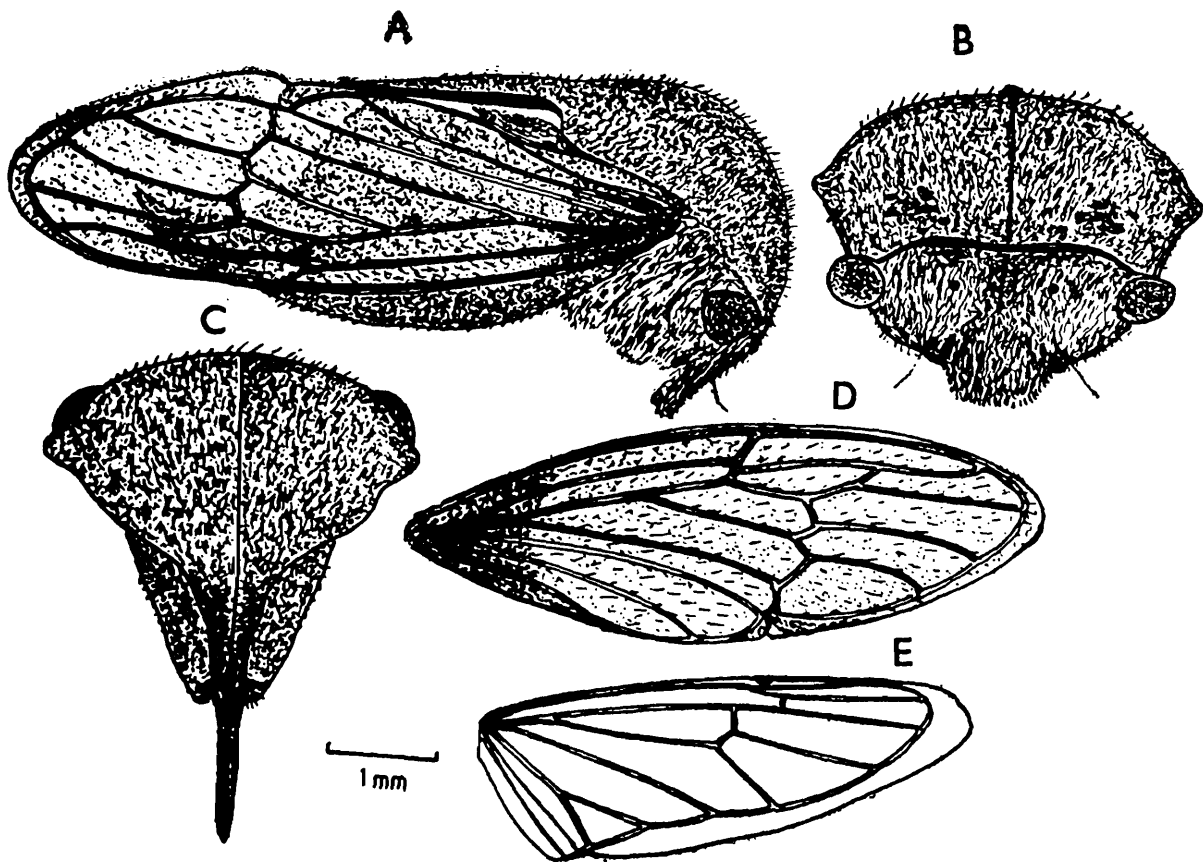


Fig. 165 : *Neocentrus rufus* Thirumalai & Ananthasubramanian. Female. A Lateral view.

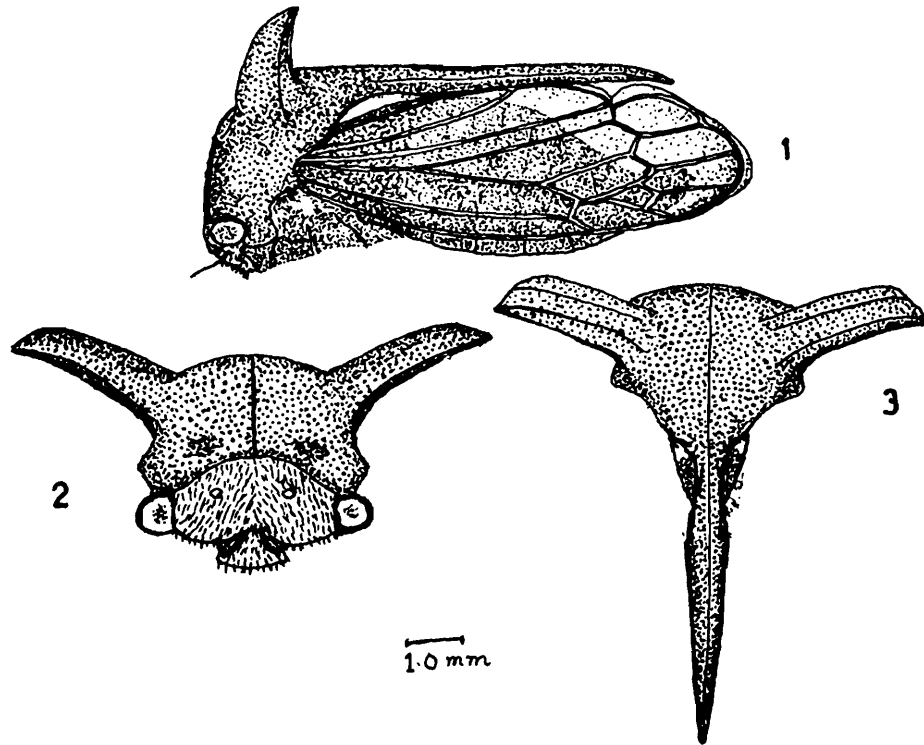


Fig. 166 : *Centrotus indicus* n. sp. Female. 1. Lateral view ; 2. Frontal view 3. Dorsal view of pronotum.

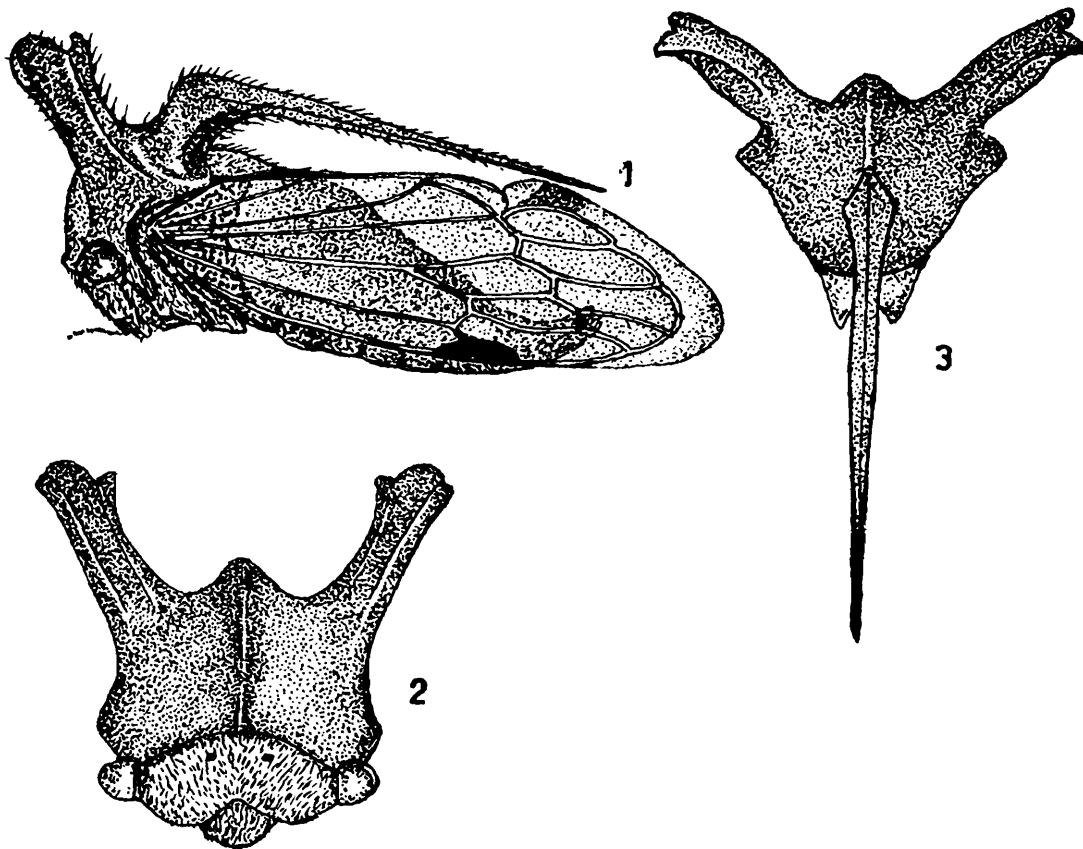


Fig. 167 : *Anchon echinatum* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

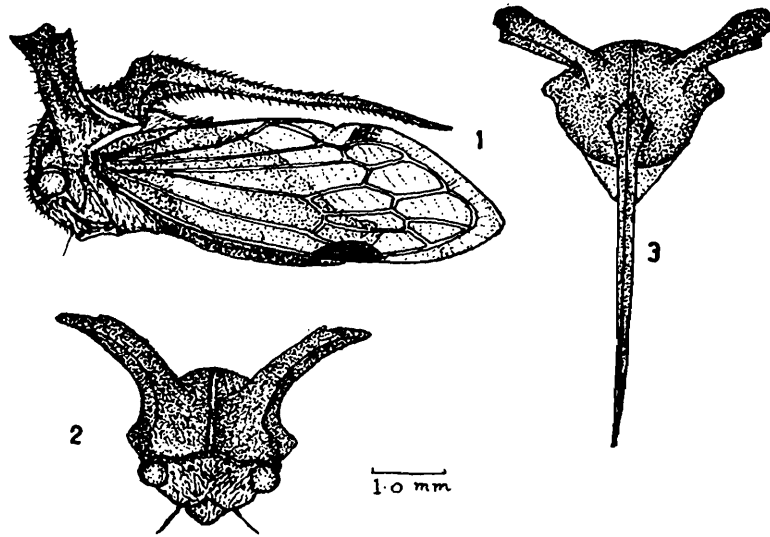


Fig. 168 : *Anchon pilosum* (Walker). Female. 1. Lateral view ; 2. Frontal view ; 3. Dorsal view of pronotum.

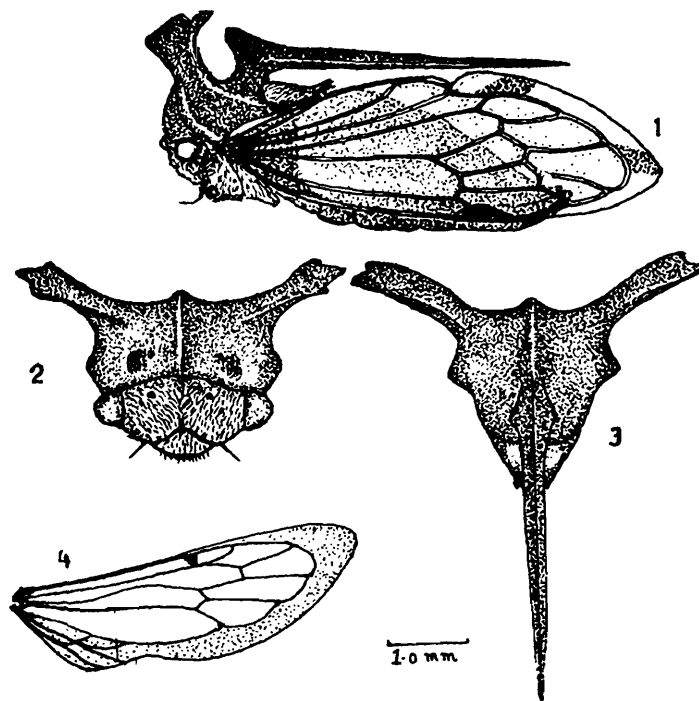


Fig. 169 : *Anchon rectangulatum* (Kirby). Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum ; 4. Hindwing.

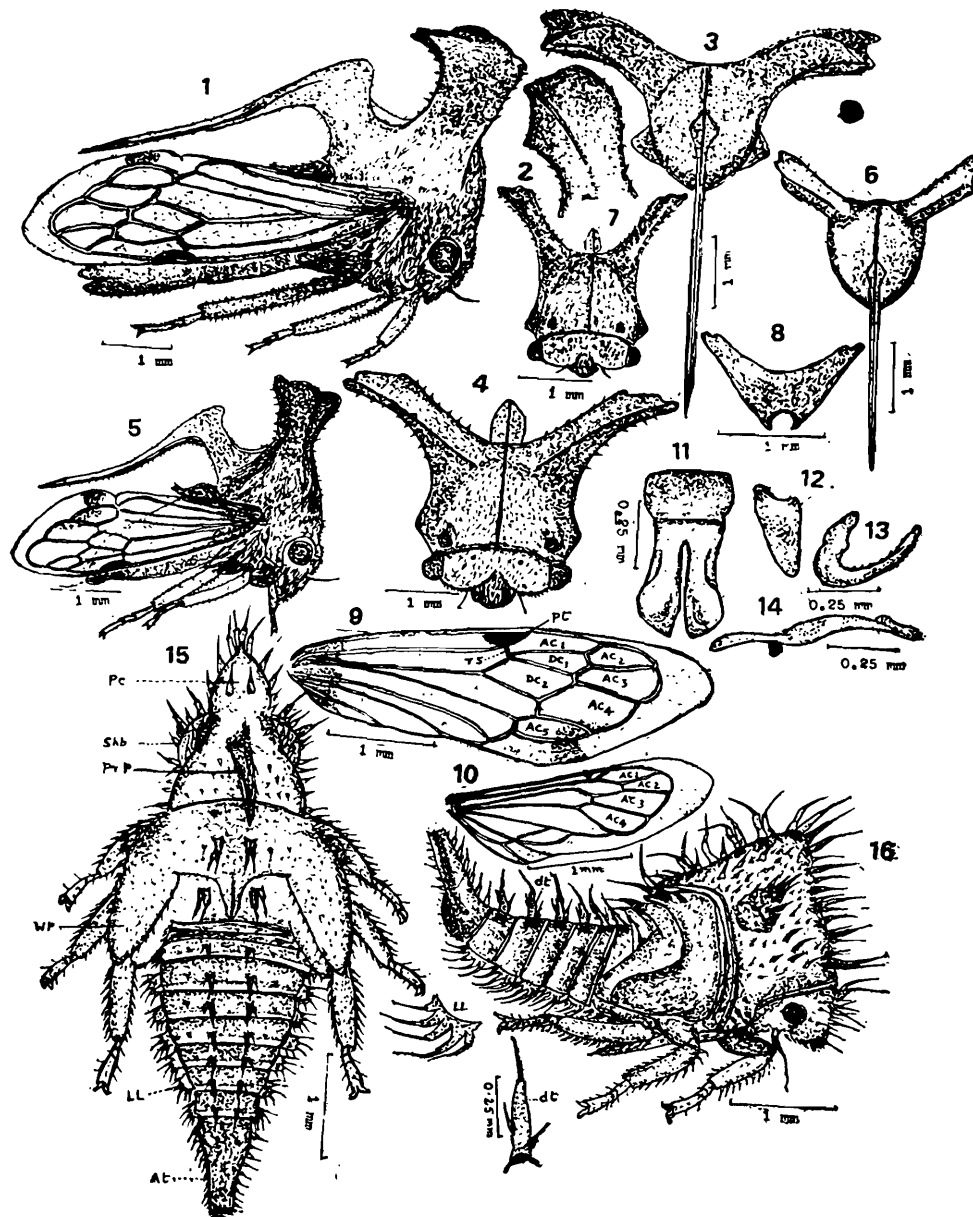


Fig. 170 : *Anchon ulniforme* Buckton. 1. Female, lateral view ; 2. Female, dorso-lateral view of the apex of horn ; 3. Female, dorsal view of pronotum ; 4. Female, frontal view of head and pronotum ; 5. Male, lateral view ; 6. Male, dorsal view of pronotum ; 7. Male frontal view of head and pronotum ; 8. Scutellum ; 9. Tegmen ; 10. Male, Hind wing ; 11-14. Parts of male genitalia ; 15. Fifth nymphal instar, dorsal view ; 16. Fifth nymphal instar, lateral view.

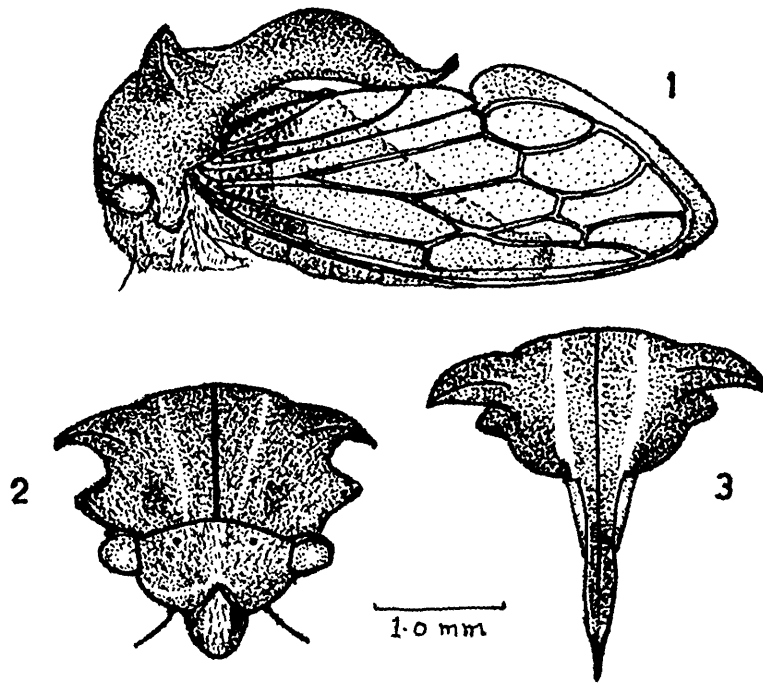


Fig. 171 : *Antialcidas attenuatus* Funkhouser. Female. 1. Lateral view ; 2. Frontal view of head and pronotum. 3. Dorsal view of pronotum.

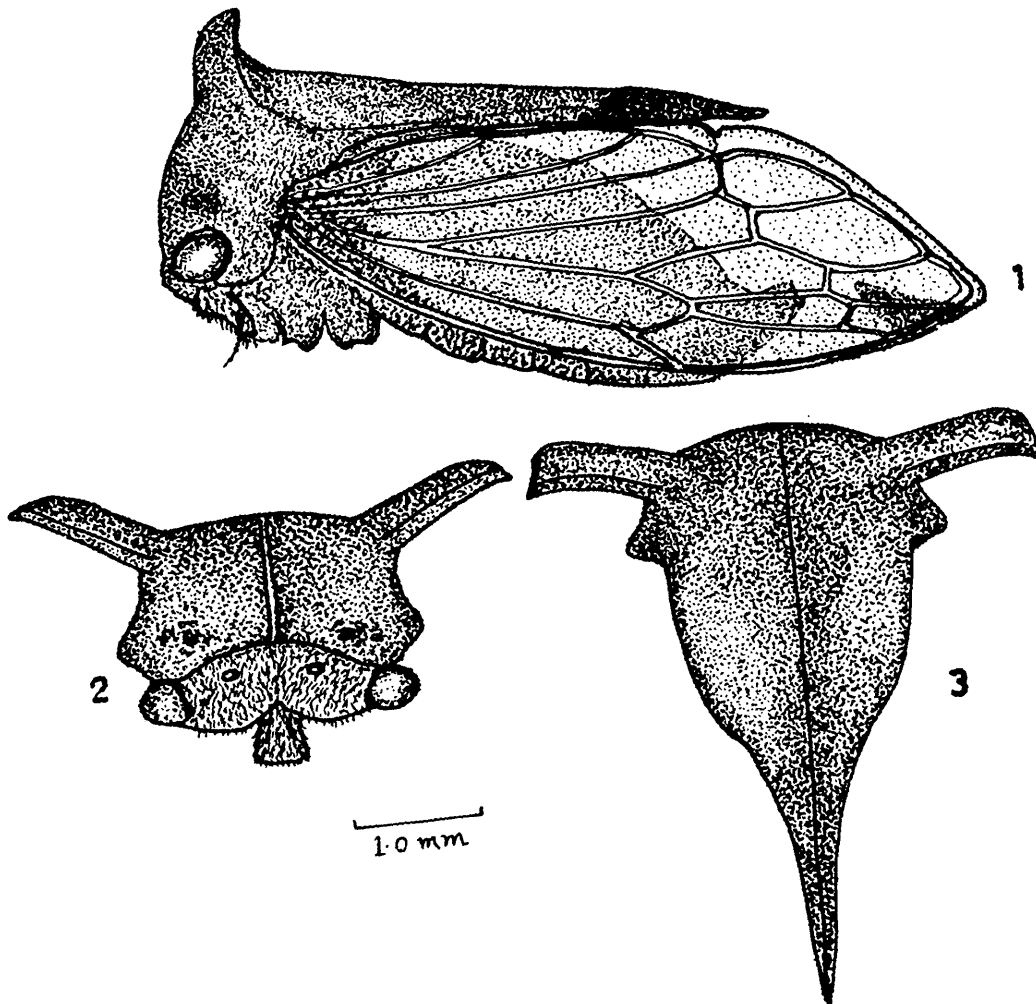


Fig. 172 : *Maurya bicolor* Funkhouser. Female. 1. Lateral view ; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

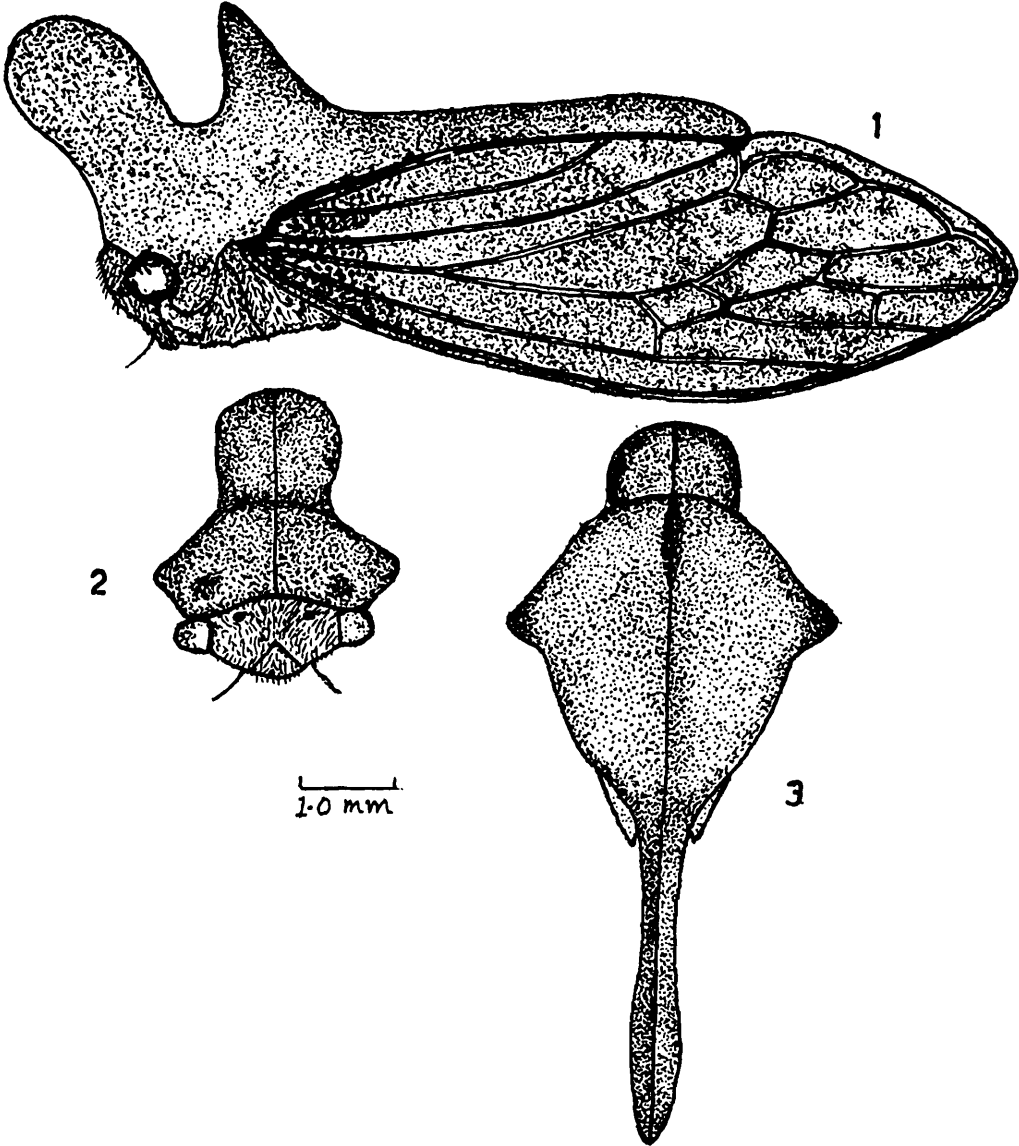


Fig. 173 : *Insitoroides typicus* Funkhouser. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

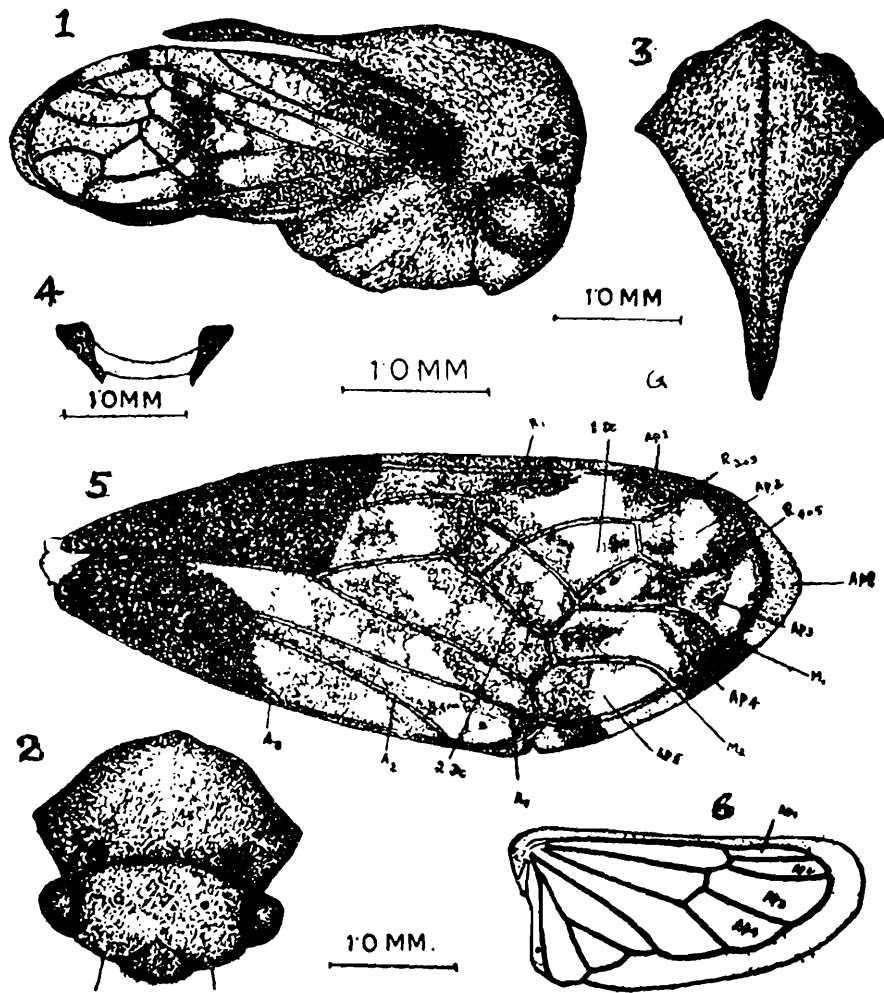


Fig. 174 : *Aleptocentrus notabilis* Thirumalai & Ananthasubramanian. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum ; 4. Scutellum ; 5. Tegmen. 6. Hind wing.

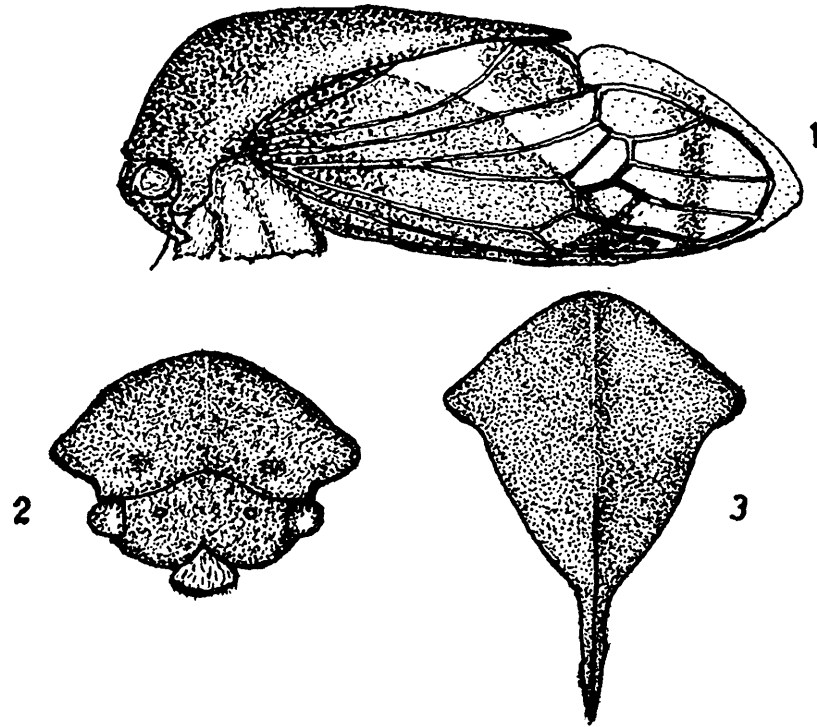


Fig. 175 : *Cryptaspidia fasciata* Funkhouser. Male. 1. Lateral view 2. Frontal view of head and pronotum ; 3, Dorsal view of pronotum.

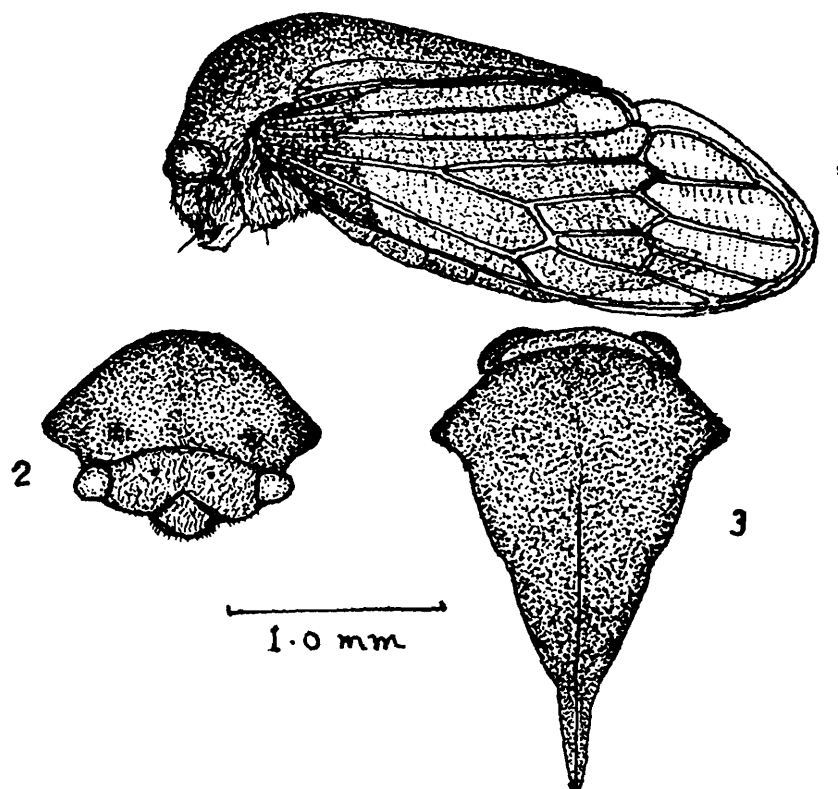


Fig. 176 : *Cryptaspidia piceola* (Melichar). Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

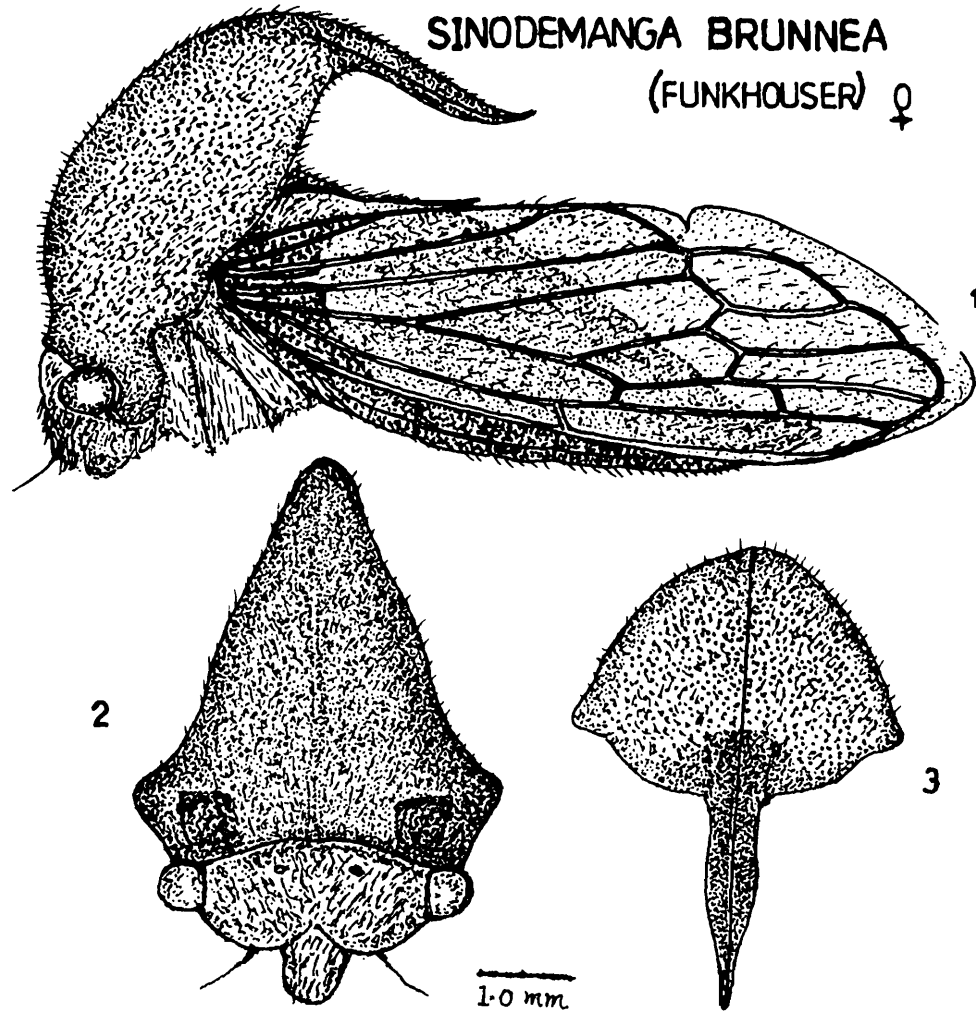


Fig. 177 : *Sinodemanga brunnea* (Fumkhouser). Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

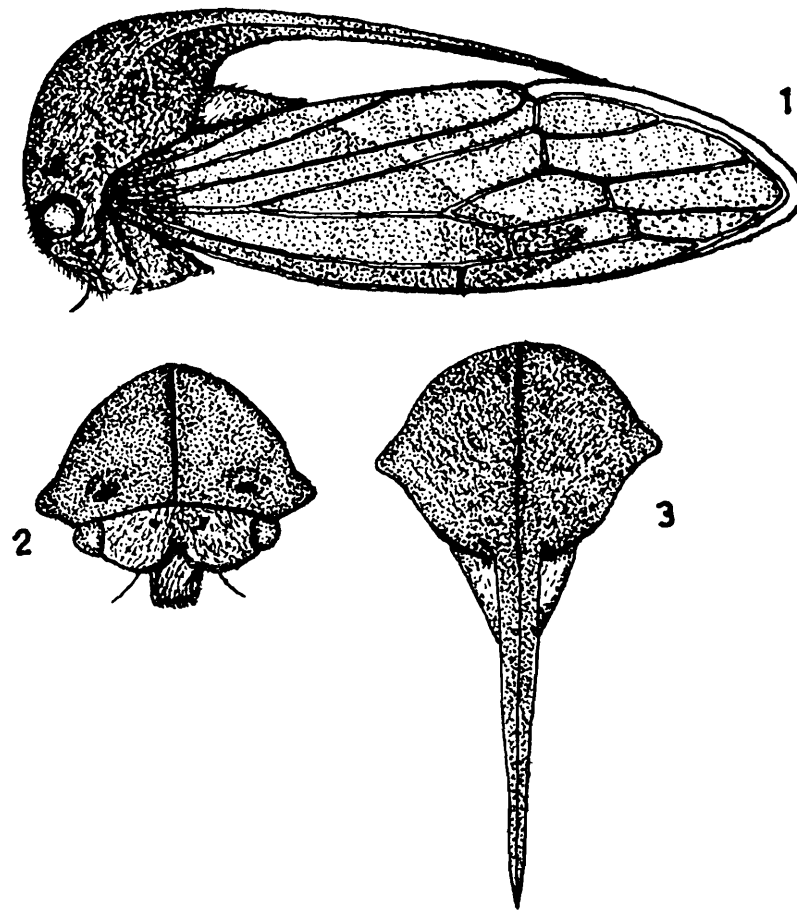


Fig. 178 : *Demanga sooknana* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

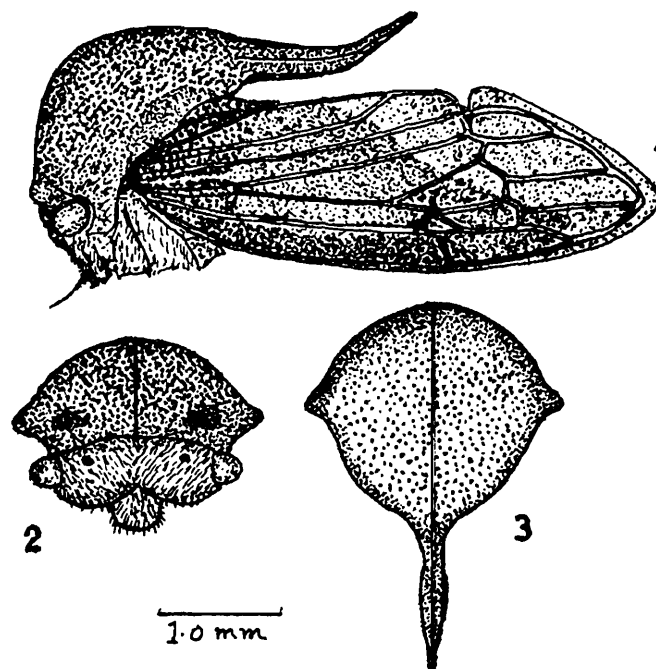


Fig. 179 : *Occator erectus* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

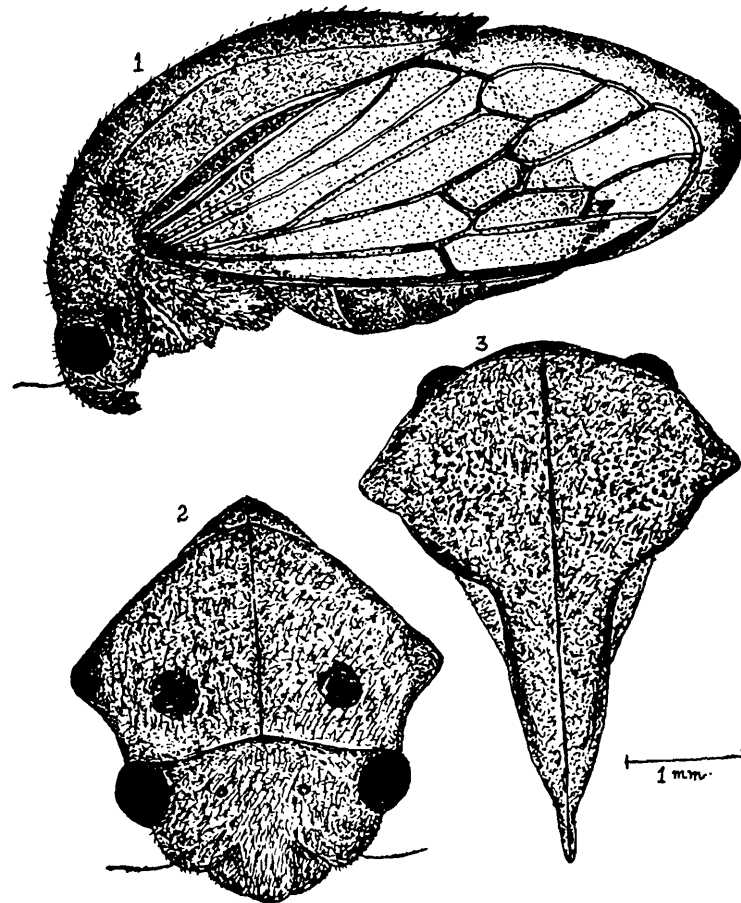


Fig. 180 : *Gargarina carinata* Ananthasubramanian. Male 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

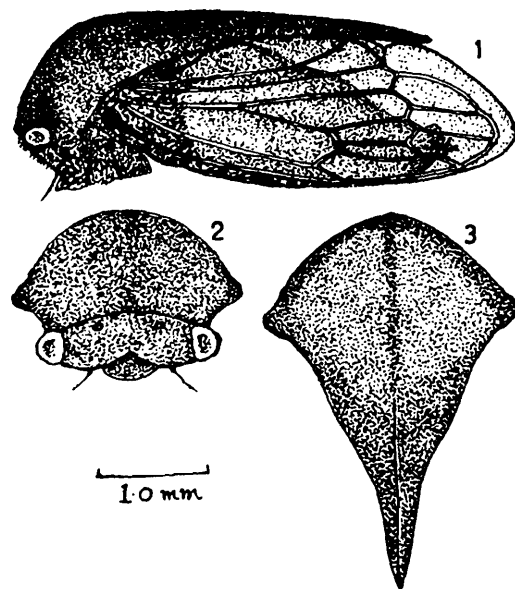


Fig. 181 : *Gargara affinis* Distant. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

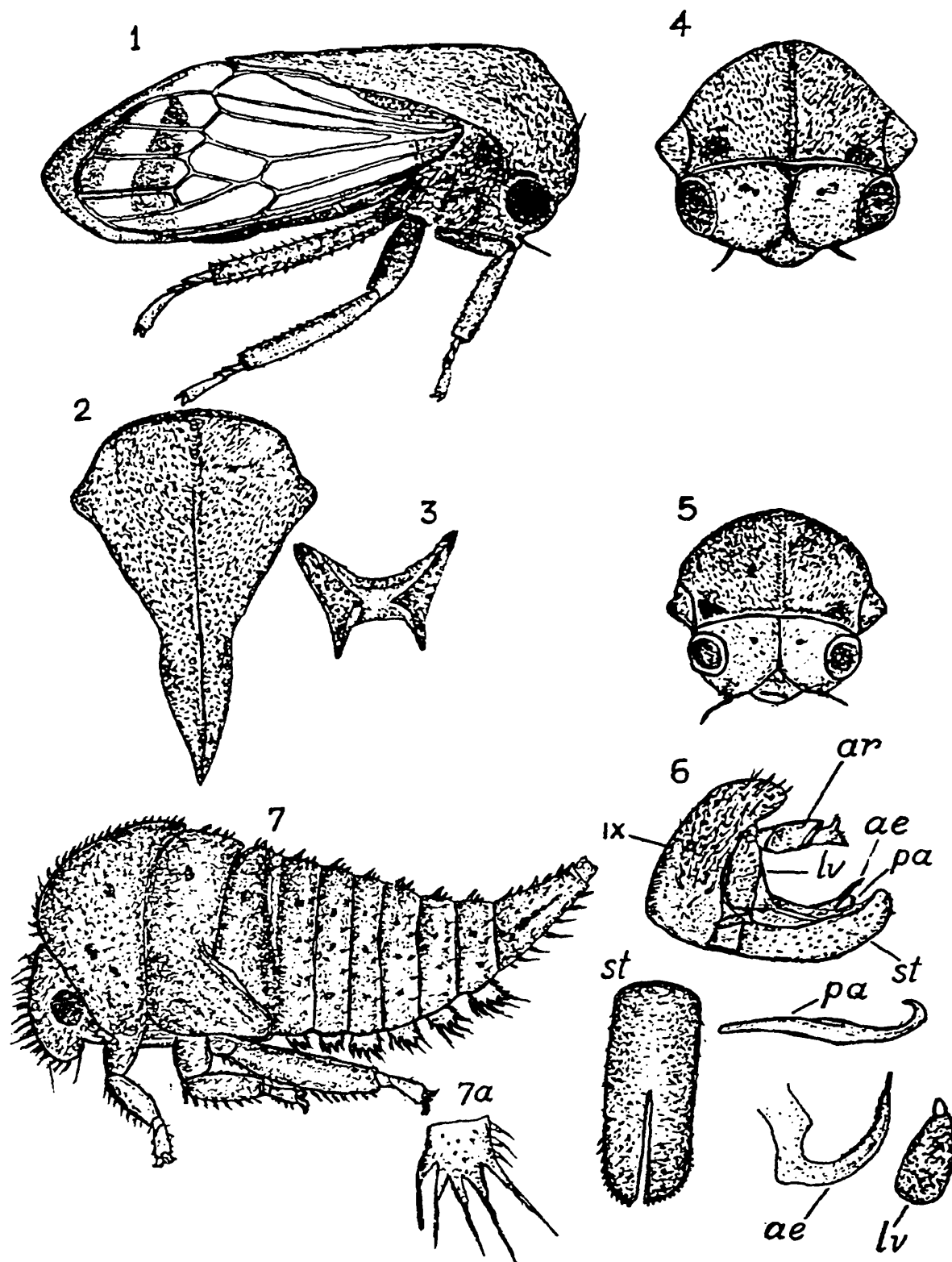


Fig. 182 : *Gargara albitarsis* Ananthasubramanian & Ananthakrishnan. 1. Female, Lateral view ; 2. Female, dorsal view of pronotum ; 3. Scutellum ; 4. Female, Frontal view of head and pronotum ; 5. Male, frontal view of head and pronotum ; 6. Male genitalia. 7. Fifth instar nymph ; 7a. Abdominal lateral lamella of 5th instar nymph.

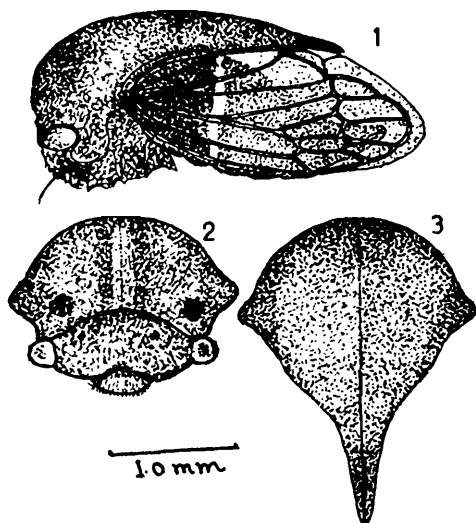


Fig. 183 : *Gargara aurea* Funkhouser. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

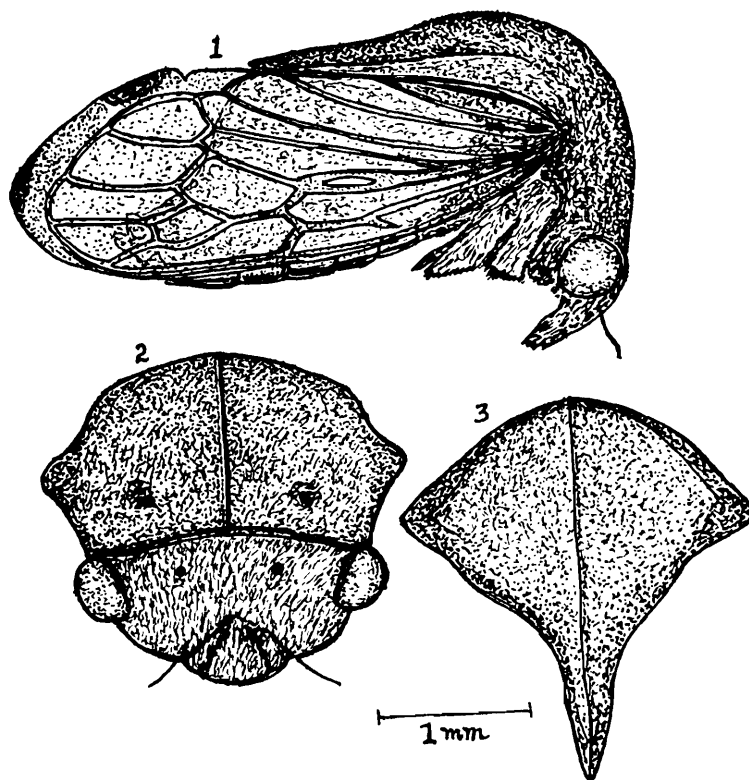


Fig. 184 : *Gaargara brevis* Ananthasubramanian. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

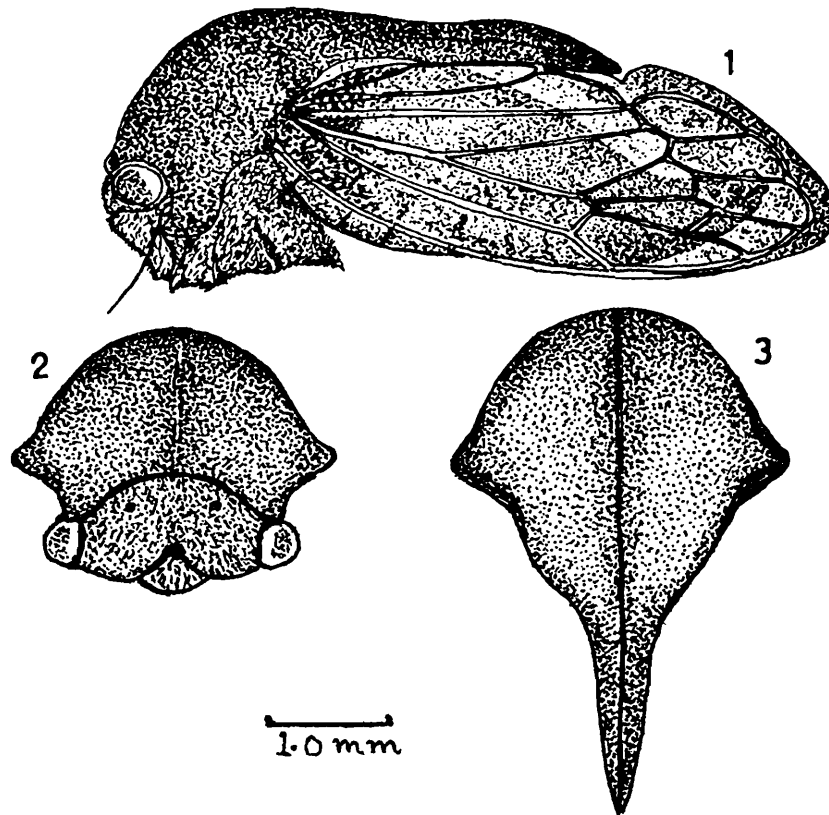


Fig. 185 : *Gargara caelata* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

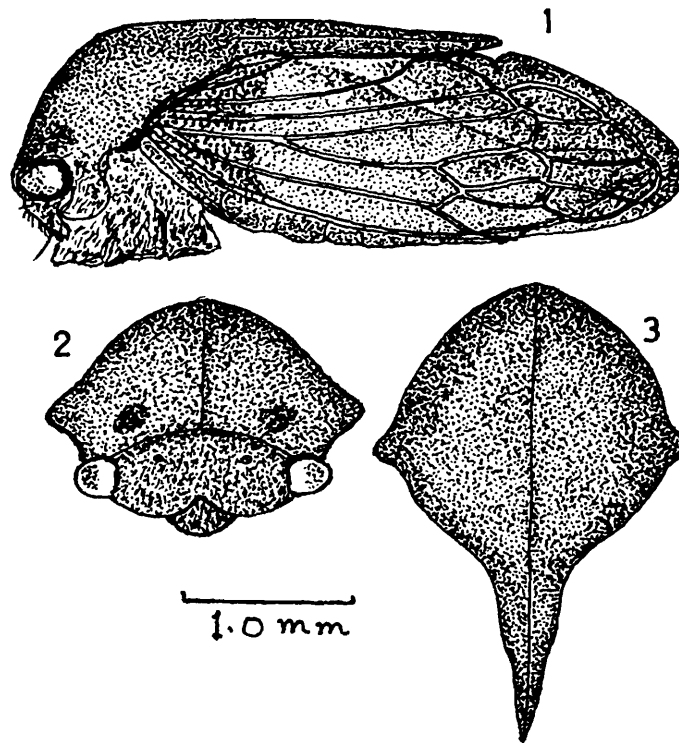


Fig. 186 : *Gargara confusa* Distant. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

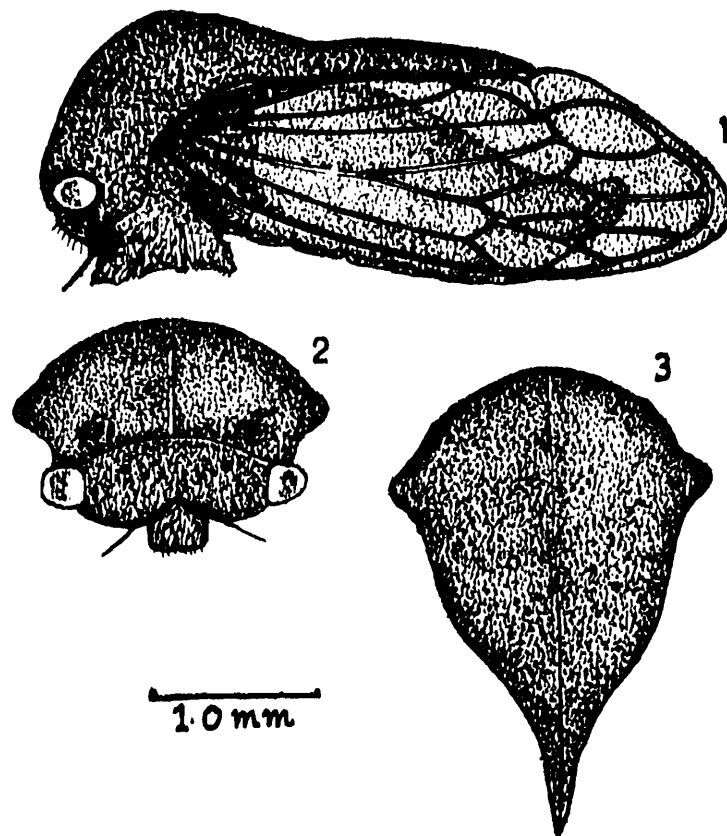


Fig. 187 : *Gargara contraria* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

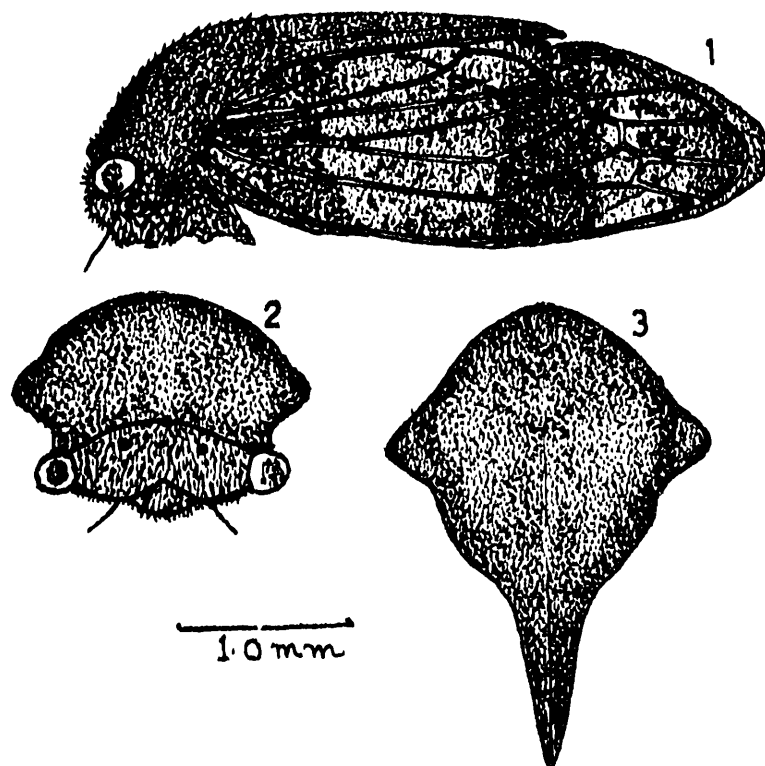


Fig. 188 : *Gargara delimitata* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

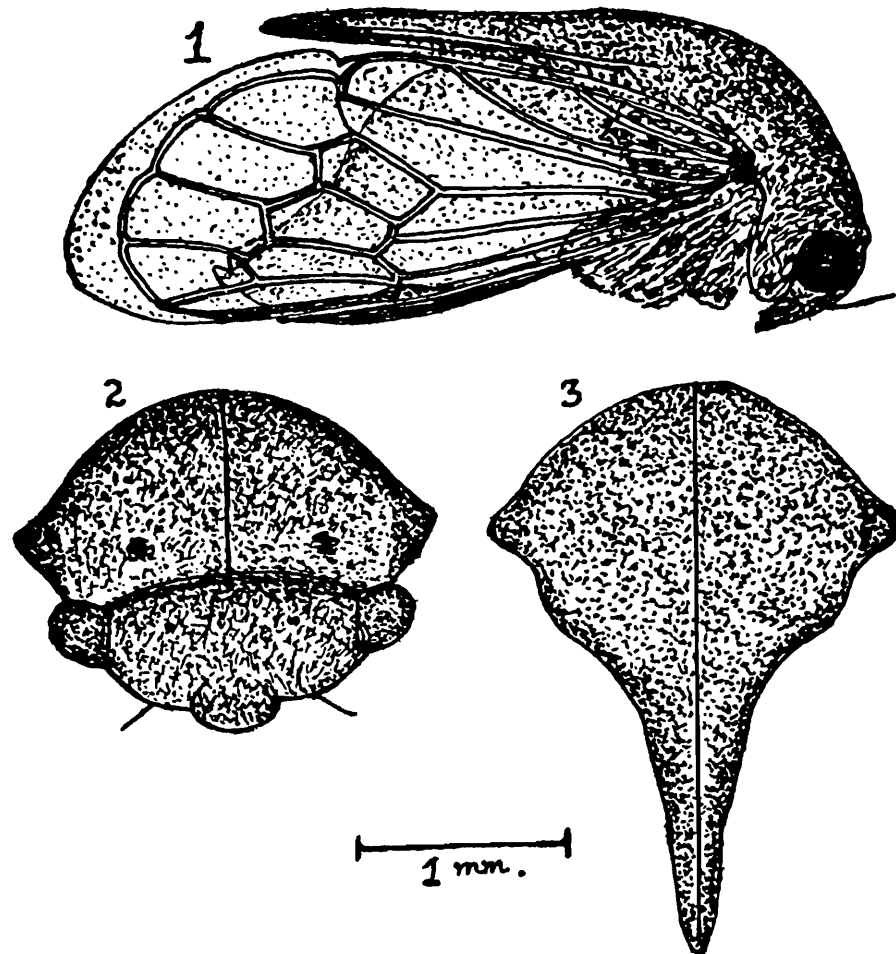


Fig. 189 : *Gargara discoidalis* Ananthasubramanian. Female 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

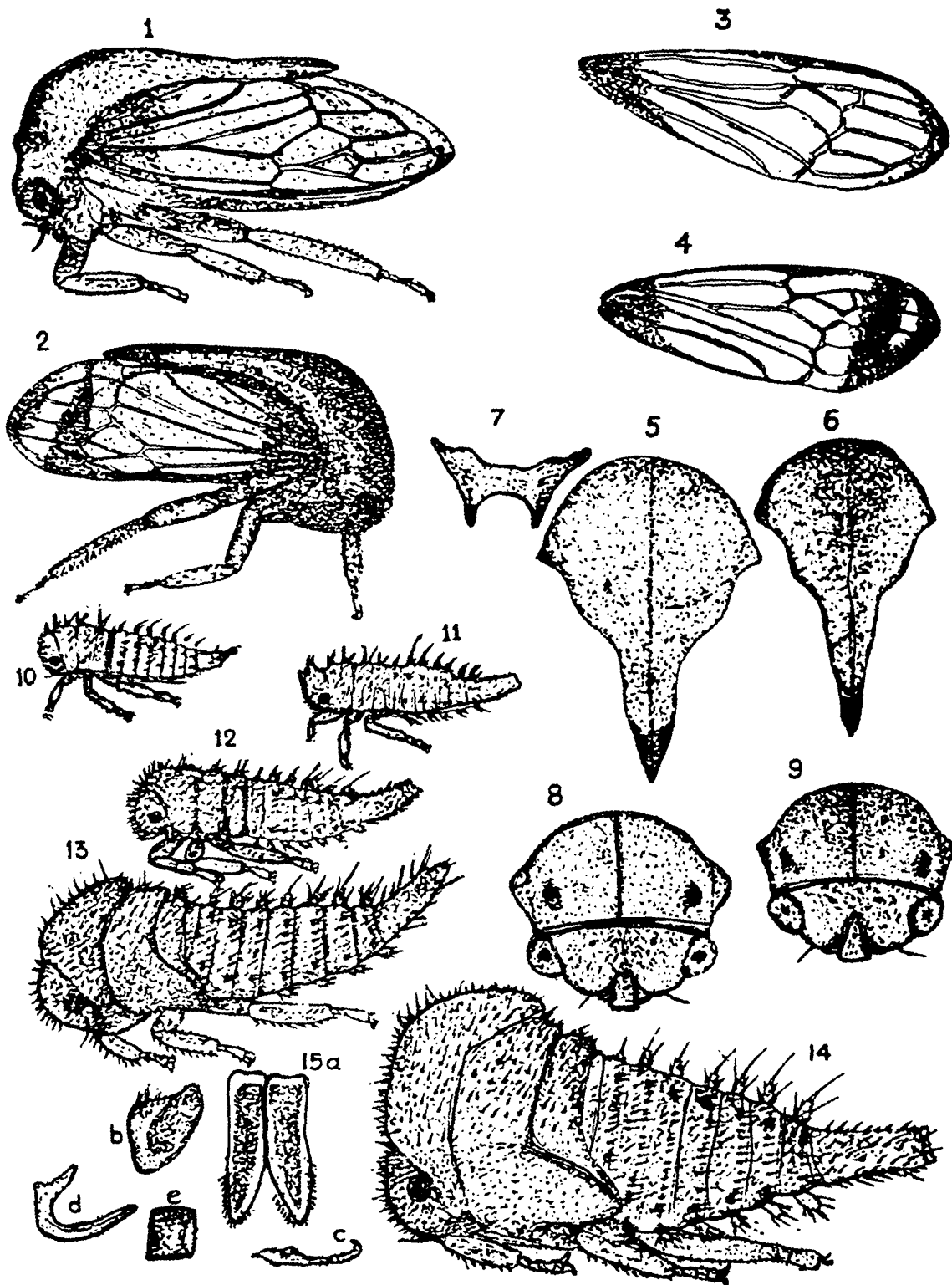


Fig. 190 : *Gargara extrema* Distant. Female, lateral view ; 2. Male, lateral view ; 3. Female, tegmen ; 4. Male, tegmen ; 5. Female, dorsal view of pronotum ; 6. Male dorsal view of pronotum ; 7. Scutellum ; 8. Female, frontal of head and pronotum ; 9. Male, frontal view of head and pronotum ; 10-14. First to fifth instar nymphs ; 15a-e., Parts of male genitalia.

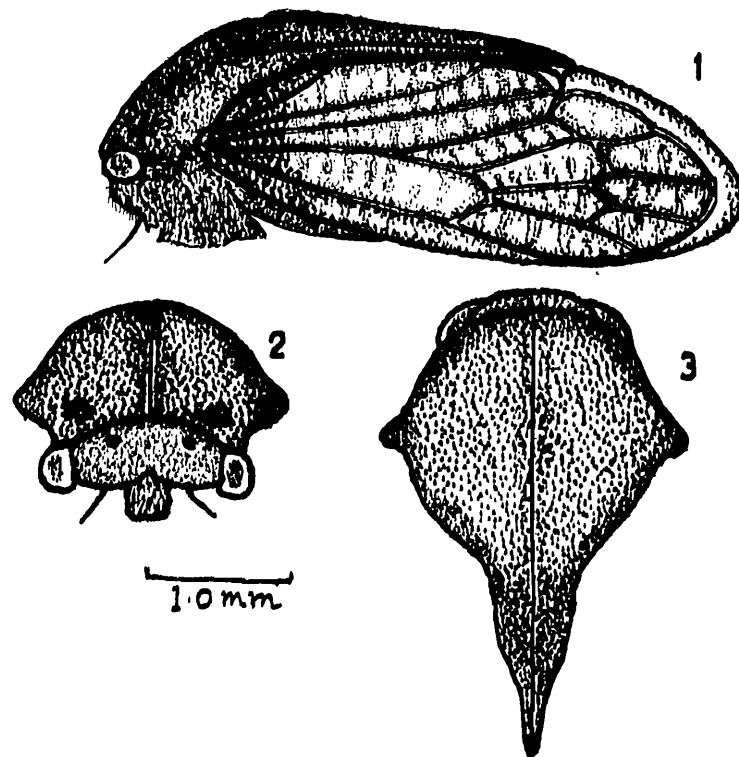


Fig 191 : *Gargara flavolineata* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

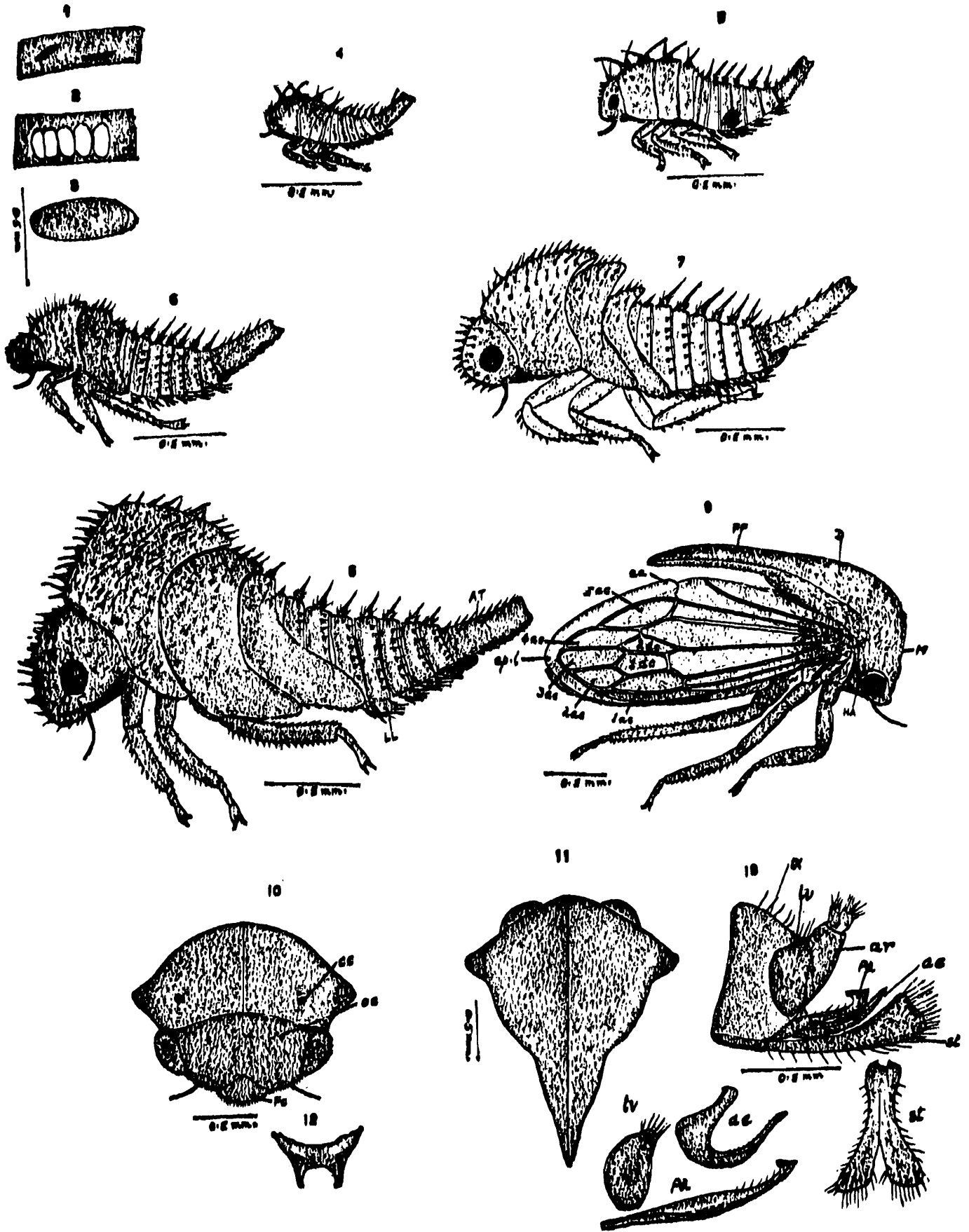


Fig. 192 : *Gargara hraswa* nom.nov. 1. Egg slits on the host plant ; 2. Egg slit cut open ; 3. Egg. 4-8. First to fifth instar nymphs ; 9. Female lateral view ; 10. Female, frontal view of head and pronotum ; 11. Female, dorsal view of pronotum ; 12. Scutellum ; 13. Male genitalia.

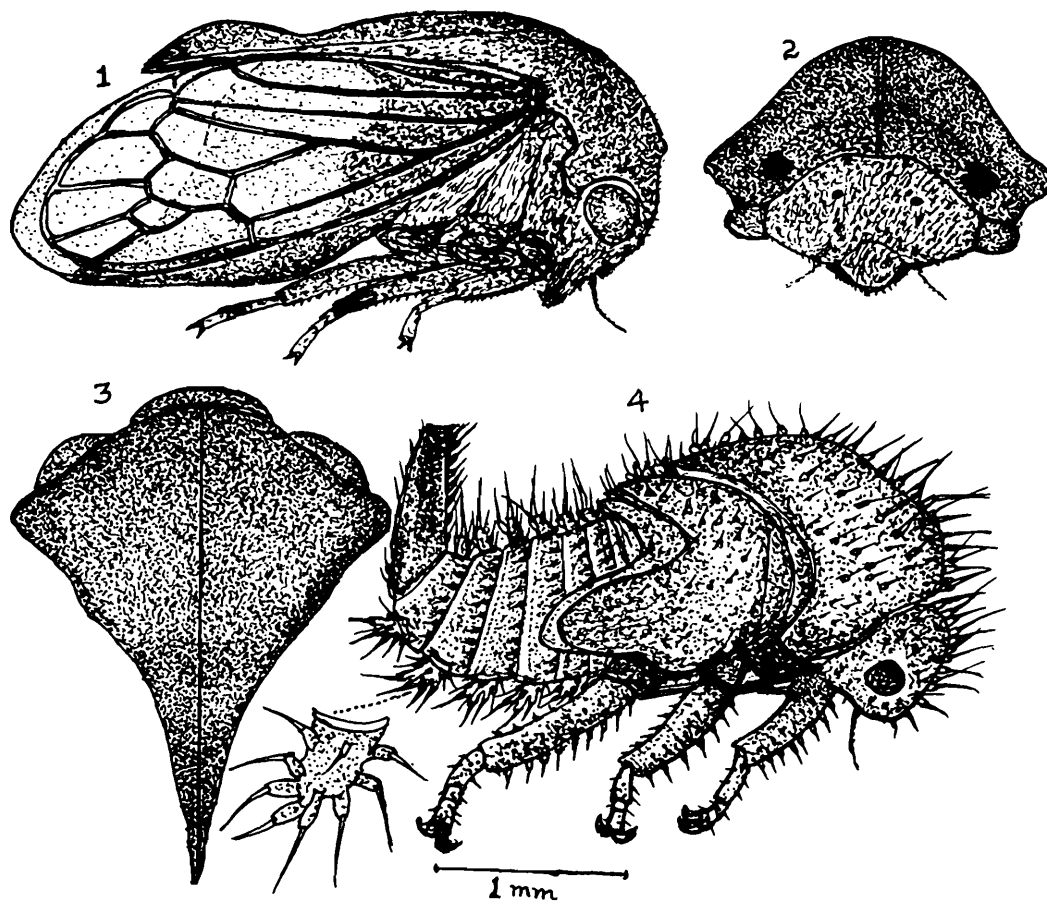


Fig. 193 : *Gargara kandala* n. sp. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum ; 4. Fifth instar nymph.

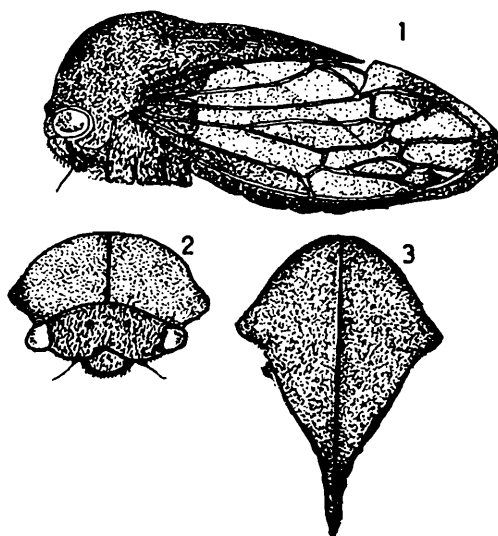


Fig. 194 : *Gargara maculata* Funkhouser. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

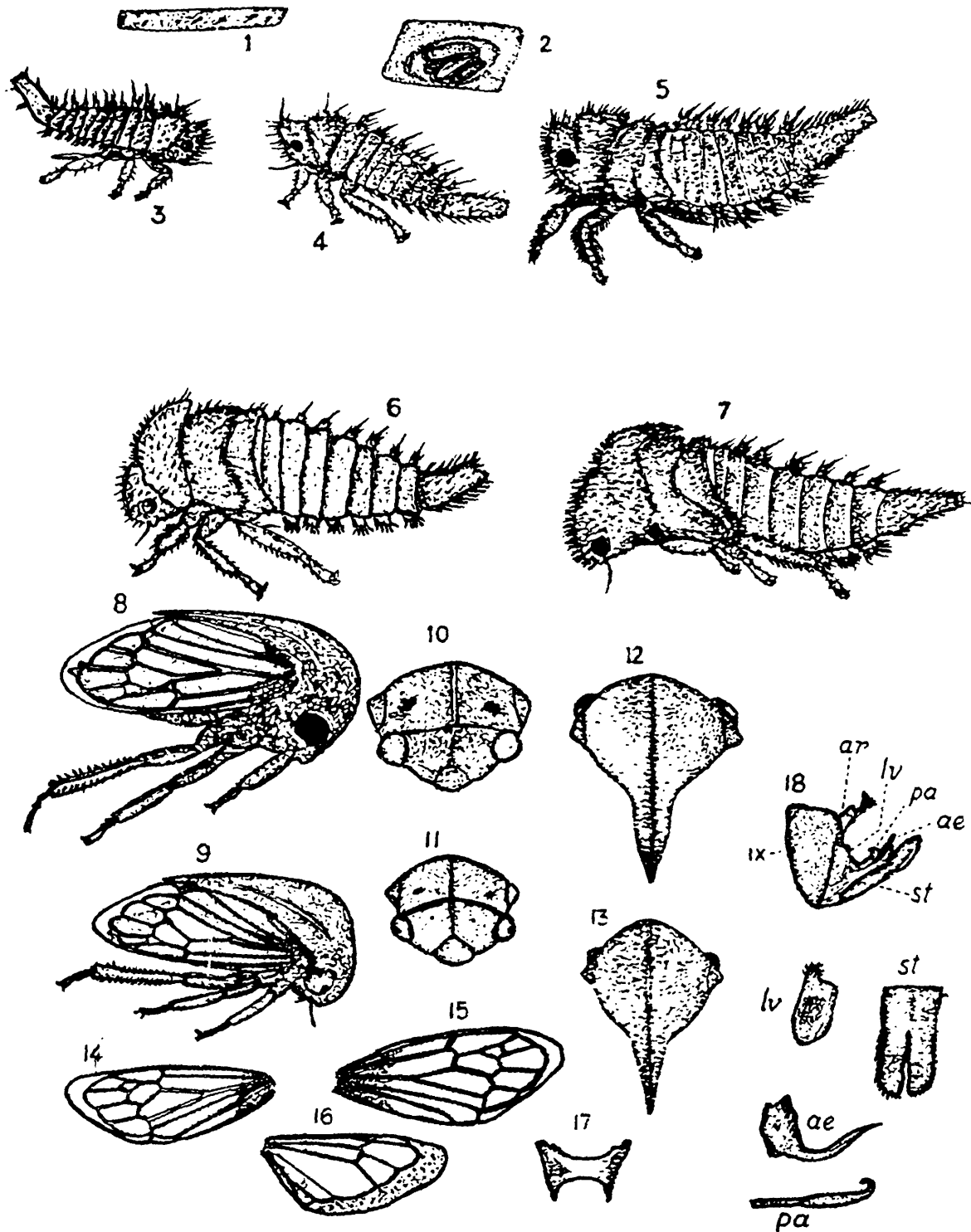


Fig. 195 : *Gargara madrasensis* Ananthasubramanian & Ananthakrishnan. 1. Twig with egg slits ; 2. Egg slit exposed ; 3-7. First to fifth instar nymphs ; 8 Female, lateral view ; 9. Male, lateral view ; 10. Female, Frontal view of head and pronotum ; 11. Male, Frontal view of head and pronotum ; 12, Female, dorsal view of pronotum ; 13. Male, dorsal view of pronotum ; 14. male, tegmina ; 15. Female, tegmina ; 16. Hind wing ; 17. Scutellum ; 18. Male genitalia.

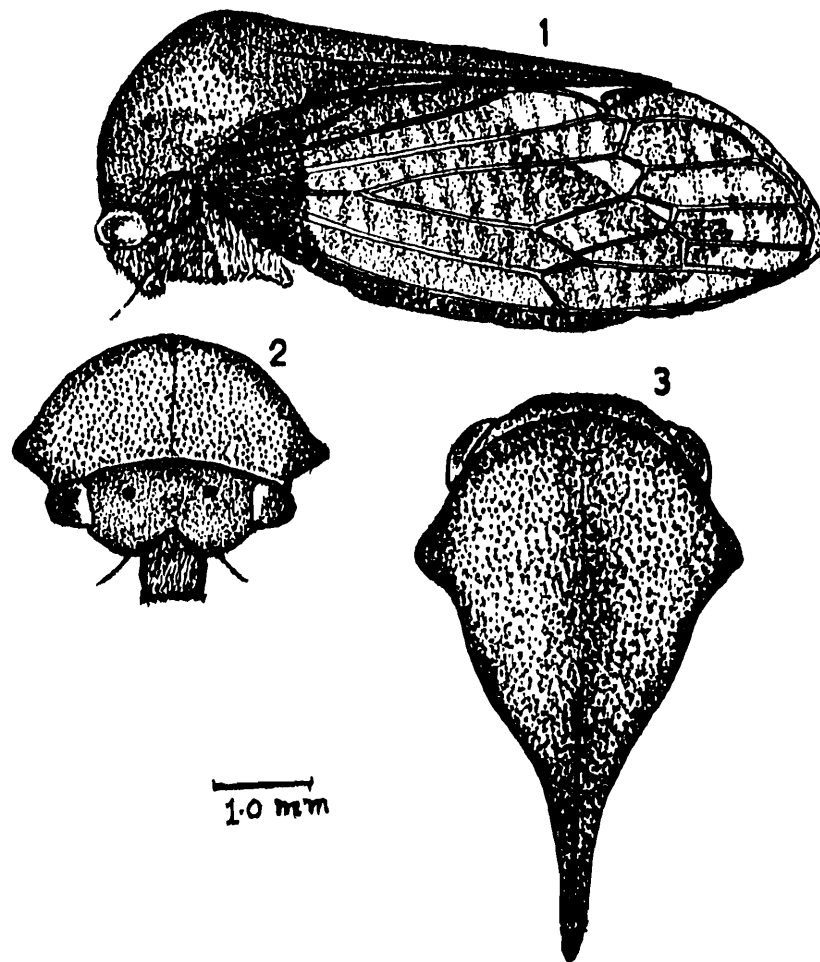


Fig. 196 : *Gargara majuscula* Distant, Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

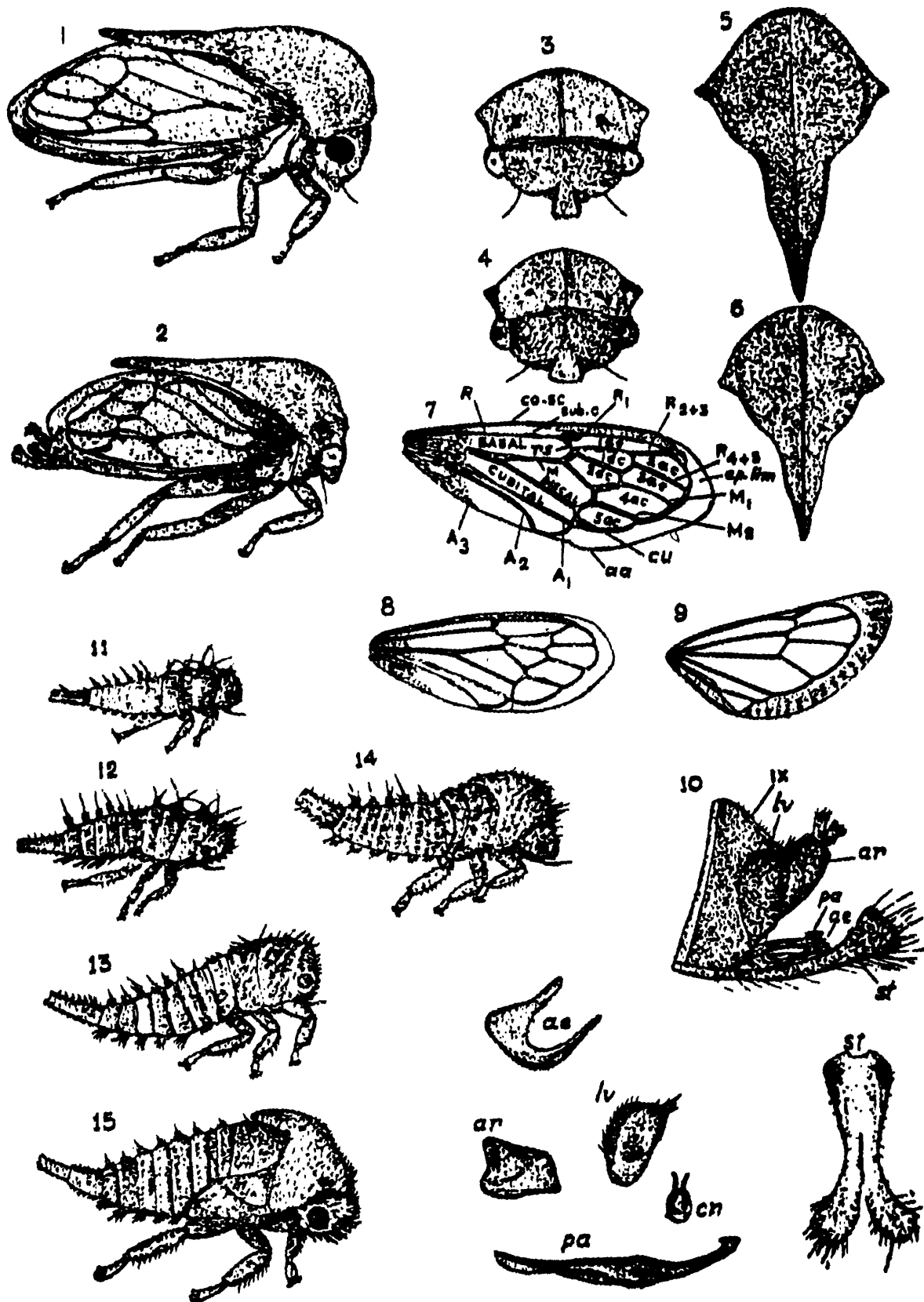


Fig. 197 : *Gargara malabarica* Ananthasubramanian & Ananthakrishnan. 1. Female, lateral view ; 2. Male, lateral view ; 3. Female, Frontal view of head and pronotum ; 4. Male, frontal view of head and pronotum ; 5. Female, dorsal view of pronotum ; 6. Male, dorsal view of pronotum ; 7. Female tegmen ; 8. Male, tegmen ; 9. Hind ; 10. Male genitalia ; 11-15. First to fifth instar nymphs.

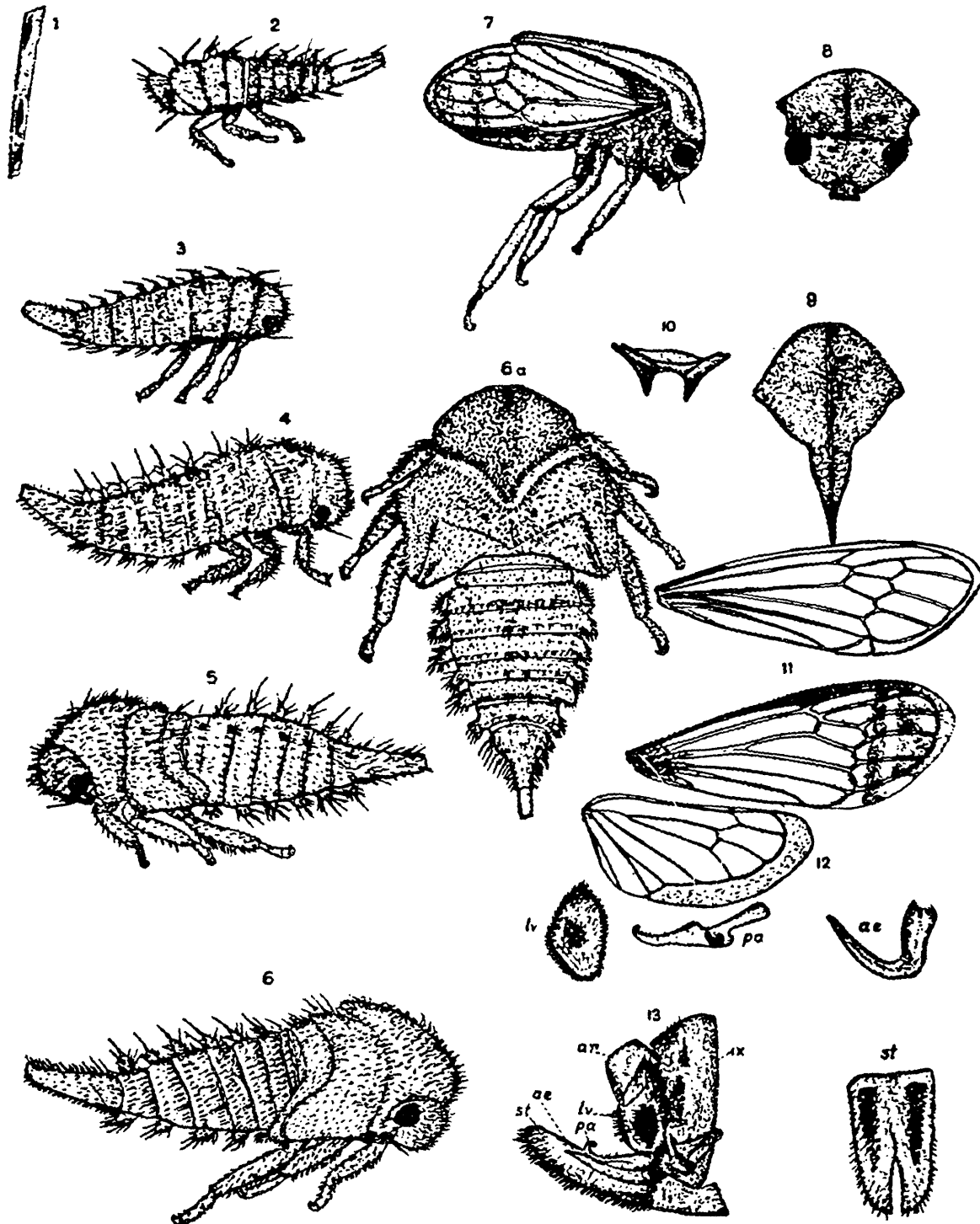


Fig. 198 : *Gargara mixta* (Buckton). 1. Egg slits on host stem ; 2-6. First to fifth instar nymphal instars ; 7. Male lateral view ; 8. Male, Frontal view ; 9. Male, dorsal view of pronotum ; 10. Scutellum ; 11. Male, tegmen ; 11a. Female, tegmen ; 12. Hind wing ; 13. Male genitalia.

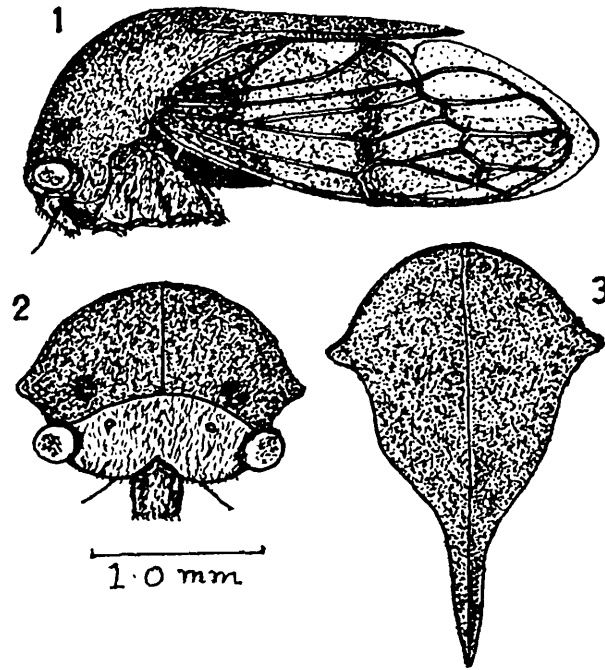


Fig. 199 : *Gargara nigrofasciata* Stal. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

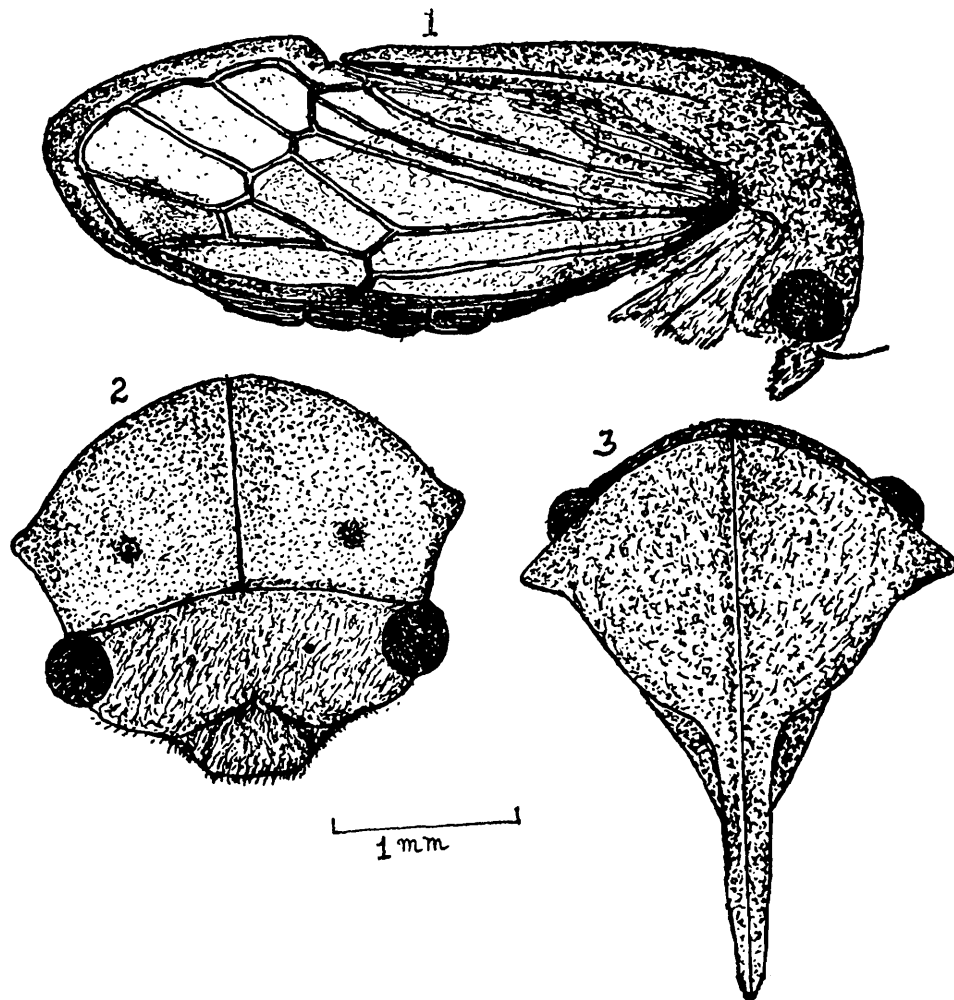


Fig. 200 : *Gargara nigrolimbata* Ananthasubramanian. Male. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.



Fig. 201 : *Gargara pellucia* Ananthasubramanian. Female. 1. lateral view ; Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

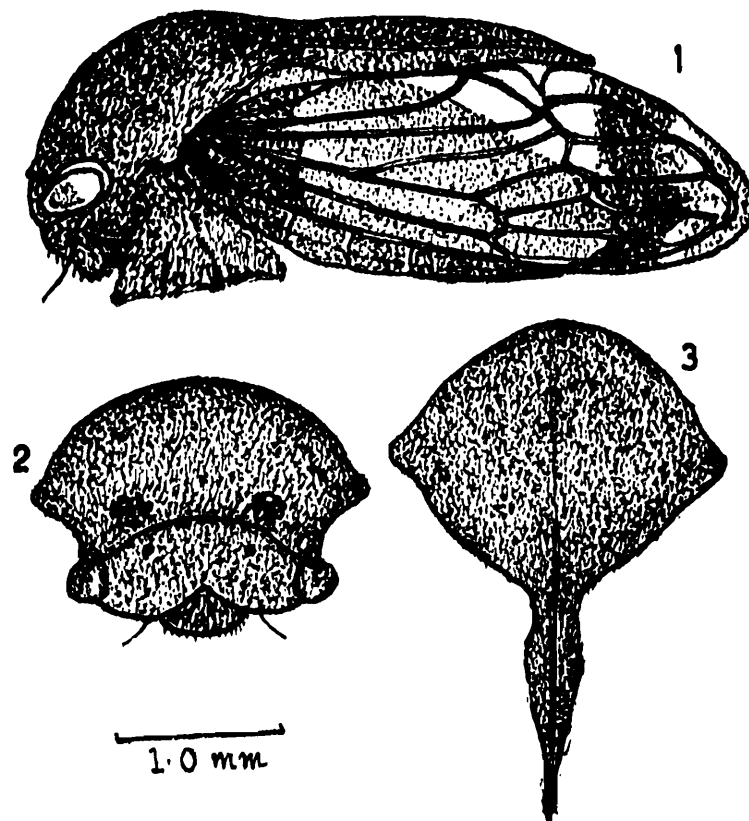


Fig. 202 : *Gargara penangi* Funkhouser. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

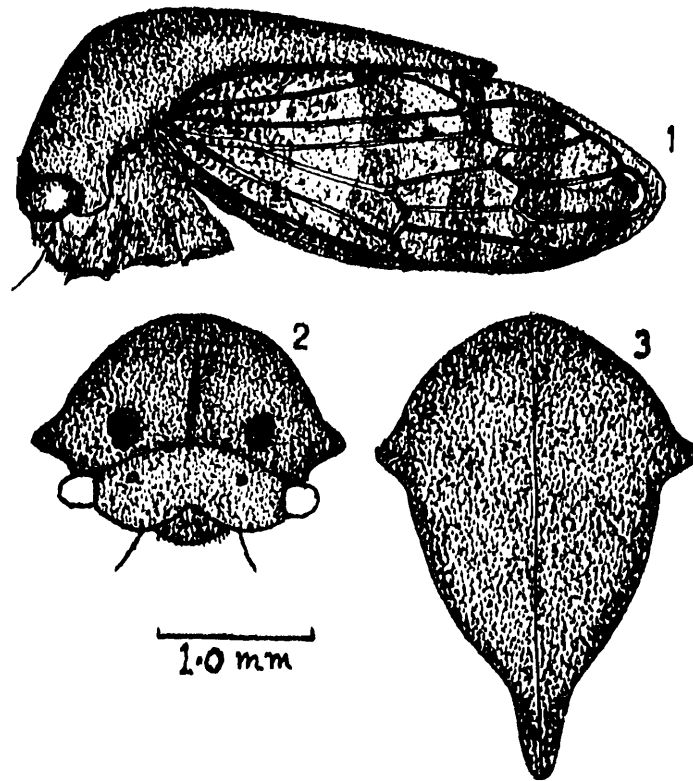


Fig. 203 : *Gargara pulchripennis* Stal. Female. 1. Lateral view ; 2. Frontal view of head of and pronotum ; 3. Dorsal of pronotum.

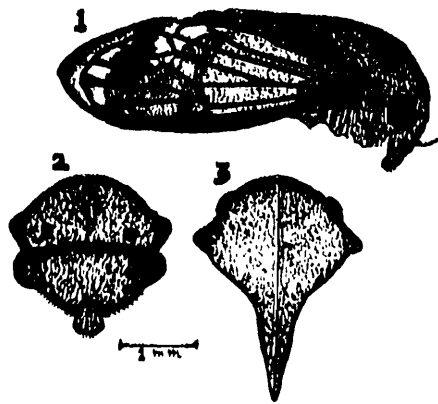


Fig. 204 : *Gargara pulniensis* Ananthasubramanian. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

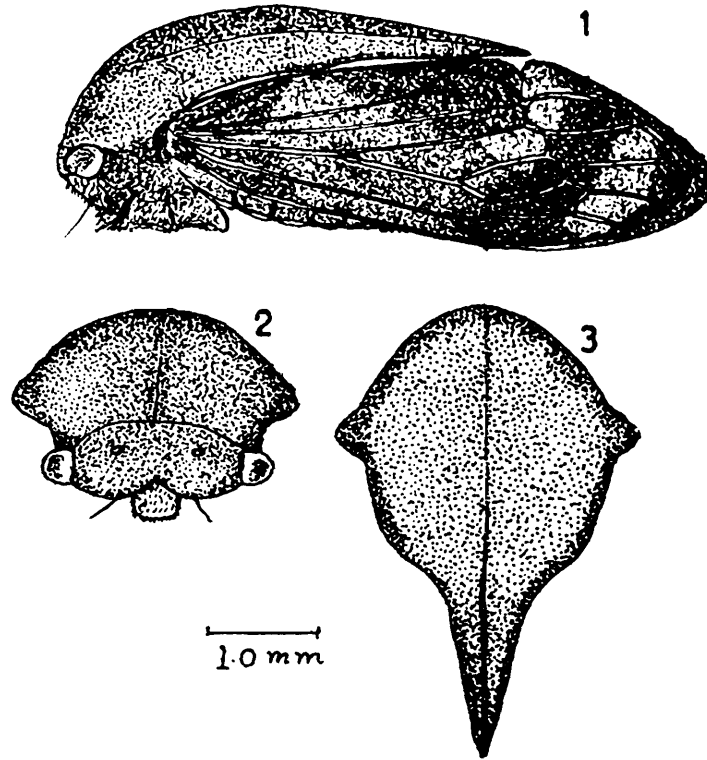


Fig. 205 : *Gargara rivulata* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

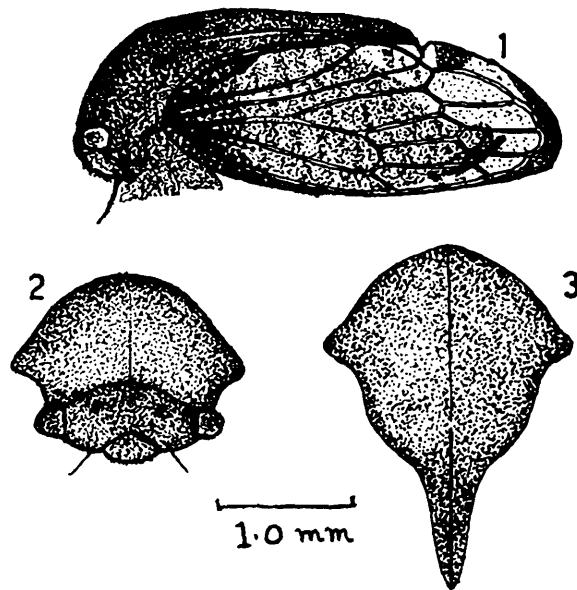


Fig. 206 : *Gargara robusta* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

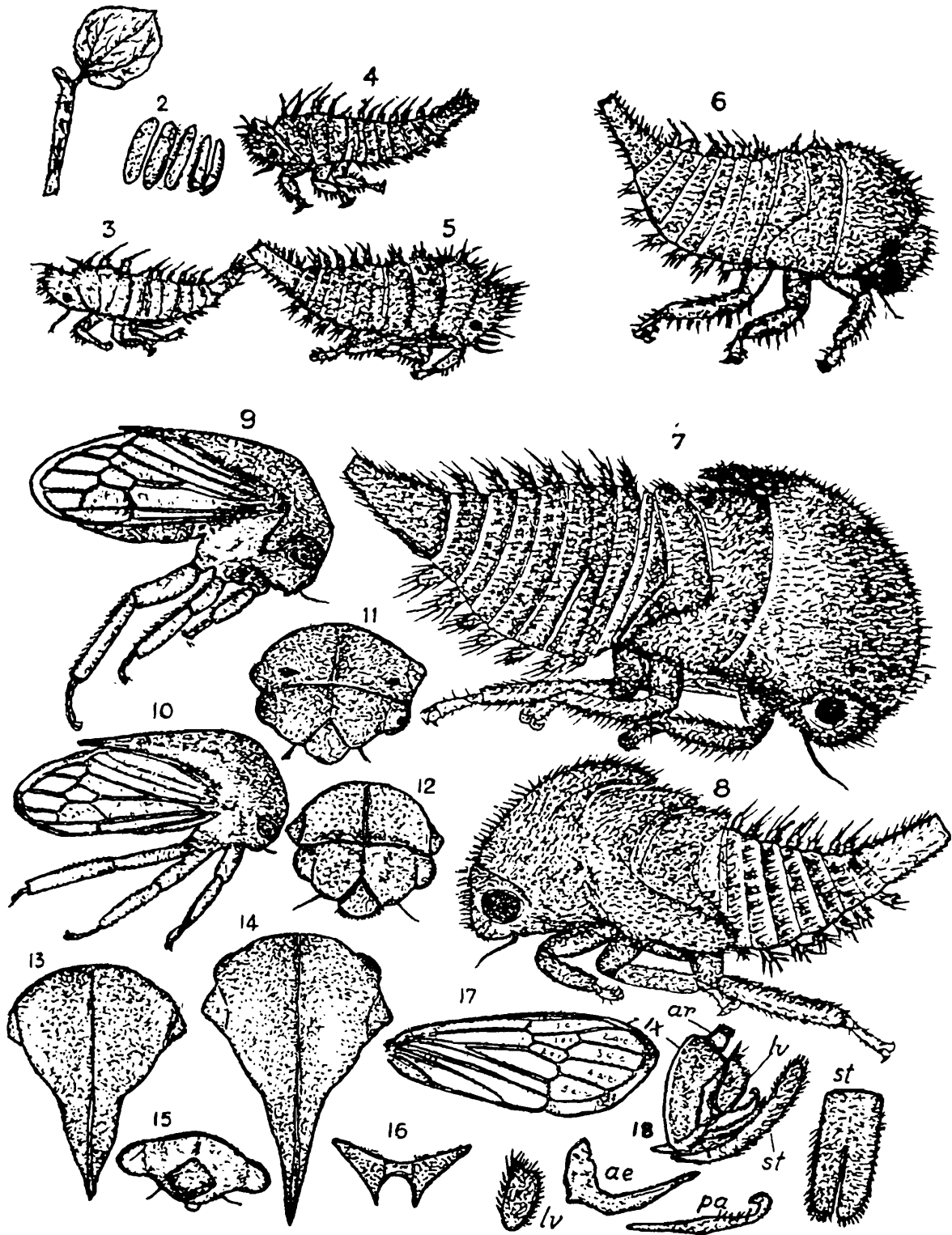


Fig. 207 : *Gargara rustica* Ananthasubramanian & Ananthakrishnan. 1. Egg slits on host stem ; 2. Eggs. 3-7. First to fifth instar nymphs ; 8. Fifth instar of male ; 9. Female, lateral view ; 10. Male,

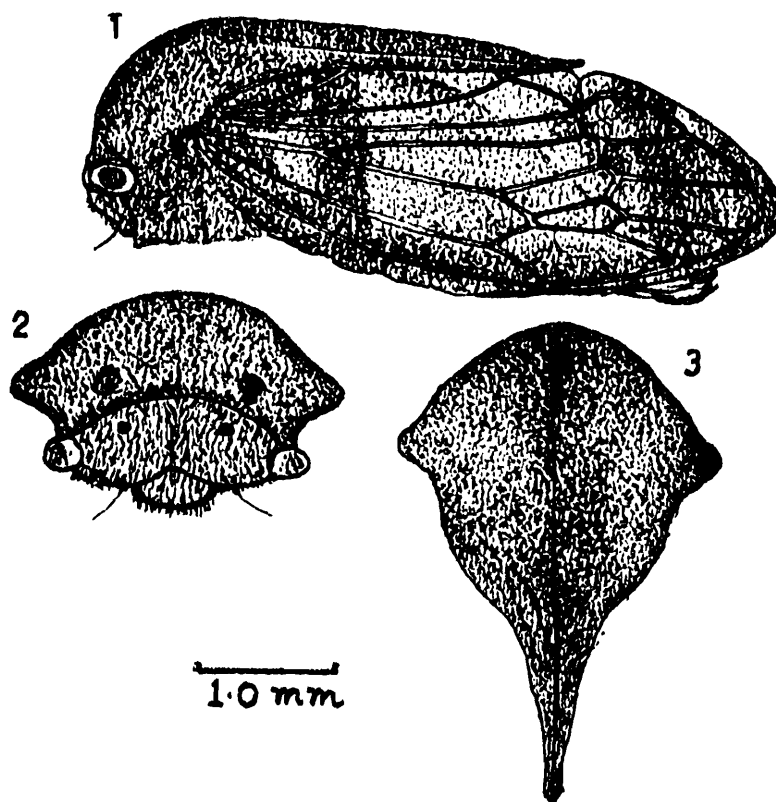


Fig. 208 : *Gargara sikhimensis* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

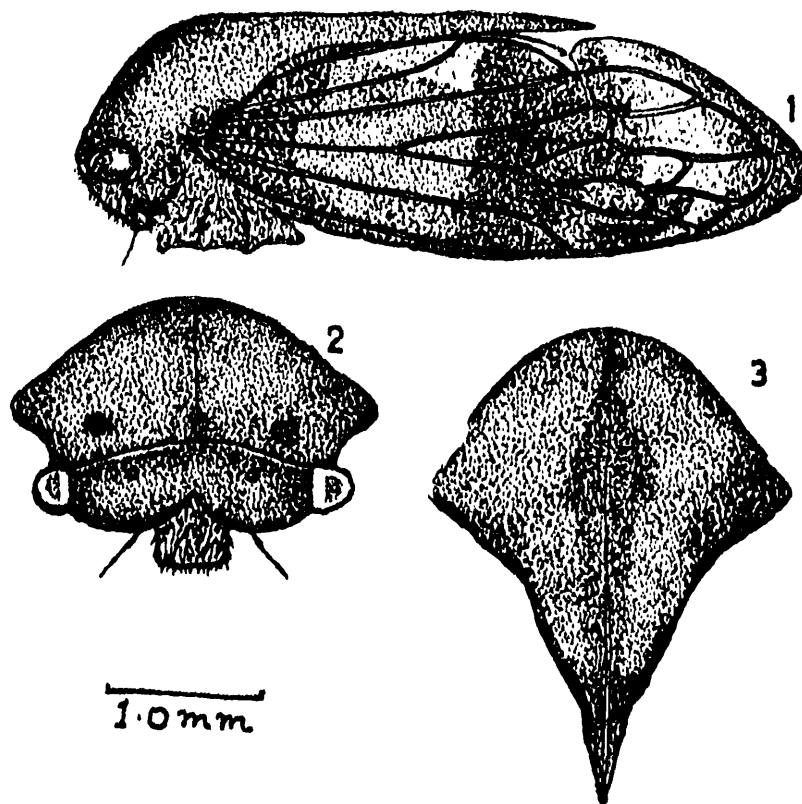


Fig. 209 : *Gargara splendidula* Distant. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

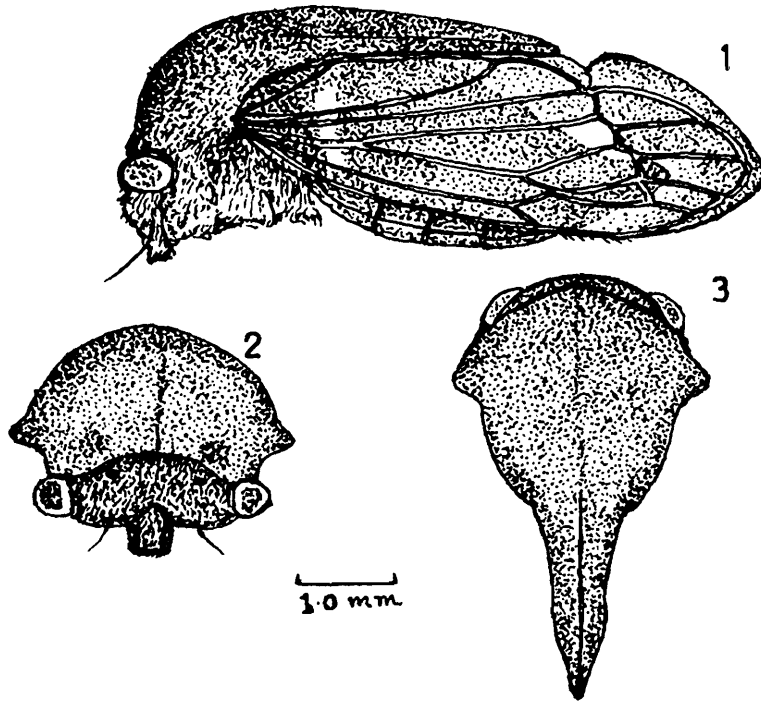


Fig. 210 : *Gargara tumida* Melichar. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

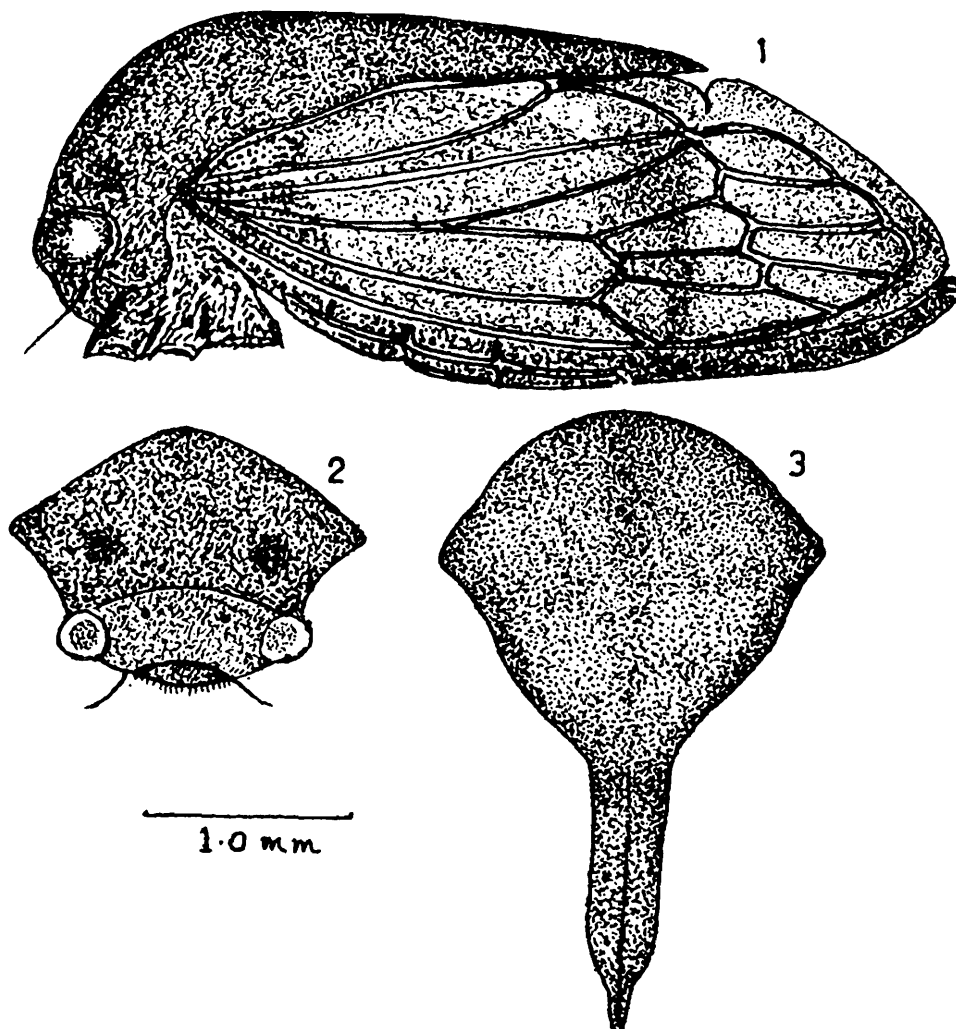


Fig. 211 : *Gargara varicolor* Stal. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

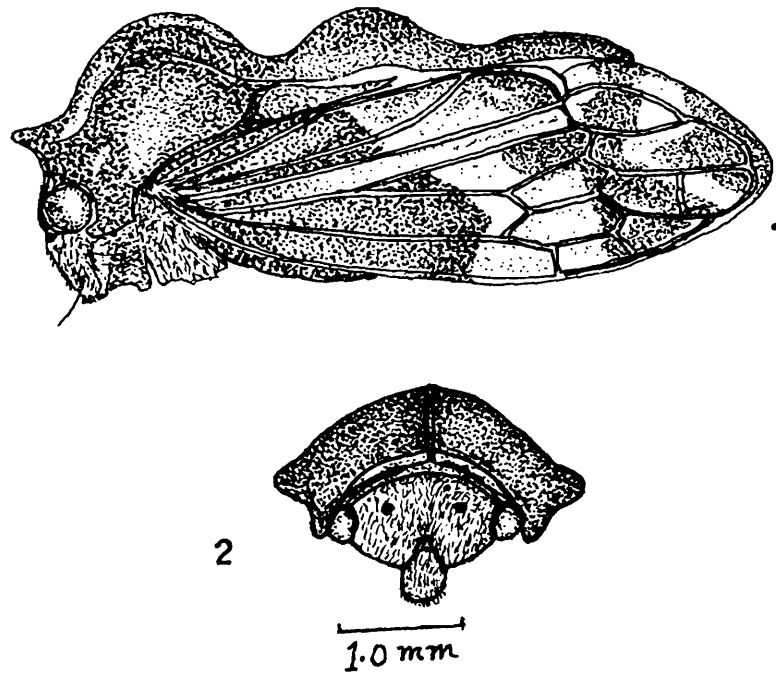


Fig. 212 : *Ebhul maculipennis* Funkhouser. Female. 1. Lateral view ; 2. Frontal view of head and pronotum ; 3. Dorsal view of pronotum.

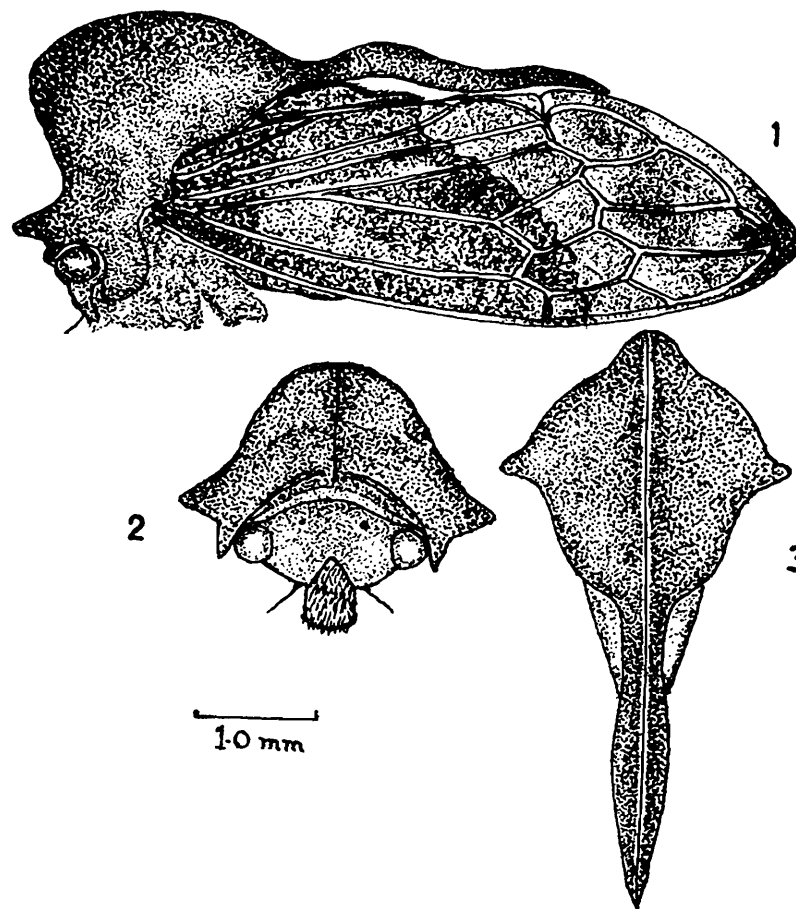


Fig. 213 : *Ebhul varium* (Walker). Female. 1. Lateral view ; 2. Frontal view of head and pronotum.

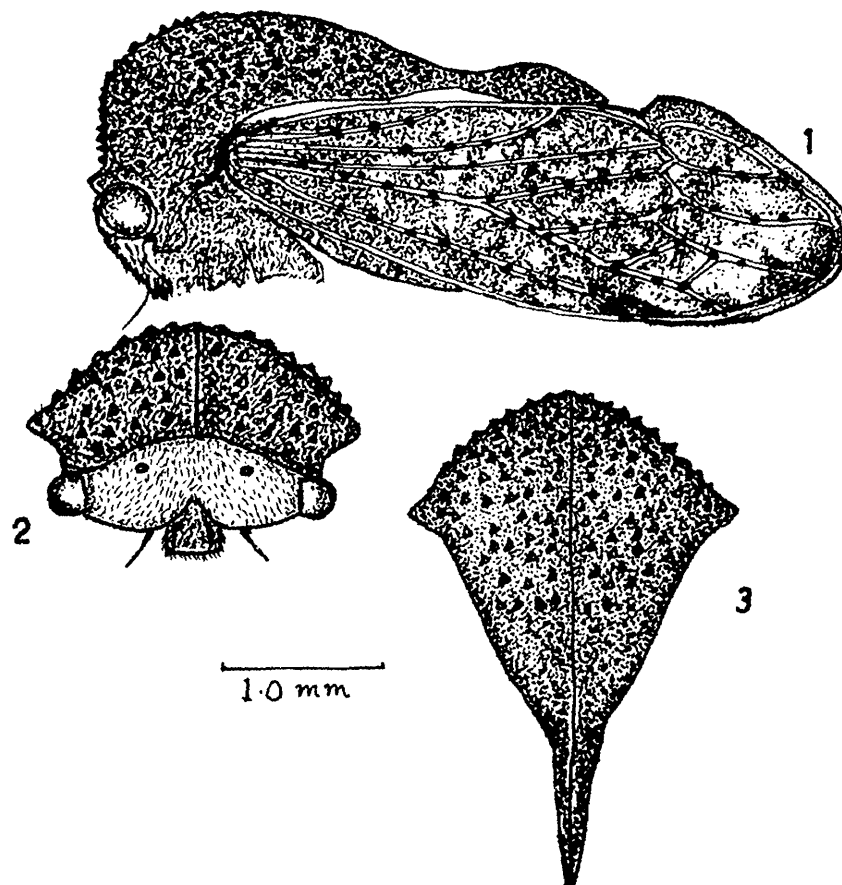


Fig. 214 : *Eucocosterphus mucronicollis* (Motschulsky). Female. 1. Lateral view ; 2. Frontal view of head pronotum ; 3. Dorsal view of pronotum.

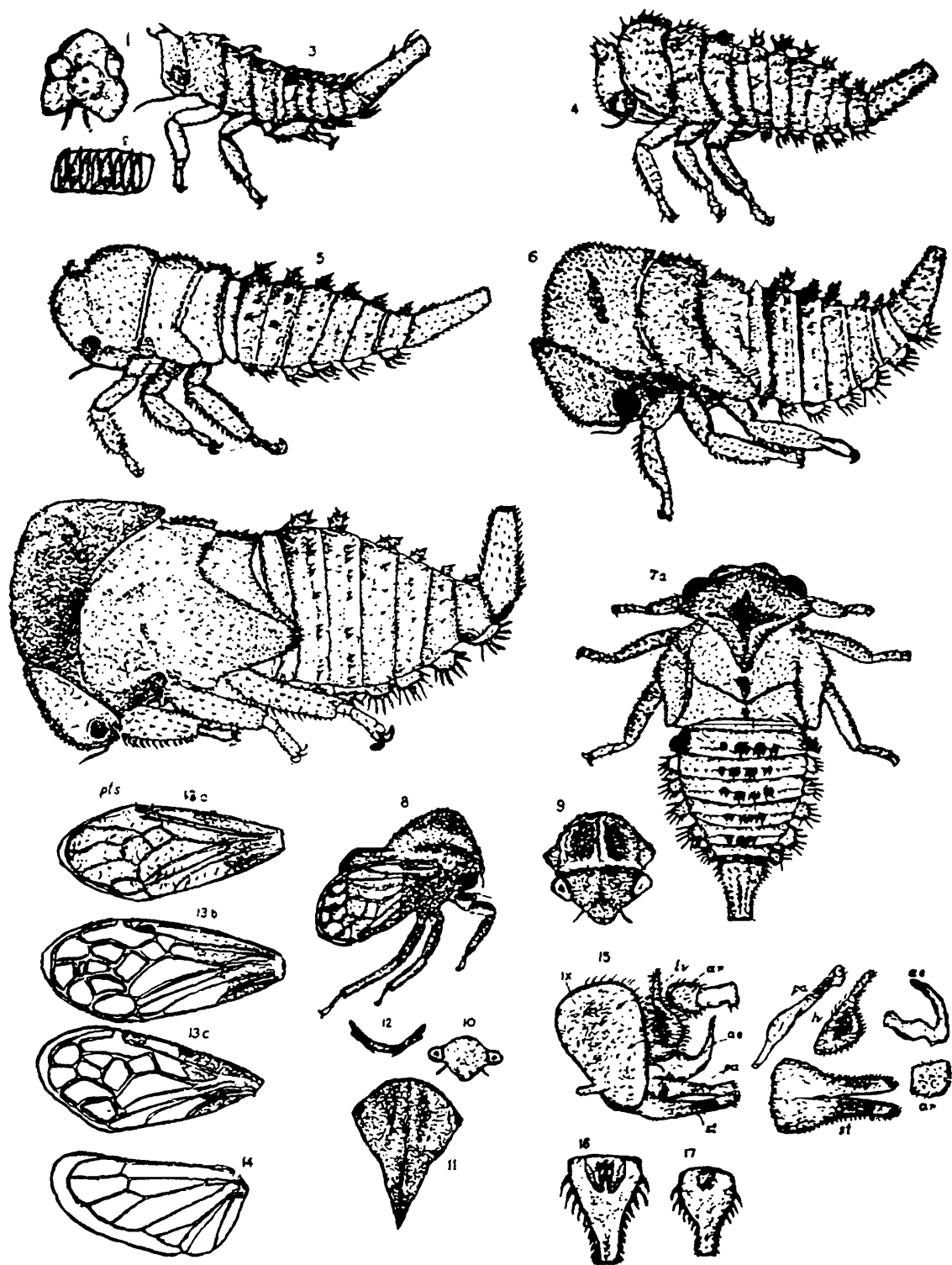


Fig. 215 : *Eucocosterphus paludatus* (Distant). 1. Egg slits on Host plant ; 2. Egg slit cut open to show wgs ; 3-7, First to fifth inster nymphs ; 7a. Dorsal view of 5th instar nymph ; 8. Female, lateral view ; 9. Female, Frontal view of head and pronotum ; 10. Frontal elevation of head ; 11. Female, Dorsal view of pronotum ; 12. Scutellum ; 13a-c. Variations in tegminal Venation ; 14. Hind wing ; 15. Male genitalia ; 16. Rudiments of genitalia in female 5th instar nymph ; 17. Rudiments of genitalia in male 5th instar nymph.

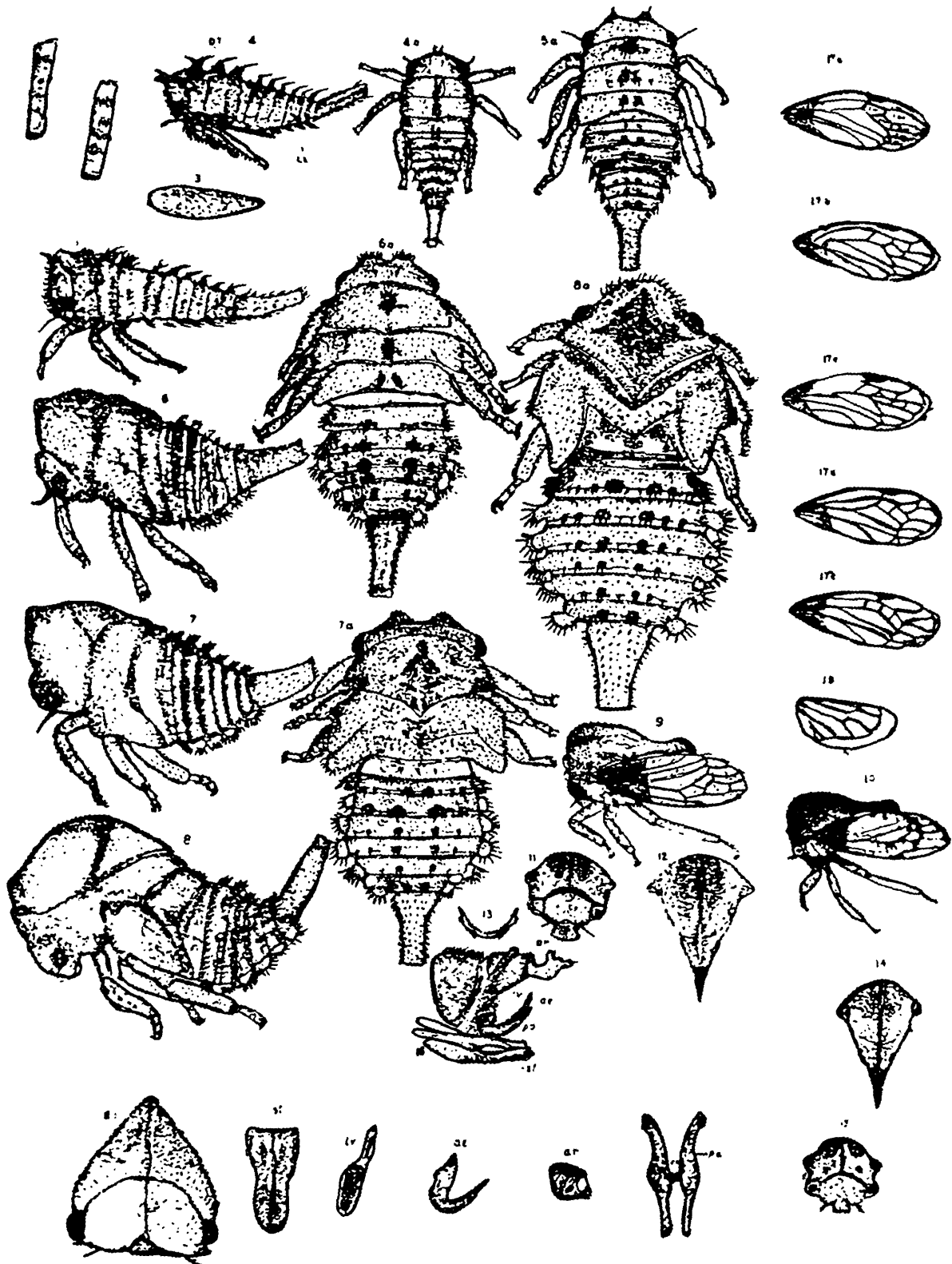


Fig. 216 : *Eucoccosterphus tuberculatus* (Motschulsky). 1. Twig with egg slits ; 2. Egg slits exposed ; 3. Egg ; 4-8. Láteral view of first to fifth instar nymphs; 4a-8a. Dorsal view of first to fifth nymphal stages; 9. Female, lateral view; 10. Male, lateral view; 11. Female, frontal view of head and pronotum; 12. Female, dorsal view of pronotum; 13. Scutellum, 14. Male, dorsal view of pronotum; 15. Male, frontal view of head and pronotum; 16. Male genitalia; 17 a-e. Variations in wing venation.

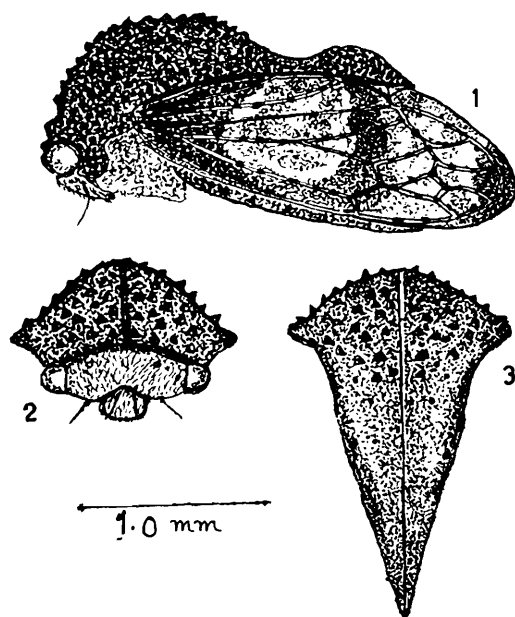


Fig. 217 : *Coccosterphus decoloratus* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

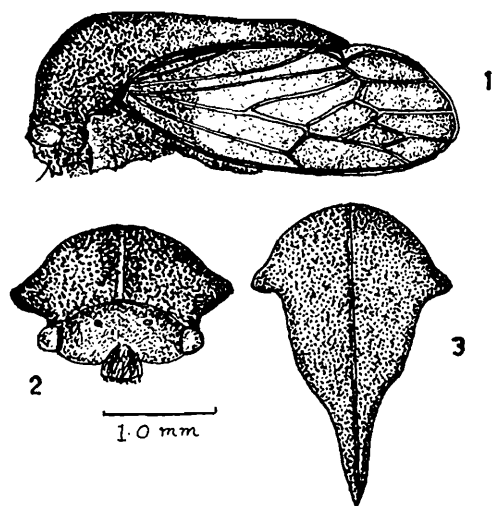


Fig. 218 : *Coccosterphus luteus* Funkhouser. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

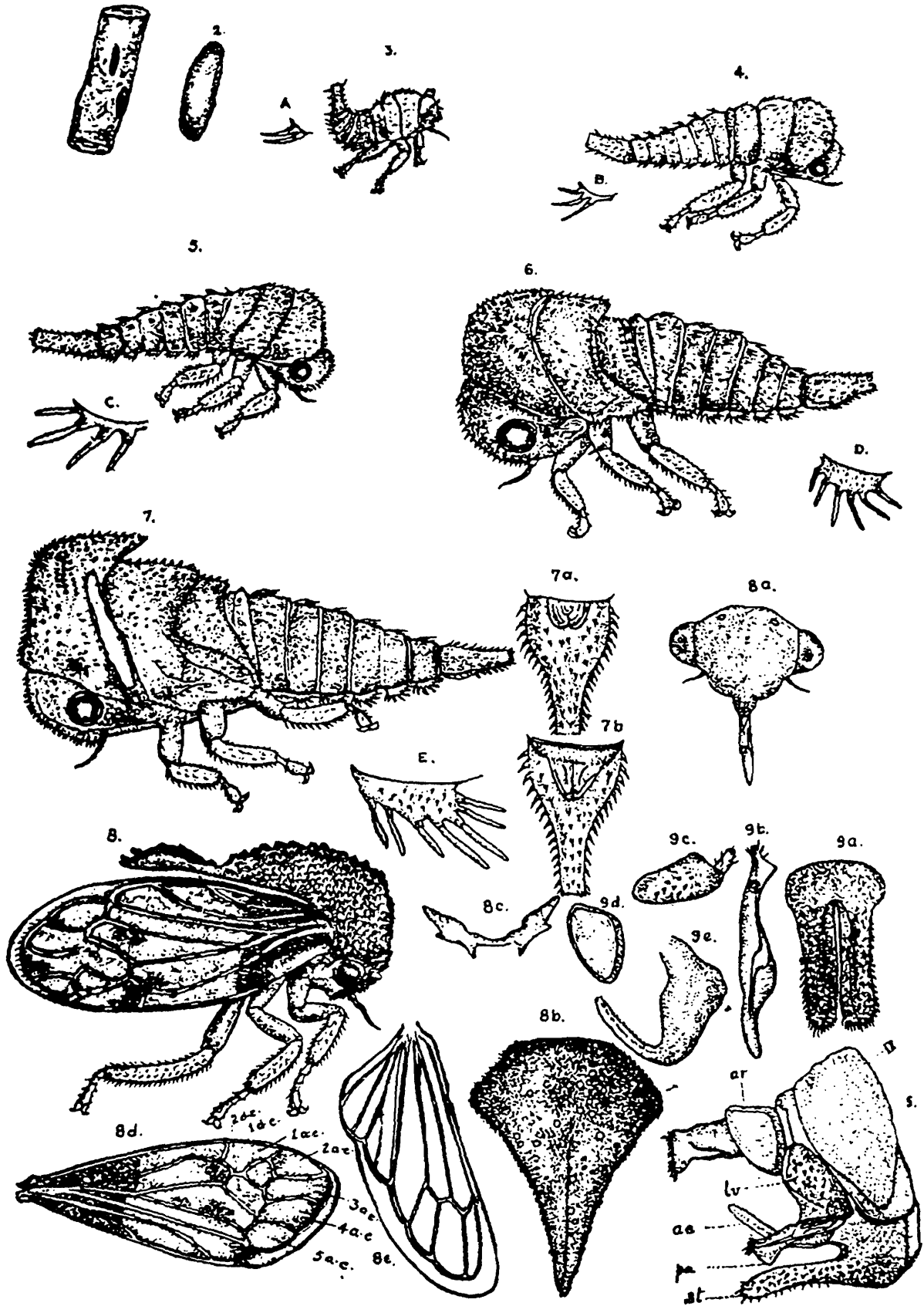


Fig. 219 : *Coccosterphus minutus* (Fabricius). 1. Twig with egg slits; 2. A single egg; 3-7. First to fifth instar nymphs; 7a. Rudiments of male genitalia in 5th instar nymph; 7b. Rudiments of female genitalia in 5th instar nymph; 8b. Female, lateral view; 8a. Head, frontal elevation; 8b. Dorsal view of pronotum; 8c. Scutellum; 8d. Tegmina; 8e. Hind wing. 9. Male genitalia; 9a. Sternal plate; 9b. Paramere; 9c. Lateral valve; 9d. Anal ring:

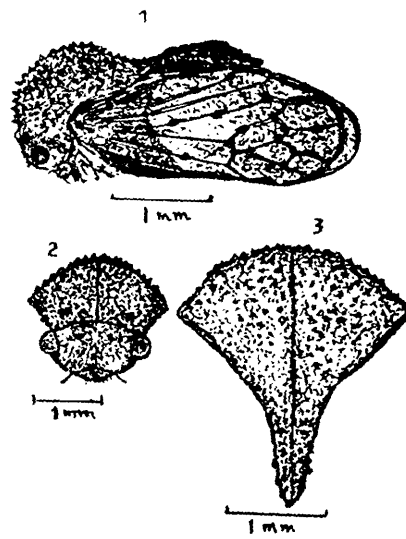


Fig. 220 : *Coccosterphus mysorensis* Ananthasubramanian & Ghosh. Male. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

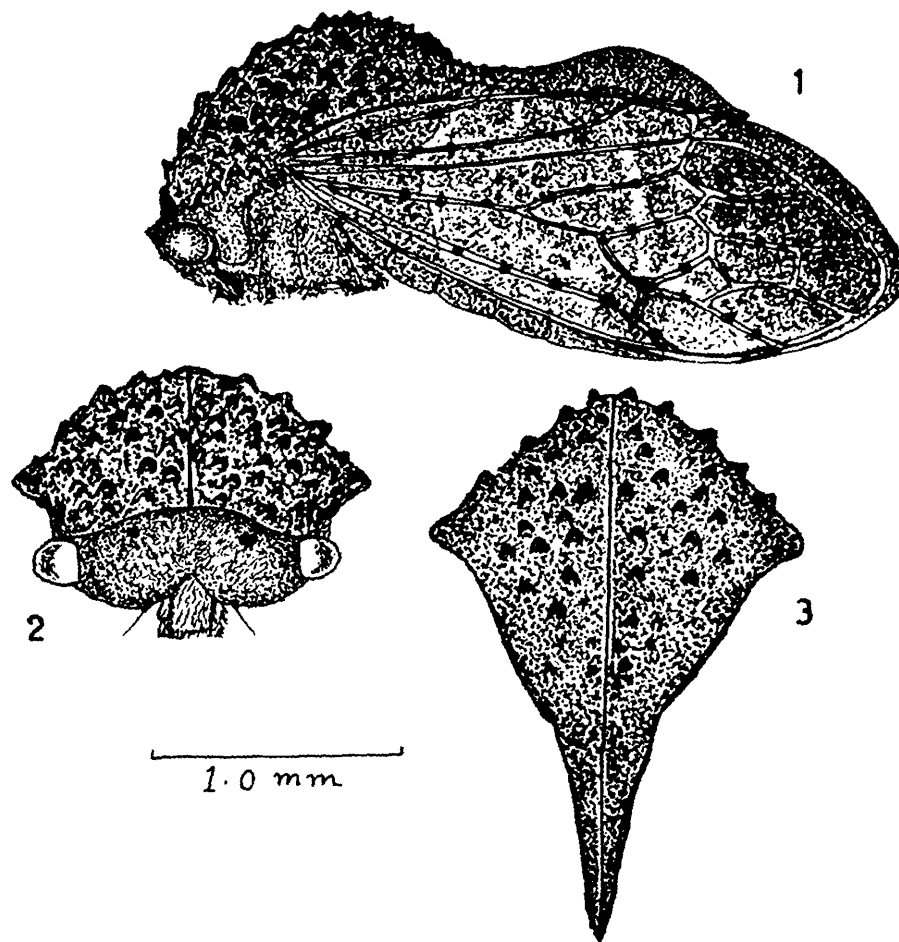


Fig. 221 : *Coccosterphus obscurus* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

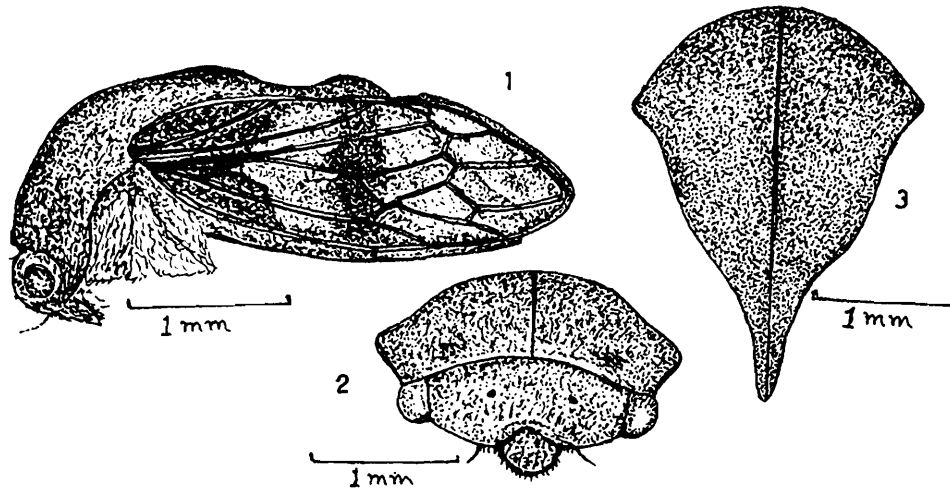


Fig. 222 : *Parayasa affinis* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

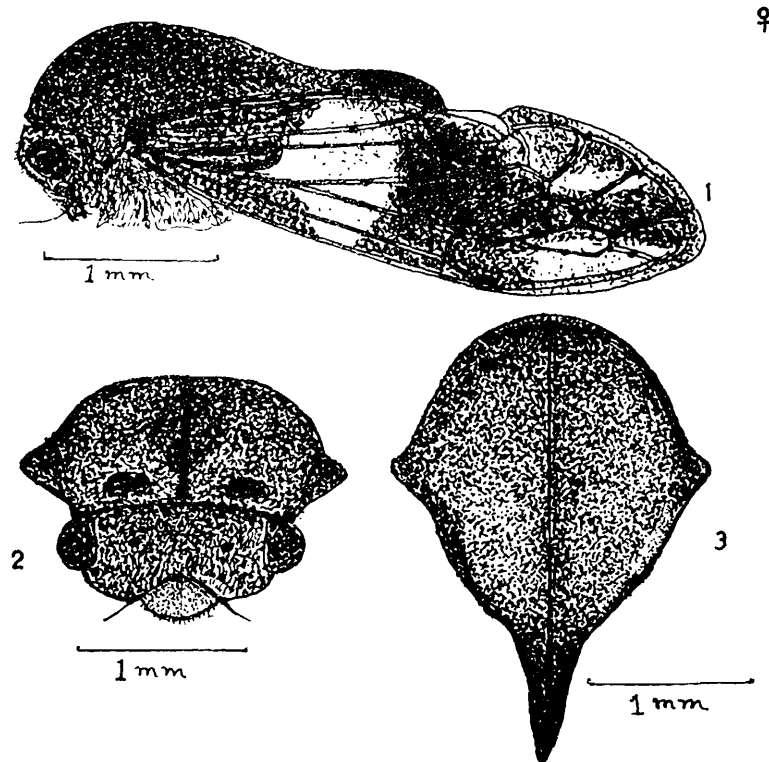


Fig. 223 : *Parayasa affixa* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

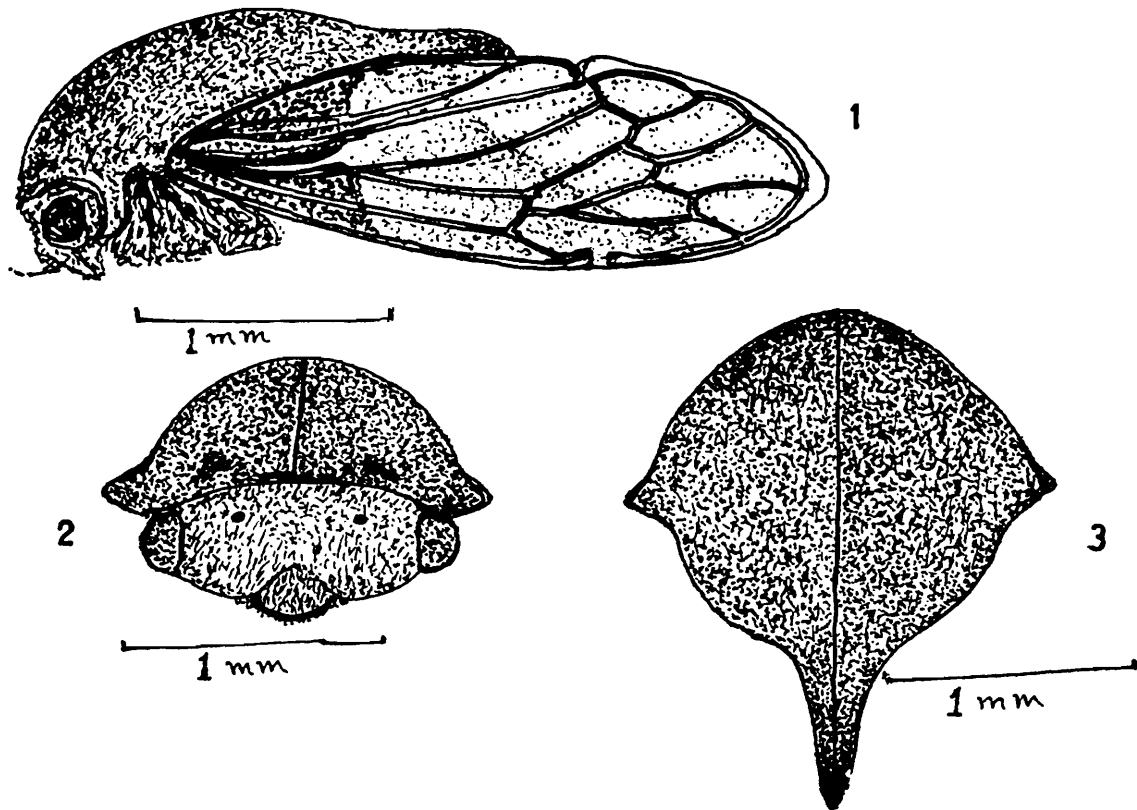


Fig. 224 : *Parayasa atricapilla* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; Dorsal view of pronotum.

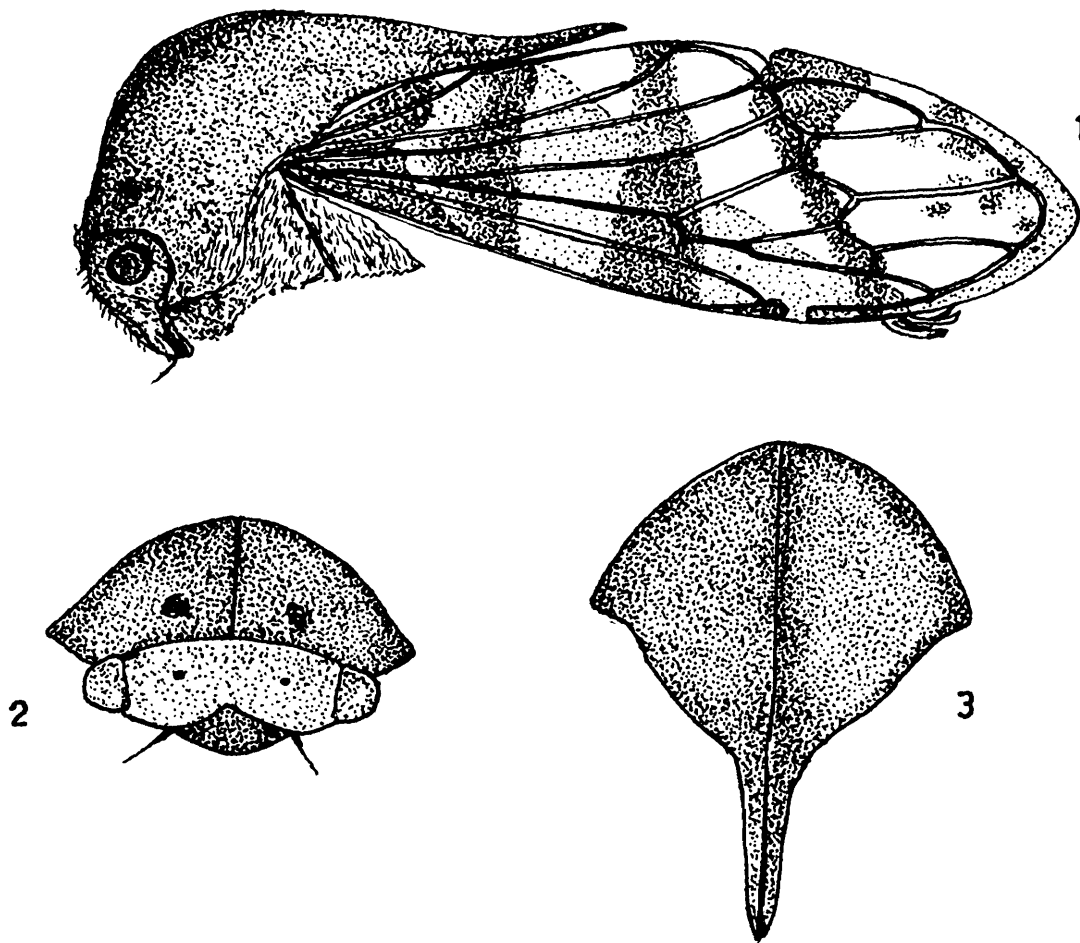


Fig. 225 : *Parayasa dissimilis* Distant. Male. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

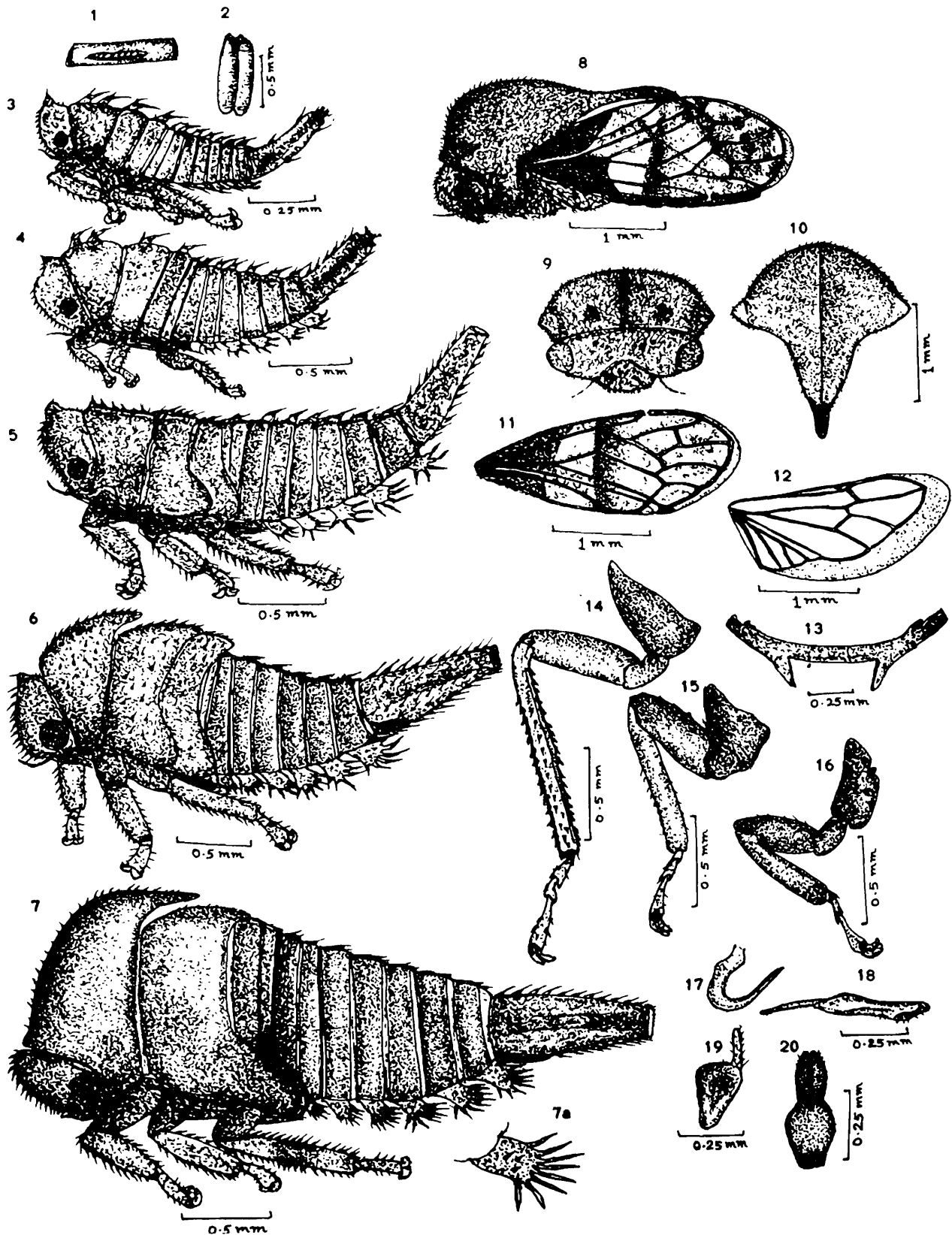


Fig. 226 : *Parayasa elegantula* Distant. Female. 1. Egg slit on host stem; 2. Eggs; 3-7 First to fifth nymphal stages; 7a. Lateral lamella; 8. Adult, Lateral view; 9. Frontal view of head and pronotum; 10. Dorsal view of pronotum; 11. Tegmen; 12. Hind wing; 13. Scutellum; 14. Hind leg with cucullate setae on tibia; 15. Midleg; 16. fore leg; 17-20. Parts of male genitalia.

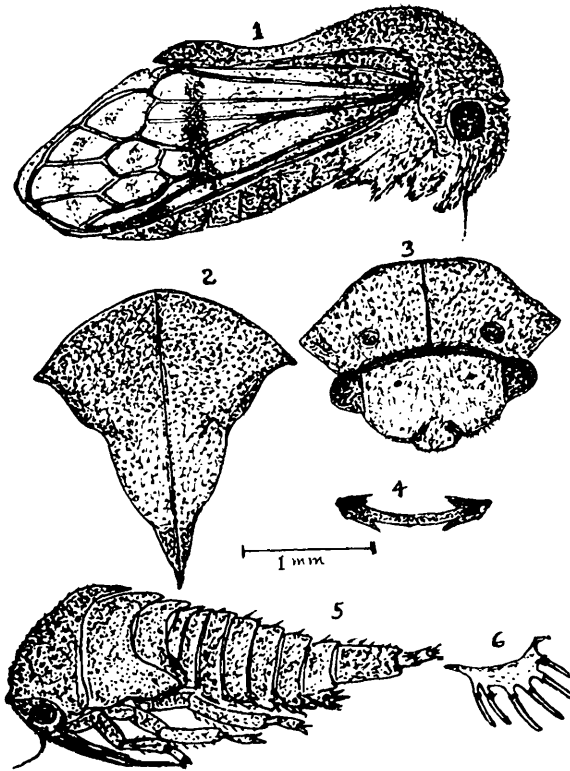


Fig. 227 : *Parayasa fasciata* Ananthasubramanian. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum; 4. Scutellum; 5. Fifth instar nymph; 6. An abdominal lateral lamella.

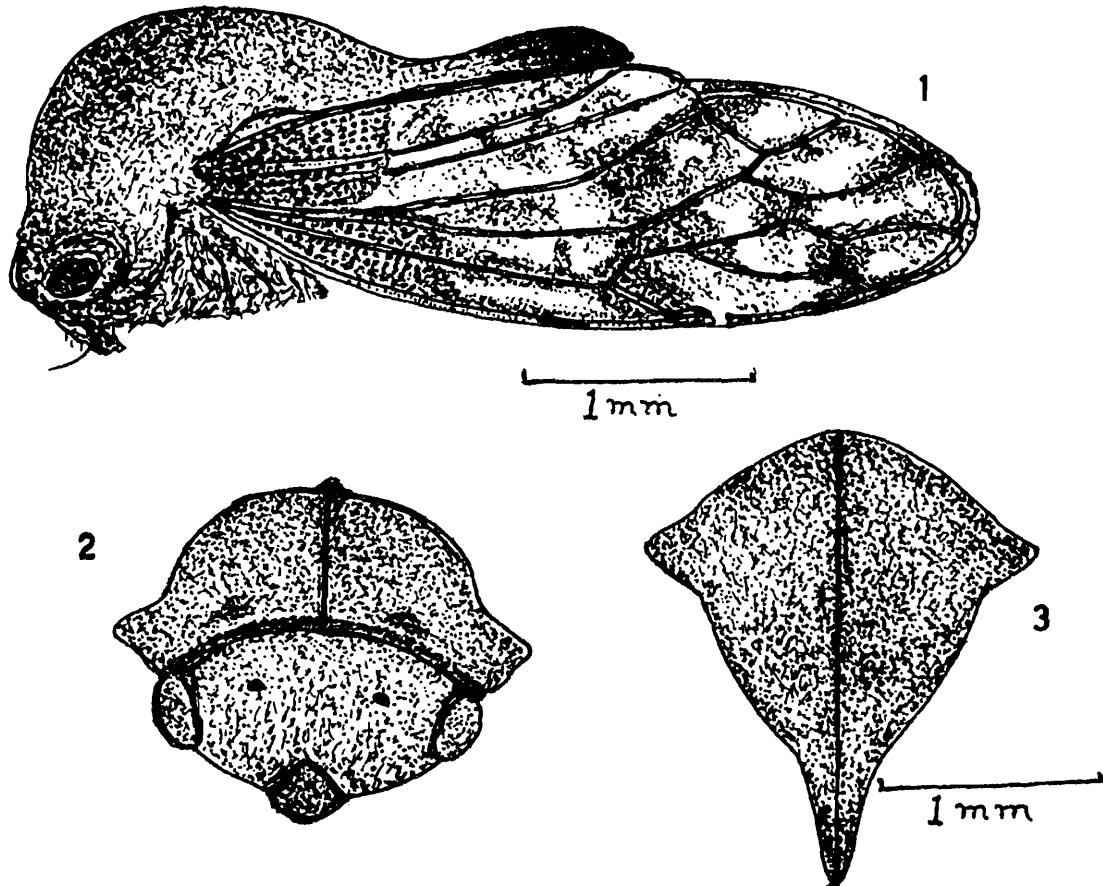


Fig. 228 : *Parayasa maculosa* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

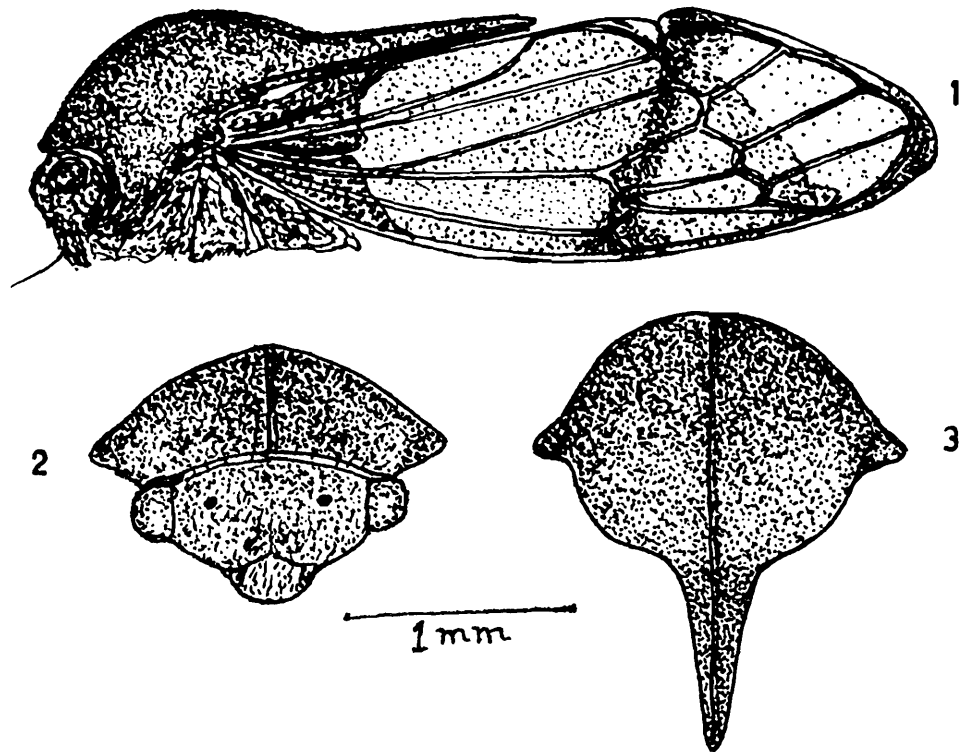


Fig. 229 : *Parayasa margherita* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

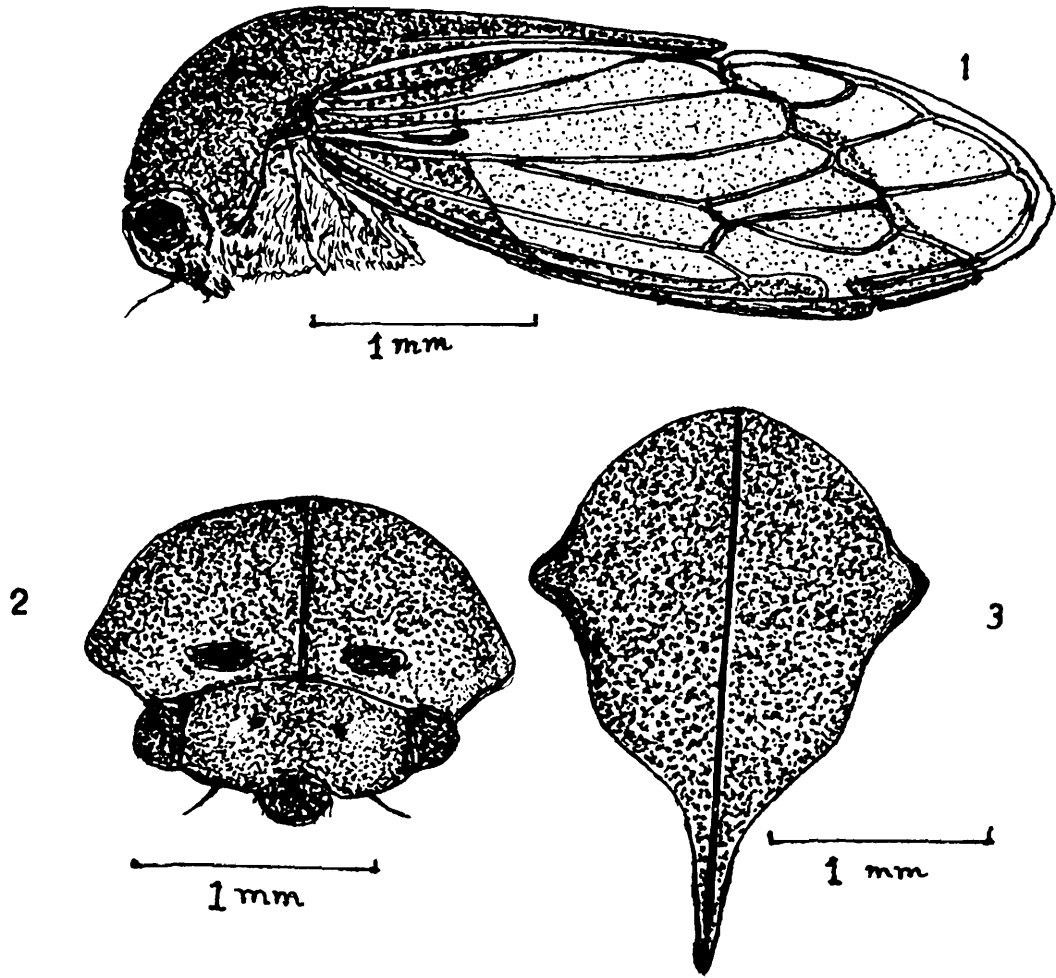


Fig. 230 : *Parayasa modesta* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

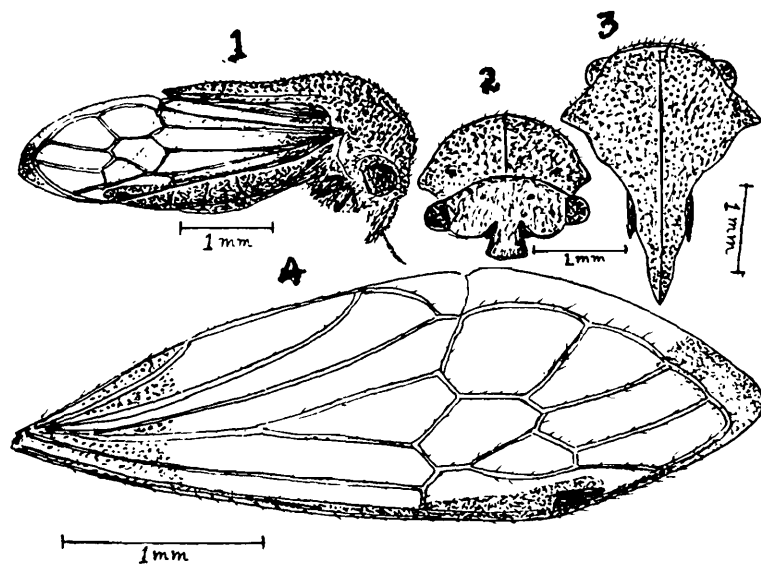


Fig. 231 : *Parayasa nigrolimbata* Ananthasubramanian. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum; 4. Tegmen.

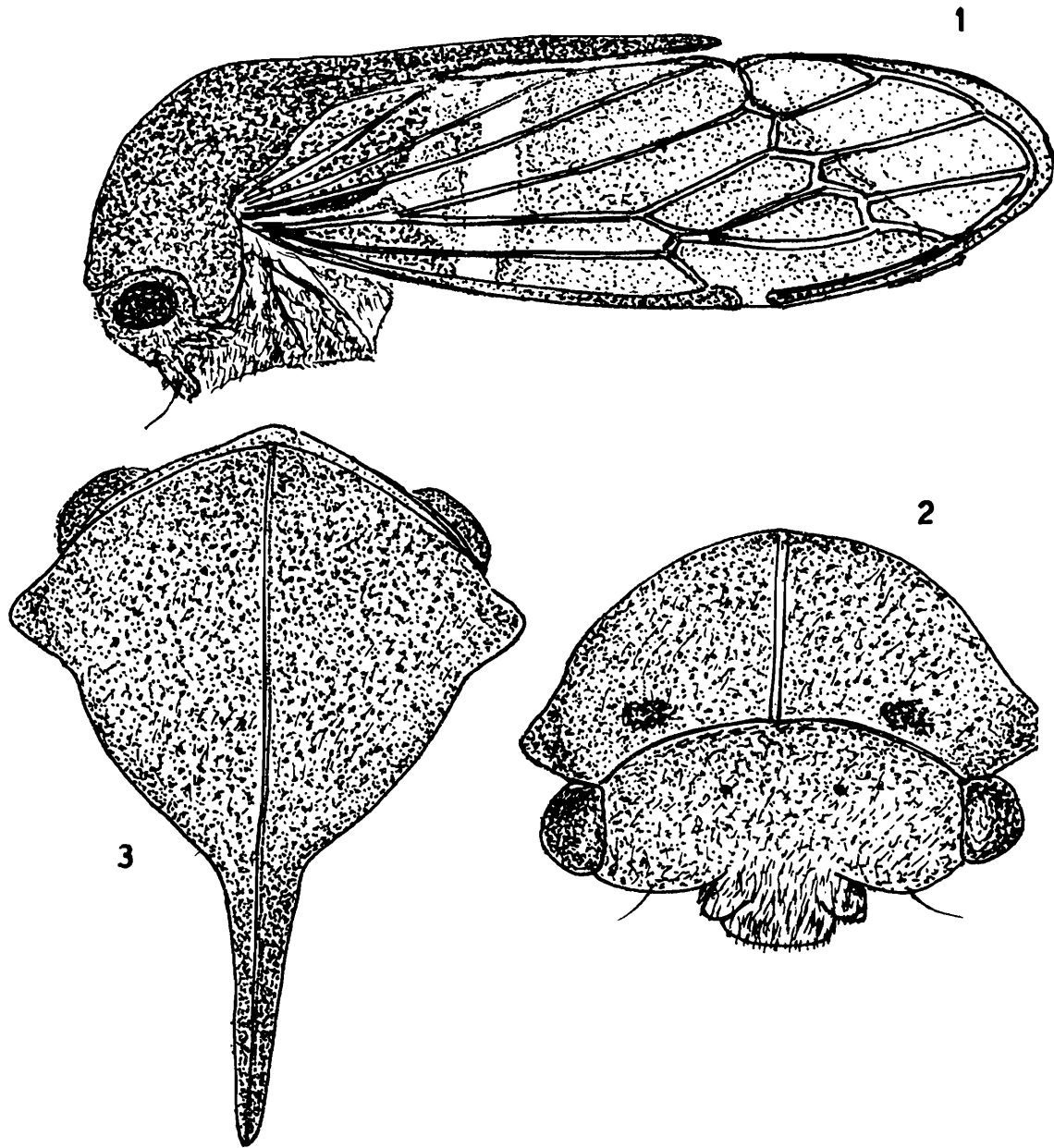


Fig. 232 : *Parayasa nilgiriensis* Distant. Male 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

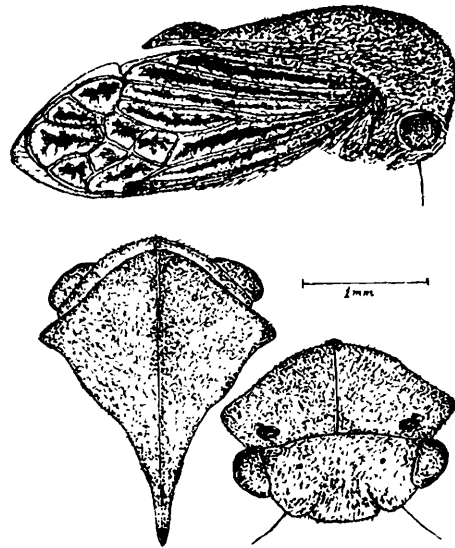


Fig. 233 : *Parayasa pilosa* Ananthasubramanian. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

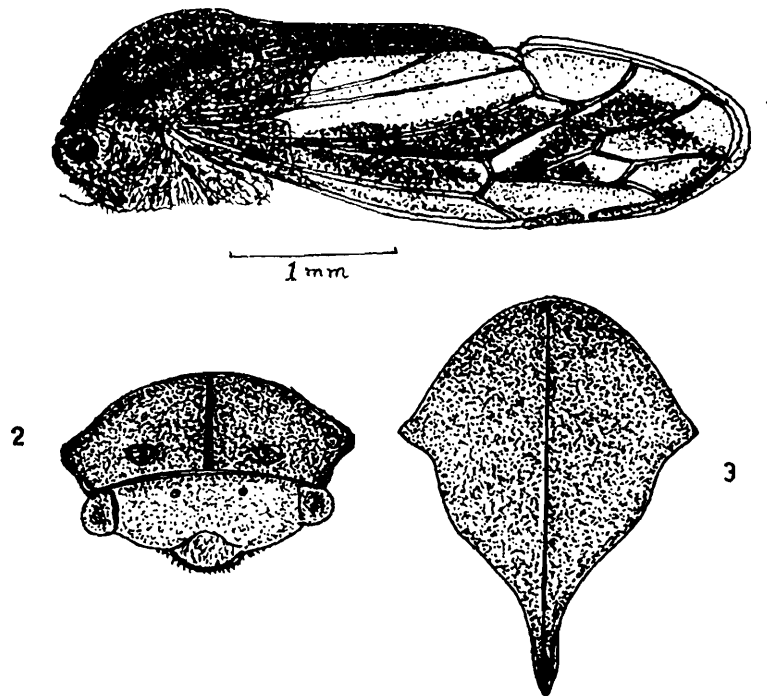


Fig. 234 : *Parayasa rustica* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

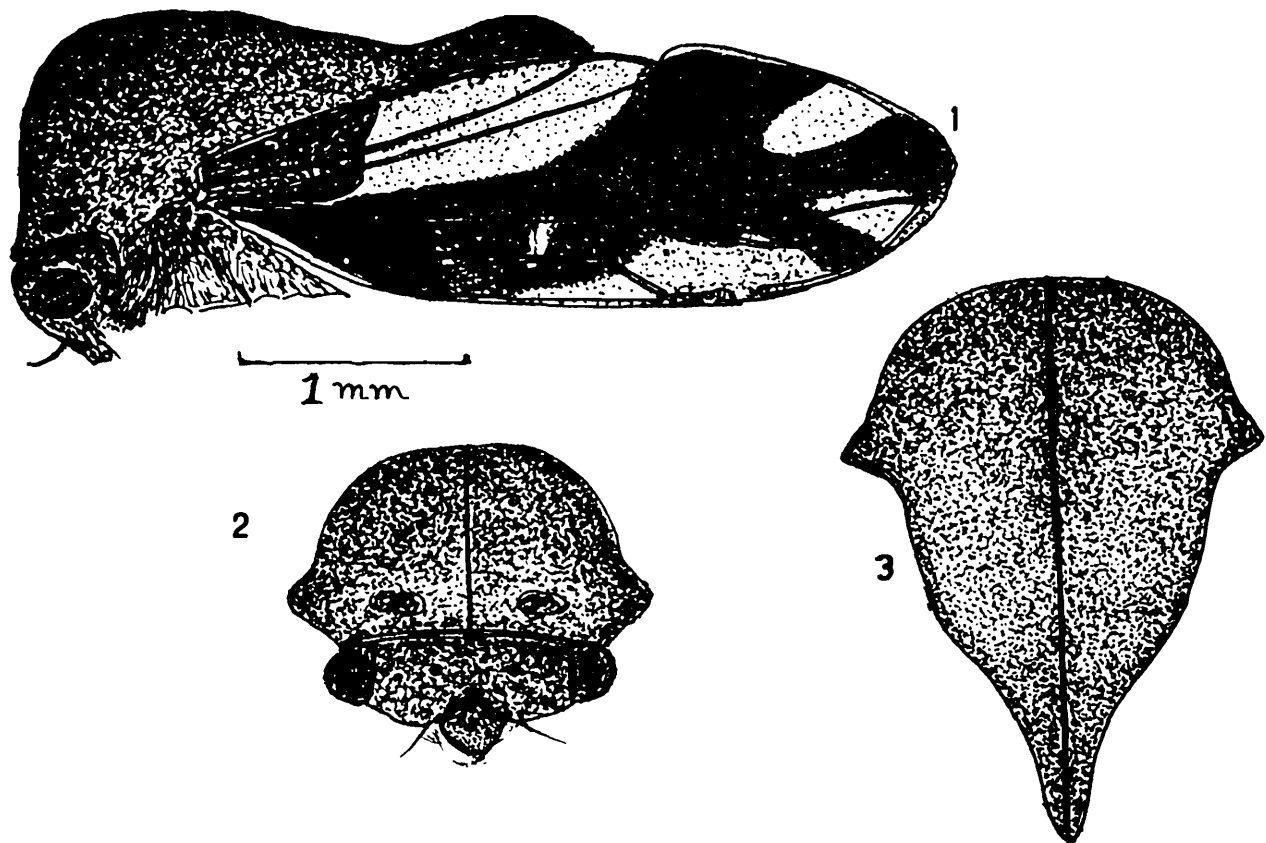


Fig. 235 : *Parayasa typica* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

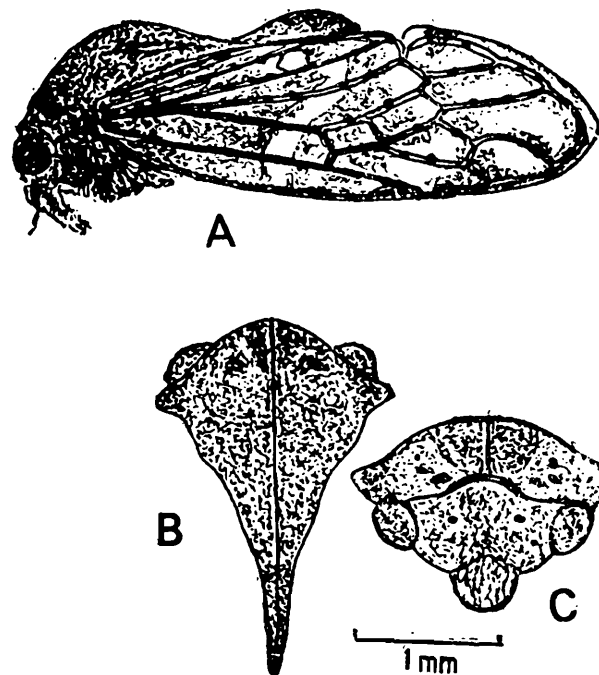


Fig. 236 : *Parayasa variegata* Ananthasubramanian. Female. A. Lateral view; B. Dorsal view of pronotum; C. Frontal view of head and pronotum.

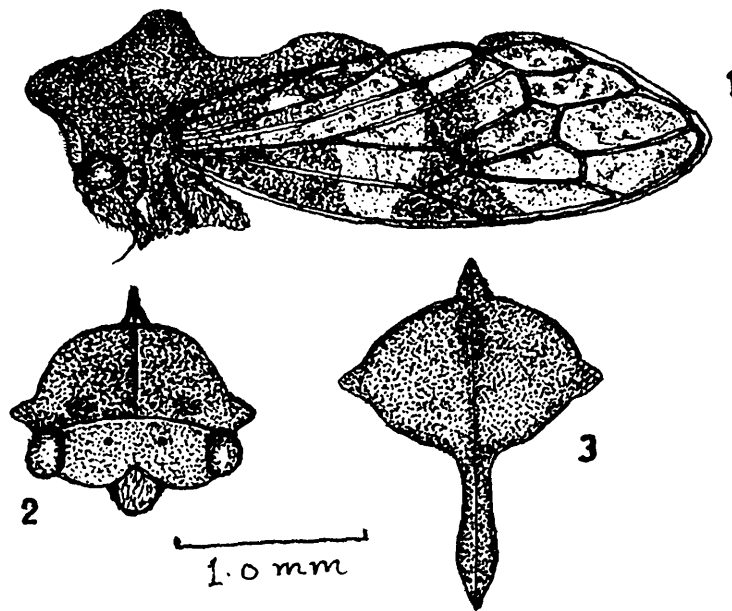


Fig. 237 : *Insitor exemplificatus* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

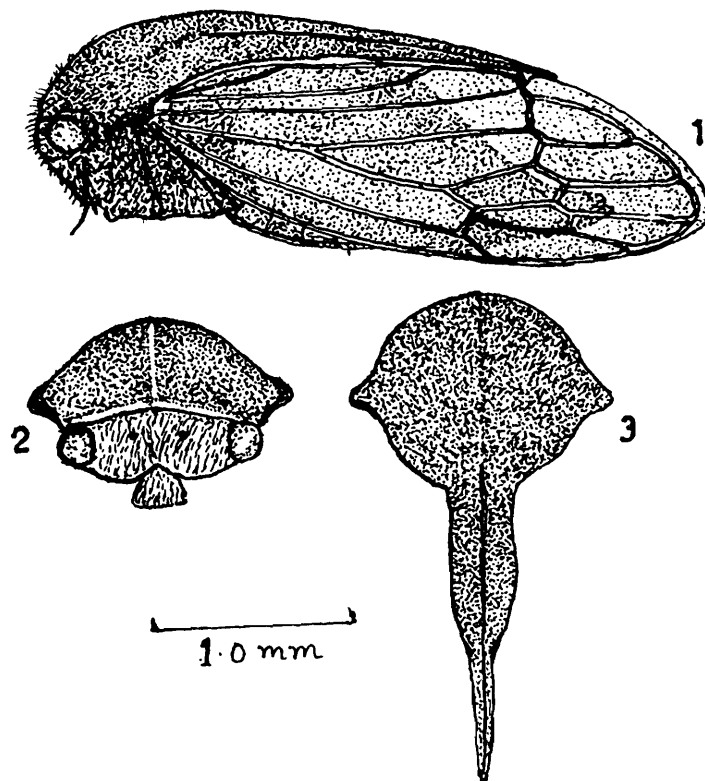


Fig. 238 : *Kanada irvinei* Distant. Female. 1. Lateral view; 2. Frontal view of head and pronotum; 3. Dorsal view of pronotum.

SUBJECT INDEX

- Acanthuchus* 230
acuticornis (*Leptocentrus*) 161
aeneus (*Tricentrus*) 69
affinis (*Gargara*) 263
affinis (*Parayasa*) 306
affixa (*Parayasa*) 307
aiyuri (*Tricentrus*) 70
albitarsis (*Gargara*) 264
albomaculatus (*Otinotus*) 202
albomaculatus (*Tricentrus*) 71
Aleptocentrus 248
allabens (*Tricentrus*) 72
ammon (*Otinotus*) 203
ananthkrishnani (*Hypsauchenia*) 117
ananthasubramaniani (*Tricentrus*) 73
Anchon 237
anodonta (*Hybanda*) 124
Antialcidas 244
apicalis (*Oxyrhachis*) 35
assamensis (*Centrotypus*) 222
assamensis (*Tricentrus*) 75
atricapilla (*Parayasa*) 308
atrus (*Tricentrus*) 75
attenuatus (*Antialcidos*) 244
aurea (*Gargara*) 265
aureus (*Otinotus*) 204
badius (*Otinotus*) 205
bajulans (*Leptocentrus*) 163
balteata (*Telingana*) 135
banguensis (*Tricentrus*) 75
bauhiniae (*Leptocentrus*) 165
beluri (*Leptocentrus*) 166
bicolor (*Maurya*) 246
bicolor (*Tricentrus*) 76
bifurcus (*Tricentrus*) 77
binsarus (*Oxyrhachis*) 36
brevicornis (*Centruchus*) 233
brevicornis (*Otinotus*) 205
brevicornutus (*Oxyrhachis*) 37
brevis (*Gargara*) 266
brevis (*Tricentrus*) 78
brunnea (*Sinodemanga*) 252
caelata (*Gargara*) 267
campbelli (*Telingana*) 136
campbelli (*Otinotus*) 206
canescens (*Telingana*) 136
capistrata (*Telingana*) 137
carinata (*Gargarina*) 257
carinatus (*Leptocentrus*) 167
cavendus (*Convecton*) 198
Centrolinae 56
Centrotini 235
Centrotus 235
Centrotypus 220
Centruchus 232
cinereus (*Tricentrus*) 79
cinnamomi (*Lanceonotus*) 153
Coccosterphini 292
Coccoterphus 297
compressus (*Tricentrus*) 80
concolor (*Tricentrus*) 81
confusa (*Gargara*) 267
congestus (*Tricentrus*) 81
consobrina (*Telingana*) 138
contraria (*Gargara*) 268
Convecton 198
cornutus (*Tricentrus*) 83
Cryptaspidia 250
curvispina (*Telingana*) 140
dama (*Leptobelus*) 126
Darthula 29
Darthulinae 29
Darthulini 29
decoloratus (*Coccosterphus*) 299
decornis (*Tricentrus*) 83
delimitata (*Gargara*) 269
Deitzius 150
Demanga 253
discoidalis (*Gargara*) 270
dissimilis (*Parayasa*) 307
distinctus (*Tricentrus*) 84
Dograna 194
Ebhul 290
echinatum (*Anchon*) 238
elegans (*Tricentrus*) 85
elegantula (*Parayasa*) 310

- elongatus (Otinotus) 207
 Emphusis 217
 erectus (Occator) 255
 Eucocosterphus 293
 euschistus (Tricentrus) 86
 exemplificatus (Insitor) 320
 extrema (Gargara) 270
 fairmairei (Tricentrus) 87
 fasciata (Cryptaspidia) 250
 fasciata (Parayasa) 311
 ferruginosus (Tricentrus) 88
 flavescens (Centrotypus) 223
 flavipes (Telingana) 141
 flavolineata (Gargara) 271
 flexuosus (Centrotypus) 224
 Gargara 257
 Gargarina 256
 Gargarini 256
 gazella (Leptobelus) 127
 geniculata (Oxyrhachis) 38
 gibbosulus (Tricentrus) 88
 grandis (Oxyrhachis) 39
 haldāri (Oxyrhochis) 40
 hameedi (Tricentrus) 89
 hardwickii (Darthula) 30
 hardwickii (Hypsauchenia) 118
 horizontalis (Tricentrus) 90
 Hybanda 124
 hraswa (Gargara) 272
 Hypsauchenia 116
 Hypsauchenini 116
 Hypsorylium 121
 imitator (Telingana) 141
 Imporcitor 195
 indicatus (Otinotus) 208
 indicus (Centrotus) 236
 indicus (Lanceonotus) 154
 indicus (Pogonotus) 197
 indicus (Tricentrus) 91
 insignis (Leptocentrus) 168
 Insitor 320
 Insitoroides 247
 irvinei (Kanada) 322
 kamaonensis (Tricentrus) 93
 Kanada 321
 kandala (Gargara) 273
 kempi (Hypsoeyrium) 122
 krusadiensis (Oxyrhachis) 40
 Lanceonotus 151
 lefroyi (Oxyrhachis) 42
 Leptobelus 125
 Leptocentrini 128
 Leptocentrus 156
 leucaspis (Leptocentrus) 169
 longiceps (Tricentrus) 93
 longicornis (Tricentrus) 94
 longispinus (Leptocentrus) 171
 luteinervis (Lanceonotus) 154
 luteus (Cocosterphus) 299
 luteus (Leptocentrus) 172
 maculata (Gargara) 274
 maculosa (Parayasa) 312
 maculipennis (Ebhul) 290
 madrasensis (Gargara) 275
 majesticus (Leptocentrus) 172
 major (Leptocentrus) 173
 majuscula (Gargara) 276
 majuscula (Telingana) 142
 malabarrica (Gargara) 277
 malabaricus (Centrotypus) 225
 malabaricus (Lanceonotus) 155
 malabaricus (Oxyrhachis) 43
 malleus (Emphusis) 218
 mangiferae (Leptocentrus) 175
 mangiferana (Oxyrhachis) 43
 manni (Hypsolyrium) 123
 margherita (Parrayasa) 313
 Maurya 245
 Micreunini 125
 mimicus (Otinotus) 210
 minomorii (Tricentrus) 95
 minusculus (Oxyrhachis) 44
 minusculus (Tricentrus) 96
 minutispinus (Acanthuchus) 230
 minutus (Cocosterphus) 300
 mitrai (Tricentrus) 97

- mixta* (Gargara) 278
modesta (Parayasa) 314
moringae (Leptocentrus) 176
mucronicollis (Eucocosterphus) 294
mysorensis (Cocosterphus) 301
mysorensis (Otinotus) 211
Neocentrus 234
nigra (Leptocentrus) 177
nigroalata (Telingana) 143
nigrodorsalis (Oxyrhachis) 46
nigrofasciata (Gargara) 279
nigrolimbata (Gargara) 280
nigrolimbata (Parayasa) 315
Nilautama 192
nilgiriensis (Parayasa) 315
nobilis (Tricentrus) 98
notabilis (Aleptocentrus) 249
obliquus (Leptocentrus) 178
obliquus (Otinotus) 212
obortus (Leptocentrus) 179
obscurus (Cocosterphus) 302
Occator 254
onerratus (Otinotus) 213
orlanda (Telingana) 144
ortus (Centrotypus) 226
Otinotus 199
Oxyrhachinae 31
Oxyrhachini 31
Oxyrhachis 32
pallescens (Otinotus) 216
paludatus (Eucocosterphus) 295
palus (Oxyrhachis) 46
Parayasa 303
paria (Telingana) 146
parvus (Centrotypus) 227
pellucida (Gargara) 281
penangi (Gargara) 282
perarmata (Emphusis) 219
Periaman 231
piceola (Cryptaspidia) 251
pilosa (Parayasa) 316
pilosum (Anchon) 239
pilosum (Periaman) 232
pilosus (Tricentrus) 99
platycornis (Tricentrus) 102
Pogonotus 196
projectus (Tricentrus) 102
projectus (Tricentroides) 115
pronus (Tricentrus) 103
propria (Tricentroides) 115
pubescens (Tricentrus) 104
pulchripennis (Gargara) 283
pulniensis (Centrotypus) 228
pulniensis (Gargara) 283
pulniensis (Telingana) 146
punctatus (Oxyrhachis) 47
rectangulatum (Anchon) 240
recurvicornis (Tricentrus) 105
repandus (Tricentrus) 106
reponens (Tricentrus) 180
rhizophagus (Leptocentrus) 181
rivulata (Gargara) 284
robusta (Gargara) 285
rubrinigris (Leptocentrus) 182
rufescens (Leptocentrus) 183
rufescens (Oxyrhachis) 48
rufus (Neocentrus) 234
rustica (Gargara) 290
rustica (Parayasa) 317
sabarigiriensis (Telingana) 147
scutellatus (Leptocentrus) 184
securris (Centrotypus) 229
sikhimensis (Gargara) 287
Sinodemanga 252
ssisoo (Tricentrus) 107
sooknana (Demanga) 254
spathodei (Tricentrus) 107
speciosus (Tricentrus) 109
splendens (Leptocentrus) 185
splendidula (Gargara) 288
subangulatus (Tricentrus) 110
subfusca (Hypsauchenia) 119
subjecta (Oxyrhachis) 49
subsimilis (Telingana) 148
substitutus (Leptocentrus) 186
suffulta (Dograna) 194

- syrandrike (*Tricentrus*) 111
taranda (*Oxyrhachis*) 50
taurus (*Leptocentrus*) 187
Telingana 130
tomentosuss (*Deitzius*) 151
transversus (*Tricentrus*) 112
transversus (*Otinotus*) 217
travancorensis (*Telingana*) 149
Tricentrini 58
Tricentroides 114
Tricentrus 59
tuberculatus (*Eucoccosterphus*) 296
tuberculus (*Oxyrhachis*) 54
typica (*Nilautama*) 193
typica (*Parayasa*) 318
typica (*Insitoroides*) 248
typicus (*Imporcitor*) 196
tumida (*Gargara*) 288
ulniforme (*Anchon*) 241
uncaus (*Oxyrhachis*) 54
uncinatum (*Hypsolyrium*) 123
unicolour (*Oxyrhachis*) 56
unicolor (*Tricentrus*) 113
Uroxiphini 246
usstus (*Leptocentrus*) 190
varicolor (*Gargara*) 289
varicornis (*Leptocentrus*) 191
varicornis (*Tricentrus*) 113
variegata (*Parayasa*) 319
varium (*Ebhul*) 291
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