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INCLUDING

THE REMAINDER OF THE ORIENTAL REGION.

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DIPTERA.

VOL. VI.

Family CALLIPHORIDÆ.

BY

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CONTENTS.

	Page
Authors' Preface	v
Systematic Index	xi
Introduction	1
Calliphorinæ	27
Chrysomyinæ	135
Rhiniinæ	149
Sarcophaginæ	208
Appendix	282
Alphabetical Index	283

PREFACE.

THE history of this volume has been one of delays, due to the changes in official posts of the original authors. In the first place Major Patton, I.M.S. (until recently Dutton Memorial Professor of Entomology in the University of Liverpool), and the present first author (R. Senior-White), after working for four years in close conjunction, though actually together only for short periods in 1920 and 1923, commenced, in the 'Records of the Indian Museum,' a series of revisions of individual groups of the family now treated, with the view ultimately of combining these into a volume in the 'Fauna of British India' series. Some parts of this revision were to appear jointly, but the majority of groups were apportioned out by mutual agreement for individual authorship. In this way the genera *Sarcophaga* and *Musca* * had appeared before unforeseen events made further progress far more difficult; though meanwhile the editor of the 'Fauna' series had definitely contracted for the present volume. In the first place, Major Patton left the University of Edinburgh and went to China on the Kala-Azar Commission of the Royal Society, thus bringing all further work on the subject by him to a lengthy pause. The present first author (R. Senior-White) had just completed the remaining revisions which fell to his share when, in 1925, he was called to work, in India, which made systematic work almost impossible. In any case, the material for the revision of the remaining groups was not

* The original intention was to cover the Muscidæ, *sensu antiquo*. After Miss Aubertin's cessation of official work in 1935 the Muscidæ, as restricted to-day, had to be omitted from the volume.

with him, even had he been in a position, under the original arrangement, to undertake them. Thus for several years the whole scheme was in abeyance, and Professor Patton finally found himself in a position in which he was unable to see his way to take up the revision of the remaining groups, or the final collation into a 'Fauna' volume, within a reasonable time. He then renounced all intention of continuing the work, so leaving the other author (R. Senior-White), who had just returned to England on leave (1930), with the idea that the volume could then be put together, in a quandary. He was not in a position to complete the revisions of the groups allotted to Prof. Patton during a six months' leave, as well as the putting of the volume together. At this point the second author (D. Aubertin) of the present volume stepped into the breach, and, taking over the uncompleted revisions (which, as separate papers, will now never all appear), collaborated with the survivor of the original partnership from 1930 to 1934.

After another period of leave, in 1934, when the work was beginning to take form, the second author (D. Aubertin) resigned her post at the British Museum (Natural History) on marriage. Her manuscripts were handed to the again-deserted first author (R. Senior-White) when he came to London on leave in 1938, and have by him been put together into final form. Miss Aubertin was succeeded at the Museum by the third author (J. Smart), whose part in the preparation of the volume has consisted mainly in helping the first author with the final preparation of the manuscript and in seeing the volume through the press.

It is hoped that all literature appearing up to the 1936 edition of the 'Zoological Record' has been covered. An Appendix giving the names of species described from 1936 up to the end of 1939, with references, has been prepared, and will be found at the end of the volume (p. 282).

Though it appears in the 'Fauna of British India' series, the volume takes cognizance of the species of the entire

Oriental region. This is a new departure in this series, but so widely are the species of this family distributed, and, compared with the more attractive groups of insects, so little collecting has been done, that the Editor agreed to the above extension of plan. When Assam and Burma have



Sketch-map of the Malay Peninsula, the Malay Archipelago and adjacent lands.

Line I is Wallace's line of division between the Australian and the Oriental faunas.
Line II is a line worked out by Rodenwaldt and de Rook (in 'Malaria,' by J. G. Overbeek and W. J. Stoker. Batavia: Kolff & Co.) showing the apparent division between the Australian and the Oriental Anopheline (Mosquito, Diptera) faunas.
Wallace's Line is the division used in this volume.

been adequately worked it is probable that many of the species here included from farther Eastern areas alone will prove to be Indian in the 'Fauna' sense.

As regards the order Diptera, the limits of the Oriental region are far from certain. Wallace's Line is certainly

not the boundary to Diptera that it is to the Vertebrata. The boundary would appear to lie farther East, between Celebes, or Amboina, and Papua (see Map). Another great difficulty is in regard to China. The boundaries of the Palæarctic and the Oriental in that country are quite undefined. Chinese species have therefore been included when their locality of origin appears to be definitely within or in the neighbourhood of the Oriental region, *i. e.*, Yunnan, and the south-east coast up to the Formosa Channel, and including that island.

These debatable lands are, however, far from the official boundaries of the 'Fauna' series, and it is hoped that for workers in India, Burma, and Ceylon all likely accretions to their faunas, which have already been described from beyond the official boundaries, have been included. But a worker in Central China, or the farther Dutch Indian islands, using this volume, would not be safe in concluding that any species collected but not found described in it was "new."

It is not claimed that the present volume can possibly compare with that on the Culicinæ, in the same series, as an exhaustive exposition of the extent of the dipterous fauna in Calliphoridæ. Unlike the author of that volume, we have not had the advantage of several years special duty collecting throughout the area treated, enabling material to be taken in all kinds of remote spots likely to yield additions to the tale of species; nor do Muscoids, unlike Culicidæ, attract, to the extent they deserve, the attention of medical entomologists, so as to produce a steady stream of material from all parts of the Empire. The present volume can only be considered as a foundation for future work. We have heard it said that the best recommendation that a volume of the 'Fauna' series can have is that it so stimulates interest in the group that the volume becomes out of date in a few years through the subsequent addition of new species described, owing to its rendering certain that the species before the describer is really new. In earlier volumes dealing with Diptera this has certainly been the fate of Brunetti's 'Nematocera.' May it likewise be the fate of our own!

The Authors are greatly indebted to the Editors and Publishers of the following Journals for their kind permission to reproduce certain illustrations and, when available, for the loan of blocks :—

Annals and Magazine of Natural History,
Annals of Tropical Medicine and Parasitology,
Bulletin of Entomological Research,
Bulletin of the Fan Institute, Pekin,
Journal of the Linnean Society of London,
Memoirs of the Department of Agriculture, India: Entomological Series,
Proceedings of the Linnean Society of New South Wales,
Proceedings of the Zoological Society of London,
Proceedings of the United States National Museum, Washington,
Records of the Indian Museum, Calcutta,
Transactions of the Royal Entomological Society of London,
Deutsche Entomologische Zeitschrift,
Konowia,
Miscellanea Zoologica Sumatrana,
Natuurhistorisch Maandblad,
Spolia Zeylanica,
Supplementa Entomologica,

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Original drawings have been prepared by Mr. Engel Terzi, Miss B. Hopkins and Miss M. Mackay.

R. SENIOR-WHITE,
D. AUBERTIN,
JOHN SMART.

SYSTEMATIC INDEX.

Page

Subfamily CALLIPHORINÆ. 27

1 Hypopygiopsis *Tnsd.* .. 28
1. fumipennis (*Wlk.*) . 29
2 robusta *Mall.* .. . 30
3. violacea (*Macq.*) 31
2. Calliphora *R.-D.* 32
4. erythrocephala (*Mq.*). 33
5. fulviceps *v. d Wulp* . 34
6 grahami *Aldr* 35
7 malayana *Mall* . .. 36
8. paradoxa (*Vill*) .. 37
9. pattoni *Aub.* 38
10. vomitoria (*L*) . .. 39
11. atripalpis *Mall.* . 41
3. Hemipyrellia *Tnsd.* 41
12. ligurriens (*Wd.*) 42
13. jucunda (*Kirby*) .. 43
14. pulchra (*Wd*) 44
15 tagalana (*Big.*) .. . 45
4 Lucilia *R.-D* 46
16. fumicosta *Mall.* ... 48
17. illustris (*Mg.*) .. 48
18. ampullacea *Vill* . . 50
19. sinensis *Aub.* 51
20. papuensis *Macq.* ... 52
21. porphyrina (*Wlk.*)... 53
22. sericata (*Mg.*) 54
23. cuprina (*Wd.*) 55
24. andrewsi, sp. n ... 57
5. Paradichosia *Sen.-Wh.* ... 58
25. abdominalis *Mall.* .. 59
26. dubia *Mall.* 60
27. flavibasis *Mall.* 60
28. scutellata *Sen.-Wh.* . 61
29. crinitarsis *Vill* 63
30. nigricans *Vill.* . . . 63
31. pusilla (*Vill.*) 64
6. Phumosia *R.-D.* 65
32. abdominalis *R.-D.* . 66
33. costata *Mall.* 68
34. promittens *Wlk.* .. 68
7. Caiusa *Sure.*... 69
35. violacea *Ség.* 70
36. indica *Sure.* 70

Caiusa (*cont.*). Page
37. testacea *Sen.-Wh.* .. 72
38. nigro-nitens *Sen.-Wh.* 74
8. Vertricia *Mall.* 75
39. orientalis *Mall* 75
40. nigra *Mall.*..... 77
41. fasciventris *Mall* ... 77
9. Booponus *Aldr.* 78
42. intonsus *Aldr.* . .. 78
43 indicus (*Aust.*) . . 79
44 aldrichi, sp. n ... 81
10 Chætoptilopsis *Baran* .. 82
45. burmanica *Baran*..
11. Bengalia *R.-D.* 83
46. labiata *R.-D.* 85
47. hastativentris *Sen.-Wh.*..... 86
48. hobbyi, sp. n. 88
49 jejuna (*Fab.*) 88
50 jejuna *var* quadrimotata (*Big.*) . . . 90
51. lateralis *Macq.*.. .. . 90
52 recurva *Mall.* . . 92
53. siamensis *Sen.-Wh.* . 93
54. concava *Mall.* 94
55 martin-leakei *Sen.-Wh* 95
56. escheri *Bezzi* . . . 97
57. xanthopyga *Sen.-Wh* 97
58. bezzii *Sen.-Wh.* . . 99
59. surcoufi *Sen.-Wh.* .. 101
60. varicolor (*Fab.*) ... 101
12 Catapicephala *Macq.* 102
61 dasyophthalma *Vill* . 103
62. ignens (*Wlk.*) 104
63. pattoni, sp. n. 105
64. ruficornis *Vill.* 106
65. splendens *Macq.* 106
13. Termitolœmus *Baran.* .. 107
66. marshalli *Baran.* ... 108
14. Tainamma *Vill.* 108
67. pilisquama (*Sen.-Wh*) 109
68. sarcophagoides (*Mall.*) 110

	Page
15. Melinda *R.-D.*	111
69 kocki *Mall.*	112
70 grisea *Mall.*	113
71. sumatrana (*Mall.*)	114
16 Pollenia *R.-D.*	115
72. rudis (*Fab.*)	117
73 townsendi, nom. nov.	119
74. khasiensis (*Sen.-Wh.*)	119
75. mongolica (*Ség.*)	120
76. pilosa (*Tusd.*)	121
77. toxopei (*Sen.-Wh.*)	122
78. meconelusa (*Wlk.*)	123
79. hazarae (*Sen.-Wh.*)	124
80. argentiemeta (*Sen.-Wh.*)	125
81. asiatica (*Sen.-Wh.*)	126
82. bicoloripes (*Mall.*)	126
83 bicolor (*Mall.*)	128
84. hirtiventris (*Mall.*)	129
85. testacea (*Tusd.*)	129
86. flava (*Aldr.*)	130
87. monsdulitae, sp. n.	131
88. luteola *Vill.*	131
17 Wilhelmina *Schin. & Vill.*	132
89. nepenthicola *Schm. & Pall.*	133
Subfamily CHRYSOMYIINÆ	135
18. Chrysomyia *R.-D.*	135
90. marginalis (*Wd.*)	137
91. megacephala (*Fab.*)	138
92. bezziana *Vill.*	140
93. rufifacies (*Macq.*)	141
94. albiceps (*Wd.*)	143
95. pinguis (*Wlk.*)	144
96. defixa (*Wlk.*)	145
97. phaonis (*Séq.*)	146
98. villeneuvi *Patton*	147
99. nigripes *Aub.*	147
Subfamily RHINIINÆ	149
19. Strongyloneura *Big.*	151
100. malayensis (*Tusd.*)	152
101. cupreo-viridis *Mall.*	154
102. dotata (*Wlk.*)	155
103. nebulosa *Tusd.*	155
104. ditissima (*Wlk.*)	156
105. viridaurea (*Wd.*)	157
106. pseudolucilia *Mall.*	158
107. delectans (*Wlk.*)	159
108. œstracea *Séq.*	161
109. chrysoides (*Wlk.*)	161
110. pseudonepalana, sp. n.	162
111. pseudonebulosa, sp. n.	163
112. zeylanica, sp. n.	164
113. pseudocerulana, sp. n	165
114. yerburyi, sp. n.	166
115. tibialis (*Vill.*)	167
20 Thoracetes *B. & B.*	168
116 abdominalis (*Fab.*)	168
21. Malayomyza *Mall.*	169
117. humeralis *Mall.*	169
22. Chloroidea *Tusd.*	170
118 prolata (*Wlk.*)	171
23 Cosmina *R.-D.*	171
119. aenea (*Fab.*)	172
120. bicolor (*Wlk.*)	173
121. confusa *Mall.*	175
122. bipluinosa (*Sen.-Wh.*)	175
24 Alikangiella *Vill*	176
123. vittigera (*Mall.*)	177
124. flava *Vill.*	177
125. rufithorax (*Mall.*)	178
25. Metallopsis *Tusd.*	179
126 setosa *Tusd.*	179
26. Metallea *v. d. Wulp*	179
127. notata *v. d. Wulp*	180
128. divisa (*Wlk.*)	180
129. flavibasis *Sen. Wh.*	182
130 pollinosa (*Tusd.*)	183
27. Rhynchomyia *R. D.*	183
131. callopis *Lw.*	183
28. Rhynchomyiopsis *Tusd.*	184
132 indica *Tusd.*	185
133. sarcotes *Séq.*	185
29. Sumatria *Mall.*	186
134. latifrons *Mall.*	186
30. Borbororhina *Tusd.*	187
135. bivittata (*Wlk.*)	187
136. pulchella (*Vill.*)	189
31. Stomorhina *Rond.*	190
137. lunata (*Fab.*)	191
138. discolor (*Fab.*)	192
139. quadrinotata *Big.*	194
140. fulvohumera, sp. n.	195
141. cuidielloides *Sen.-Wh.*	196
142. luteigaster (*de Meij.*)	197
143. xanthogaster (*Wd.*)	197
144. mandarina (*Wd.*)	199
145. sternalis (*Mall.*)	200
146. nila (*Sen.-Wh.*)	200
147. unicolor (*Macq.*)	201
148. simplex (*Wlk.*)	202
149. melanostoma (*Wd.*)	202
150. bipartita (*Mall.*)	203
151. mallochi, sp. n.	204
32. Rhinia *R.-D.*	204
152. testacea *R.-D.*	204
33. Chlororhinia *Tusd.*	206
153. exempta (*Wlk.*)	206
154. fuscohirta *Mall.*	206
Subfamily SARCOPHAGINÆ	208
34. Sarcophaga *Mg.*	208
155. calcifera *Bött.*	216
156. josephi *Bött.*	217

Sarcophaga (*cont.*). Page
157. caudagalli *Bott* 217
158 pes-helicis *Sen.-Wh.* . 218
159. sera *Rohd.* 220
160. melanura *My.* 221
161. barbata *Thoms.* ... 222
162. basalis *Wlk.* 223
163. gravelyi *Sen.-Wh.* .. 224
164. hæmatodes *Mg.*... . 225
165. aspinata, *Sen -Wh.* . 226
166. valangæ *Aldr.* 227
167. baranoffi, nom. nov.. 228
168. kästneri *Baran.* 229
169. walayari *Sen.-Wh.* . 230
170. doleschalli *J. & T.* . 231
171. banksi *Sen.-Wh.* 232
172. henryi *Sen -Wh.* 233
173. pusana *Sen -Wh.* ... 233
174 ostindicæ *Sen.-Wh.* . 235
175. antilope *Bott.* 235
176. basiseta *Baran.* 237
177. kankauensis *Baran.* . 237
178. annandalei *Sen.-Wh.* 238
179. prosbalina *Baran.* .. 239
180. knabi *Parker* 240
181. albiceps *Meig.* 242
182 *a.* hirtipes *Wied.*..... 243
182 *b.* hirtipes *var.* orchi dea *Bott.* 244
183. phœnicopterus *Bott.* . 245
184. talonata *Sen.-Wh.*... 246
185. krameri *Bött* 247
186 beesoni *Sen -Wh.* . 248
187 pattoni *Sen.-Wh.* . 248
188. formosana *Sen.-Wh.* . 250

Sarcophaga (*cont.*). Page
189. orientalis *Parker* ... 251
190. orientaloides *Sen.-Wh.* 251
191. sinica *Rohd.* 253
192. tristylata *Bott.* 254
193. crinita *Parker* 254
194. khasiensis *Sen.-Wh.* . 255
195. futilis *Sen.-Wh.* .. . 257
196. martellata *Sen.-Wh.* 258
197. martellatoides *Baran.* 259
198. hui *Ho* 260
199. similis *Meade* 261
200. hainanensis *Ho* 262
201. brevicornis *Ho* 262
202. kempi *Sen.-Wh.* 264
203. tsushimæ *Sen.-Wh.* . 265
204 *a.* dux *Thoms.* 266
204 *b.* dux *var.* harpax *Pand.* 267
204 *c.* dux *var.* scoparuiformis *Sen.-Wh.* . 269
205. ruficornis *Fab.* 270
206. iwuensis *Ho* 271
207. fuscicauda *Bött.*..... 272
208 karnyi *Hardy*..... 274
209. bambriggei *Sen -Wh.* 275
210. ballardi *Sen.-Wh.* ... 276
211. hæmorrhoidalis (*Fall*) 276
35. Sarcophila *Rond*..... 278
212. cinerea (*Fab.*) 278
36. Agria *R.-D.* 280
213. hutsoni *Sen.-Wh.* ... 280
37. Wohlfartia *B. & B.* 282
214. nuba *Wd* 282

INTRODUCTION.

In this section it is proposed to deal with the general structure, morphology, anatomy and bionomics of the Calliphoridæ as concisely as possible, stressing only those features which are of importance in the work of the systematist. Specialists in search of further information will hardly need to have their attention drawn to the monographs of Lowne and Hewitt, the text-books of Patton and Cragg, Patton and Evans, and the manual of Townsend. For an exposition of the external morphological characters specialist and beginner alike cannot do better than refer to the introductory part of Mr. Colbran J. Wainwright's paper (1928) on the British Tachinidæ, which includes the Calliphoridæ of the present volume *. Important references on morphological and biological questions have been given in the text, but, in view of the anticipated appearance of a complementary catalogue to be published under the auspices of the Indian Insect Catalogue Committee, these have been reduced to a minimum.

External Anatomy.

In describing the parts of the Calliphorid body it must be remembered that many of the terms used have been applied by different authors in different senses. Most of the terms were coined by systematists, and few of them have any valid morphological value. In the pages which follow the terms used are those which convenience, experience and usage indicate as best. Other equivalent terms, some of which appear in this volume, are given enclosed in brackets immediately following the term to which they are equivalent.

* The references to these books and papers are :—

Hewitt, C. G. (1914). 'The House Fly.' Cambridge.
Lowne, B. T. (1890–92). 'The Blow Fly.' London.
Patton, W. S., and Cragg, F. W. (1913). 'Medical Entomology.' London.
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Townsend, C. H. T. (1934). 'Manual of Myiology.'—Part I. São Paulo.
Wainwright, C. J. (1928). "The British Tachinidæ (Diptera)." Trans. Ent. Soc. Lond. lxxvi, pp. 139–254.

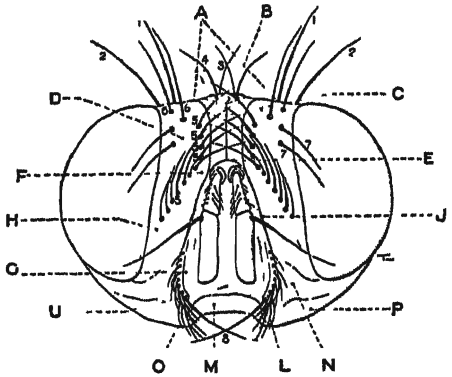


Fig. 1.—Head, anterior view. (From Wainwright.)

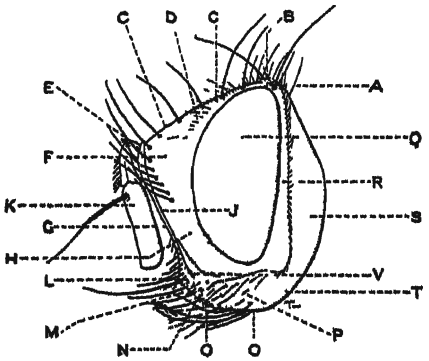


Fig. 2.—Head, lateral view. (From Wainwright.)

Explanation of lettering.

A. Vertex.
B. Ocellar triangle.
C. Frontal stripe.
D. Parafrontalia.
E. Lunule.
F. Profrons.
G. Face.
H. Parafacialia.
J. Frontal suture.
K. Antennæ.
L. Vibrissaria.
M. Epistome.
N. Mediana.
O. Peristome.
P. Buccæ.
Q. Compound eyes.
R. Postorbita.
S. Occiput.
T. Post-buccæ.
U. Face.
V. Frontal suture.

Bristles.

1. Inner vertical.
2. Outer vertical.
3. Post-vertical.
4. Ocellars.
5. Parafrontals and parafacials.
6. Frontals.
7. Fronto-orbitals.
8. Vibrissæ.

The *Body* of the Calliphorid fly consists, as in other insects, of head, thorax and abdomen with the relative appendages. As in other Diptera, there is an extraordinary development of the mesothorax, resulting from the complete dependence of the fly on the mesothoracic wings as organs of flight, the metathoracic wings having been reduced to small knob-like organs which apparently have a sensory equilibriating function. The mouth-parts are haustorial and the genitalia terminal.

The *Head* (figs. 1 & 2) takes the form of a hemispherical capsule with its flat side towards the thorax, and connected thereto by a narrow and extremely mobile neck.

The *Compound Eyes* (fig. 2, *Q*) are the most conspicuous feature of the Calliphorid head, and may occupy one-third to almost one-half of its surface. In the males of some species the eyes may be very closely approximated on the antero-dorsal surface of the head, a condition which may be termed sub-holoptic to distinguish it from the completely approximated or holoptic condition found in some other Diptera, *e. g.*, Tabanidæ, where the approximation is closer than in the Calliphoridæ. The eyes of the females are always separated by a strip of the surface of the head-capsule, a condition to which the term dichoptic is applied. The degree of separation of the eyes may be of systematic importance even within a genus. The eyes of males may have the facets (lenses, ommatidia) of the upper part of the eye larger than those of the lower part (fig. 65). This feature and the presence or absence of hairs on the surface of the eye may have systematic significance.

The *Antennæ* (fig. 2, *K*) (feelers) are, after the compound eyes, and omitting reference to the buccal apparatus, the most noticeable feature of the head. They are placed about the middle of the anterior convex surface of the head, with their bases close together, between the compound eyes. Each antenna consists of three segments, the basal one being smallest and the third, or terminal one, the largest. The *Arista* (stylo, flagellum), about the morphological significance of which there has been considerable dispute, is a filiform appendage of the third antennal segment. The arista may be bare or haired, in which latter case the hairs are in a dorsal and ventral row or in a dorsal row alone. The arista has considerable taxonomic value.

The *Ocellar Triangle* (figs. 1 & 2, *B*) (ocellarium, stemmata) is a small raised area of the dorsal surface of the head-capsule.

The *Ocelli* (simple eyes), three in number, are always present, and are situated close together within the ocellar triangle.

The *Frontal Suture* (figs 1 & 2, *J*) (ptilinal suture, ptilinoraph, frontal fissure) is one of the few features of the head-capsule that, apart from those already noted, has a real morphological significance. It is a suture in the form of an inverted U lying close above the insertion of the antennæ, with the arms of the U extending down on either side of them. When emerging from the puparium (see below, p. 19) the fly accomplishes this by means of a sack-like evagination of membranous skin, the ptilinum, that it thrusts out through the then unclosed suture under the action of blood-pressure. After emergence the evagination is completely withdrawn, but the suture remains clearly visible.

The *Peristome* (figs. 1 & 2, *M* & *O*) (mouth, stoma, epistome) is the edge of the head-capsule immediately surrounding the buccal cavity, to which, incidentally, the term peristome has sometimes been applied. Some authors have used the word to describe a considerable area of the head-capsule around the buccal cavity on the ventral surface of the head. The term is best restricted to the actual rim of the buccal cavity, which is almost ridge-like. The mouth-parts take the form of a soft and retractile proboscis, and, except for the palps, whose shape, size, and colour must be noted, offer few taxonomic characters.

The *Occiput* (fig. 2, *S*) is the whole of the surface of the back of the head towards the thorax. Some authors restrict the term to that part of this surface which lies above a horizontal line drawn through the foramen of the neck ; in this case the term *Succiput* is applied to the lower portion.

The *Frons* is the antero-dorsal surface of the head-capsule extending from the upper margin of the occiput, around the ocellar triangle, forward and down between the compound eyes to the frontal suture, and further down on either side of it to an extent that varies with the usage of authors. It may be taken to end at a line drawn horizontally through the bases of the antennæ, there being no morphological character by which to define its lower limits. The frons is subdivided into various regions for the sake of taxonomic description.

The *Vertex* (figs. 1 & 2, *A*) is that part of the frons on the top of the head immediately around the ocellar triangle and in front of the occiput. Its posterior margin where it joins the occiput is the vertical margin. Its anterior margin is not clearly defined.

The *Frontal Stripe* (figs. 1 & 2, *C*) (frontalia, vitta) is a clearly defined part of the frons running down from the vertex in front of the ocellar triangle to the frontal suture. Its coloration is of significance, and in some cases the ratio of its width to adjacent parts must be noted. A fine median line may

sometimes be seen passing down the middle of the stripe to the frontal suture. To this the term *Interfrontalia* is applied.

The *Parafrontalia* (figs. 1 & 2, *D*) (fronto-orbita, parafrontals, geno-vertical plates, peri-orbita, orbits) constitute the rest of the frons, and extend from the vertex down between the eye and the frontal stripe on either side to an arbitrary line drawn horizontally through the bases of the antennæ.

The *Parafacialia* (figs. 1 & 2, *H*) (lateralia) are those areas below the parafrontalia which are bounded by the frontal suture and the anterior margins of the compound eyes.

The *Face* (figs. 1 & 2, *U* & *G*) (interfacialia) is the region of the head-capsule which, bearing the antennæ, is enclosed by the frontal suture and limited ventrally by the anterior margin of the peristome. The part just above the insertion of the antennæ is called the *Lunule* (fig. 1, *E*) and the antennæ are often found to lie in two grooves, or *Foveæ*, separated by a median ridge, keel or *Carina*. The *Facial Ridges* are lateral to the antennæ and extend downwards towards the peristome.

The *Genæ* (figs. 1 & 2, *M*, *N* & *P*) (buccæ, jowls, cheeks, medianæ) are those areas on either side of the head-capsule lying above the peristome and below the parafacialia. The compound eyes mark their lateral margin, but there is no clear line of demarcation between them and the parafacialia and the peristome. In consequence of this there has been some confusion in the application of the term by various authors, many of whom have adopted other names for parts of the genæ which they have seen fit to differentiate. Thus the lower parts around the peristome have been called the *Buccæ* (*P*). The *Medianæ* (*N*) is a term that has been applied to that part of the genæ immediately below the eyes.

The *Post-orbita* (fig. 2, *R*) is the narrow strip of head-capsule behind the compound eyes and in front of the occiput joining up the genæ below with the parafrontalia and the vertex above.

Various other terms have at various times been applied by authors to the regions indicated above or to parts of them. For these the reader is referred to the paper by Wainwright mentioned above. For an exposition of the dipterous head-capsule from the point of view of a morphologist Peterson's paper on the Head-Capsule of Diptera * should be consulted. Unfortunately Peterson uses nearly all the common terms used by the systematic dipterist in senses quite different from that in which they are usually applied, and in consequence, in spite of the very careful work that had obviously been carried out

* Peterson, A. (1916), 'Illinois Biological Monographs,' vol. iii (2).

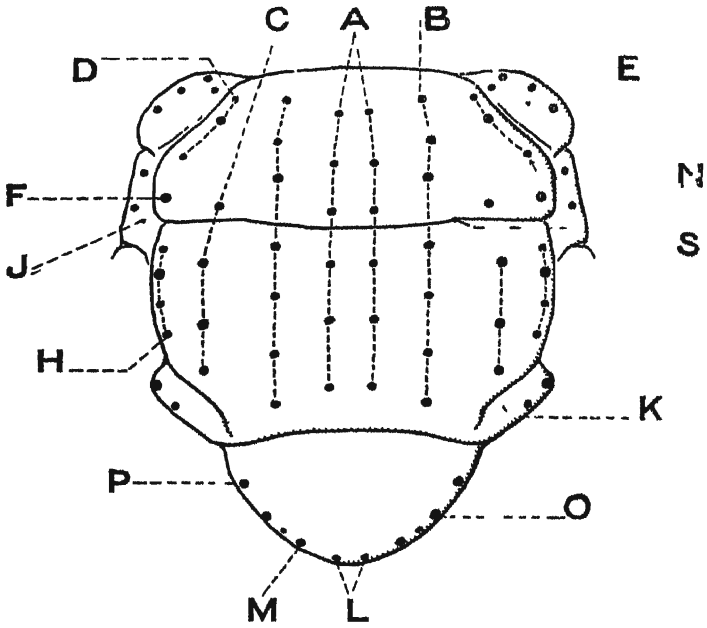


Fig. 3.—Thorax, dorsal view. (From Wainwright.)

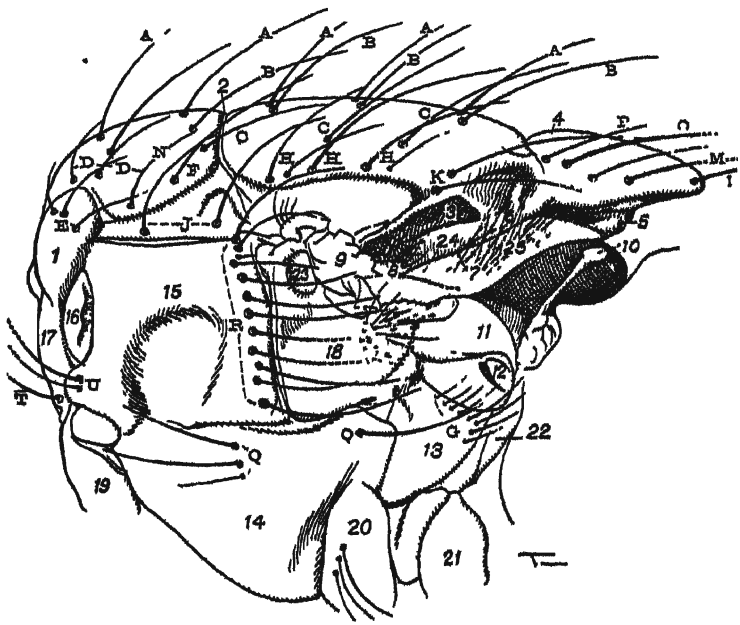


Fig. 4.—Thorax, lateral view.

by him before redefining the terms, they have not been taken into general use.

Chætotaxy of the Head.—The arrangement of the major bristles (macrochætæ) of the head is of the greatest importance systematically. The majority of them take their names from the regions of the head from which they spring, and they can only be learnt by reference to actual specimens or adequate drawings (*vide* fig. 1).

On the vertex are a pair of Inner Verticals (*1*) and a pair of Outer Verticals (*2*). Behind the ocellar triangle are a pair of Post-Verticals (post-ocellars) (*3*). The parafrontalia bear three recognizable series of bristles. The Frontals (præverticals) (*6*) are usually large bristles situated anterior to the verticals. The Fronto-orbitals (*7*) are situated on the parafrontals near the eye-margin, while the Parafrontal bristles proper (*5*) are a series running down the parafrontalia on either side of the frontal stripe above and the frontal suture below. The Parafacials are a series of rather smaller bristles running down the parafacialia near the frontal suture. At the lower corners of the face just above the peristome are two large bristles, usually beset by several smaller ones, called the Vibrissæ (*8*). The Orbitals are a series of small bristles that run up, on the postorbita, behind the compound eye. The Ocellars (*4*) are bristles arising from the ocellar triangle. The Genals are small bristles found on the genæ.

The *Thorax* (figs. 3 & 4) is composed of three segments. These are the prothorax, bearing the anterior pair of legs,

Explanation of lettering and numbering in figs. 3 and 4.

A. Acrostichal bristles.
B. Dorso-central bristles.
C. Intra-alar bristles.
D. Posthumeral bristles.
E. Humeral bristles.
F. Præsutural bristles.
G. Hypopleural bristles.
H. Supra-alar bristles.
J. Notopleural bristles.
K. Post-alar bristles.
L. Apical scutellar bristles.
M. Subapical scutellar bristles.
N. Outer posthumeral bristles.
O. Lateral scutellar bristles.
P. Basal scutellar bristles.
Q. Sternopleural bristles.
R. Mesopleural bristles.
S. Transverse suture (in fig. 3).
T. Propleural bristles.
U. Prostigmatic bristles.

1. Humerus.
2. Transverse suture (in fig. 4).
3. Post-alar declivity.
4. Scutellum.
5. Postscutellum.
6. Position, in certain genera, of the parasquamal tuft.
7. Insertion of squama.
8. Tympanic tuft.
9. Insertion of wing.
10. Halter.
11. Supraspiracular convexity.
12. Metathoracic spiracle.
13. Hypopleuron.
14. Sternopleuron.
15. Mesopleuron.
16. Prothoracic spiracle.
17. Propleuron.
18. Pteropleuron.
19. Fore coxa.
20. Middle coxa.
21. Hind coxa.
22. Metapleura.
23. Pre-alar knob.
24. Suprasquamal ridge.
25. Squama.

the mesothorax, with the middle pair of legs and the wings, and the metathorax, bearing the hind legs and the halteres. When viewed from the dorsal aspect the entire visible surface is composed of what is morphologically the mesotergite, though it is usually referred to as the mesonotum (disc). The lateral walls of the thorax are composed of a complex series of chitinized plates or sclerites, many of which carry bristles and are otherwise of taxonomic importance. The mesonotum itself appears to be divisible into three distinct parts, but these divisions are superficial, though they serve as useful points of reference in describing the chætotaxy. The more important parts of the thorax are noted below : —

The *Scutellum* (fig. 4, *1*) is the hindmost section of the dorsal surface of the thorax. Beneath it and above the junction of the thorax with the abdomen is a convexity of the thoracic wall called the postscutellum (postnotum, metanotum), the relatively undeveloped condition of which is one of the characteristics of the CALLIPHORIDÆ.

The *Scutum* (fig. 4) is that portion of the thorax which is anterior to the scutellum, from which it is demarcated by a deep groove. The scutum itself has a groove, the *Transverse Suture* (fig. 3, *S*, and fig. 4, *2*), on its surface, which, though not as deep as that between the scutellum and the scutum, is of importance as a reference point in describing the features of the thorax.

The *Stigmata* (fig. 4, *12* & *16*) (stomata, spiracles) are the openings on the tracheal system. There are two on the lateral walls of the thorax, the prothoracic and the metathoracic stigmata. The colour of the margin of the prothoracic one may be of importance, as also may be the presence of the *Prostigmatic bristle* (*U*) near it. The posterior one may be somewhat difficult to detect owing to a chitinous flap that covers it.

The *Propleuron* (fig. 4, *17*) is the area of the lateral wall of the thorax just anterior to the prostigmata. The condition of the hirsute covering of this plate must be noted.

The *Pteropleuron* (fig. 4, *18*) is a large, somewhat convex plate beneath the root of the wing. The bristles on it are of great importance in classification.

The *Hypopleuron* (fig. 4, *13*) is another lateral area just behind the pteropleuron. The presence of bristles on it is a family character shared by the CALLIPHORIDÆ with the TACHINIDÆ, and the way in which they are arranged may be of import.

The *Sub-alar Knob* (fig. 4, *23*) is a small knob that can be seen just below the wing. It is part of the pteropleuron, and its

shape and the presence or absence of hairs upon it may have systematic significance.

The *Post-alar Declivity* (fig. 4, *3*) (tympanic membrane) is a sort of trough that lies just below the edge of the scutellum, running up from the root of the wing above the line of attachment of the squamæ (see below); the presence or absence of hairs on it must be noted, and, if present, their arrangement.

The *Supra-squamal ridge* (fig. 4, *24*) (tympanic ridge) is a ridge that runs along the ventral side of the post-alar declivity. It is directly above the squama, which has the appearance of being attached to it.

Chætotaxy of the Thorax.—The arrangement of the bristles (macrochætæ) on both the dorsal and lateral surfaces of the thorax is of the highest importance to the taxonomist. Little purpose can be served by attempting to describe them by word, and reference should be made to figs. 3 & 4 for the names of the various series. Only long practice with actual specimens will eventually give the degree of familiarity with chætotaxy that is required by any worker on this family.

The Abdomen.—This consists of four visible segments. The greater part of the visible surface consists of the tergites, which pass well down the sides of the abdomen and on to the ventral surface. The visible segments may bear marginal and discal bristles whose positions may be of significance systematically. The genitalia are composed of the remaining segments of the insect's abdomen, and are often collectively called the hypopygium. They are highly modified in both sexes, and in the male afford characters of the greatest value in separating species which often are otherwise inseparable; they will be considered below.

The *Male Genitalia* (figs. 5, 5 *a* & 5 *b*) are of pre-eminent importance for the separation of species, and their external structure must be referred to in some detail. Basically they consist of modifications of the VIth–Xth segments of the abdomen.

At the extreme tip of the abdomen are a pair of processes, the *Superior Claspers* or *Mesolobes*, which are apparently the homologues of the anal cerci of the primitive hexapod. They vary from a small and more or less posteriorly directed, rather plate-like and not very highly chitinized form in *Musca*, to the downwardly directed, highly chitinized forceps found in *Sarcophaga* The anus opens between them, and they apparently represent the sole vestiges of the Xth segment. Exterior and slightly anterior to the Superior Claspers are the *Accessory Claspers* or *Paralobes*. These are always much

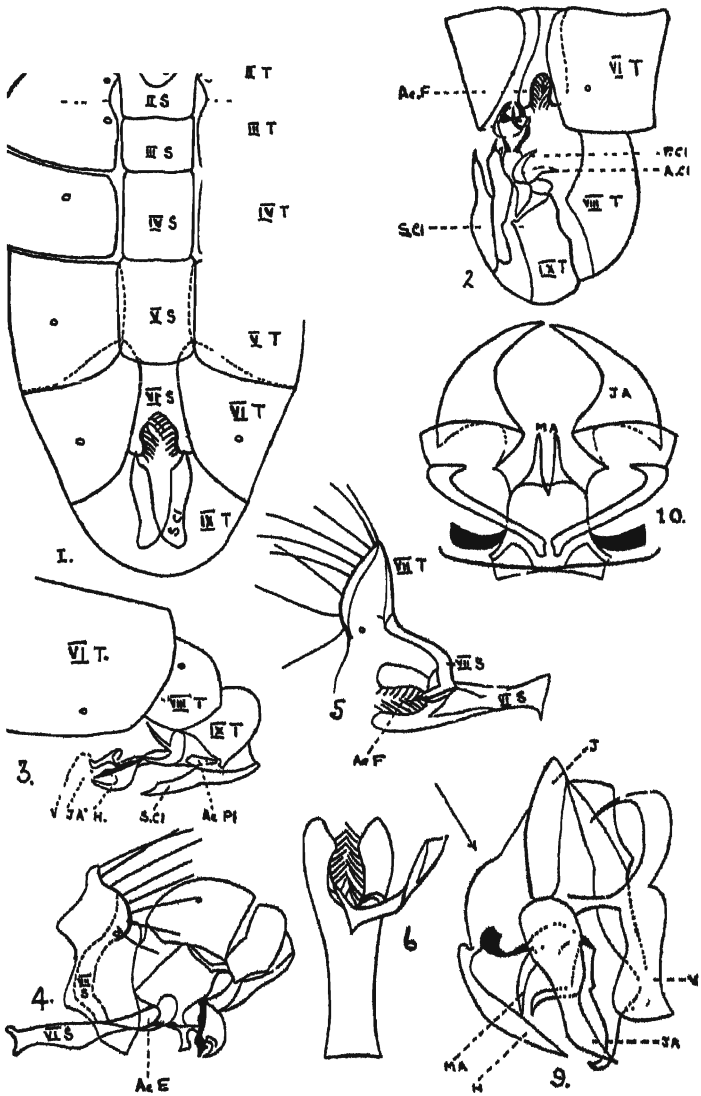


Fig. 5.—The genitalia of *Sarcophaga albiceps* Mg., dissected. (From Senior-White, rearranged.)

1. Ventral view of ♂ abdomen, genitalia retracted, in position of rest.
2. ♂ abdomen, genitalia everted, in position of use, viewed from below and to the side.
3. ♂ abdomen, genitalia everted, viewed laterally.
4. ♂ abdomen, genital segments extracted, viewed laterally.
5. VIIth tergite and sternite and VIth sternite, viewed laterally.
6. VIth and VIIth sternites, viewed from below.

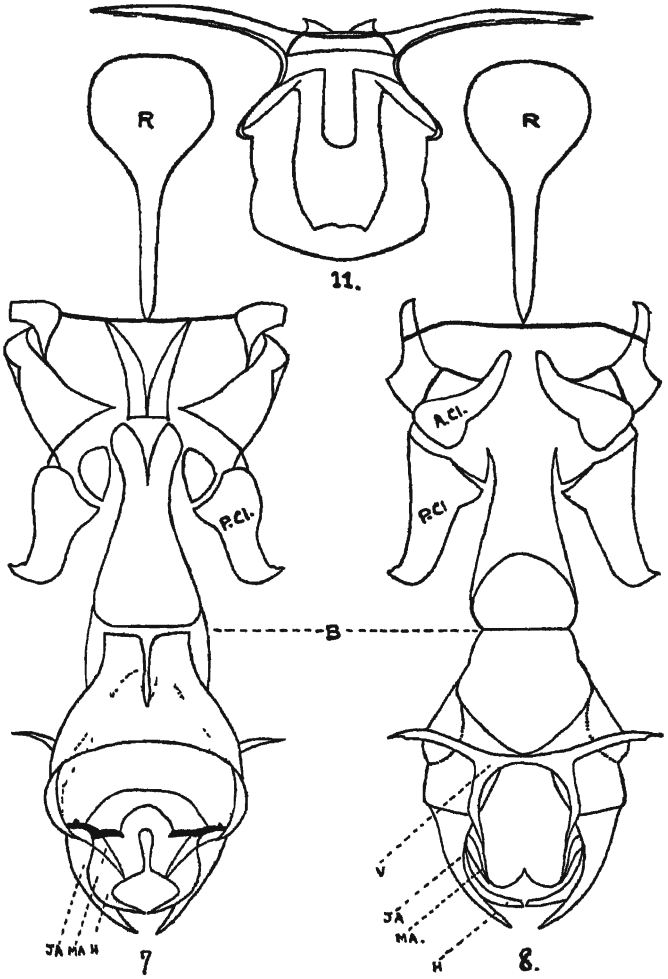


Fig. 5 (*cont.*).

7. Ædeagus and its "shaft," viewed from behind.
8. Ædeagus and its "shaft," from in front.
9. Ædeagus, from the side.
10. Ædeagus, from behind and above, in direction of the arrow in 9.
11. Vesica, viewed from in front.

Explanation of lettering.

Ac.F. = accessory forceps; *A.Cl.* = anterior claspers; *Ac.P.* = accessory plate; *B* = junction of ædeagus and "shaft"; *H* = harpe; *J* = juxta; *JA* = appendage of juxta; *MA* = median apophyses; *P.Cl.* = posterior claspers; *R* = basal plate of ædeagus; *S* = sternite; *S.Cl.* = superior claspers; *T* = tergite; *V* = vesica.

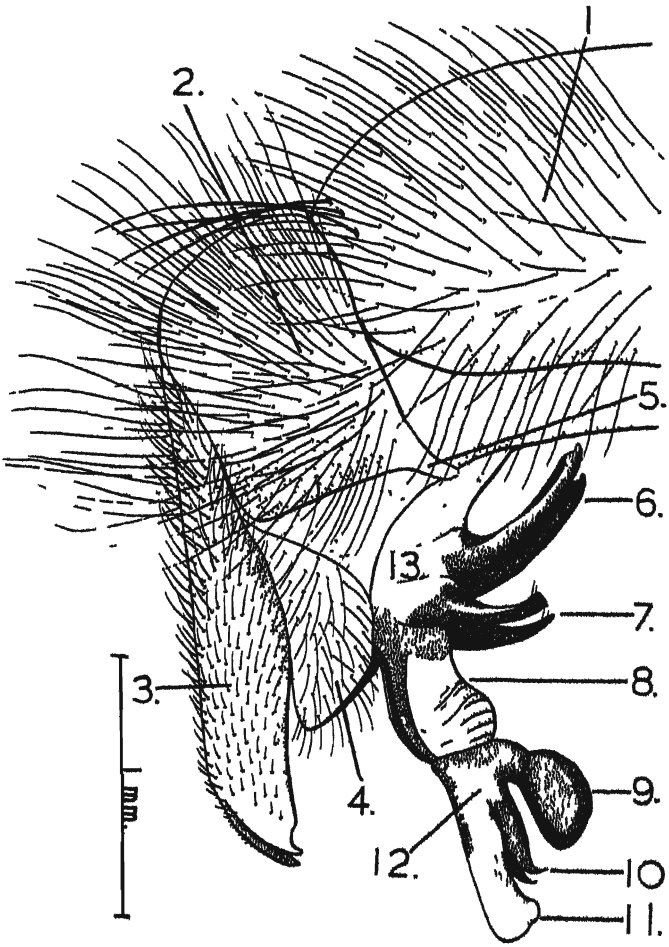


Fig. 5 *a*.—Genitalia of male *Sarcophaga* sp., lateral view.

1. VIIIth tergite.
2. IXth tergite.
3. Superior claspers (mesolobes).
4. Accessory claspers (paralobes).
5. Lateral lobes.
6. Anterior claspers.
7. Posterior claspers.
8. Hypophallus.
9. Vesica.
10. Juxta.
11. Harpe.
12. Præputium, aedoagus or penis.
13. Paraphallus.
14. VIth sternite or accessory forceps.
15. VIth tergite.

Nos. 6 to 13 constitute the penis or aedoagus, which is indicated by P in the ventral view (fig. 5 *b* on p. 13), the "shaft" commencing at the suture between 8 and 12. The numbering does not correspond with that used in fig. 5.

less strongly chitinized than the Mesolobes, and are apparently outgrowths of the pleural margins of the IXth segment. They are not developed at all in certain genera. Anterior to the paralobes are two more or less plate-like structures, never modified into actual claspers, the *Lateral Lobes*, the homologies of which are exceedingly obscure. The actual *Penis* or *Ædeagus* depends from the interior of the dome of the IXth tergite. Its structure will be described later.

The VIIIth tergite is a plain domed structure, with apparently its sternite, as in the IXth, invaginated merely to cover the hind gut. It serves as a sheath for the penis ("Genital Atrium") when it, with the two subsequent segments (often

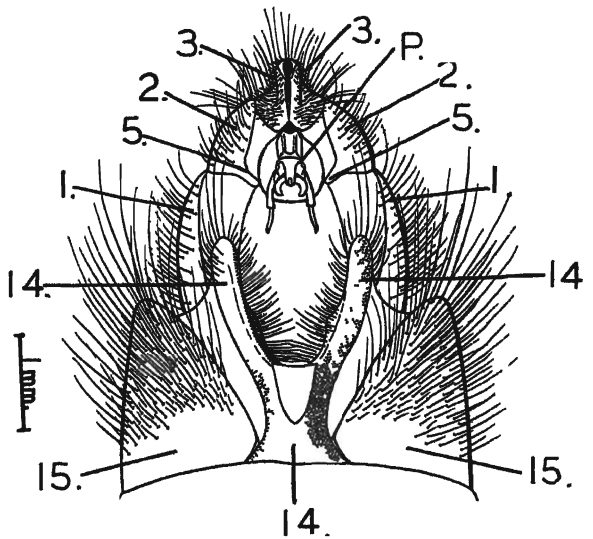


Fig. 5 *b*.—Genitalia of male *Sarcophaga* sp., ventral view. For details of numbering see lateral view (fig. 5 *a*, p. 12).

referred to in systematic descriptions, for brevity, as the 1st and 2nd genital or hypopygial segments), is retracted into the body of the abdomen, appearing from outside as a small, and frequently shiny, chitinous knob at its apex. The tips of the superior claspers are likewise inserted beneath the penis, into the cavity of the VIIIth segment. In all the Muscidæ the VIIth tergite is represented by an asymmetrical bar of chitin on one side of the body only. What this bar is can only be recognized by the fact that on the membranous area around the bar there is a spiracle.

The tergite of the VIth segment is normal, but the sternite is modified to form the *Accessory Forceps*, a plate with a more

or less V-shaped opening. One imagines that *in copula* the apex of the female abdomen is held by the various claspers in this vice of the accessory forceps whilst the penis is brought into play.

As stated above, the *Penis* or *Ædeagus* depends from the dome of the IXth tergite. Essentially it consists of three main portions, the *Paraphallus*, *Hypophallus* and *Præputium*, otherwise referred to as the "shaft of the ædeagus," the "ædeagus" and the "harpe." The *Paraphallus* in some genera has laterally a further pair of hooks, the *Anterior* and *Posterior Claspers*, the latter being possibly, in these genera, a modification of the lateral lobes of others. In the higher genera the *Hypophallus* forms a complete tube, but in the lower genera it is much less highly chitinized anteriorly, and, when cleared, appears as a gutter-shaped piece. Intermediate stages, in the Rhiniinæ, exist in which an anterior plate, seen free in cleared preparations, is present. The junction between the paraphallus and the hypophallus is membranous. The *Præputium* may be of the most bizarre shape, with series of processes and outgrowths of all kinds which cannot even be homologized within the genus, though a general similarity of design can often be recognized in closely related species. This, however, is not invariable, and it is mainly in the picture presented by the præputium that the value of the genitalia for specific determination lies. The parts, in the CALLIPHORIDÆ at least, are chitinized and specifically constant in shape, and, almost invariably, the least difference either in shape or design is of specific value. The *Vesica* likewise can be of the most diverse shapes, but apparently may be absent in some species in genera in which other species possess it.

All this assemblage of accessory structures is not present in any one genus or species. No complete study of the development of these structures through the subfamilies comprising the CALLIPHORIDÆ has yet been made, and to make such would involve a study of the genera of the World. Chitinization, at least of the ædeagus, is least in the Chrysomiinæ and the Calliphorinæ, for which reason they are placed first in the systematic part of this volume, though it is very pronounced in the genera *Termitolæmus* and *Bengalia* of the Oriental fauna. It is in the Sarcophaginæ that the ædeagus reaches its most chitinized and complex form.

In the Rhiniinæ the accessory claspers have apparently taken over the function of the superior pair, which are weak in many species, and are actually fused into a single piece in some: the absence of an apical hook or curve indicates the absence of any true clasping function. In the Sarcophaginæ the superior claspers again assume their true function

and the accessory claspers are represented by a plate-like structure that in only a few species like *basalis* and *gravelyi* is elongated and clasper-like.

As far as is possible the various parts in typical species and genera are shown in figs. 5, 5 *a* & 5 *b*, and an attempt has been made to indicate homologous parts of the apparatus; but, as stated above, the whole subject of the development of these organs demands an exhaustive piece of morphological research through all the genera, and this has not yet been undertaken by any worker.

The female genitalia, almost without exception, appear to be without specific characters. Böttcher has described peculiar forms in one or two species of *Sarcophaga*, but no real work has been done on the subject in the Muscoidea. As the male genitalia differ specifically so profoundly it seems probable that real differences in the female must exist.

The Wings (fig. 6), as in all Diptera, are the anterior pair only. The hind pair are represented by the *Halteres* (fig. 4, *10*), which possess specialized sensory functions, but have no

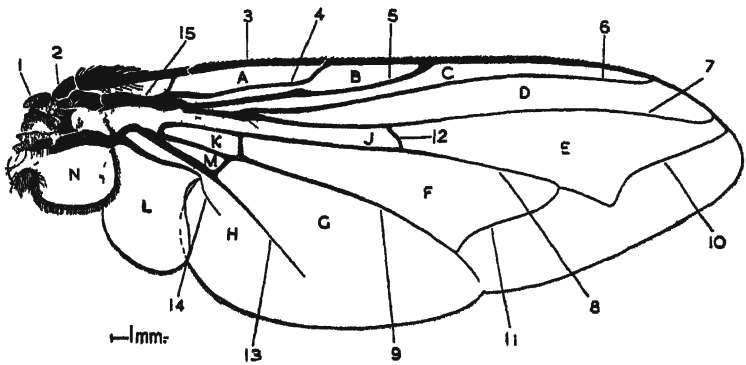


Fig. 6.—Wing of *Calliphora*, upper surface.

Explanation of lettering and numbering.

A. Costal cell.
B. Subcostal cell.
C. Marginal cell.
D. Submarginal cell.
E. 1st posterior cell.
F. Discal cell (2nd posterior).
G. 3rd posterior cell.
H. Axillary cell.
J. 1st basal cell.
K. 2nd basal cell.
L. Alula.
M. 3rd basal cell.
N. Calypter.
The subcostal sclerite is on the lower surface of the wing.

1. Epaulet.
2. Basicostal scale.
3. Costa.
4. Subcostal vein.
5. 1st longitudinal vein.
6. 2nd longitudinal vein.
7. 3rd longitudinal vein.
8. 4th longitudinal vein.
9. 5th longitudinal vein.
10. Upper marginal cross-vein.
11. Lower marginal cross-vein.
12. Discal cross-vein.
13. 6th longitudinal vein.
14. Axillary vein.
15. Stem-vein.

systematic value other than, occasionally, those of colour. The venation of the wing is very constant within the family, and even more so within the genus. Its arrangement is shown in fig. 6. Good specific characters, however, are often found in the rows of bristles which exist on the upper or lower sides, or both, of certain veins and in the proportions of the sections of the costal vein; these are mentioned in their place. Coloration of the membrane into patterns, so common in the Acalyptrate Cyclorrhapha, is very rare in the higher groups. An accessory lobe of the wing, near its root, the *Squama* (*N*) (calypter), covers the halteres, and has some systematic value.

Legs.—These show remarkably few modifications. The normal proportions of the femur, tibia, and the five tarsal segments are seldom, if ever, departed from. It is only in the chætotaxy of the legs that useful characters are found. In describing the chætotaxy of a dipterous leg certain conventions, first enumerated by Osten-Sacken, are observed. The leg is considered as if spread out at right angles to the longitudinal axis of the body, and as if each segment was of square, and not of round, or elliptical, section. There are thus superior and inferior, anterior and posterior sides, and positions for bristles, with intermediate positions (*e. g.*, antero-superior) between the four main surfaces.

Individual genera, moreover, often show special developments, often sexual, in this respect. In one group of *Bengalia* there are in the male strong spines, of specific value in their arrangement, on the inferior side of the front tibiæ. In *Sarcophaga* the mid-femora usually have an inferior "comb" of spines, strongest towards the tip, whilst in many species the male hind femora and tibiæ, sometimes also the mid-femora, have on the inferior aspect strong hair fringes which may be double, *i. e.*, antero-inferior and postero-inferior.

From the above account it may be seen that in the groups which form the subject of the present volume, though there are few macroscopic characters (which has greatly acted as a deterrent to their study in the past), there is a wealth of microscopic structural characters, and species thus distinguished rest on an assured basis of definition.

Internal Anatomy.

(i) *Alimentary System.*—This is divided, as usual, into the fore, mid-, and hind gut, only the second part being of endodermic origin. The fore gut commences at the prostomium between the labella, where the pseudotracheal channels of the latter lead into the food-channel. At this point is situated the discal sclerite, with its development of pharyngeal teeth in

the biting Muscidæ. Above this point the food-channel is formed by the labrum-epipharynx and the hypopharynx, situate in the haustellum of the proboscis, which leads to the buccal cavity (the pumping or sucking organ). From this point commences the œsophagus, which, narrowing and passing through the circum-œsophageal nerve-ring into the neck, extends to the proventriculus in the thorax. At the junction of the œsophagus and the proventriculus the œsophageal diverticulum, or crop, arises. In most species the crop is very long, and extends into the abdomen. All food taken is first passed into this reservoir, and is only subsequently regurgitated into the stomach. During this process the "vomit drop" forms at the tip of the proboscis.

The mid-gut commences at the proventriculus. It is not dilated into a "stomach" as in the lower Diptera, but compared with them is very much elongated and coiled. It is lined throughout by digestive epithelium. At its junction with the hind gut are inserted the two pairs of Malpighian tubes, the excretory system. The hind gut extends more or less straight from the junction of the Malpighian tubes to the rectum. There is a peritrophic membrane, chitinous in structure and apparently an outgrowth of the proventriculus, from which it extends curtain-like within the gut to the anus. The salivary glands are very long and coiled, and extend into the abdomen. They discharge by a common duct which passes into the proboscis along the hypopharynx to its tip.

(ii) *Reproductive System*.—This is simple in the male. There is a pair of highly pigmented testes, easily recognized in dissections, each with a vas deferens that leads to the vesicula seminalis extending into the ædeagus.

In the female the essential organs are the ovaries, each of which consists of a number of ovarian tubes, or ovarioles. They open on each side into an ovarian duct, the two latter uniting into a common channel which becomes a wider passage, the bursa copulatrix, ending at the genital opening. Into the common oviduct lead the passages from the highly chitinized spermathecæ, the receptacles of the spermatozoa of the male, and the accessory glands. In larviparous forms the common oviduct is expanded to form the "uterus."

The detailed structure and change of development of the ovaries must be sought in the larger works already referred to (p. 1). There may be considerable modification in the larviparous forms, as only one larva can be nourished in the uterus at one time; thus the ova in the two ovarian tubes are never in the same state of development, the lowest ovum on one side being always much more advanced than that on the other.

Around the uterus, especially at its distal end, the transverse muscular fibres are much more strongly developed than in oviparous forms, and form a sort of sphincter. The accessory glands are greatly enlarged and modified in species which nourish the larva *in utero* to an advanced stage.

Early Stages.

(i) *Egg.*—In the Muscoidea the egg (ovum) is nearly always a simple elongate cylindrical structure, though some that breed in cow-dung have an apical spine which apparently serves for the respiration of the egg when this is buried in the dung. In a few species the mature egg is black, but in general it is yellowish-white. Its size relative to that of the fly varies. It is very much larger in some species than in others, containing when deposited a larva in a much more advanced stage of development that hatches much sooner.

(ii) *Larva.*—The general shape is elongate coniform, narrowing from the posterior end to the head. As in all the Muscoid larvæ, the latter is greatly reduced—the acephalous condition—and is retractile within the body. The larvæ are amphipneustic, except in stage I, which is metapneustic, the anterior spiracles being lobed or finger-like processes extending from the side of the larva, the posterior being large, highly chitinized structures on a stigmatic plate, the design of which varies generically. In larvæ which live in a very liquid medium, the posterior end is developed into a series of fleshy processes, which can close over the spiracles when the larva is submerged. There are, beside the head segment (*pseudocephalon*), three thoracic and ten abdominal segments. The mouth-parts consist of a pair of fleshy lobes, traversed by food-channels, very suggestive of the pseudo-tracheal channels of the adult, as in adult stages only liquid food is consumed. There are two pairs of minute sensory papillæ, the vestiges of the antennæ and the palpi. Between the lobes are a pair of strongly chitinized oral hooks, which are used for boring into food and for progression. They move backwards and forwards in a longitudinal plane, past one another, and do not articulate together like jaws. In the Calliphoridæ, so far as is known, they are both of equal size, but in the Muscidæ, or at least in the genus *Musca*, the left hook is very much smaller than the right, and is easily overlooked in a specimen mounted on its side. These hooks articulate through the dental sclerite with the pharyngeal sclerite, a large, highly chitinized structure that can be seen in life through the integument of the larva. At each instar the development of these chitinized structures becomes more complicated. The

pharyngeal sclerite consists of a large dorsal and a shorter ventral cornua, joined anteriorly. The pharynx passes through the structure, and Keilin has shown that in coprophagous larvæ there are a series of grooves on the floor of the sclerite that are absent in parasitic and blood-sucking larvæ. As the pharyngeal skeleton of the last larval instar can be found in the puparium after the imago has emerged, study of this point in the case of a fly taken as a pupa will give an indication of the mode of life of the larva.

At the segmental junctions the larva has belts of backwardly projecting spines, which serve for progression and in the case of burrowing forms for holding the larva in place in the tissues. These spines are arranged in definite patterns in different species, as are also the various fleshy tubercules on the mid-areas of the segments themselves. Sinton has reduced these varying arrangements to definite patterns on a conventionalized plan, and when the larvæ have been sufficiently studied it will be possible to differentiate them as separate organisms, as in the case of the Culicidæ, separating the genera chiefly by the designs of the posterior spiracles and the species by the pattern of the spines and tubercles; but far more study of individual species, correctly determined, in all instars is needed before keys can be attempted.

The Pupa.—The larva pupates within the last larval skin, in a barrel-shaped puparium often of a very different colour from the larva. Two new pupal spiracles are found as small spine-like projections dorso-laterally at the junction of the first and second abdominal segments. The puparium may be smooth or strongly ridged, and individual species within a genus present considerable differences in this respect. The adult emerges by pushing off the hard end of the puparium by means of the ptilinum, as mentioned earlier.

Bionomics.

So far as our knowledge goes the Calliphoridæ dealt with in this volume are nearly all saprophytic in their early stages, but enormous gaps in our knowledge exist, and it appears certain that some genera, which have never been bred and concerning which nothing is known, must have unusual life-histories. In the present section no complete account can therefore be given. The bionomics of many genera will perforce not be mentioned, for the simple reason that nothing whatever is known concerning them.

The subject of the viviparity of certain species is of interest. Judging from other genera, such as *Glossina*, in the Muscidæ,

it has been evolved as a result of the abundant and rich food of the female. But whereas *Glossina* represents the end-point of the process, commonly but incorrectly described as pupiparity, the other larviparous species show a lesser degree of specialization. In *Glossina* the larva is nourished in a special dilatation of the oviduct, described as the uterus and furnished with milk-glands and a teat-like papilla, until fully mature, and is deposited ready to pupate as soon as it has crawled from where it is born to suitable shelter; but in no other genus is this degree of protection for the larva ever achieved. But whereas the *Glossina* larva, once extruded, never feeds externally, in all other larviparous species the larva has to feed up on some external pabulum.

Very little is known of the predators and parasites of the CALLIPHORIDÆ, at least in the Oriental region. Many of the rare species have never been bred at all.

The CALLIPHORIDÆ present greater blanks in our knowledge than the MUSCIDÆ. Even among the metallic Calliphorines the saprophagic habit is not general, and in this respect they here and there show interesting departures from the usual. In the genus *Calliphora* several such species are Palæarctic, and so much is already on record concerning some of them that there is no need to enlarge here on the hæmatophagous habits of the larvæ. Another species, *pattoni*, has never been bred, but has been seen to extrude living larvæ in the killing bottle, and whilst its adult habits are apparently those of its common congeners, in the light of what is recorded below it would be very dangerous to state that its complete life-history is similar.

The genus *Hemipyrellia* contains at least one larviparous species, *pulchra*, though the adult is a fruit- and nectar-feeder, which would suggest that larviparity is not always induced by a rich adult diet. The others that have been studied are oviparous. *Lucilia cuprina* is the common bazaar meat and sweet "blue bottle" of India. It is the worst culprit in wool blowing in Africa and Australia. *L. papuensis* has the habits of the European species of *Calliphora*. *L. ligurriens*, whilst it will feed readily on human excrement, will not breed in it, but only on decomposing carcases. No Oriental species has yet been found with the habits of the Palæarctic *L. bufonivora*, which parasitizes toads. *Chrysomyia*, however, is the genus with the most diverse habits. *C. megacephala*, as larva and adult, has the habits of *Calliphora*, whereas the very closely related *bezziana* is a notorious producer of myiasis. It is not, as Keilin has shown from the structure of the larval mouth-parts, an obligatory biontophage, and its attack is probably always secondary to a septic condition of the original wound.

The habits of the adults rest in complete obscurity—in spite of the terrible conditions which are seen (and smelled) as the result of attack by the larva of this species. *C. pinguis* is a breeder in decomposing carcases, and its adults are very rare in houses: it is essentially a fly not intimately connected with man. *C. rufifacies* and *C. villeneuvi* have, as larvæ, entirely different habits, being predators on the larvæ of other necrophagous Calliphorines and Sarcophagines. The larvæ are covered, in the third stage, with spiny fleshy processes, quite unlike the rest of the subfamily. The adults mainly frequent decomposing carcases with a view to oviposition among the larvæ of other species. They do not enter houses. Nothing is on record concerning other species of the genus.

Concerning the testaceous Calliphorinæ of the Oriental region extremely little is known. So far as is known none of them reach the completely hæmatophagous biontophage status of *Auchmeromyia luteola* (the Congo floor-maggot) of the Ethiopian region, or *Phormia regina* of the Palæarctic. We can find nothing on record concerning most of them. A species of *Caiusa* has once been bred from frogs' spawn by Ballard, which hints at an exceptionally interesting life-history. The senior author has taken one male of *C. indica* at food in the open. The large and common genus *Bengalia*, however, represents a complete puzzle. The habits of several species of the adults appear similar. They are predators on ants, seizing the pupæ from columns carrying these on the march, the proboscis being specially adapted for this; but where and how they breed is a complete mystery. Dissection by one of us shows that *B. jejuna* at least is oviparous, but hours of watching adults has failed to yield any hint as to where the larva may be looked for. *B. jejuna* has once been bred from a pupa in soil, but the finder did not keep the puparium, from which extraction of the larval mouth-parts would have yielded at least a hint of the type of life-history.

Placed by us at the end of the Calliphorinæ, but by some authors in the Rhiniinæ, is the large genus *Pollenia*. Concerning one species only is anything really known, and that is *Pollenia rudis*. The life-history of this species, parasitic on the earthworm *Allolobophora*, has been very fully worked out by Keilin (C. R. Soc. Biol. lxvii, 201), whose account should be studied by all interested in Muscoid bionomics. Beyond this single species there is not one regarding which anything certain is known.

Of the true Rhiniinæ one of us has bred *Stomorhina discolor* from puparia found in the nest of the ant *Camponotus angusticollis*, and has drawn attention to how a freshly opened termitarium will call up adults of otherwise exceedingly rare

species like *Borbororhinia bivittata*. The males of the large and very handsome *Stomorhina melanostoma* occur annually in Ceylon in thousands, hovering bee-like (as do the males of many species in this subfamily at various flowering trees) round *Hevea brasiliensis* during the short flowering season of this tree, being thereafter never again seen until the process is repeated the following year. With this phenomenon in mind the first author has been present at the felling of many rubber-trees either on account of disease or for thinning-out purposes, but without gaining any clue to the life-history. Yet the rubber estates of Ceylon were then absolutely clean weeded, and for miles there was no other form of vegetation. Almost certainly myrmecophilous and termitophilous species will be found.

The great genus *Sarcophaga* is, so far as is known, without exception viviparous, the larvæ being extruded in stage I. Yet, as the first author has shown, these species are not uniform in their life-histories. Some affect one sort of decaying matter, others another—and in one sort of pabulum at least there are definite species successions, according to the freshness of the material or the reverse. The genus is not free of implication in human and animal myiasis, and at least one species is umbriphilous as an adult. The next genus, *Sarcophila*, is strictly littoral in its distribution, and is not found more than a few yards from the beach.

Connection with Disease.

The Diptera dealt with in this volume include a number of species of medical and veterinary importance. From their filthy habits it is obvious that they must nearly all be covered with bacteria, not excepting pathogenic forms.

Chrysomyia megacephala is a foul breeder that is undoubtedly dangerous. During a sporadic outbreak of cholera one of us recovered fæcal organisms in 60 per cent. of flies plated out, though the vibrio was not found. Other workers have inculpated it in the sporadic, as opposed to the generalized (water-borne), outbreaks of this disease. The food-haunting species are likewise strongly suspected in this connection. Whilst there is only one specifically human myiasis-producing fly in the Orient, *Chrysomyia bezziana*, numerous other species, as recorded earlier in this section, are facultative myiasis producers.

Collecting and Mounting.

Whilst some of the species dealt with in this volume are only too easy to encounter, the majority require search in special localities for their collection.

Suitable oviposition baits will yield many interesting species. Such are put up in conveniently portable form, like cigarette-tins, taken to selected localities, not omitting such places as forest shade, and then exposed for infection and subsequent breeding out. Many examples of some of the otherwise apparently rare species of *Sarcophaga* have been obtained by this means. In breeding out, the infected material should always be kept over dry sieved earth, to allow of emerging maggots pupating.

But the real rarities, and especially the Rhiniinæ, only fall to the net in the course of general collecting on shrubs and flowers, as with most other orders of insects. Flowering trees are especially productive of results.

No one familiar with the wealth of insect and of dipterous life in the Tropics can possibly imagine that the species listed in the present volume represent anything but a small proportion of the true extent of the Calliphorid fauna. Though the number of species of *Sarcophaga*, for instance, has increased from "about eight" to over sixty as a result of the first author's work on this genus, yet this number is less than half the total of the same genus in the Palæarctic region. It is, of course, true that generally the species of the higher Muscoids are far more widely distributed than are the species of a family like the Tipulidæ, but, on the other hand, so little attention has hitherto been paid to them, and the characters separating species are so much less obvious to the eye of the collector in the field, that there can be no doubt that a rich harvest of new forms awaits the thorough worker. The submontane tracts of the further East are likely to be especially productive in this respect.

When pinning CALLIPHORIDÆ the main consideration to bear in mind is to avoid obliterating the dorsal thoracic chætotaxy. When long ("continental") pins are used, as thin a pin as possible should be taken and inserted into the insect's back slightly to one side so as to leave the chætotaxy of the other side undamaged. A more elaborate method is to use short double-pointed pins and insert them into the thorax of the specimens from below between the legs, and to "stage" the flies on small pieces of card, celluloid, pith or polyporus through which a larger pin is run to carry the stage and on which the labels are placed. Short steel points may also be used and the flies "staged," but these, like the "continental" pins, should be thrust into the thorax slightly to one side to avoid damage.

When it is desired to spread the genitalia the method described by Ho (An. Trop. Med. Para. xxxii, p. 141, 1938) is good and simple. In Ho's method a small slip of paper

(medium weight typewriting paper is suitable) of a suitable size is run up the pin from beneath the insect, so that its edge catches under the anal cerci that have been extended by traction with forceps. The other genitalia are eased out with a needle. When dry the slip of paper is snipped with a pair of scissors and falls away leaving the genitalia extended.

If short steel points or double-pointed pins are used the genitalia may be extended and set by pinning the flies in a special box in which narrow strips of cork-board have been pinned to the floor about 2″ apart, the pin being inserted into a side, not the top, of the cork strip so that the floor of the box is "hard up" against one side of the specimen. Then with a long fine pin (or a short one held in forceps) the tips of the superior claspers are engaged and pulled backwards and outwards. When the genital segments are at full stretch the pin is driven home into the floor of the box. Usually the penis also emerges from the genital atrium in the process, but if it does not it must be delicately felt for with a fine pin and held exposed by driving this pin into the cork floor ahead of it.

The setting may be most advantageously carried out under the low power of a binocular microscope, but if this is not available a hand-lens will usually be found to be sufficient aid. It is undoubtedly worth while to spread the legs to facilitate their examination, and this may be simply done with a needle. No other setting is required or desired, since excessive manipulation almost invariably results in a loss of bristles on which so much of the systematics of the group depends.

The use of double-pointed pins, ventral pinning, extension of genitalia, and staging, as described above, undoubtedly gives the best specimens for study. This method, however, involves considerable work, and in the field the disadvantages, attendant to the use of pins and points inserted through the dorsal surface of the thorax, are outweighed by the time saved, provided the pins are inserted a little on one side as suggested above, or, where long series are captured, a few specimens are pinned sideways.

On no account should flies, or for that matter any other insects, be pinned by inserting a short pin upwards through a stage and then ventrally into the body of the fly. Insects so pinned cannot be removed from the stage for detailed examination without relaxing them and repinning them, both of which processes invariably result in damage where Diptera are concerned. It is also necessary to relax them if the old "stage" wears out and "restaging" is needed.

Old specimens can be relaxed, and the genitalia subsequently

set as above, but extreme care is necessary, and with old specimens, and species with very small and cryptic genitalia, it is better to snip off the end of the abdomen with very fine scissors and boil the dissection in caustic potash, and dissect out the genitalia under a binocular. To keep specimen and genitalia together the latter are mounted on a narrow strip of celluloid in balsam and pinned below the stage carrying the actual specimen. This can be swung sideways on the carrier pin for examination, or if necessary floated off in xylol and more carefully studied in a watch-glass or on a slide Before dissecting careful note should be taken of the colour, chætotaxy, etc. of the genital segments, which sometimes carry valuable characters, as they are lost in the process. By this method, which is due to Edwards, the accumulation of a long series of glass slide mounts is avoided, which may easily become broken or otherwise dissociated from their related specimens.

For a complete study of the genitalia proper methods of clearing and mounting in balsam on slides are essential. By this means features obscure in the natural state can be made out. But it should be remembered that the various articulations on the ædeagus can move *inter se*, and whilst they may retract in dried and set specimens they may appear very prominent in cleared ones. Thus two figures of the same species by different authors may at first sight appear very different. All the senior author's genitalia figures are drawn from cleared specimens in balsam, many of those by Böttcher and the Australian writers on *Sarcophaga* apparently are not.

In many groups the females are not specifically determinable. Every advantage therefore should be taken of opportunities of obtaining pairs *in cop.*, which are fairly common in many genera, and of breeding from single females.

Larvæ are best preserved by throwing them into boiling water, which kills them with all segments, including the head end, extended. They can then be preserved in spirit. For mounting larvæ for study the two extremities are cut off. The mouth-parts are cleared in caustic potash, brought to boil in 40 per cent. alcohol, and mounted on their sides. The posterior spiracles, on their plate, similarly cleared, are mounted in end view. The remainder of the body of the larva is slit longitudinally along the mid-dorsal line, macerated in potash, and mounted flat. Pupæ are best preserved on a card mount on the pin. They become very brittle with age, and are apt, at a jar, to break where transfixed by the pin.

Key to the Families of CALYPTRATA.

1. Hypopleura without a row of strong bristles below spiracle .. .. **Muscidæ.**
   Hypopleura with one or more vertical series of bristles below spiracle .... 2.
2. Mouth-parts vestigial .... **Œstridæ *.**
   Mouth-parts functional, well developed ..... 3.
3. Post-scutellum not conspicuously convexly developed. At least basal sternite overlapping tergite .... **Calliphoridæ.**
   Post-scutellum prominently convexly developed. Sternites more or less hidden by overlapping tergites .... **Tachinidæ.**

Key to the Subfamilies of CALLIPHORIDÆ.

1. Stem-vein of wing not setulose on upper side of basal section 2
   Stem-vein of wing with distinct setulæ on posterior upper side of its basal section ..... 3.
2. Notopleurals nearly always two; the anterior two bristles on area between presutural dorso-centrals and notopleurals not in a straight line, the anterior one distinctly lateral of the posterior..... ..... [p. 27. **Calliphorinæ,**
   Notopleurals almost invariably three or four; the two anterior bristles on the area between the presutural dorso-centrals and notopleurals either in straight line or anterior one mesiad of posterior..... [p. 208. **Sarcophaginæ,**
3. The small rounded protuberance below base of wing (subalar knob) frequently with erect hairs. Lower calypter subtruncate at apex, concave on outer margin, haired on part of upper surface. [p. 135. **Chrysomylinæ,**
   The small rounded protuberance below base of wing (subalar knob) bare or without distinct hairs. Lower calypter rather narrowly rounded at apex, straight or nearly so on outer margin. A bare glossy submarginal band on upper occiput extending almost entirely across its width. **Rhiniinæ, p. 140.**

Treated by Brunetti, in F. B. I., Diptera, vol. iii, 1923.

Subfamily CALLIPHORINÆ.

The subfamily contains a considerable number of genera, diverse in size, shape and colouring. The majority of flies are either metallic or testaceous, and if the latter they may have a certain amount of metallic colouring; flies of a few genera such as *Wilhelmina* and *Pollenia* have a considerable amount of pile on the body. A number of the genera are confined to the region under discussion. Life-histories are known in certain cases, but there is scope for much research on this aspect of the matter.

The subfamily may be separated from the Chrysomyiinæ and Rhiniinæ by the absence of setulæ on the posterior side of the stem-vein of the wing, and from the Sarcophaginæ by the relative positions of the two bristles lying between the notopleurals and the presutural dorso-centrals, the anterior bristle being lateral of the posterior. There are usually two notopleurals in the Calliphorinæ, whereas in the Sarcophaginæ there may be three or four.

Key to the Genera of Calliphorinæ*.

1. Convexity above posterior thoracic spiracle clothed with long, upstanding, fine hairs. 2.
   Convexity above posterior thoracic spiracle bare or covered with short, decumbent hairs . . . . . 5.
2. Colour predominantly brilliant metallic-green, blue or purple; subcostal sclerite covered with short black bristles . . . . . 3.
   At least parts of thorax and base of abdomen testaceous; subcostal sclerite without short black bristles or upstanding hairs . . . . . 4.
3. Very large flies (15 mm. or more); legs in ♂ more or less hairy; ♂ hypopygium strongly developed . . . . . [p. 28. HYPOPYGIOPSIS Tnsd.,
   Smaller flies (not exceeding 12 mm.); legs in ♂ not noticeably hairy; ♂ hypopygium not abnormally strongly developed (except in *H. jucunda* Kirby from Christmas Island) . . . . . [p. 41. HEMIPYRELLIA Tnsd.,
4. Sternopleural bristles 1 : 1; supra-squamal ridge devoid of minute fine hairs . . . . . CAIUSA Surc., p. 69.
   Sternopleurals 2 : 1; supra-squamal ridge bearing minute fine hairs . . . . . PHUMOSIA R.-D., p. 65.
5. Lower lobe of squama quite bare . . . . . 6.
   Lower lobe of squama with hairs or with a patch of small setulæ towards inner margin . . . . . 16.

* Including *Chætopitliopsis* Baranoff (1938).

6. Brilliant shining green, blue or purple flies, or the upper half of the parafacialia distinctly hairy . . . . . 7.
Not such flies . . . . . 9. [p. 102.
7. Postsutural dorso-centrals 4 . . . . . CATAPICEPHALA Macq.,
Postsutural dorso-centrals 3 . . . . . 8.
8 Upper half of parafacialia bare . . . . . LUCILIA R.-D., p. 46.
Upper half of parafacialia more or less hairy . . . . . MELINDA R.-D., p. 111.
9. Sternopleurals 1 : 1 . . . . . 10. [Wh., p. 58.
Sternopleurals 2 : 1 . . . . . PARADICHOSIA Sen -
10. Thorax heavily grey-dusted, with an indefinite dark mark across the suture and base of scutellum; first posterior cell open or closed almost at wing-tip; pleura bearing soft white hairs . . . . . [Vill., p. 132.
Otherwise coloured. Pleura without soft white hairs . . . . . WILHELMINA Schm. &
11. Vibrissæ inserted well above oral margin. If more or less level with the margin the face not deeply sunk, and arista long plumose to tip . . . . . 11.
Vibrissæ inserted more or less level with oral margin . . . . . 12.
12. Face with at least some indication of a carina between antennæ; eyes approximated in ♂ . . . . . 13.
No facial carina; eyes widely separated in ♂; prosternum hairy; propleura bare . . . . . [(part).
13. Arista bare or microscopically plumose . . . POLLENIA R.-D., p. 115
Arista pectinate or strongly plumose . . . . BENGALIA R.-D., p. 83.
14. Arista bare; face normally formed . . . . . 14.
Arista microscopically plumose; frons nearly horizontal; face vertical. Very small flies . . . . . 15. [Baran., p. 82.
15. Arista plumose; face normally formed . . . CHÆTOPTILIOPSIS
Arista pectinate; face sunk, the facialia diverging for the greater part of their length, then rapidly converging above the oral margin . . . . . [Baran., p. 107.
16. Lower lobe of squama covered completely or in part with long hairs or fine bristles; metallic-purplish flies . . . . . TERMITOLŒMUS
Lower lobe of squama with a small patch of setulæ . . . . . VERTICIA Mall., p. 75.
17. ♂ eyes much closer approximated than ♀ . . BOOPONUS Aldr., p. 78.
♂ eyes nearly as widely separated as ♀ . . [p. 32.
CALLIPHORA R.-D.,
17. [(part).
POLLENIA R.-D., p. 115
TAINANINA Vill., p. 108.

Genus 1. **HYPOPYGIOPSIS** Townsend.

Hypopygiopsis Tnsd., Proc. U.S. Nat. Mus. li, no. 2152, p. 300, 1916. Genotype, *Musca fumipennis* Wlk., by original designation as *H. splendens*, Tnsd.

Large metallic-coloured flies, with the wings more or less infuscated and the femora in the males swollen and very hairy.

Head : eyes somewhat approximated in male ; face without carina ; vibrissæ ascending for one-half to two-thirds of total length of facialia. *Thorax* : acrostichals 2 : 1 or 2, dorso-centrals 3 : 3, posthumerals 3, intra-alars 0 : 2, supra-alars 1 : 3 ; convexity above posterior thoracic spiracle covered with long upstanding hairs ; prosternum setulose ; propleura with soft hairs. *Abdomen* : marginal macrochætæ on third and fourth visible segments only ; in male sternites covered with long soft hair and hypopygium prominent. *Wings* : subcostal sclerite covered with short wiry black bristles ; third longitudinal vein with bristles above and below reaching halfway to anterior cross-vein. Squama bare ; tympanic and parasquamal tufts present. *Legs* : in male with, in female without, long fringes of soft hairs. Femora swollen in male, normal in female ; one antero-dorsal bristle on middle tibia in both sexes ; posterior surface of hind tibia somewhat ridged, more noticeably so in males than in females.

Distribution.—Oriental and Australian Regions.

Nothing is known of the breeding habits of the species in this genus.

Key to the Species of Hypopygiopsis.

1. Facial tomentum and antennæ brilliant yellow ; tarsi in males without long pubescence	2.
Facial tomentum silver ; antennæ dark brown ; tarsi in males with long fringes ..	*violacea* (Macq.), [p. 31.
2. Only one pair of postsutural acrostichal bristles	*robusta* Mall., p. 30.
Two pairs of postsutural acrostichal bristles ..	*fumipennis* (Wlk.), [p. 29.

1. **Hypopygiopsis fumipennis** (Walker). (Fig. 7.)

Musca fumipennis Wlk., Journ. Proc. Linn. Soc. Lond. i, p. 25, 1857.
Cynomyia fortis Wlk., Journ. Proc. Linn. Soc Lond. i, p. 127, 1857.
Cynomyia fulwventris Rond., Ann. Mus. Civ. Hist. Nat. Genova, vii, p. 425, 1875.
Hypopygiopsis splendens Tnsd., Proc. U S. Nat. Mus. li, no. 2152, p. 300, 1916.
Typo-locality : Singapore. *Type* in the British Museum.

♂♀.—*Head* : eyes bare, separated in male by distance equal to three times width of third antennal segment, in female by rather more than one-third width of one eye as seen from vertex ; parafrontalia greyish at vertex, covered with golden tomentum anteriorly ; parafacialia, face and jowls also covered with golden tomentum ; antennæ and palpi orange, third segment of former about six times length of second segment. *Thorax* : shining bluish-green, lightly grey-dusted anteriorly ; two pairs postsutural acrostichals.

Abdomen: shining bluish-green; first visible tergite bluish-black; sternites in male mainly orange, covered with long soft orange pubescence; in female venter shows somewhat orange reflections and sternites carry marginal macrochætæ. *Wings*: greyish hyaline, slightly infuscated, brown colour being most intense above anterior cross-vein and in distal part of marginal cell; basicostal sclerite dark brown; squama parchment-coloured, rim of upper lobe slightly brown. Halteres dull orange. *Legs*: in male mainly dark brown to black; coxæ and trochanters orange, femora swollen, shining black, the posterior pair curved, all with soft long hair ventrally; tibiæ dark brown, slightly curved, with long fringes of soft dark hair on antero-ventral and postero-ventral surfaces, middle tibia with a chitinous projection, bearing a bristle, distally; tarsi dark brown, without any fringes of hairs, pulvilli orange. In female coxæ, trochanters and femora orange, the last not swollen nor curved nor with fringes of hair; tibiæ and tarsi dark brown, without fringes; middle tibia without chitinous projection; pulvilli greyish-brown.

Length 18–20 mm.

Distribution.—Federated Malay States, Pahang; Northern Borneo, Samawang.

Walker's type is from Singapore, Townsend's from Trong, Lower Siam. A further specimen (female) in the British Museum is from Siam, Bulsit Besar. Malloch has seen specimens from the Federated Malay States: Pahang, Kuala Teku, and there are specimens in the Hamburg Museum from East-Central, and Central Borneo.

Rondani's type is from Sarawak in Borneo. It is almost certainly this species, but may possibly be *robusta* Malloch if that should prove to be a good species.

2. **Hypopygiopsis robusta** Malloch.

Hypopygiopsis robusta Mall., Ann. Mag. Nat. Hist. (9) xvii, p. 502, 1926.

Type-locality: Dutch East Indies. *Type*: location not stated.

♂.—Metallic violet-blue. Differs from the foregoing species, *H. fumipennis* Wlk., in having the basal tergite in male blue, not black, the venter and its hairs not so conspicuously yellow.

Much more robust than *fumipennis*, the legs stouter, the hind femora and tibiæ longer and more densely haired. In other respects similar to *fumipennis*, except as noted in the key.

Length 18 mm., greatest width 8 mm.

Type, Dutch East Indies: Sibolangit, ix. 1920.

We have seen no specimens of this species.

3. Hypopygiopsis violacea (Macquart). (Fig. 8.)

Cynomyia violacea Macq., Suites à Buff. ii, p. 233, 1835.
Musca infixa Wlk., Journ. Proc. Linn. Soc. Lond. i, p. 25, 1857.
Phrissopoda metallica v. d. Wulp, Midden-Sumatra, iv, N. H. Fauna, pt. ii, p. 43, 1892.
Type-locality : Java. *Type* in the Paris Museum.

♂♀.—*Head* : eyes bare, separated in male by distance equal to two and a half times width of third antennal segment, in female by half width of one eye as seen from vertex ; frons dark brown, in male rather wider than one of the parafrontalia ; parafrontalia, parafacialia and face covered with grey tomentum, which may, at certain angles, appear slightly golden ; antennæ brown, third segment in male somewhat orange ; palpi orange. *Thorax* : shining blue-green, grey-dusted anteriorly and on pleura ; two pairs of postsutural acrostichal bristles present. *Abdomen* : bluish-green to purple ; sternites in male brownish-purple, bearing upstanding black pubescence ;

Fig. 7.



Fig. 8.

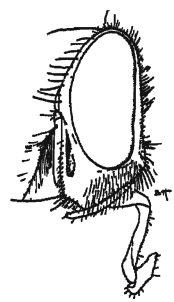


Fig. 7.—*Hypopygiopsis fumipennis* Walker (Macquart) : leg.
Fig. 8.—*Hypopygiopsis violacea* (Macquart) : head.

hypopygium prominent. *Wings* : greyish-hyaline, infuscated anteriorly and along wing-veins ; basicostal scale black ; squama parchment-coloured. Halteres dull brown *Legs* : entirely brownish-black, in male with fringes of long black hair on femora, tibiæ and tarsi ; pulvilli in male orange, in female grey.

Length 18 mm.

Distribution.—Macquart's type from Java, Walker's from Singapore, and v. d. Wulp's from Sumatra. Three further specimens from Singapore and one from Sarawak, in the British Museum. Four males in the Hamburg Museum from East-Central and Central Borneo. Malloch has seen a male from the Federated Malay States. S. China Sea, Anamba Is. Also seen from N. Borneo : Bettotan, Samawang. West Coast Federated Malay States, Sembilan Is.

Genus 2. **CALLIPHORA** Robineau-Desvoidy.

Calliphora R.-D., Myodaires, p. 433, 1830.
Genotype, *Musca erythrocephala* Mg., by original designation (as *vomitoria* L.). (Coquillett, 1910.)
Mufetia R.-D., Myodaires, p. 431, 1830. Genotype, *M. autisiodorensis* R.-D.
Mya Rond., N. Ann. Sci. Nat. Bologna (3), ii, p. 175, 1851.
Somomya Rond. (part), Atti Acad. Sci. Bologna, p. 4, 1861.
? *Compsomyia* Rond. (part) Ann. Mus. Genov. vii, p. 425, 1875.
Eucalliphora Tnsd., Smiths Misc. Coll. li, p. 118, 1908. Genotype, *M. lilæa* Wlk.
Tricycleopsis Vill., Rev. Zool. Afr. xv, 1927, p. 388. Genotype, *T. paradoxa* Vill.
Pseudo-Calliphora Mall., Suppl. Ent. xvi, p. 51, 1927.
Aldrichiella Rohd., Zool. Anz. xcv, p. 177, 1931 [preoc.].
Aldrichina Tnsd., Man. Myiol. v, p. 135, 1937 [nom. nov.].

Head: eyes more or less approximated in male, widely separated in female; jowls about one-half eye height, arista long plumose. *Thorax*: acrostichals 1 or 2 : 3; dorsocentrals 2 : 3; 2 postsutural intra-alars, the presutural bristle present or absent; 4 humeral, 3 posthumeral, 2 notopleural, 3 sternopleural arranged 2 : 1; propleuron and postalar declivity hairy. *Abdomen*: marginal bristles only on third, and discal and marginal bristles only on fourth visible segments. *Wings*: lower squama bearing long upstanding hairs on at least part of the upper surface. Stem-vein bare.

Distribution.—Cosmopolitan.

Key to the Species of Calliphora.

1. Squama with a very minute, insignificant patch of hairs. A brownish species ..... [p. 37. *paradoxa* (Vill.),
   Squama distinctly hairy on lower lobe, or shining blue species .... 2.
2. Presutural intra-alar bristle absent ..... 3.
   Presutural intra-alar bristle present ..... 5.
3. Eyes in ♂ separated by a distance equal to 2–2½ times width of 3rd antennal segment; facialia and jowls blackish-grey; postbuccæ black-haired; abdomen heavily dusted in patches; hypopygium very large ..... *grahami* Aldr., p. 35.
   Eyes in ♂ less widely separated; facialia and jowls orange-red; hairs on post-buccæ brilliant red; abdomen shining; hypopygium inconspicuous .... 4.
4. One pair of presutural acrostichals; 3rd antennal segment dark brown ..... [p. 34. *fulviceps* v. d. Wulp,
   Two pairs of presutural acrostichals; 3rd segment of antennæ brown, reddish basally .. [p. 36. *malayana* Mall.,
5. Facialia and jowls reddish, with black hairs; eyes in ♂ separated by a distance equal to 1½ times width of 3rd antennal segment ... [p. 33. *erythrocephala* (Mg.),
   Jowls blackish-grey; eyes in ♂ almost contiguous ..... 6.

6. Hairs on post-buccæ reddish or pale brown intermixed with black .... *vomitoria* (L.), p. 39.
Hairs on post-buccæ all black ..... . 7.
7. Palpi orange .... *pattoni* Aub., p. 38.
Palpi dark brown to black..... . .. ... *atripalpis* Mall., [p. 41.

4. **Calliphora erythrocephala** (Meigen). (Fig 9.)

Musca erythrocephala Mg., Syst. Beschr. v, p. 62, 1826; Wied, Auss. Zweifl. Ins. ii, p. 395, 1830.
Calliphora littoralis R.-D., Myodaires, p. 435, 1830.
Calliphora spitzbergensis R.-D, ibid. p. 435.
Calliphora vicina R.-D., ibid. p. 435.
Calliphora monspeliaca R.-D., ibid. p. 436,
Calliphora musca R.-D., ibid. p. 436.
Calliphora nana R.-D., ibid. p. 436.
Calliphora scutellata Macq, Soc Sci. Lille (1833), 161 (24), 1834.
Musca aucta Wlk., *nec* Patton, Ins. Saund. p. 334, 1852.
Calliphora insidiosa R.-D., Posth. ii, p 695, 1863.
Musca vomitoria auctt., *nec* Linn.

♂♀.—*Head*: eyes in male separated at point of closest approximation by a distance equal to one and a half times width of third antennal segment; in female equal to one-third

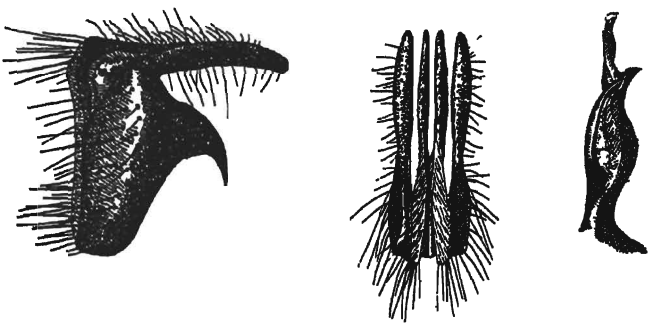


Fig. 9.—*Calliphora erythrocephala* (Meigen): ♂ genitalia.

width of head; frons black in male, narrowed at one point but not entirely obliterated; parafrontalia silver-grey; parafacialia and epistome reddish; jowls reddish to grey, post-buccæ and jowls covered with black hair; antennæ dark brown, second segment reddish; palpi orange. *Thorax*: dull bluish-black, lightly silver-dusted. Acrostichals 2 : 3, dorso-centrals 2 : 3, a presutural bristle present. *Abdomen*: greenish-blue, irregularly silver-dusted; hypopygium inconspicuous; male genitalia as in fig. 9, the paralobes less highly chitinized than the mesolobe. *Wings*: hyaline, very slightly darkened at base. Basicostal scale deep yellow to dark brown; subcostal sclerite covered with soft tawny pubescence; squama

dark brown, lower lobe white-rimmed in certain lights. Halteres orange. *Legs*: black.

Length up to about 12 mm.

Bionomics.—There is considerable literature on this insect. The two volumes of the second edition of Lowne's 'The Anatomy, Physiology, Morphology and Development of the Blow Fly (Calliphora Erythrocephala),' published in 1890, contain what is probably the most complete account of the anatomy of any Dipteron. The species breeds in decaying matters of many kinds. Current literature contains many references to the bionomics.

Distribution.—North America; Europe; Egypt; INDIA: Baluchistan, Quetta, Nushki; NORTHERN INDIA: Simla, Cherat, Mussooree, Dehra Dun, Sikkim, Darjeeling; Japan; Australia; New Zealand.

5. **Calliphora fulviceps** van der Wulp. (Fig. 10.)

Calliphora fulviceps v. d. Wulp, Middon Sumatra, iv, N. H. Fauna, pt. ii, p. 44, 1892.

Type-locality: Sumatra. *Type* in the Leyden Museum ?.

♂♀.—*Head*: eyes bare, in male very closely approximated but not holoptic, in female separated at vertex by distance



Fig. 10.—*Calliphora fulviceps* van der Wulp: ♂ genitalia.

slightly less than width of one eye; frons dark reddish-brown, in male obliterated for short space, in female parallel-sided, rather more than twice width of one of the parafrontalia, with numerous fine black hairs on middle part; parafrontalia dark at vertex, dull gold-dusted elsewhere, in male very narrow except anteriorly, touching for short space, in female about equal in width to width of third antennal segment; frontal bristles descending to level of insertion of antennæ, male without, female with, two fronto-orbital bristles, and both sexes with numerous fine hairs outside the series of bristles; parafacialia dull gold-dusted and hairy above, orange-yellow and more or less bare below; jowls yellowish, with a few black hairs on upper part and brilliant reddish-yellow hairs below, which

also extend over the occiput; face reddish-yellow, the vibrissæ inserted well above upper margin of epistome, which projects diagonally forwards and downwards; facialia with minute decumbent bristles on about half their length; first and second antennal segments orange-red, third uniformly dark brown: arista long plumose, the basal half thickened; palpi orange-yellow. *Thorax*: dark dull bluish-purple, lightly grey-dusted anteriorly, acrostichals 1 : 3, dorso-centrals 2 : 3, intra-alars 2, supra-alars 3, post-alars 4, humerals 2–3, post-humerals 3, presutural intra-alar bristle missing. *Abdomen*: shining bluish-purple with coppery reflections, lightly grey-dusted, male hypopygium inconspicuous. *Wings*: greyish-hyaline, slightly infuscated basally; squama dark brown, rather sparsely covered with long strong hairs. Halteres dark brown. *Legs*: black.

Length 8 mm.; length of wing 8 mm.

Bionomics.—Nothing is known.

Distribution.—Sumatra; Java, Tjibodas; Borneo, Mt. Kinabalu.

6. **Calliphora grahami** Aldrich. (Fig. 11.)

Calliphora grahami Aldr., Proc. U.S. Nat. Mus. lxxviii Art. 1, p. 1, 1930.
Aldrichiella grahami Rohd., Zool. Anz. lxxxviii, p. 177, 1930.
Type-locality: Szechuen; China. *Type* in the United States National Museum.

♂♀.—*Head*: eyes separated in male by distance equal to three times width of third antennal segment, in female by

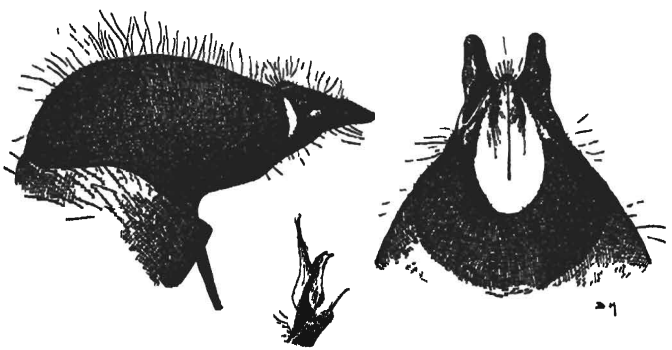


Fig. 11.—*Calliphora grahami* Aldrich: ♂ genitalia.

one-third total width of head; frons dark brown to black below ocellar triangle, becoming reddish anteriorly; parafrontalia and parafacialia covered with yellowish silver-grey tomentum; facialia and epistome reddish; genæ grey, black-haired;

antennæ dark brown, base of third joint sometimes slightly or extensively rufous; palpi orange. *Thorax*: dull black, slightly silver-dusted anteriorly; acrostichals, 3:3, dorsocentrals 3:3 (in each series the anterior pair of bristles small, irregularly placed, and sometimes difficult to discern). A presutural bristle present; the presutural intra-alar bristle absent. *Abdomen*: shining blue, silver-dusted in patches, so that it presents a slightly tesselated appearance; hypopygium very prominent, shining black, reaching forward halfway to base of abdomen; male genitalia as in fig. 11, the mesolobe long, pointed, concave, and projecting forwards, the paralobes short, blunt, and projecting downwards. *Wings*: greyish hyaline, slightly clouded at base; basicostal scale black; subcostal sclerite covered with soft tawny pubescence; lower squama brown, white-rimmed in certain lights. Halteres orange. *Legs*: black.

Length 8–10 mm.

Bionomics.—The Californian specimens were reared from a single batch of eggs on meat.

Distribution.—INDIA: Chitral; China: Yunnan, Szechuen Province, Hang Kow, Hong Kong, Foo-Chow, Shanghai, Fokien Province; Chusan Archipelago, Lukwang Is.; Shensi Province, Senling; Siberia; Japan; California.

7. **Calliphora malayana** Malloch. (Fig. 12.)

Calliphora malayana Mall., Ann. Mag. Nat. Hist. (9) xx, p. 415, 1927. Type-locality: Federated Malay States, Pahang. *Type* in the British Museum.

This species resembles *C. fulviceps* v. d. Wulp very closely, differing only in the characters given in the key.

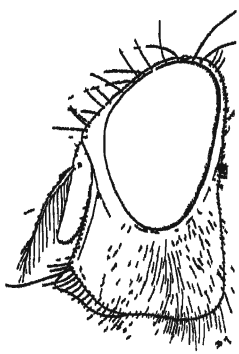


Fig. 12.—*Calliphora malayana* Malloch: head.

In the series of specimens which we have examined the presutural acrostichal bristles give the impression of being variable in number (*i. e.*, they are sometimes weak and

incorrectly aligned), and the extent of the reddish colouring on the third antennal segment is also variable. We are therefore inclined to think that this species may prove to be only a variety of *C. fulviceps* v. d. Wulp.

It is possible also that an examination of van der Wulp's types at Leyden may show that this author had a mixed series in front of him. For the present, however, the names are being used in the sense defined by Malloch.

Bionomics.—Nothing is known.

Distribution.—Federated Malay States: Pahang, Gunong Benom; Sumatra: Mt. Dempo, Kornchi Peak; Java, Mt. Adjoeno, 6000 ft.; Borneo, Mt. Kinabalu.

8. **Calliphora paradoxa** (Villeneuve). (Fig. 13.)

Tricycleopsis paradoxa Vill., Rev. Zool. Afr. xv, p. 389, 1927 (Sept. 15).

Calliphora (*Pseudocalliphora*) *semifulva* Mall., Supp. Ent. xvi, p. 51, 1927 (Nov. 10).

Type-locality: Formosa. *Type* in the Deutsches entomologische Institut, Berlin.

♂♀.—*Head*: eyes bare, in ♂ closely approximated with uniformly small facets, in ♀ separated at vertex by distance

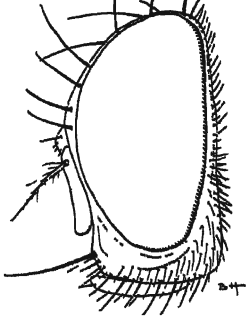


Fig. 13.—*Calliphora paradoxa* (Villeneuve): head.

equal to one-third width of one eye; frons in ♂ reddish-brown, obliterated towards vertex, in ♀ dull, black towards vertex, reddish anteriorly, about three times width of one of the parafrontalia; parafrontalia in ♂ almost linear, silver-dusted, contiguous for a short distance, in ♀ narrow, each about half width of third antennal segment, silver-grey dusted with a few fine hairs outside frontal series, this series consisting of about six pairs of strong bristles, the uppermost pair directed outwards and backwards; parafacialia in ♂ reddish, covered with

silver tomentum which shows shifting reflections, in ♀ similar, the tomentum rather more grey; medianæ reddish with thin covering of grey tomentum; jowls grey-dusted with black bristles; face greyish, flat, almost vertical, the upper margin of the epistome barely projecting, the vibrissæ inserted slightly above this level; antennæ in ♂ orange, the third segment about three times as long as second and darkened distally, in ♀ brown, the first, second and base of third segments reddish; arista long-plumose to tip, palpi orange, rather thick throughout their length. *Thorax*: testaceous, dorsum and pleura partially darkened, overlaid in the ♂ with grey, in the ♀ with golden tomentum; centre of scutellum darkened in ♂; dorsum with traces of five black stripes anteriorly. Chætotaxy: acrostichals 2 : 3, dorso-centrals 2 : 3, intra-alars 2, supra-alars 3, posthumerals 3. Presutural intra-alar bristle absent in ♂, present in ♀; propleura and prosternum hairy; prostigmatic bristle present; mesopleura with one or two fine bristles in upper anterior corner; sternopleurals 1 : 1; anterior and posterior spiracles yellowish white. *Abdomen*: first visible segment testaceous-yellow, in ♂ with darkened hind margin; second testaceous-yellow with darkened hind margin in both sexes and a dark central stripe; third and fourth blackish, the posterior margins very narrowly orange in the ♀; black areas on the abdomen thinly overlaid with greyish tomentum in ♂ and greyish gold in ♀; venter in ♀ orange basally, black towards apex. *Wings*: hyaline, strongly yellow-tinged; squama testaceous, semitransparent with darkened hind margins, the lower lobe with a small patch of black setulæ (these are hard to see and very easily rubbed off). Halteres yellow. *Legs*: yellow, tarsi blackish; mid-tibia with one antero-dorsal bristle.

Length 7 mm.

Bionomics.—Nothing is known.

Distribution.—Federated Malay States, Kedah Peak; Sumatra, Fort de Kock; Formosa: Koshun.

Villeneuve's type is a ♂ and Malloch's type and paratype are ♀♀; there are certain differences of colour between the two sexes and a notable difference in the absence of the presutural bristle in the ♂, but an examination of the three known specimens leaves little doubt that they belong to the same species.

9. **Calliphora pattoni** Aubertin. (Fig. 14.)

Calliphora pattoni Aub., Ann. Mag. Nat. Hist. (10) viii, p. 615, 1931.
Calliphora aucta plur. auct., *nec* Walker, Patton, Bull. Ent. Res. xiii, p. 113, 1922; Sen.-Wh., Mem. Dept. Agric. Ind., Ent. Ser. vii, p. 99, 1922; id., Rec. Ind. Mus. xxviii, p. 129, 1926.
Type-locality: India, Darjeeling. *Type* in the British Museum.

♂♀.—*Head*: eyes in male separated at point of closest

approximation by one-half width of third antennal segment, in female by slightly less than one-third width of head as seen from the vertex. Frons, parafrontalia, parafacialia and jowls dark greyish-black, the epistome and facial ridges slightly reddish. Silver flecks, visible in certain lights, below ocellar triangle, opposite point of insertion of antennæ, and halfway down parafacialia. Antennæ dark brown, third segment rufous at base; palpi orange. Jowls and post-buccæ covered with black hair. *Thorax*: dull, silver-dusted; four narrow black longitudinal stripes anteriorly; acrostichals 2 : 3, dorso-centrals 2 : 3, a presutural bristle present. *Abdomen*: metallic blue-green with irregular silver dusting; sternites rather hairy in male; hypopygium inconspicuous; male genitalia as in fig. 14, the paralobes being less highly chitinized than the mesolobe. *Wings*: hyaline, slightly

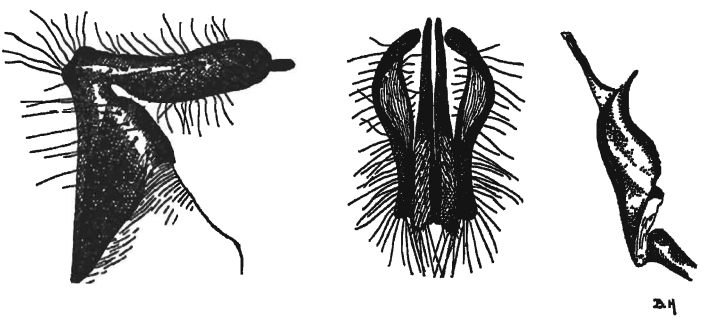


Fig. 14.—*Calliphora pattoni* Aubertin: ♂ genitalia.

darkened at base, along submarginal cell, and at small cross-vein; basicostal scale black; subcostal sclerite covered with soft tawny pubescence; squama dark brown, the lower lobe white-rimmed in certain lights. *Legs*: black.

Length 10 mm.

Bionomics.—This species is larviparous. Nothing else appears to be known of its life-history.

Distribution.—INDIA: Kashmir, Himalaya region, Darjeeling, Khasi Hills, Mishmi Hills, Dalai Valley, 4000–10,000 ft.; BURMA (*sine loc.*).

10. **Calliphora vomitoria** (Linnæus). (Fig. 15.)

Musca vomitoria L., Syst. Nat. (ed. x) 1, p. 595, 1758.
Musca carnaria Scop., Entom. Carn. pp. 325, 868, 1763.
Musca carnaria (*cærulia*) de G., Ins. vi, 29, 1776.
Musca carnivora F., Entom. Syst. iv, p. 313, 1784.
Musca obscœna Esch., Entomographien, p. 113, 1822.
Calliphora brunnibarbis R.-D., Myodaires, p. 434, 1830.
Calliphora fulvibarbis R.-D., ibid. p. 434, 1830.

Calliphora erythrocephala Macq. (*nec* Mg.), Soc. Sci. Lille, 1833, 160, 1834.
Musca affinis Macq., Suit à Buff. ii, p. 263, 1835.
Calliphora crocaipalpis Jaenn., Abh. Senckenb. Ges. vi, p. 376, 1867.
Calliphora antarctica Schin., Nov. Reise, p. 308, 1868.
Calliphora capensis B. & B., Denk. Akad. Wien, lviii, p. 442, 1891.
Calliphora loewi End., D. Tiefsee Exp. iii, p. 254, 1903.
Calliphora vicarians Schin. (*in litt.* ap. Brauer).

♂♀.—*Head* : eyes in the male separated at point of closest approximation by a distance slightly less than width of third antennal segment, in female by distance equal to rather less than one-third width of head ; frons more or less obliterated at narrowest point, black. Parafrontalia dark grey, silver-flecked below ocellar triangle and opposite point of insertion of antennæ ; parafacialia dark red to dark grey ;

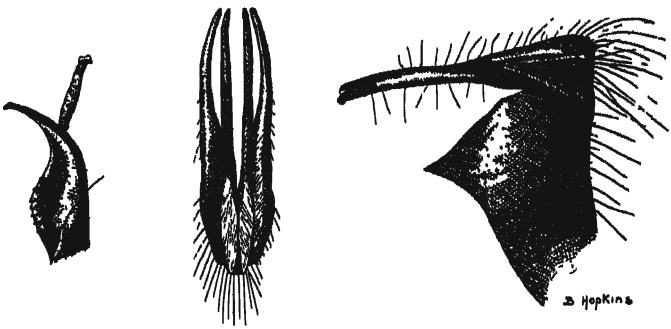


Fig. 15.—*Calliphora vomitoria* (Linnæus) : ♂ genitalia.

epistome reddish, jowls black covered with black hair ; post-buccæ covered with a mixture of black and reddish or light brown hair ; antennæ dark brown, third segment sometimes reddish at base ; palpi orange. *Thorax* : dull bluish-black, very lightly silver-dusted anteriorly ; acrostichals 2 : 3, dorso-centrals 2 : 3, a presutural bristle present. *Abdomen* : shining blue to purple with very sparse silver dusting ; hypopygium inconspicuous ; male genitalia as in fig. 15, the paralobes very slender and almost as heavily chitinized as the mesolobe. *Wings* : hyaline, slightly infuscated at the base ; basicostal scale black ; subcostal sclerite covered with tawny pubescence ; squama dark brown, the lower lobe white-rimmed in certain lights. Halteres orange. *Legs* : black.

Length variable, up to about 12 mm.

Bionomics.—Breeds in many kinds of decaying matter. There are many references in the literature to the habits of this species.

Distribution.—Europe ; INDIA : Western Himalayas, Darjeeling, Sikkim ; China : Hong Kong ; Japan ; North America.

The colour of the hairs on the buccæ varies, and they may appear to be completely black, as in some specimens from Gulmarg in the British Museum.

Separated from *pattoni* by ♂ genitalia.

11. **Calliphora atripalpis** Malloch, 1935.

Calliphora atripalpis Mall., Journ. Federated Malay States Mus. xvii, p. 669, 1935.
Type-locality: Borneo. *Type* in the British Museum.

♀.—*Head*: width of frons not quite one-third the diameter of the eye. Frontal stripe very dark greyish-black. Parafrontalia concolorous, but with velvety black patches. Face and genæ concolorous with frons, no patches. Genal bristles black. Epistomal margin ochreous. Antennæ and palpi black. *Thorax*: dull blue, with greyish pollen. Pleural hairs all black. *Abdomen* metallic-blue. *Wings*: lightly infuscate basally and faintly above vein I. Squamæ fuscous. *Legs*: black.

Length 7 mm.

Bionomics.—Nothing is known.

Distribution.—Borneo, Mt. Kinabalu.

Genus 3. **HEMIPYRELLIA** Townsend.

Hemipyrellia Tnsd. Insec. Inscit. Mens. vi, p. 154, 1918.
Genotype, *Lucilia fernandica* Macquart.

A genus of wholly or partially metallic flies closely allied to *Lucilia*.

Head: eyes in the male closely contiguous or separated. Frons reddish-brown to black. Parafrontalia, face, cheeks, posterior orbits and jowls covered with silver or golden tomentum. In female frons and parafrontalia together, as seen from the vertex, about a quarter of the width of head as seen from same point of view; vertex shining, slightly grey-dusted. *Thorax*: metathorax with a bunch of upstanding hairs on the convexity above the metathoracic spiracle. Dorso-central bristles 2 : 3; acrostichals 2 : 2. Scutellum with four pairs of marginal bristles and one pair of discal bristles. *Abdomen*: second and third visible segments may or may not have dark posterior margins. Macrochætæ developed on hind margin of third and on fourth visible segment. Genitalia more or less prominent in male. *Wings*: third vein bristly almost to anterior cross-vein both above and below; subcostal sclerite bears short bristles; supra-squamal ridge with two tufts of hairs. Squamæ white. *Legs*: middle tibia with one antero-dorsal bristle.

Distribution.—Ethiopian, Oriental, and Australian regions.

Key to the Species of Hemipyrellia.

Male and Female.

1. Large flies; in male hypopygium very prominent, lateral lobes forming heavily chitinized shields enclosing mesolobe and paralobes; dorsum of thorax covered with short upstanding hairs in addition to the serially arranged bristles; posterior margin of mesopleura with a few golden hairs among the bristles ..... [p. 13. *pecunda* (Kirby).

   Smaller flies; hypopygium sometimes prominent, but not markedly conspicuous; posterior margin of mesopleura without golden hairs.. 2.

2. Eyes in male very closely approximated, parafrontalia reduced to a fine line; wings slightly yellow-tinged; paralobes elongate narrow, rounded apically ..... [p. 45. *tagaliana* (Big.),

   Eyes in male separated by distance equal to width of third antennal segment; facial tomentum in female brilliant shining silver; third segment of antenna bright orange; abdomen rather heavily silver-dusted..... [p. 44. *pulchra* (Wied.),

   Eyes in male separated by distance rather greater than width of third antennal segment; lateral lobes elongate, testaceous, very sparsely haired; facial tomentum greyish; third antennal segment generally dark brown ..... [p. 42. *ligurriens* (Wied.),

12. **Hemipyrellia ligurriens** (Wiedemann). (Fig. 16.)

Musca ligurriens Wd., Aussor. Zweifl. Ins. ii, p. 655, 1830.
Musca solaia Wlk., List Dipt. Brit. Mus. iv, p. 887, 1849.
Musca fortunata Wlk., Journ. Proc. Linn. Soc. Lond. iv, p. 137, 1860.
Somomyia cæruleolimbata Big., Bull. Soc. Zool. Fr. xii, p. 599, 1887.
? *Lucilia ballardi* Patt., Ind. Journ. Med. Res. ix, p. 573, 1922.
Lucilia albopilosa Sen.-Wh., Rec. Ind. Mus. xxviii, p. 130, 1926.
? *Hemipyrellia orientalis* Tnsd., Suppl. Ent. xvi, p. 56, 1927.
Hemipyrellia cyanco-marginata Mall. (*nec* Macq.), Proc. Linn. Soc. N. S. Wales, lii, p. 320, 1927.
Type-localities: Java and China. *Co-types* in Leyden and Vienna.

♂♀.—*Head*: frons much narrowed, occasionally obliterated for a short space; parafrontalia narrowed but not obviously compressed; eyes, when most nearly approximate, separated by a distance rather greater than width of third antennal segment. Parafrontalia, cheeks and jowls silver-grey, the jowls moderately well-defined. Antennæ tawny-yellow to dark brown. Palpi orange. Vibrissæ ascending about halfway up the facialia in a rather irregular row. Frons in female about the same width as the parafrontalia, although rather narrower just above the antennæ. *Thorax*: shining green to purple, rather heavily dusted anteriorly and on the lower part of the hypopleura. *Abdomen*: shining green to purple, the hind margins of the segments sometimes darkened. First visible sternite and edges of tergites with sparse, short, bristly

hairs in male; male genitalia prominent and characteristic (fig. 16), the mesolobe diverges for a considerable distance, paralobes long, slender, and pointed, lateral lobes elongate, testaceous. and covering para- and mesolobes; the genitalia are not markedly hairy as in other species of this genus. *Wings*: hyaline or slightly tinged with yellow. *Legs*: black. *Length* 10 mm.

Bionomics.—Patton (Ind. Jour. Med. Res. ix, p. 573, 1922) states that *L. ballardi*, the synonymy of which is doubtful, feeds as an adult on human excreta, but the eggs are laid only in decaying animal matter.

Distribution.—INDIA: Calcutta; CEYLON; Java; Celebes; China: Hong Kong, Hankow, Foo-chow, Swatow; Japan;

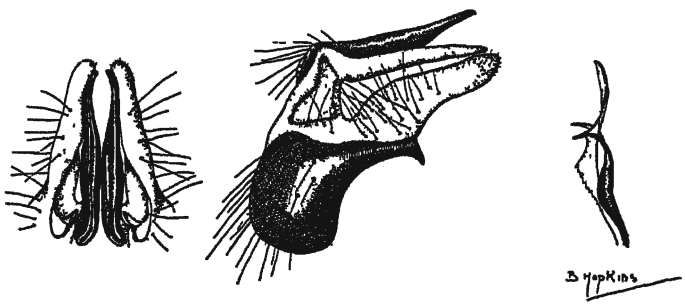


FIG. 16.—*Hemipyrellia ligurriens* (Wiedemann): ♂ genitalia. (From Aubertin.)

Philippine Islands; Siam; Malay Peninsula, Singapore; New Britain; Australia, Queensland.

The species is widely spread over the Oriental and Australian regions, and has sometimes been confused with *H. pulchra* Wied. on account of the variable colour of the antennæ; but the genitalia and comparatively wide separation of the eyes make it easily recognizable.

13. **Hemipyrellia jucunda** (Kirby). (Fig. 17.)

Stilbomyia jucunda Kirby, Proc. Zool. Soc. Lond. p. 555, 1888.
Type-locality: Christmas Island. *Type* in the British Museum.

♂♀.—*Head*: frons not obliterated although narrowed; distance between the eyes at point of closest approximation equal to twice the width of third antennal segment. Parafrontalia, parafacialia and jowls silver-grey, vibrissæ ascending halfway up the facialia; jowls covered with obvious black hairs. Antennæ brown; palpi orange. In female distance between eyes at vertex one-quarter width of head. *Thorax*:

metallic green, slightly dusted anteriorly and on pleura. Dorsum covered with coarse upstanding hairs, apart from the serial bristles. Posterior margin of mesopleura with a few fine golden-brown hairs among the bristles. *Abdomen*: metallic green, thinly dusted, the posterior margins of the segments darkened. Sternites in male covered with long golden hairs and edges of tergites with sparse long black bristles.

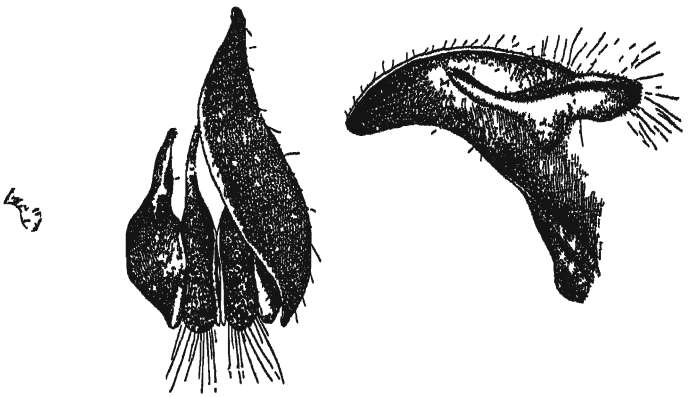


Fig. 17.—*Hemipyrellia jucunda* (Kirby): ♂ genitalia. (From Aubertin.)

Hypopygium very prominent; male genitalia as in fig. 17; the lateral lobes developed into heavily chitinized triangular shields which completely enclose the mesolobe and paralobes. *Wings*: hyaline, greyish. *Legs*: dark brown to black.

Length 11 mm.

Bionomics.—Nothing is known.

Distribution.—Christmas Island, Indian Ocean.

14. **Hemipyrellia pulchra** (Wiedemann). (Fig. 18.)

Musca pulchra Wd., Aussor. Zweifl. Ins. ii, p. 406, 1830.
Lucilia ruficornis Macq., Mém. Soc. Nat. Sci. de l'Agr. et des Arts, Lille, p. 100, 1847; Dipt. Exot. Suppl. ii, p. 84, 1847.
Musca phellra Wlk., List Dipt. Brit. Mus. iv, p. 884, 1849.
Somomyia pagodina Big., Ann. Soc. Ent. Fr. (5) vii, p. 40, 1877.
Type-locality: unknown. *Types* in the Vienna Museum.

♂♀.—*Head*: eyes almost contiguous, frons obliterated at closest approximation of eyes, where they are separated by a distance equal to the width of the third antennal joint. Basal and proximal part of second antennal segment dark brown, distal part and third segment clear orange, the latter six times as long as the former, slim, and not quite reaching the level of insertion of the vibrissæ. Parafacialia and jowls silver, the latter somewhat reddish, and covered with very

short inconspicuous black hairs. Vibrissæ hardly ascend the facialia at all; palpi orange. In female parafrontals wider than frons, with frontal bristles rather widely spaced; upper part of frons silver-dusted; parafrontalia, parafacialia and jowls markedly silvery. Third segment of antenna very clear orange, almost twice as broad as that of male, and rather longer. *Thorax*: metallic green with purple reflections, heavily dusted anteriorly and on the hypopleura. *Abdomen*: greenish to purple; sternites and edges of tergites covered with long bushy hairs. Genitalia hairy; mesolobe divergent at the tip; paralobes dilated at the base to form shining testaceous bosses; lateral lobes small, brown, triangular, and covered with long hair. In the female the hind margins of segments sometimes appear to be slightly banded; sides and fourth visible segment very heavily silver-dusted.

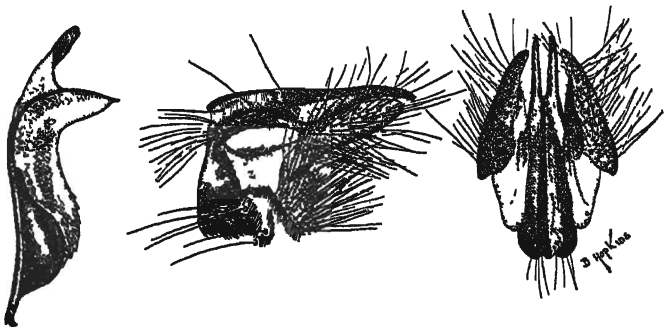


Fig. 18.—*Hemipyrellia pulchra* (Wiedemann): ♂ genitalia. (From Aubertin.)

venter without noticeable hairs. *Wings*: hyaline; veins brown, tending to orange in the region of the second and third basal cells. *Legs*: black.

Length 9 mm.

Bionomics.—A viviparous species, breeding in human excrement or decomposing carcases both of animals and birds. The adult appears to be essentially a flower and fruit juice feeder.

Distribution.—India: Punjab, Agra; Northern Bengal; Bihar; Pondicherry; Coimbatore.

15. **Hemipyrellia tagaliana** (Bigot). (Fig. 19.)

Somomyia tagaliana Big., Ann. Ent. Soc. Fr. (5) vii, p. 44, 1877. Type-locality: Philippines. *Type* in the British Museum.

♂.—*Head*: eyes almost contiguous, frons obliterated and parafrontalia reduced to a fine line; parafacialia and

jowls covered with grey tomentum, the latter with inconspicuous black hairs. Vibrissæ ascend facialia for one-third their total length. Antennæ dark brown; palpi orange. *Thorax*: metallic blue-green. *Abdomen*: metallic blue-green, the hind margins of the segments somewhat darkened. First visible sternite and edges of tergites with bunches of long coarse bristles. Genitalia hairy, the mesolobes and paralobes compact, the latter testaceous at the tips; lateral lobe well



Fig. 19.—*Hemipyrellia tagaliana* (Bigot): ♂ genitalia. (From Aubertin.)

developed, oval, with long fine hairs (fig. 19). *Wings*: hyaline, but tinted greyish-brown. *Legs*: black.

Length 8–9 mm.

Bionomics.—Nothing is known.

Distribution.—Philippine Islands; Java; Lombok; Singapore.

We have been unable to find any satisfactory character for separating the females of *tagaliana* (Big.) and *ligurriens* (Wied.); the colour difference used by Malloch may be a guide, but it is too unreliable for purposes of identification. Among the females which may belong to *tagaliana* (Big.) is the type of *Lucilia nesiotis* Schin.

Genus 4. **LUCILIA** Robineau-Desvoidy.

Lucilia R.-D., Myodaires, p. 452, 1830.
Somomyia Rond. (part), Dipt. Ital. Prod. iv, p. 9, 1861.
Phœnicia R.-D., Posth. ii, xxx, p. 750, 1863.
Phumonesia Vill., Bull. Soc. Ent. Fr. p. 307, 1914.
Bufolucilia Tnsd., Proc. U.S. Nat. Mus. lvi, p. 542, 1919.
Francilia Shn., Insec. Inse. Mens. xii, p. 74, 1924.
Argoracrites Ség., Bull. Soc. Path. Exot. xviii, p. 734, 1925, *nom. nud.*
Cæsariceps Rohd., Rev. Zool. Russe, iv, fasc. 1, 1925 (Ent. Mitt. xvii, p. 337, 1928).
Dasylucilia Rohd., Rev. Zool. Russe, iv, fasc. 1, 1925 (Ent. Mitt. xvii, p. 338, 1928).
Roubaudiella Ség., Bull. Soc. Path. Exot. xviii, p. 735, 1925.

Lucilvella Mall., Ann. Mag. Nat. Hist. (9) xvii, p. 507, 1926.
Viridinsula Shn., Proc. Ent. Soc. Wash. xxviii, p. 131, 1926.
Genotype, *Lucilia cæsar* L.

Metallic coloured Calliphorine flies of medium size.

Head: eyes bare; parafrontalia and parafacialia covered with silver or golden tomentum; arista long-plumose; jowls one-third of eye-height; vibrissæ ascend almost half-way up facilia but are inconspicuous. *Thorax*: chætotaxy as follows: humerals *3* : *4*, notopleurals *2*, supra-alars *2* : *3*–4, intra-alars *2*–*3* : 2–3, post-alars *2*–3, acrostichals *2* : 3 : *2*–3, dorso-centrals *3* : *3*, marginal scutellars *4* *. *Abdomen*: second abdominal segment with or without marginal macrochætæ; discal macrochætæ on last segment only. *Wings*: third longitudinal vein bristly both above and below, as far as small cross-vein; squama bare; post-alar and tympanic tufts present. *Legs*: brown to black; middle tibia usually with one, sometimes with two or three antero-dorsal bristles.

Key to the Species of Lucilia.

1.	Costa infuscated; parafacialia with a row of minute hairs	[p. 48. *fumicosta* Mall.,
	Wings hyaline; parafacialia bare	2.
2.	Basicostal scale yellow	3.
	Basicostal scale dark brown or black	4.
3.	Abdomen somewhat arched in profile, sternites with tufts of long hairs; hypopygium prominent; parafrontalia bare, or almost bare, except for frontals and fronto-orbitals	[p. 55. *cuprina* (Wd.),
	Abdomen not arched in profile, sternites without tufts of long hairs; hypopygium inconspicuous; parafrontalia in ♀ with short decumbent bristles among frontals and parafrontals	[p. 54. *sericata* (Mg.),
4.	Very large flies. Holoptic, 3rd antennal segment remarkably slender; jowls shallow and rounded	[p. 51. *sinensis* Aub.,
	Smaller flies. Never completely holoptic, though often very closely approximated; jowls deeper	5.
	Very small fly, 5–6 mm.; jowls shallow; ♂ genitalia conspicuous	[p. 57. *andrewsi*, sp. n.,
5.	Upper and lower squama infuscated	6.
	Upper squama white, lower infuscated; ♂ genitalia (fig. 22)	[p. 50. *ampullacea* Vill.,
	Upper and lower squama predominantly white; ♂ genitalia (fig. 21)	[p. 48. *illustris* (Mg.),
6.	Antennæ reaching upper margin of epistome, with only one antero-dorsal bristle on middle tibia	[p. 53. *porphyrina* (Wlk.),
	Antennæ not reaching upper margin of epistome, with two antero-dorsal bristles on mid-tibia	[p. 52. *papuensis* Macq.,

* Italic figures indicate the more usual number of bristles where there is any variation.

16. **Lucilia fumicosta** Malloch. (Fig. 20.)

Lucilia (*Lucilella*) *fumicosta* Mall., Ann. Mag. Nat. Hist. (9) xvii, p. 507, 1926.
Type-locality: Philippine Islands, Los Banos. *Type*: location not stated.

♂♀.—*Head*: eyes at point of closest approximation separated by a distance equal to half the width of third antennal segment in male, in female distance equal to quarter width of head, parafrontalia narrowed above, contiguous for a short space with very fine hairs outside the frontal bristles; these hairs continued down on to the parafacialia in an irregular line; antennæ dark brown, rufous at the base; palpi yellow. *Thorax*: shining green, two postsutural acrostichals. *Abdomen*: shining green, the posterior margins of the second and third abdominal segments sometimes dark-margined;

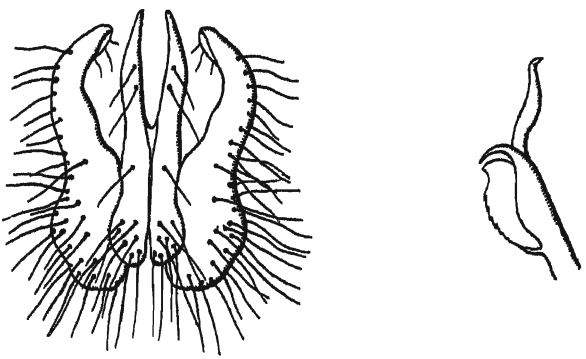


Fig. 20.—*Lucilia fumicosta* Malloch: ♂ genitalia.
(From Aubertin.)

genitalia as in fig. 20, inconspicuous. *Wings*: infuscated along the anterior border, the colour fading away towards the posterior border, which is almost hyaline; basicostal scale dark brown to black; subcostal sclerite with a few stiff upstanding brown hairs; squama brown. *Legs*: dark brown; middle tibia with two antero-dorsal bristles.

Length 6–8 mm.

Bionomics.—Nothing is known.

Distribution.—Philippine Islands: Los Banos, Mt. Maquiling.

17. **Lucilia illustris** (Meigen). (Fig. 21.)

Musca illustris Mg., Sitz.Beschr. v, p. 54, 1826.
Musca parvula Mg., Sitz.Beschr. v, p. 55, 1826.
Musca equestris Mg., Sitz.Beschr. v, p. 57, 1826.
? *Lucilia lepida* R.-D., Myodaires, p. 453, 1830.

? *Lucilia consobrina* Macq., Mem. Soc. Sci. Agric. Arts, Lille, p. 217, 1848 ; id., Dipt. Exot. Suppl. iii, p. 57, 1848.
? *Lucilia fraterna* Macq., ibid.
Musca muralis Wlk., List Dipt. Brit. Mus. iv, p. 883, 1849.
Callyphora simulatrix Pand., Rev. Ent. xv, p. 218, 1896.
Lucilia purpurea Tnsd., Smiths. Misc. Coll. li, p. 122, 1908.
Lucilia cæsar Hough (*nec* L.), Zool. Bull. p. 288, 1899 ; Howard (*nec* L.), Proc Wash. Acad. ii, p. 563, 1900 ; Johnson (*nec* L), Ann. Ent. Soc. Amer. vi, p. 242, 1913 ; Tothill (*nec* L.), Ann. Ent. Soc. Amer. vi, p. 248, 1913 ; Shn (*nec* L), Inst. Insc. Mens. xii, p. 75, 1924 ; id., Proc. Ent. Soc. Wash. xxviii, p 130, 1926 ; Tnsd. (*nec* L.), Ann. Ent. Soc. Amer. xxi, p. 121, 1928.
Type-locality : Europe. *Type* in the Paris Museum ?.

♂♀.—*Head* : ♂, frons usually obliterated for a short space ; eyes separated by a little less than width of third antennal segment ; frontal bristles small, but run in continuous series almost to base of ocellar triangle. Tomentum on face silver ; antennæ dark brown. *Thorax* : green, shining,

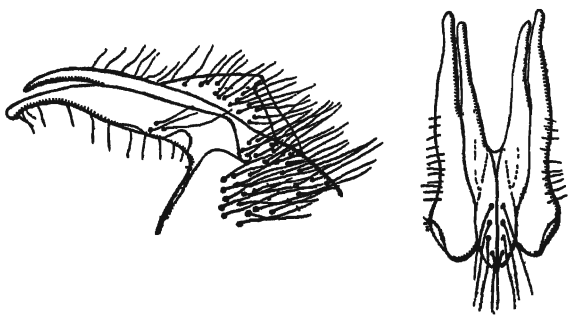


Fig. 21.—*Lucilia illustris* (Meigen) : ♂ genitalia. (From Aubertin.)

but not extremely so. Two postsutural acrostichals. *Abdomen* : covered with short upstanding hairs, and therefore less shining than usual. Second abdominal segment may have a row of semi-erect marginal setæ, but they are never sufficiently pronounced to be regarded as marginal macrochætæ. Genitalia less robust than in *L. cæsar* ; median forceps diverge and curve forwards and taper to points ; lateral forceps longer than median forceps, and also curve forwards (fig. 21) *Wings* : sometimes very slightly infuscated at the base. Basicostal scale black. Subcostal sclerite with a few inconspicuous wiry black hairs among thick dark brown decumbent pubescence. Lower squama sometimes slightly darkened. *Legs* : one antero-dorsal bristle on middle tibia.

Length 6–8 mm.

Bionomics.—Under the name of *L. cæsar* there are many notes on this species in literature published in the United States of America.

Distribution.—Europe ; INDIA, Himalayas ; BURMA, Rangoon ; China, Shanghai ; Manchuria ; N. America.

L. illustris is well established in northern and central Europe, and appears to have spread to the eastern coast of Asia ; also it is one of the commonest species in North America. It is rare in the Oriental region, but may sometimes be found encroaching from the Palæarctic region.

18. **Lucilia ampullacea** Villeneuve. (Fig. 22.)

Lucilia ampullacea Vill., Bull. Mus. H. N. Paris, xxviii, p. 515, 1922.
Lucilia flavipennis Kram. (*nec* Macq.), Abh. Naturforsch. Ges. Gorlitz, p. 283, 1917.
Lucilia krameri Ség., Encyc. Ent. ser. B, ii, p. 94, 1925.
Cæsariceps flavipennis Kram., Rev. Zool. Russ. iv, fasc. 1, 1925 ; id., Ent. Mitteil. xvii, p. 7, 1928.
Type-locality: France, Rambouillet. *Type* in Villeneuve collection.

♂♀.—*Head* : frons in ♂ entirely obliterated, parafrontalia reduced to a fine line. In ♀ eyes separated by rather more than one-quarter the total head-width. Frons black, 2½ times

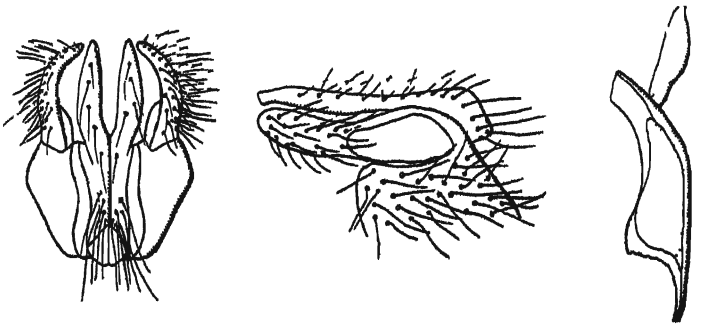


Fig. 22.—*Lucilia ampullacea* (Villeneuve) : ♂ genitalia. (From Aubertin.)

the width of one of the parafrontalia. Facial tomentum silver. Antennæ dark brownish-black. Palpi yellow. *Thorax* : shining green. Two postsutural acrostichals. *Abdomen* : first visible segment greenish-black. Second without marginal macrochætæ. Sternites and ventral edges of tergites with long thick bristles. Hypopygium (fig. 22) not prominent. *Wing* : hyaline, basicostal scale black. Upper squama definitely white. Lower definitely infuscated. In ♀ a slight yellow tinge along costa. *Legs* : black. Mid-tibia with one antero-dorsal bristle.

Length 6–8 mm.

Bionomics.—Nothing is known.

Distribution.—Europe ; Algeria ; INDIA, Darjeeling ; Japan ; Australia.

19. **Lucilia sinensis** Aubertin. (Fig. 23.)

Lucilia sinensis Aub., Journ. Linn. Soc. Lond. xxxviii, p. 407, figs. 12, 13, 1933.
Type-locality: Western China, Chin-Fu-San. *Type* in the British Museum.

♂.—*Head*: eyes quite contiguous for a short space; antennæ short, third segment four times length of second and very slightly rufous at the base; jowls short and rounded; tomentum on parafacialia greyish-red. *Thorax*. green to purple; two pairs of postsutural acrostichal bristles set well towards the posterior end. *Abdomen*: green to purple;

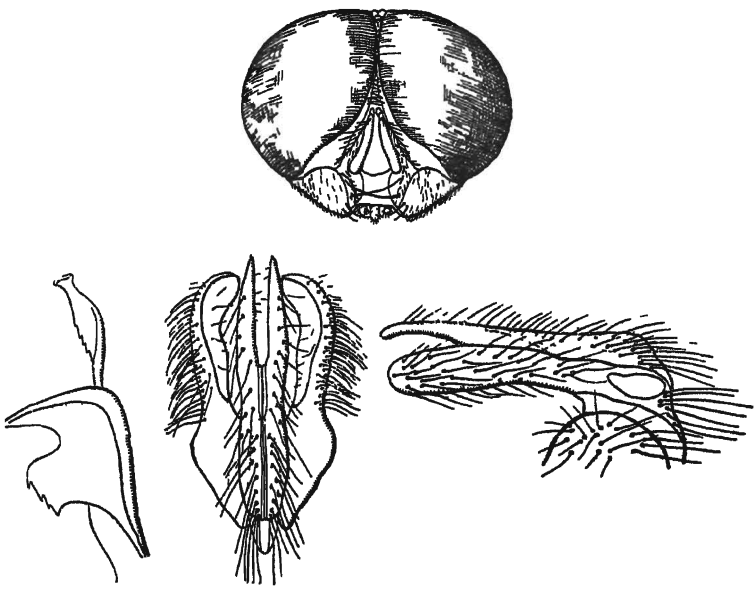


Fig. 23.—*Lucilia sinensis* Aubertin: head and ♂ genitalia. (From Aubertin.)

macrochætæ not strongly developed; genitalia inconspicuous (fig. 23); median and lateral forceps much as in *L. papuensis* Macq., penis very similar to that of *L. porphyrina* (Walk.). *Wings*: slightly infuscated at the base; squama dark brown. *Legs*: black, middle tibia with one antero-dorsal bristle.

Length 10–12 mm.

Distribution.—Western China, Chin-Fu-San.

There is a male in the British Museum Collection from Java, Soekaboemi, vi. 1925, that agrees with this species, except that the upper squama is much paler than the lower The antennæ are missing.

20. **Lucilia papuensis** Macquart. (Fig. 24.)

Lucilia papuensis Macq., Dipt. Exot. ii, p. 141, 1842; id, Mem. Soc. Roy. Sci. Agric Arts, Lille, p. 298, 1842.
Musca metilia Wlk., List Dipt Brit. Mus. iv. p. 898, 1849.
Musca tifata Wlk., List Dipt. Brit. Mus. iv, p. 871, 1849.
Lucilia cyaneo-marginata Macq., Dipt. Exot. Suppl. iv, p. 248, 1851; id., Mem. Soc. Roy Sci. Agric. Arts, Lille, p. 221, 1851.
Musca inducta Wlk, Dipt. Saunders, p. 335, 1852.
Musca marginifera Wlk., Journ. Proc. Linn. Soc. Lond. iii, p 105, 1859
Musca inscribens Wlk., Journ. Proc. Linn. Soc. Lond. iv, p 136, 1860.
Musca nitescens Wlk., Journ. Proc. Linn. Soc. Lond. v, p. 302, 1861.
Lucilia nosocomiorum Dol., Nat. Tijd Ned. Ind. xiv, p. 413.
Lucilia azurea Dol (*nec* R.-D.), Nat Tijd Ned Ind. xviii, p 64.
Somomyia nebulosa Big. (part), Bull. Soc. Zool. Fr. p. 604, 1887.
Lucilia calviceps Bezzi, Bull. Ent. Res xvii, p. 238, 1927.
Type-locality: Papua. *Type* in the Paris Museum.

♂.—*Head*: frons obliterated for a short space, parafrontalia much narrowed; eyes separated, at point of closest approximation, by the width of third antennal segment; third antennal

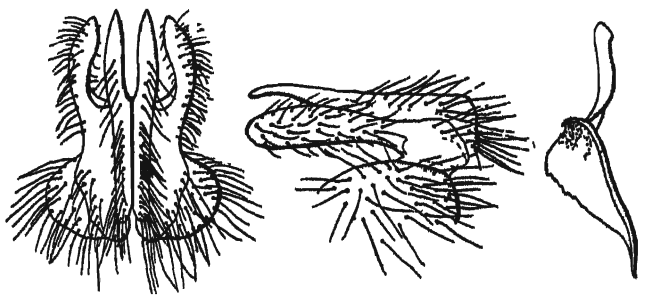


Fig. 24.—*Lucilia papuensis* Macquart: ♂ genitalia. (From Aubertin.)

segment very short and slender, three and a half to four times length of second segment, slightly rufous at the base; tomentum of face greyish-silver. *Thorax*: shining green to purple, lightly dusted anteriorly; two postsutural acrostichal bristles inserted at the same level as the two posterior pairs of dorsocentral bristles. *Abdomen*: shining green to purple, the posterior margins of the second and third visible segment sometimes darkened. Genitalia (fig. 24) inconspicuous; mesolobes pointed, slightly divergent; paralobes not very strongly chitinized and inconspicuously haired; penis characteristic. *Wings*: basicostal scale black; subcostal sclerite with wiry hairs; base of wing very faintly darkened and remainder greyish; squama dirty white to dark brown. *Legs*: black; one antero-dorsal bristle to middle tibia in male (a second

small one may occasionally be present above it); the female has two well-developed bristles on the middle tibia.

Length 6–8 mm.

Bionomics.—Since this species was recognized properly no work has been done on the biology of the Indian green-bottles. The life-history etc. remain quite unknown.

Distribution.—INDIA, Malabar; CEYLON; Malay Peninsula; Siam; Java; Borneo; Celebes; Amboina; Ternate; Lombok; Sumbawa Isld.; New Guinea; S. China; Philippine Islands, Endermo; (? Japan); Australia, Queensland and N. S. Wales; N. Hebrides.

This species is one of the commonest Indian "Green-Bottles."

21. **Lucilia porphyrina** (Walker). (Fig. 25)

Musca porphyrina Wlk., Journ. Proc. Linn. Soc. Lond. i, p. 24, 1857.
Somomyia obesa Big. (part), Ann. Soc. Ent. Fr. (5) vii, p. 43, 1877.
Somomyia pachysoma Big., Bull. Soc. Zool. Fr. p. 603, 1887.
Somomyia nebulosa Big. (part), Bull. Soc. Zool. Fr. p. 604, 1887.
? *Lucilia craggi* Patt., Ind. Journ. Med. Res. ix, p. 553, 1922.
Lucilia flavicornis Mall., Proc. Linn. Soc. N. S. Wales, lii, p. 322, 1927.
Type-locality: Malaya, Mt. Ophir. *Type* in the British Museum.

♂.—*Head*: eyes more closely approximated than in *L. papuensis* Macq., the parafrontalia being reduced to a fine

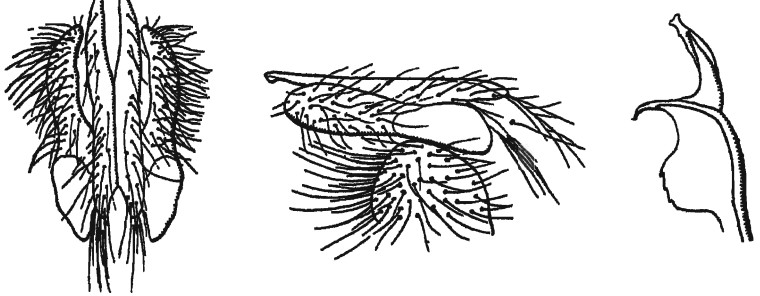


Fig. 25.—*Lucilia porphyrina* (Walker): ♂ genitalia. (From Aubertin)

line; third segment of antenna five times as long as second, narrower in male than in female, dark brown. Parafacialia brown with a silvery sheen. *Thorax*: green to purple, very slightly dusted in front. Two pairs of postsutural acrostichals which lie in front of the two corresponding pairs of postsutural dorso-central bristles. A pair from Hong Kong have the pleura and anterior part of abdomen brownish.

Abdomen: shining green to purple; genitalia inconspicuous (fig. 25), mesolobes pointed, flattened, and hardly divergent; paralobes dark brown at tips, lighter in colour basally, heavily haired; lateral lobe small but thickly covered with long hairs; penis characteristic. *Wings*: faintly and uniformly tinged with brown, which deepens slightly at the base; basicostal scale black; subcostal sclerite with stiff black hairs; squama testaceous to very dark brown. *Legs*: dark brown, one antero-dorsal bristle to middle tibia in both sexes.

Length 6–8 mm.

Bionomics.—Patton states that *L. craggi*, the synonymy of which is uncertain, breeds in carcases of birds and animals, laying the eggs in a mass, close to the basis of the feathers or hairs, on the underside of the body. As many as ten females may be found ovipositing together. The eggs are sometimes laid in the nostrils. The adult female will enter houses.

Distribution.—INDIA: Kashmir, Gulmarg, Kasauli, 6000 ft.; Assam: Mishmi Hills, Dalai V., 5000–6000 ft.; CEYLON; Malay Peninsula; China; Hong Kong; Swatow, Krakatoa; Sebesi; Sumatra; Java; Philippine Islands, Japan; Tsu Shima; Australia: Queensland, Brisbane.

22. **Lucilia sericata** (Meigen). (Fig. 26.)

Musca sericata Mg., Sitz. Beschr. v, p. 53, 1826.
? *Musca tegularia* Wd., Ausser. Zweifl. Ins. ii, p. 655, 1830.
? *Lucilia chloris* Hal., Ent. Mag. i, p. 165, 1833.
Lucilia basalis Macq., Mem. Soc. Roy. Agric. Arts, Lille, p. 305, 1842; id., Dipt. Exot. ii, p. 148, 1842.
Lucilia flavipennis Macq. (*nec* Kram.), Mem. Soc. Roy. Agric. Arts, Lille, p. 296, 1842; id., Dipt. Exot. iii, p. 130, 1842.
Musca lagyra Wlk., List. Dipt. Brit. Mus. iv, p. 885, 1849.
? *Lucilia sayi* Jaen., Abh. Senck. Ges. vi, p. 375, 1867.
Lucilia barberi Tnsd., Smiths. Misc. li, p. 121, 1908.
Lucilia giraulti Tnsd., Smiths. Misc. li. p. 121, 1908.
Type-locality: Europe. *Type* in the Paris Museum ?.

♂♀.—*Head*: distance between eyes at point of closest approximation two and a half to three times width of third antennal segment; parafrontalia covered with fine hairs as well as frontal bristles, narrow towards vertex, leaving frons slightly broader above antennæ than at this point; frons in female rather more than one-third total width of head, parafrontalia covered with minute bristles; antennæ dark brown; palpi orange. *Thorax*: shining green; three postsutural acrostichals. *Abdomen*: shining green, evenly covered on dorsum and venter with short bristles; no macrochætæ on margin of second visible segment; hypopygium inconspicuous, genitalia as in fig. 26; in female abdomen heavily dusted with silver tomentum, and with a dark longitudinal line on second visible segment. *Wings*: hyaline; basicostal

scale yellow; subcostal sclerite with decumbent, dark brown, felted pubescence; squama white. *Legs*: black; middle tibia with one antero-dorsal bristle.

Length 6–8 mm.

Bionomics.—There is a large amount of literature on this insect in connection with its habit of "blowing" sheep. Much investigatory work has also been done on its physico-chemical ecology. In temperate climates the fly is comparatively harmless, but in Africa and Australia it is one of the species most intimately connected with the blowing of wool, and is a very serious pest.

Distribution.—Cosmopolitan.

This widely distributed species is commonest in the Palæarctic and Ethiopian regions, and has probably been more recently introduced into the Oriental, Australian, Nearctic and Neotropical regions, occurring apparently

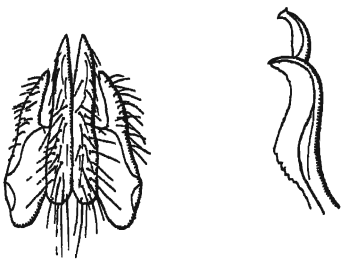


Fig. 26.—*Lucilia sericata* (Meigen): ♂ genitalia. (From Aubertin.)

with least frequency in S. America. Indian specimens have been seen from Afghanistan, Chaman, and Baluchistan, Quetta. A female from Punjab, Umballa, in British Museum appears to be this species.

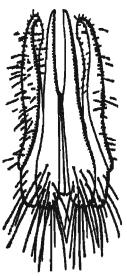
L. sericata shows rather striking regional colour changes, being bright green in Europe and Africa, dull, rather bronzy-green in India, and a peculiar coppery colour in New Zealand.

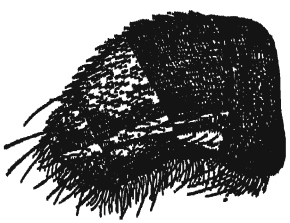
23. **Lucilia cuprina** (Wiedemann). (Figs. 27 & 28.)

Musca cuprina Wd., Auss. Zweifl. Ins. ii, p. 654, 1830.
Lucilia amica R.-D., Myodaires, p. 453, 1830.
Lucilia elegans R.-D., Myodaires, p. 458, 1830.
Lucilia argyricephala Macq., Mem. Soc. Roy. Agr. Arts, Lille, p. 326, 1846; id., Dipt. Exot. Suppl. i, p. 198, 1846.
Musca fucina Wlk., List. Dipt. Brit. Mus. iv, p. 883, 1849.
Musca serenissima Wlk., Ins. Saund. pt. iv, p. 340, 1852.
Musca temperata Wlk., Ins. Saund. pt. iv, p. 340 1852.
Somomyia pallifrons Big., Ann. Soc. Ent. Fr. (5) vii, p. 258, 1877.
Lucilia pallescens Shn., Ins. Insc. Mens. xii, p. 76, 1924.
Strongyloneura nigricornis Sen.-Wh., Spol. Zeyl. xiii, p. 115, fig. 3, 1924.
Type-locality: China. *Type* in the Leyden Museum.

♂♀.—*Head*: ♂, eyes at point of closest proximity separated by distance three to four times width of third antennal segment; frons at narrowest point about twice width of one of the parafrontalia at same point, parafrontalia with fine hairs outside the frontal bristles in male; frons in female one-third width of head, parafrontalia bare except for frontal bristles. *Thorax*: shining green; three postsutural acrostichal bristles. *Abdomen*: characteristic in shape in male, fig. 28, shining green, the sternites and edges of tergites with bunches of long thick hairs; no tomentum in female; hypopygium rather prominent in male; genitalia similar to those of *L. sericata*, but the claspers slimmer and the penis rather different in shape (fig. 27). *Wings*: hyaline, slightly yellow at the base, basicostal scale yellow, subcostal sclerite

Fig. 28.





Figs. 27 & 28.—*Lucilia cuprina* (Wiedemann): ♂ genitalia and abdomen. (From Aubertin.)

without upstanding hairs; squama white. *Legs*: black; middle tibia with one antero-dorsal bristle.

Length 6–8 mm.

Bionomics.—In India it is a rare cause of animal myiasis. As an adult it does not enter houses. The female prefers to oviposit on fresh meat and butcher's offal. It will also readily oviposit in fresh, and to some extent stale, carcases of birds and animals.

In Africa and Australia it appears to be nearly as harmful to the sheep farmer as *L. sericata*, and, like this species, it becomes noticeably dull and copper-coloured in the Oriental Region, although a brilliant green in Africa.

Distribution.—North and South Amercia; Africa; throughout INDIA; French Indo-China; Laos; Australia.

This species is typically African, but has spread through southern Asia, and has been introduced comparatively recently into Australia and North and South America.

24. **Lucilia andrewsi**, sp. n. (Fig. 29.)

Type-locality: Christmas Island, Indian Ocean. *Type* in the British Museum (*C. W. Andrews*, 1898).

♂.—*Head*: frons black, reduced to a line; parafrontalia greatly narrowed, greyish-silvery. Face and parafacialia concolorous, the whole blackish in certain lights. Epistomal margin yellowish. A brownish area outside the facial ridges, otherwise genæ very dark grey with black hairs, shallow beneath the eyes. Occiput blackish. Antennæ brown, base of third segment reddish, three and a half to four times length of second, ending well above epistomal margin. Arista black, biplumose. Palpi orange. *Thorax*: a rather dull steel-blue, shining, but not markedly so, very lightly grey pollinose anteriorly. Scutellum concolorous. Pleura with a good deal of brownish in the blue. Acrostichals 1 : 2,

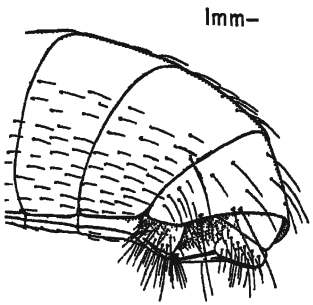


Fig. 29.—*Lucilia andrewsi*, sp. n. ♂ abdomen.

the anterior in mid-presutural area. Dorso-centrals 2 : 3, the presutural pairs in front of and behind the level of the acrostichal, the last postsutural pair not very near the base of scutellum. Humerals 3. Notopleurals 2. Supra-alars 1 : 3. Post-alars 2. Intra-alars 1 : 2, the presutural one very far forward, almost in line with humerals. Sternopleurals 1 : 1, a fairly strong extra one below anteriorly. *Abdomen*: more elongate than usual in the genus, shining steel-blue, with traces of black posterior margins to second and third visible tergites (fig. 29). Third with strong marginals, fourth with weaker marginals and discals. Sternites not conspicuously bristled. Genitalia rather large and conspicuous. *Wings*: hyaline, basicostal scale black. Squamæ both fuscous. *Legs*: blackish, front femora and coxæ and all the tarsi dark brownish. Mid-tibia without an anterodorsal bristle.

Length 5·5 mm.

Bionomics.—Nothing is known.

Distribution.—Christmas Island, Indian Ocean.

It is interesting that this isolated island of the Indian Ocean should produce an indigenous species of *Lucilia* as well as of *Hemipyrellia*.

Genus 5. **PARADICHOSIA** Senior-White.

Paradichosia Sen.-Wh., Spol. Zeyl. xii, p. 311, 1923; Mall., Ann. Mag. Nat. Hist. (10) vii, p. 194, 1931.
Gymnadichosia Vill., Rev. Zool Afr. xv, p 388, 1927.
Genotype, *Paradichosia scutellata* Sen.-Wh. by original dosingation.

Head: eyes closely approximated in male, separated in female; parafacialia with fine hairs above; facialia with fine bristles on half or three-quarters of their length; vibrissæ inserted slightly above margin of epistome; face slightly concave; jowls one-third to one-quarter eye-height. *Thorax*: prosternum and propleura hairy; post-alar declivity setulose: acrostichals 2 · 3, dorso-centrals 2 : 3, a prosutural intra-alar bristle present; sternopleurals 2 : 1, the lower anterior bristle fine. *Abdomen*: ovate, rather pointed; first visible sternite in male remarkably long. *Wings*: stem-vein bare; third longitudinal vein with a few setulæ at base, above and below. Supra-squamal ridge with a tuft of bristles at anterior extremity. Squama bare. *Legs*: strongly bristled. The bristles in the male are sometimes very long and very fine towards tips.

Bionomics.—Nothing is known of the breeding habits of these flies.

Distribution.—India: Darjeeling district; Federated Malay States; Java; Formosa.

Key to the Species of Paradichosia. (Males only.)

1. Eyes bare	*pusilla* (Vill.), p. 61.
Eyes hairy	2.
2. Scutellum entirely black	3.
Scutellum with at least the apex yellowish...	4.
3. Femora and tibiæ entirely fulvous-yellow; hind tibiæ with the submedian antero-dorsal and preapical dorsal bristles not over three times as long as the tibial diameter; hind tarsus with normal hairing above. Wings quite conspicuously yellow at base	*flavibasis* Mall., [p. 60.
All femora black. Tibiæ brownish-yellow. The submedian antero-dorsal and preapical dorsal bristles more than three times as long as the tibial diameter; hind tarsus with dorsal hairs longer than usual, forming a short fringe. Wings not yellow at bases. Calypters fuscous	*dubia* Mall., p. 60.

4. Scutellum entirely semi-pellucid yellow. First two visible tergites of abdomen semi-pellucid yellow, with black apices and a black median vitta. None of the hind tibial bristles exceptionally long or slender. All coxæ yellow ..... [p. 59. *abdominalis* Mall.,
Scutellum with only the apex or apical margin yellow, black at base. One or two of the hind tibial bristles two to three times as long as the tibial diameter .... 5.
5. Hind tarsi not fringed on postero-dorsal surface. Front coxæ fuscous in front; fore and hind tibiæ fulvous yellow. Abdomen not yellow on basal half ..... [p. 61. *scutellata* Sen.-Wh.,
Hind tibiæ fringed on postero-dorsal surface 6.
6. Front and mid-tibiæ yellow, browned dorsally. Abdomen with first and second visible tergites largely yellow, with black apices and median vitta ..... [p. 63. *crinitarsis* Vill.,
Insect entirely black except for legs and apex of scutellum All tibiæ a dull yellow..... *nigricans* Vill., p. 63.

25 **Paradichosia abdominalis** Malloch.

Paradichosia abdominalis Mall., Ann. Mag. Nat. Hist. (10) vii, p 198, 1931.

Type-locality: Federated Malay States. *Type* in the British Museum.

Head: eyes hairy, closely approximated but not touching; frons dark brown obliterated above; parafrontalia silver-grey dusted, narrowed above, bearing series of frontal bristles and fine setulæ on outside third; jowls grey-dusted with fine black setulæ, reddish towards vibrissal angle; face grey-dusted with slight carina at base of antennæ; vibrissæ inserted above margin of epistome, facialia with setulæ on lower three-fourths; antennæ reddish; palpi yellow. *Thorax*: mainly dark blackish-grey; humeri, post-alar calli and scutellum yellow; dorsum grey-dusted anteriorly with traces of three black stripes; 3 posthumeral bristles; presutural intra-alar bristle present; lower surface of scutellum setulose; post-alar declivity very setulose. *Abdomen*: first visible segment yellow, the hind margin narrowly brown, second yellow, with a median brown stripe, and the margin more widely brown, third and fourth mainly brownish-black, with silver dusting which produces an irregular pattern; fine decumbent marginal bristles on second visible segment, erect marginals on third and fourth, and discals on the latter; first visible sternite about two and a half times as long as broad, orange, terminal sternite with a tuft of rod-like hairs; male hypopygium moderately well developed. *Wings*: hyaline, with a yellow tinge; veins mainly yellow; third vein with a few setulæ at base above and below; basicostal scale orange; subcostal sclerite without upstanding setulæ.

Squama orange-testaceous. Supra-squamal ridge with a tuft of hairs at extreme anterior end. *Legs*: orange, tarsi black; hind tibiæ strongly bristled, but the bristles not unusually long.

Length 8 mm.

Distribution.—INDIA: United Provinces, Mussoorie; Federated Malay States, Pahang.

26. **Paradichosia dubia** Malloch

Paradichosia dubia Mall., Ann. Mag. Nat. Hist. (10) vii, p. 197, 1931. Type-locality: Java. *Type* in the British Museum.

♂♀.—*Head*: eyes thickly haired in male, rather more sparsely so in female, closely approximated in male, separated at vertex in female by slightly less than half width of one eye; frons dark reddish-brown, obliterated above in male, parallel-sided in female, about three times width of one of the parafrontalia, and bearing numerous fine setulæ; parafrontalia grey-dusted, contiguous and much reduced towards vertex in male, in female slightly wider than third antennal segment, bearing two pairs of fronto-orbital bristles; parafacialia grey-dusted, reddish below, setulose above; jowls grey-dusted, thickly covered with rather long fine black bristles; antennæ brown, third segment about three times length of second; face grey, slightly carinate between bases of antennæ; palpi orange. *Thorax*: shining bluish-black, dorsum slightly grey-dusted anteriorly. Chætotaxy normal, intra-alars 2, post-alar declivity uniformly covered with fine setulæ; bristles long and strong. *Abdomen*: shining bluish-black; first visible sternite very long in male, normal in female. *Wings*: hyaline, rather smoky; basicostal scale brownish-yellow; subcostal sclerite covered with soft decumbent dark brown bristles. Squama dark brown. *Legs*: dark brown; hind tibia in male well bristled, with a particularly long postero-dorsal bristle about the middle and another dorsally at extreme apex.

Length 5–6 mm.

Distribution.—Java, Montes Tengger.

27. **Paradichosia flavibasis** Malloch.

Paradichosia flavibasis Mall., Ann. Mag. Nat. Hist. (10) vii, p. 196, 1931.

Type-locality: Tjibodas, Java. *Type* in the Hamburg Museum.

♂.—*Head*: eyes sparsely haired, almost touching at one point; frons dark brown, obliterated for a short space towards vertex; parafrontalia silver-dusted, reduced to a fine line at one point, bearing a series of frontal bristles and fine setulæ; parafacialia silver-grey dusted, setulose above;

jowls grey-dusted with black bristles; about one-quarter eye-height; face grey-dusted with hardly any trace of a median carina; vibrissæ inserted just above oral margin; antennæ dark brown, third segment about twice length of second; arista long-plumose; palpi orange. *Thorax*: entirely dark blackish-grey with a thin covering of grey dust, the dorsum showing traces of three dark stripes anteriorly. Chætotaxy: intra-alars 3, supra-alars 3, post-alars 2, humerals 2, posthumerals 3, presutural intra-alar bristle present; post-alar declivity with a bunch of fine setulæ Many of the bristles on the thorax are unusually long and very fine towards the tip. *Abdomen*: dark blackish-grey (pattern indistinguishable in type); male hypopygium fairly well developed. *Wings*: hyaline, strongly yellow-tinted at base and along anterior margin; basicostal scale orange; subcostal sclerite bare; squama testaceous. Halteres yellow. *Legs*: yellow; tarsi black.

Length 7 mm.

Distribution.—Java, Tjibodas.

28. **Paradichosia scutellata** Senior-White. (Figs. 30, 31, & 32.)

Paradichosia scutellata Sen.-Wh., Spol. Zeyl. xii, p. 312, 1923.
Type-locality: India, Darjeeling District. *Type* in the British Museum.

♂.—*Head*: eyes hairy, very closely approximated but not touching; frons black, obliterated above, widening out below; parafrontalia bluish-grey dusted, contiguous and much narrowed above, broader below, bearing a series of frontal bristles and a few fine setulæ outside them; parafacialia silver-grey with darker reflections, with numerous fine setulæ on upper third; jowls grey-dusted, about one-third eye-height, reddish towards vibrissal angle, covered with long fine black bristles, face grey-dusted, with a very slight carina at the base of the antennæ; vibrissæ inserted slightly above upper margin of epistome, the facialia with bristles on the lower two-thirds, antennæ brown; third segment lighter than the other two and rufous at the base; arista long-plumose; palpi yellow. *Thorax*: dark grey, with uneven silver-grey dusting, scutellum dark at base, becoming rufous towards tip; dorsum of thorax with indications of five black stripes anteriorly. Chætotaxy: intra-alars 2, supra-alars 3 or 4, post-alars 2, humerals 3, posthumerals 4, presutural intra-alar present; post-alar declivity bearing a bunch of black bristles. *Abdomen*: blackish-grey with patches of silver tomentum which form a shifting pattern; second visible segment with very fine marginal bristles, third and fourth with stronger marginals, the latter with discals as well; male hypopygium small; first visible sternite very large and long, second with a thick

tuft of rod-like bristles projecting downwards, at posterior margin, third covered with rather similar but much shorter and finer bristles. *Wings*: hyaline, rather yellowish; stem-vein bare, third longitudinal vein with a few strong bristles at base, above and below; basicostal scale orange; subcostal sclerite with rather long decumbent golden pubescence, but

Fig. 30.

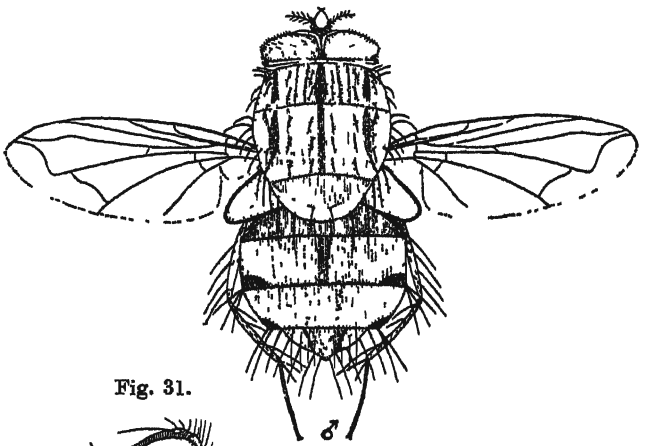


Fig. 31.

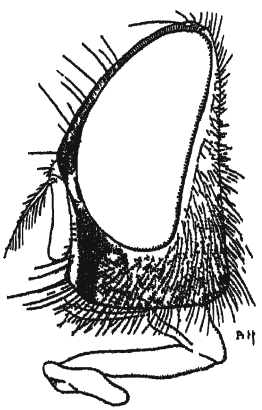


Fig. 32.

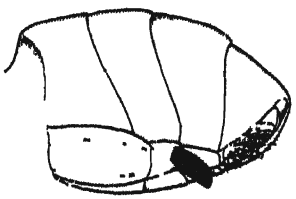


Fig. 30.—*Paradichosia scutellata* Senior-White: ♂ imago. (From Senior-White.)

Fig. 31.—*Paradichosia scutellata* Senior-White: ♂ head.

Fig. 32.—*Paradichosia scutellata* Senior-White: ♂ abdomen.

no upstanding setulæ. Squama testaceous. Halteres yellow. *Legs*: orange-yellow, tarsi dark brown; hind tibiæ with five very long bristles among the shorter ones.

Length 7 mm.

Distribution.—INDIA: Darjeeling Dist., Mungpoo; Federated Malay States, Pahang.

29. **Paradichosia crinitarsis** Villeneuve.

Paradichosia crinitarsis Vill., Rev. Zool. Afr. xv, p. 219, 1927.
Type-locality: Formosa. *Type* in the Deutsches entomologisches Institut, Berlin.

Redescription of unique ♂ type:—

♂.—*Head*: eyes covered with short rather sparse hairs, with uniform facets, and almost contiguous for a short distance; frons brown, obliterated except anteriorly; parafrontalia narrow, grey-dusted, contiguous for a short space, where they are reduced to a fine line; parafacialia and jowls silver-grey dusted with black setulæ; medianæ brown; face grey-dusted, becoming slightly testaceous at epistome, and with slight trace of a carina between bases of antennæ; antennæ brown, the third segment reddish at base; palpi orange. *Thorax*: slightly metallic in colouring, overlaid with greyish tomentum, the humeri, post-alar calli and margin of the scutellum testaceous; dorsum with interrupted longitudinal dark stripes. *Abdomen*: first visible segment black, testaceous ventrally, second testaceous except for the hind margin and a longitudinal central stripe, which are black; third and fourth segments blackish; all except first visible segment overlaid with golden tomentum; first visible sternite very long, with a black stripe down the middle; hypopygium inconspicuous, rather bristly. *Wings*: hyaline, with a yellow tinge anteriorly, basicostal scale brownish-yellow; squama testaceous. Halteres dark orange. *Legs*: femora and tibiæ yellowish-brown, tarsi dull black, the hind tibia with a postero-dorsal bristle near apex which is not more than twice the tibial diameter in length; hind tarsi with a fringe of hairs about as long as diameter of tarsus on the postero-ventral surface.

Length 10–11 mm.

Distribution.—Formosa, Koshun.

In the original description rather too much emphasis is laid on the hairiness of this insect; in particular, the long fine hair on the hind tibia is at most twice, and not three times the tibial diameter in length.

30. **Paradichosia nigricans** Villeneuve.

Paradichosia nigricans Vill., Rev. Zool. Afr. xv, p. 387, 1927.
Type-locality: Formosa. *Type* in the Deutsches entomologische Institut, Berlin.

Redescription of ♂ co-type:—

♂.—*Head*: eyes hairy, closely approximated for a short distance, and with uniform small facets; frons dark brown, triangular anteriorly, completely obliterated towards vertex;

parafrontalia dark silver-grey, very narrow, contiguous and linear for a short distance; parafacialia, face, medianæ and jowls dark grey, the parafacialia with silver reflections; antennæ brown, third segment about three times length of second; palpi yellow. *Thorax*: shining metallic bluish-black, lightly grey-dusted anteriorly on dorsum, where rudimentary dark stripes are indicated; tip of scutellum testaceous; anterior spiracle brown, posterior dark brown to black. *Abdomen*: shining bluish-black, thinly and irregularly grey-dusted, with a complete series of upstanding marginal bristles on the third visible segment; first visible sternite very long and broad, extending almost the entire length of the venter; hypopygium visible, bearing paired tufts of stiff hairs which together form a semicircle, open anteriorly. *Wings*: grey-hyaline; squama testaceous. Halteres orange. *Legs*: anterior pairs of femora brownish, posterior pair testaceous-yellow; tibiæ dull yellowish; tarsi dark brown; hind tibia with markedly long fine bristle near apex on postero-dorsal surface; hind tarsi with rather irregular fringe of bristles on postero-dorsal surface.

Length 5–6 mm.

Distribution.—Formosa, Chip-Chip.

It should be noted that the margin of the scutellum is yellow, and not black as implied in the original description.

31. **Paradichosia pusilla** (Villeneuve).

Gymnadichosia pusilla Vill., Rev. Zool. Afr. xv, p. 388, 1927.
Type-locality: Formosa. *Type* in the Deutsches entomologische Institut.

Redescription of unique ♂ type :—

♂.—*Head*: eyes bare, with uniform facets, separated at point of closest approximation by distance equal to width of third antennal segment; frons orange, triangular, disappearing between parafrontalia below ocellar triangle; parafrontalia narrow, contiguous for a short distance below ocellar triangle, silver-dusted; parafacialia silver-dusted with slight reflections; medianæ gold-dusted; jowls grey-dusted with black bristles; first, second and base of third antennal segments orange, remainder of third segment pale brown; palpi orange. *Thorax*: slightly metallic in colouring, overlaid with grey tomentum, in which dark longitudinal stripes are visible anteriorly on dorsum; thoracic spiracles yellowish-white; rim of scutellum testaceous. *Abdomen*: first and second visible segments testaceous-yellow, the posterior margin of the latter and a longitudinal central stripe on both segments black; third and fourth visible segments black,

except for anterior margin of the former, the black colour being overlaid with irregular patches of silver tomentum; first visible sternite very long, with tuft of stronger bristles towards posterior margin; last two segments with upstanding discal and marginal macrochætæ; hypopygium inconspicuous. *Wings*: hyaline; first posterior cell almost closed at wing-margin; basicostal scale yellow; squamæ semi-transparent, slightly testaceous. Halteres orange. *Legs*: testaceous-yellow, tarsi dark brown to black; mid-tibia with one antero-dorsal bristle.

Length 5 mm.

Distribution.—Formosa, Tainan.

Villeneuve erected the genus *Gymnadichosia* for the reception of this species, acknowledging its close resemblance to *Paradichosia*, but considering that the bare eyes and absence of markedly long tibial hairs in the ♂ warranted the formation of a new genus. We are not of this opinion, and have modified the original generic diagnosis of *Paradichosia* so that the species may be included in this genus.

Genus 6. **PHUMOSIA** Robineau-Desvoidy.

Phumosia R.-D., Myodaires, p. 427, 1830. Genotype: *P. abdominalis* R.-D. (the first species).

Pinthomyia Rond., Ann. Mus. Civ. Gen. vii, p. 427, 1875. Genotype: *P. emimelania*, the only species. [*Type* lost, not at Milan or Genoa.]

Ochromyia B. & B. (*nec* Macq.), Denk. Akad. Wien, lx, p. 178, 1893.

Head: eyes in male closely approximated, in female widely separated. Parafrontalia and parafacialia narrow, the latter devoid of setulæ except above. Jowls narrow. Face not unduly sunk below facialia, with very faint trace of carina between bases of antennæ, and a pair of small bristles in middle just above epistomal margin, which is slightly projecting, the vibrissæ inserted almost on a level with it. Third segment of antennæ three or four times length of second. Arista long-plumose to tip. *Thorax*: intra-alars 3, supra-alars 3, posthumerals 3, presutural intra-alar present. Sterno-pleurals 2 : 1. Prostigmatic bristle present and one strong propleural bristle. Prosternum, propleura and post-alar declivity bearing hairs or setulæ. Convexity above post-thoracic spiracle covered with fine upstanding hairs Supra-squamal ridge bearing fine minute hairs. *Wings*: stem-vein bare, third vein with setulæ above and below reaching part way to small cross-vein. Subcostal sclerite without upstanding hairs. Squama bare.

Distribution.—Ethiopian, Oriental and Australian regions.

Key to the Species of Phumosia.

1.	Four posterior dorso-centrals	*promittens* (Wlk.),
	Three posterior dorso-centrals	2. [p. 68.
2.	Genal hairs black. Hind tibia with one postero-dorsal bristle. Costal suffusion general, starting from apex of subcosta ...	[p. 66. *abdominalis* R.-D.,
	Genal hairs yellow. Hind tibiæ with two postero-dorsal bristles. Costal suffusion very distinct, starting from apex of vein I, with a weak posterior suffusion	*costata* Mall., p. 68.

32. **Phumosia abdominalis** Robineau-Desvoidy.

Phumosia abdominalis R.-D., Myodaires, p. 427, 1830.
Type-locality: Timor. *Type* lost.
? *Ochromyia analis* Macq, Dipt. Exot., ii (3) p. 290 1843.
Type-locality: New Holland. *Type* in the Paris Museum.
? *Ochromyia ferruginea* Dol., Nat. Tijd. Ned. Ind. xiv, p. 414 1857.
Type-locality: Amboina. *Type* in the Vienna Museum.
? *Ochromyia fulvescens* Big., Bull. Soc. Zool. Fr. p. 609, 1887.
Type-locality: Moluccas. *Type* in the Paris Museum.

♂.—*Head*: a little narrower than the thorax. Eyes bare, the anterior facets a little larger than those behind. Frons broad, equal to three-quarters an eye-width. Frontal stripe broad, slightly depressed, shining brown. Ocellar and prevertical bristles strong. Parafrontalia ochreous, with two strong erect verticals and seven inner orbitals, the first erect. Two strong external orbitals, the internal orbitals which should stand opposite them lacking. Parafrontalia with short black hairs, in a single row above, in a double row below. Parafacialia not broad, almost bare, bearing at most three or four concolorous hairs, in a single row, on the upper part. Frontal suture very deep V-shape, reaching to almost below the eyes. Epistome concave, straight-edged, slightly projecting. Two small outstanding hairs just below the tips of antennæ. Vibrissæ at level of mouth, with some black bristles just above them but not reaching far up the ridges. Genal margins weakly but distinctly converging, with nine black hairs. Genæ about one-fifth an eye-height, with numerous distinct black hairs. Antennæ ochreous, first segment short, second four times as long as first, with numerous weak black hairs and a small bristle. Third segment a little more than three times as long as second. Arista biplumose to tip, twice as long as third segment. Palpi long, fine, ochreous, with fine black hairs. Proboscis long, thin, ochreous. *Thorax*: ochreous, with very faint brown vittæ and fine black pilosity. Pleura yellow. 1 distinct and 1 (anterior), very weak, presutural acrostichals, 1 pre-

scutellar postsutural. Dorso-centrals 2 : 3. Humerals 3. Posthumerals 2. 2 presuturals, 2 notopleurals. 3 intra-alars; 3 supra-alars; 2 post-alars. 1 prothoracic and 1 stigmatic. 7 mesopleurals, the 2 upper reduced. Mesopleuron also with 2 fine hairs in its antero-superior angle. Sternopleurals 2 : 1. Pteropleura with 5 fine hairs. Hypopleurals very prominent. Scutellum with apicals, preapicals and 3 marginals, the hindmost pair weak. One pair premarginals with another, much weaker, hair. *Abdomen*: cordiform. First visible segment all yellow. Second yellow anteriorly, with a median triangle of slaty-blue extending up two-thirds its length and extending laterally as a band over one-third of segment. Third segment dull blue above, yellow laterally Fourth a brighter blue anteriorly, sides and hind margin o. segment yellow. Sternites visible, bare Segments two to four with marginals. *Wings*: vein III bristly almost to cross-vein. A weak costal spine. Base of wing yellow, apical half beyond the cross-vein infuscated, more deeply along costal margin. Calypters yellow. Halteres very small. *Legs*: ochreous, with black bristles and hairs, tarsal tips apically darkened. Mid-tibia with a bristle on posterior side.

Length 9 mm.

The foregoing account is taken from Surcouf's description of specimens accepted as this species by Bezzi. Malloch follows this identification. The type has disappeared: *analis* Macq. appears to differ by no more than points of colour. The type, in bad condition, has been redescribed by Surcouf, who considered it a separate species on colour differences. The extent of the bristles on vein III above towards the cross-vein appears to be variable, as is also the amount of blue on the abdomen. Malloch is in doubt whether the species he named *costata* may not be *analis*, but when examining the type Surcouf would surely have noticed the difference in the colour of the genal hairs. We accept specimens answering to the above description as *abdominalis* R.-D., with *analis* Macq. as a probable synonym. If this species does ultimately prove to be distinct it is in any case not Oriental, but Australian. *O. ferruginea* Dol. is regarded as a synonym of Desvoidy's species, *O. fulvescens* Big. of Macquart's species.

Bionomics.—Nothing is known.

Distribution.—Apart from the type-localities Bezzi's specimens came from the Philippine Islands, Los Banos, and Malloch's from Mt. Maquiling in the same islands. Surcouf also records it from Borneo. There is a specimen in the British Museum from Celebes.

33. **Phumosia costata** Malloch.

Phumosia costata Mall., Ann. Mag. Nat. Hist. (9) xvii, p. 499, 1926.
Type-locality: Philippine Islands. *Type*, location not stated.

♀.—*Head*: eyes bare, separated at vertex by slightly less than one-half width of one eye; frons reddish-brown, parallel-sided, the ocellar triangle surrounded by a long-oval grey margin; parafrontalia gold-dusted, each slightly narrower than width of third antennal segment; parafacialia, face and jowls gold-dusted, the uppermost part of parafacialia and the facialia with minute gold setulæ, the jowls with rather longer golden hairs; antennæ golden-yellow, third segment three and a half to four times length of second; face with two minute setulæ placed centrally above oral margin; palpi orange. *Thorax*: testaceous-yellow, lightly gold-dusted anteriorly on dorsum; chætotaxy: acrostichals 1 : 1, dorso-centrals 2 : 3, intra-alars 3, supra-alars 3, post-alars 2, humerals 3, posthumerals 3, a presutural intra-alar bristle present; only one strong propleural bristle present; sterno-pleurals 2 : 1; prosternum, propleura and post-alar declivity hairy. *Abdomen*: testaceous-yellow, with a hint of metallic sheen on posterior two-thirds; marginal macrochætæ thin and decumbent on second visible segment, stronger and semi-erect on third and fourth. *Wings*: yellowish, with a dark brown indeterminate stripe extending from tip of the first vein towards the tip of the wing; setulæ at base of third longitudinal vein extending almost to small cross-vein above, rather more restricted below; basicostal scale orange; sub-costal sclerite without upstanding hairs; supra-squamal ridge with minute golden hairs; squama bare, testaceous. Halteres orange. *Legs*: testaceous-yellow; hind tibiæ with three antero-dorsal and two postero-dorsal bristles.

Length 9 mm.

Bionomics.—Nothing is known.

Distribution.—Philippine Islands, Los Banos.

34. **Phumosia promittens** (Walker).

Musca promittens Wlk., Proc. Linn. Soc. Lond. iv, p. 134, 1860.
Type-locality: Celebes. *Type* in the British Museum.
Phumosia incerta Mall., Ann. Mag. Nat. Hist. (9) xvii, p. 499, 1926.
Type-locality: Federated Malay States. *Type*, location not stated.

♂♀.—*Head*: eyes bare. In male contiguous for a short distance, in female separated at vertex by distance equal to two-thirds an eye-width. In male frons reddish, obliterated except for a small triangle anteriorly; parafrontalia reduced to a fine line at one point, grey-dusted anteriorly. In female frons black, grey-dusted, about three times width of third antennal segment; parafrontalia narrow, greyish-brown dusted, bearing two pairs of fronto-orbitals, and minute

setulæ outside frontal series; parafacialia, face and jowls grey-dusted: face with two small setulæ in middle, just above the yellow oral margin, which has the vibrissæ inserted slightly above it. Antennæ orange, third segment thrice second. Arista long-plumose to tip. Palpi orange. *Thorax*: testaceous-yellow; chætotaxy: acrostichals 1 : 2. Dorsocentrals 2 : 4. Intra-alars 3. Supra-alars 3. Post-alars 2 or 3. Humerals 3. Posthumerals 3. Presutural intra-alar present. Sternopleurals 2 : 1. Prosternum, propleura, post-alar declivity and area above posterior thoracic spiracle covered with fairly long, pale pubescence. *Abdomen*: first visible segment testaceous-yellow; second narrowly yellow anteriorly, metallic purple posteriorly; third and fourth metallic bluish-purple. Marginal macrochætæ fine and decumbent. *Wings*: smoky, rather darker along anterior margin; veins dark brown. Third vein with setulæ above and below reaching about halfway to small cross-vein. Basicostal scale orange. Subcostal sclerite without upstanding setulæ. Squama testaceous-orange, bare. Halteres orange. *Legs*: femora bright yellow, tibiæ and tarsi more brownish yellow, the hind tibiæ definitely brown.

Length 8 mm.

Bionomics.—Nothing is known.

Distribution.—Celebes; Borneo; Sarawak; Siam: Khow Sai Dow, Sempam Paham, 2500 ft.; Federated Malay States: Selangor, Kuala Lumpur, Pahang; Sumatra.

Genus 7. **CAIUSA** Surcouf.

Caiusa Surc. Arch. Mus. Hist. Nat. Paris, (5) vi, p. 52, 1919. Genotype, *C. indica* Surc.

Head: eyes in male closely approximated, in female widely separated. Parafrontalia and parafacialia narrow, the latter quite without setulæ. Face without or only with very minute inconspicuous bristles above the epistomal margin. A faint trace of carina between bases of antennæ. Vibrissæ situated slightly above mouth-margin. Third antennal segment three to four times the length of second. Arista long plumose to tip. *Thorax*: supra-alars 3; intra-alars 3 (the anterior may be weak); post-alars 3. Presutural intra-alar present. Sternopleurals 1 : 1. Prostigmatic and one propleural present. Propleura bare. Post-alar declivity with hairs or setulæ. Convexity above the post-thoracic spiracle with fine minute hairs. *Wings*: stem-vein bare. Vein III with setulæ above and below on inner half of length before cross-vein. Subcostal sclerite without upstanding hairs. Squama bare.

Distribution.—Only recorded from the Oriental region.

Key to the Species of Caiusa.

1.	Posterior acrostichals 1	2.
	Posterior acrostichals 3–4	*violacea* Ség., p. 70.
2.	Scutellum yellow	3. [p. 74.
	Scutellum dark	*nigro-nitens* Son.-Wh.,
3.	Mesonotum all pale testaceous	*testacea* Son.-Wh., p. 72.
	Mesonotum with dark markings	*indica* Surc., p. 70.

35. **Caiusa violacea** Séguy.

Caiusa violacea Ség., Bull. Mus. Hist. Nat. Paris, xxxi, p. 441, 1925. Type-locality: Cambodia. *Type* in the Paris Museum.

♀.—*Head*: eyes bare. Frontal stripe twice as wide as an orbital. Orbits, cheeks, medianæ and peristome black with grey pruinosity. Fronto-orbitals 10–12. Peristome narrowly red in front and near vibrissal roots. Face somewhat prominent, brown, red on the margins. Antennæ clear brown. *Thorax*: ochreous-yellow, with a large median presutural brown band. Acrostichals 1 : 3–4. Dorso-centrals 2 : 3–4. Intra-alars 3. Supra-alars 4 (presutural strong). Both stigmata yellow. *Abdomen*: stout. First two visible tergites red, third and fourth black with purplish reflections, or blue or violet, according to light. Sternites and ventral borders of tergites red, with long hairs. *Wings*: calypters and halteres yellow. *Legs*: reddish.

Length 8·5 mm.

Bionomics.—Nothing is known.

Distribution.—Only known from Cambodia.

36. **Caiusa indica** Surcouf. (Fig. 33.)

Caiusa indica Surc., Arch. Mus. d'Hist. Nat. Paris, (5) vi, p. 53, 1919.

Type-locality: ♂, S. India, Trichinopoly; ♀, Kattapuli (Cape Comorin). *Type*, ♂ in Bezzi's collection, Turin?; ♀ in the Paris Museum?.

♂♀.—*Head*: eyes bare, in male contiguous, the upper facets much larger than the lower, in female separated at vertex by distance equal to one-half width of one eye; frons black, reddish anteriorly, almost completely obliterated in male, in female about three times width of one of the parafrontalia; parafrontalia silver-dusted, reduced in male to a single fine line, in female slightly narrower than width of third antennal segment; parafacialia silver-dusted, reddish below; jowls and face silver-grey dusted. Occiput grey: the colour continued on to genæ, leaving the reddish colour just visible below lower eye-margin. The face with two minute setulæ situated in the middle line above the oral margin; antennæ orange, third segment a little darker, two and a half times length of second, arista long-plumose to tip; palpi orange. *Thorax*: dorsum more or less darkened, the humeri, lateral margins,

and sometimes the prescutellar area, yellow; scutellum, metanotum and pleura bright testaceous-yellow, the latter sometimes with greyish patches; chætotaxy: acrostichals

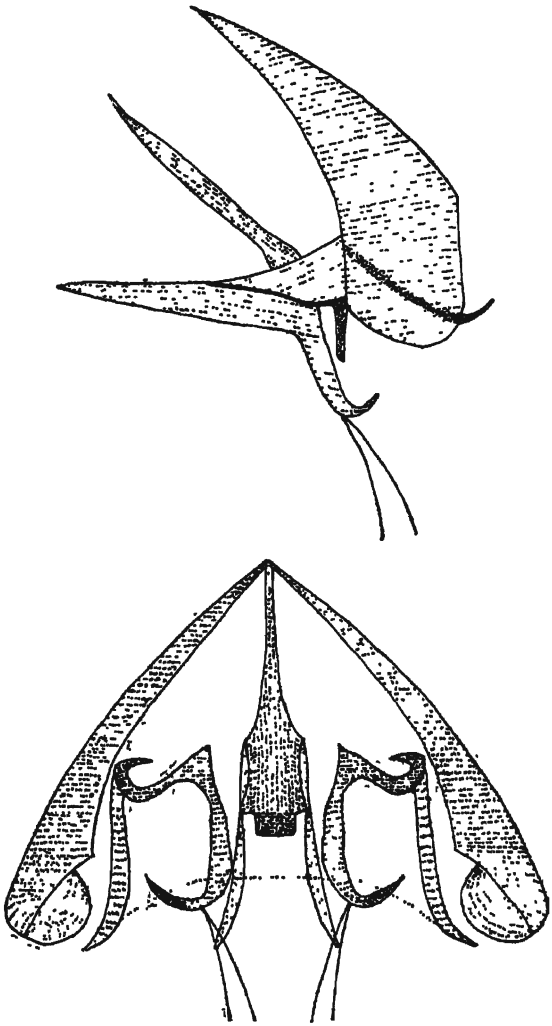


Fig. 33.—*Caiusa indica* Surcouf: ♂ genitalia.
(From Senior-White.)

2 : 1 (presutural pairs very fine and small), dorso-centrals 2 or 3 : 4, intra-alars 3, supra-alars 3, post-alars 2, humerals 3, posthumerals 3 or 4, a presutural intra-alar bristle present,

propleural bristles 2, sternopleurals 1 : 1. Prosternum hairy propleura with very fine short hairs; post-alar declivity setulose, tympanic pit with a small tuft of setulæ. *Abdomen*: more or less orange, with a slight metallic lustre towards apex, male hypopygium inconspicuous. *Wings*: hyaline; veins yellow; first longitudinal vein with a single bristle at base below, third with setulæ reaching halfway to small cross-vein both above and below; basicostal scale orange, subcostal sclerite without upstanding hairs. Squama bare, pale testaceous. Halteres orange. *Legs*: yellow; hind tibia with one postero-dorsal bristle.

Length 7 mm.

Bionomics.—The Jeypore Hills ♂ was taken at food in the open.

Distribution.—CEYLON, general, wet and dry zones, SOUTHERN INDIA: Trichinopoly, Kattapuli (Cape Comorin), Jeypore Hills, Komarada, Federated Malay States, Taiping, Java; Formosa; Celebes.

37. Calusa testacea Senior-White. (Fig 34.)

Carusa testacea Sen.-Wh., Spol. Zeyl. xii, p. 310, 1923.
Type-locality: Ceylon. *Type* in the British Museum.
Carusa dubiosa Vill., Rev. Zool. Afr. xv, p. 392 (1927)
Type-locality: Formosa. *Type* in the Berlin Museum.

♂♀.—*Head*: eyes bare in male, almost touching, the upper facets larger than the lower, in female separated at vertex by distance equal to one-third width of a single eye; frons dark brown, reddish anteriorly, almost obliterated in male, four to five times width of one of the parafrontalia in female, parafrontalia grey-dusted, much reduced in male, bearing frontal bristles anteriorly, in female about one-half width of third antennal segment, bearing a complete row of frontal bristles, two pairs of fronto-orbitals and some fine setulæ; parafacialia narrow, bare except at extreme top, grey-dusted, reddish below; jowls narrow, grey-dusted; face testaceous-orange, lightly grey-dusted, with two minute setulæ situated centrally just above oral margin; vibrissæ inserted almost at level of oral margin, facialia bare on the greater part of their length; antennæ orange, third segment slightly darker, about three times length of second; arista long-plumose to tip; palpi orange. *Thorax*: entirely testaceous-orange, covered with black setulæ; chætotaxy: acrostichals 1 : 1 (2 : 2 as a variant, bristles rather irregular), dorso-centrals 2 : 4, intra-alars 2 or 3, supra-alars 3, post-alars 2, humerals 3, post-humerals 3, presutural intra-alar present; prostigmatic bristle present, propleural present with a fine bristle beneath it; sternopleurals 1 : 1; prosternum setulose; propleura hairy. *Abdomen*: entirely testaceous; marginal macrochætæ fine

and decumbent; male hypopygium inconspicuous. *Wings*: hyaline, with a slightly yellowish tint; veins orange; first longitudinal vein with a few bristles below at base, third with setulæ halfway to small cross-vein above and at base below;

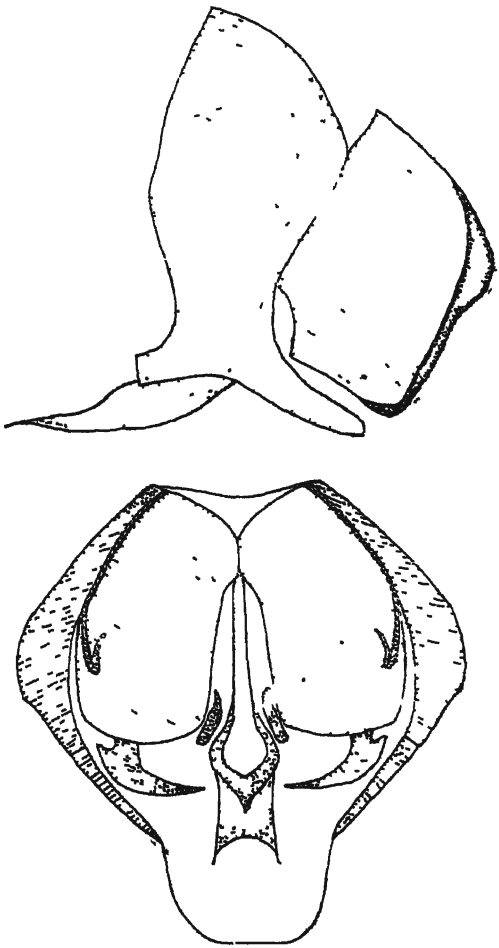


Fig. 34.—*Caiusa testacea* Senior-White: ♂ genitalia. (From Senior-White.)

basicostal scale orange; subcostal sclerite without upstanding hairs. Squama testaceous, bare. Halteres orange. *Legs*: orange · hind tibiæ with two postero-dorsal bristles.

Length 7 mm.

Bionomics.—The Coimbatore specimens were bred from a frog's egg mass.

Distribution.—Ceylon: Maskeliya, Matale, Kandy, Trincomali, Mahagany; S. India, Coimbatore, 2 ♂♂ and 2 ♀♀. Singapore; Malaya; Federated Malay States, Taiping; Philippine Islands.

38 **Caiusa nigro-nitens** Senior-White.

Caiusa nigro-nitens Sen.-Wh., Mem. Dept. Agric. Ind., Ent. Ser. viii, p. 38, 1923.

Type-locality: Singapore. *Type* in the Hungarian National Museum, Budapest.

♂♀.—*Head*: male frontalia pinched out, parafrontalia reduced to a line. Female frons one-fifth of head-width viewed from in front; frontal stripe brown, darkened laterally; parafrontalia dark silvery-grey. Face, parafacialia and cheeks silvery. Antennæ, second segment testaceous, third dark greyish; arista pale dirty brownish. Epistomal margin pale dull yellowish. Proboscis black, palpi yellow. About ten internal frontals, two external, of which the lowest is the strongest. *Thorax*: disc shining black with hints of bluish posteriorly, some short white pollen anteriorly, which may spread to make whole disc appear dark grey. Humeri yellow, pleura dark pollinose greyish, both spiracular areas yellow. Scutellum concolorous with mesonotum. Chætotaxy: acrostichals 1 : 1 (presutural weak); dorso-centrals 2 : 4; humerals 3, notopleurals 2, presuturals 3, anterior supra-alars 2 : 1, post-alars 2, mesopleural fan of 6, pteropleurals 3, small, in a bunch, but strong, sternopleurals 1 : 1, hypopleurals 6, in angled row, scutellars, an apical, subapical and 2 marginal pairs. *Abdomen*: first apparent segment, except hind margin, pale yellow, remainder and other segments all shining black with a tinge of bluish. Venter yellow. *Wings*: clear, veins yellowish, costal spine weak, third vein spinulose above and below about half the distance to small cross-vein. Halteres and squamæ pale yellowish. *Legs*: coxæ, fore and hind femora pale yellow, mid-femora and all tibiæ and tarsi rather darker brownish.

Length 7 mm.

Bionomics.—Nothing is known.

Distribution.—Described from a unique female in good condition, Singapore, 20th–26th January, 1902 (*Biro*). Federated Malay States, Kuala Lumpur; Borneo, Boron Mahakam.

It is possible that this species is no more than a variety of *indica* Surcouf, but the concolorous or differentiated scutellum serves to separate the most grey specimens of *nigro-nitens*.

Genus 8. **VERTICIA** Malloch.

Verticia Mall., Ann. Mag. Nat. Hist. (9) xx, p. 388, 1927.
Genotype, *V. orientalis* Mall.

Head: frons in both sexes wide, in the male about one-third, in the female from two-fifths to one-half of the head-width. Edge of vertex sharp, because of head lying close against front of thorax, and the occiput slightly concave, much as in Rhiniinæ. Ocelli removed from vertex, and between them and its edge there is a pair of divergent bristles as long as the ocellars. Each orbit with a series of inner marginal bristles, the upper one curved backwards, the other curved inward, and on upper half one outer forwardly directed bristle. Parafacialia setulose. Facial ridges setulose on lower half. Arista long-haired on upper side almost throughout, much shorter haired below. Palpi normal. *Thorax*: three pairs presutural acrostichals, the posterior pair close to the suture. Prosternum and centre of propleura bare. Sternopleurals 1 : 1 (a fairly strong bristle below the anterior). Both propleural and stigmatal bristles present. No hairs on supra-spiracular convexity or post-alar declivity. Sometimes a few present below lower calypter, which is reniform, rounded behind, lobed on inner margin, and wider than long. *Abdomen* with second sternite overlapping sides of tergite. Tergites without discal bristles. *Wings*: first posterior cell ending near wing-tip, narrowly open at apex. Vein IV with a broadly rounded curve beyond middle of apical section, running close to and parallel with margin of wing from beyond curve. Sixth vein traceable to wing-margin. There is a sexual dimorphism in the costal armature, the female having quite conspicuous bristles from base to beyond middle, while the male lacks them.

Distribution.—Only known from the Malay Peninsula.

Key to the Species of Verticia.

1.	Vein I with several long bristles on upper side near middle	*orientalis* Mall., p. 75.
	Vein I bare on upper side	2.
2.	Dorsum of abdomen practically all black ..	*nigra* Mall., p. 77.
	Abdomen testaceous-yellow, with a narrow black apical fascia on each tergite, usually interrupted in the middle	*fasciventris* Mall., p. 77.

39. **Verticia orientalis** Malloch. (Fig. 35.)

Verticia orientalis Mall., Ann. Mag. Nat. Hist. (9) xx, p. 390, 1927.
Type-locality: Federated Malay States, Pahang. *Type* in the British Museum.

♂♀.—*Head*: Testaceous-yellow, frons more brownish, ocellar spot fuscous. Upper occiput infuscated. All cephalic

bristles and hairs dark. Frons in male one-third, in female about two-fifths, of head-width; about 1½ times as long as wide in male, less elongate in female. Interfrontalia smooth and bare, many short setulæ lateral of the orbitals; several hairs behind the postocellar bristles, one pair, probably representing the postverticals, close to vertex. Parafacialia narrower in male than in female, in the former with one series of setulose hairs, in the female with several. Facial ridges setulose on lower half of their length. Antennæ testaceous-yellow, third segment browned above; this is fully five times as long as second in male, shorter in female. Arista with both long and short hairs above and short hairs below. Palpi rather stout. *Thorax*: testaceous-yellow, mesonotum except lateral margins blackened, disc of scutellum blackened

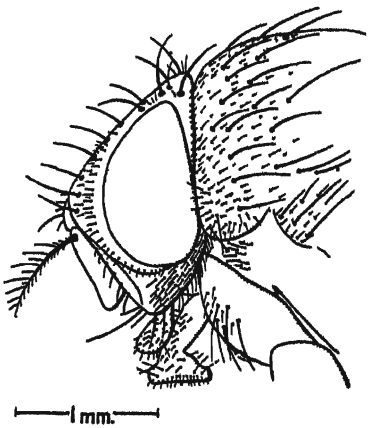


Fig. 35.—*Verticia orientalis* Malloch: head.

basally, metanotum brown in centre, in female less definitely darkened. Mesonotum not much longer than wide, humerals 3–4; 3 or 4 bristles on presutural area; post-alar callosity with 3 bristles, the middle one much longer than the others; pre-alar short; lower stigmatal bristle almost or quite indistinguishable from the surrounding hairs; scutellum thin on edge, the hairs extending on sides but not on to venter. *Abdomen*: testaceous-yellow, shining, with an apical fascia on all tergites except the basal, which is widened in the middle, the one on fifth tergite interrupted in middle. Bristles at apex of fourth tergite and on sides of apices of other tergites outstanding in the male, those on apices of third and fourth tergites in female quite long but not very strong. Male hypopygium with two pairs of downwardly directed chitinous processes, one behind the other, the anterior pair shortest,

with slightly knobbed apices and connected about one-third from tips; the posterior pair are more parallel-sided and separated to bases. In addition to these processes there is a rather broad leaf-like plate on each side, which projects straight back to or beyond apex of abdomen, the apices of which are armed with dense black bristly hairs on the outer sides. *Wings*: greyish-hyaline. Calypters and halteres yellow. Inner cross-vein at middle of discal cell, the bristles on first and third vein above long, the latter continued to beyond the inner cross-vein, on lower side of third confined to extreme base and very short. *Legs*: testaceous-yellow, rather stout, mid- and hind femora (especially in female) noticeably thickened, front tibia with one posterior and three antero-dorsal bristles; mid-tibia in male with one antero-dorsal and about three posterior bristles, that of female with three antero-dorsal, one ventral, and three posterior bristles; hind femora of male with four or five long bristles on apical half of antero-ventral surface and one or two near base on postero-ventral surface; the female with more numerous bristles, and those on anterior and antero-dorsal surfaces apically conspicuous.

Length 6 mm.

Bionomics.—Nothing is known.

Distribution.—Federated Malay States: Pahang, Kuala Taku, Perak, Batang Padang, Jor Camp, Selangor, Kuala Lumpur, Kedah Peak.

40. **Verticia nigra** Malloch.

Verticia nigra Mall., Ann. Mag. Nat. Hist. (9) xx, p. 391, 1927.
Type-locality: Malaya, Singapore. *Paratypes* in the British Museum.

♀.—Differs from *V. orientalis* in having the dorsum more extensively and intensely blacked, that of the abdomen being almost entirely black. No particular structural differences except that vein I is bare above.

Length 6·5 mm.

Bionomics.—Nothing is known.

Distribution.—Malaya, Singapore; Federated Malay States: Selangor, Bukit Kutu, and Kuala Lumpur.

41. **Verticia fasciventris** Malloch.

Verticia fasciventris Mall. Ann. Mag. Nat. Hist. (9) xx, p. 391, 1927.
Type-locality: Malaya, Mt. Ophir. *Type* in the British Museum.

♀.—Differs from *V. nigra* by the characters listed in the key, and also by the longer third antennal segment and less strongly bristled hind femora.

Length 6 mm.

Bionomics.—Nothing is known.

Distribution.—Federated Malay States : Lubok Kedondong (N.W. of Mt. Ophir) ; Langkawi Islands ; Pulo Layang ; Kedah, near Jitva Catchment Area.

Genus 9 **BOOPONUS** Aldrich.

Booponus Aldr., Phil. Journ. Sci. xxii, p. 141, 1923.
Elephantolæmus Austen, Proc. Zool. Soc. Lond. p. 679, 1930.
Genotype, *Booponus intonsus* Aldr. (The only species included in the original paper.)

Head : eyes widely separated in both sexes ; ocellar bristles present, fronto-orbital bristles absent in male, present in female ; parafacialia fairly broad, covered with setulæ ; face deeply sunk between facialia, a low sharp carina generally present underneath the antennæ ; third segment of antenna broad and long ; arista thickened on at least the basal half, pectinate ; facialia convergent below, the epistome projecting forwards at right angles from face, between, but not beyond, the vibrissæ. *Thorax* : chætotaxy variable. Sternopleurals 1 : 1 ; prosternum and propleura bare ; post-alar declivity with a few setulæ ; postscutellum slightly developed. *Abdomen* : discal macrochætæ absent, except on fourth visible segment ; sternites clearly visible between tergites. *Wings* : stem-vein bare ; third vein with setulæ halfway to small cross-vein above ; subcostal sclerite without upstanding hairs ; fourth vein bent gently forward (figs. 36 & 38) ; squama bare.

Distribution.—Burma ; Philippine Islands.

Flies of this genus appear to breed in sores on domestic animals such as elephants and water-buffalo. The larva is probably the cause of the sore, and is not merely introduced after the sore has developed.

Key to the Species of Booponus.

1. Insect entirely yellow ..... *intonsus* Aldr., p. 78.
   Dorsum of thorax and part of abdomen dark ..... 2.
2. Pleura yellow ..... *aldrichi*, sp. n., p. 81.
   Pleura darkened ..... *indicus* (Austen), p. 79.

42. **Booponus intonsus** Aldrich.

Booponus intonsus Aldr., Phil. Journ. Sci. xxii, p. 142, 1923.
Type-locality : Philippine Islands. *Type* in the United States National Museum.

♀.—*Head* : eyes bare, separated by distance equal to one-third total head-width ; frons broad, parallel-sided, orange, occupying almost entire width between eyes ; parafrontalia narrow, orange, lightly dusted with golden tomentum, bearing series of frontal bristles and fine black setulæ, but no fronto-orbitals ; parafacialia and jowls orange, both covered with

short black setulæ ; face yellow, deeply sunk between facialia, with slight indication of a carina ; vibrissæ inserted more or less at oral margin ; antennæ yellow, arista strongly thickened on basal two-fifths ; palpi rather thick, yellow ; ocellar bristles well developed ; facialia covered with short downwardly directed setulæ. *Thorax*: yellow, very slightly gold-dusted anteriorly ; chætotaxy: acrostichals 2–3 : 3 dorso-centrals 2 : 3–4, intra-alars 3, supra-alars 2, post-alars 2, humerals 3, six bristles on posthumeral area, prostigmatic bristle present, sternopleurals 1 and 1 ; prosternum and propleura bare, post-alar declivity with one or two fine hairs ; postscutellum slightly developed. *Abdomen* : yellow, covered with black setulæ, the hind margins of the segments with decumbent macrochætæ. *Wings*: hyaline ; costal spine not developed ; stem-vein bare, third vein with setulæ reaching halfway to cross-vein on upper side ; fourth vein bent gently forward, the first posterior cell opening on to costa by a narrow neck ; subcostal sclerite bare. Squama bare, yellowish-white. Halteres yellow. *Legs*: yellow, covered with black bristles.

Length 5–6 mm.

Bionomics.—This fly has been bred from sores in the hoof of the water-buffalo.

Distribution.—Philippine Islands, Luzon.

43. **Booponus indicus** (Austen). (Figs 36 & 37.)

Elephantolœmus indicus Austen, Proc. Zool. Soc. Lond. p. 680, 1930. Type-locality : Burma. *Type* in the British Museum.

♂♀.—*Head* : eyes bare, separated in both sexes by rather more than one-third total head-width ; frons very broad, brownish-red, more or less parallel-sided ; parafrontalia reddish, thinly grey-dusted, about half width of third antennal segment, male without, female with fronto-orbitals ; parafacialia reddish, silver-grey dusted, about width of third antennal segment, covered with black setulæ ; medianæ orange-red ; jowls yellow, setulose, distance from lower margin of eye to bottom of head about half eye-height ; face deeply sunk, grey-dusted, with traces of a low carina throughout its length ; first and second antennal segments testaceous, third dark brown, paler at base, rather broad, the outer bottom corner somewhat pointed ; arista yellowish-brown, thickened almost to tip, short pectinate above ; palpi orange, laterally compressed, slightly clavate. *Thorax* : dorsum dark brown except for a triangular patch based on scutellum, and lateral margins, which are testaceous ; meso-, sterno-, and hypopleura dark brown, grey-dusted ; chætotaxy: acrostichals 2 : 4, dorso-centrals 2 : 4, intra-alars

2 or 3, supra-alars 3 or 4, post-alars 2, humerals 3, 2 post-humerals, 1 presutural intra-alar; humeri and scutellum testaceous-yellow; postscutellum slightly developed; post-alar declivity with a few black bristles. *Abdomen*: in male first

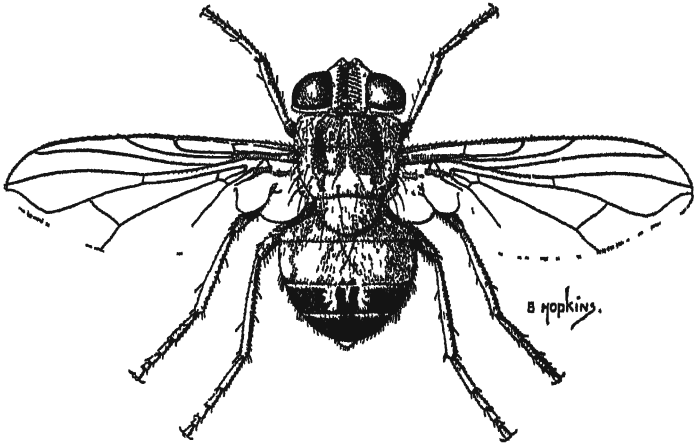


Fig. 36.—*Booponus indicus* (Auston): imago. (From Auston.)

and second visible segments testaceous, the latter with a central brown mark on posterior margin, third segment mainly brown, testaceous anteriorly and on either side of a broad central stripe;

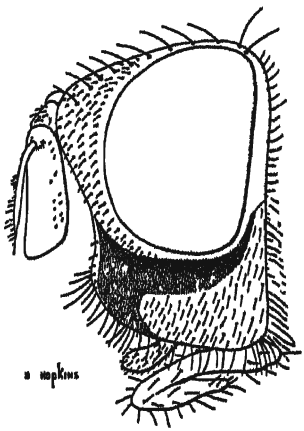


Fig. 37.—*Booponus indicus* (Austen): head. (From Auston.)

fourth segment shining dark brown except on extreme anterior margin; hypopygium moderately well developed, testaceous. In female first visible segment testaceous,

second mainly brownish-black, subshining. *Wings*: hyaline, yellowish, veins yellow; stem-vein bare; third vein setulose above halfway to small cross-vein; basicostal scale orange; subcostal sclerite without upstanding hairs. Squama bare, off-white, lower lobe slightly tinged with brown towards outer edge. Halteres yellow. *Legs*: yellow.

Length 5 mm.

Bionomics.—Larvæ of flies of this species have been obtained from subcutaneous abscesses on Indian elephants.

Distribution.—BURMA: Mawkai, Pyinmana, Insein.

44. **Booponus aldrichi,** sp. n. (Fig. 38.)

Type-locality: Burma. ***Type*** **in the British Museum**

♀.—*Head*: eyes bare, separated by rather less than one-third total head-width; frons broad, brownish towards vertex, orange anteriorly; parafrontalia dull orange, about

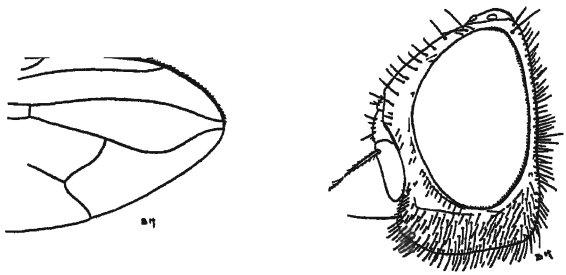


Fig. 38.—*Booponus aldrichi*, sp. n.: wing and head.

half width of third antennal segment, bearing series of frontal bristles, fine black setulæ, and one pair of fronto-orbitals; parafacialia and jowls orange, covered with black setulæ: face yellow, deeply sunk, with an almost imperceptible carina: vibrissæ inserted slightly above oral margin; first and second antennal segments orange, third dark brown, orange at extreme base, about two and a half times length of second; arista pectinate on both sides, basal third thickened, orange. *Thorax*: pleura and scutellum clear yellow; dorsum blackish except on lateral margins, gold-dusted anteriorly, with traces of four black stripes; chætotaxy: acrostichals 3 : 4, dorso-centrals 2 : 4, supra-alars 3, post-alar declivity with a few black bristles: otherwise as in *B. intonsus* Aldr., postscutellum slightly developed, lower half and mesonotum black. *Abdomen*: first visible segment yellow, the hind margin blackish-brown: remaining segment blackish-brown, very narrowly yellow anteriorly and on hind margin; terminal segment grey-dusted:

the whole covered with short decumbent black setulæ, and the margins of the segments with fine decumbent bristles. *Wings*: hyaline with a yellow tinge; third vein with setulæ extending about two-thirds of distance to small cross-vein above, and with a few setulæ at base below; basicostal scale orange; subcostal sclerite without upstanding setulæ. Squama testaceous. Halteres yellow. *Legs*: yellow, covered with black setulæ.

Length 6 mm.

Bionomics.—The life-history of this species is unknown.

Distribution.—Burma: Zibingi (*D. J. Atkinson*).

Genus 10. **CHÆTOPTILIOPSIS** Baranoff.

Chætoptiliopsis Baran., Bull. Ent. Res. xxix, p. 411, 1938.
Genotype, *C. burmanica* Baran., the original species.

Head: eyes bare. Male subholoptic, eye-facets all the same size. Female frons about one-quarter of head-width. Apparently no lateral verticals in female, which has three orbitals. Vibrissæ a little above the epistomal margin. Antennæ with third segment not much more than one and a half times as long as second in male, apparently rather longer in female. Arista bare. Palpi cylindrical. *Thorax*: acrostichals 3 : 3 (the last rather far from base of scutellum). Dorso-centrals 2 : 3. Postsutural intra-alars 3. Supra-alars 2. Post-alars 1. Scutellum with one marginal and one preapical. Sternopleurals 1 : 1. Pteropleurals much shorter than sternopleurals. Pleura generally very bristly. *Abdomen*: second visible segment without, third and fourth with marginals, fourth also with discals. The general bristliness makes distinction difficult. *Wings*: stem-vein and vein I bare. Two bristles at base of vein III above. *Legs*: front tibia with a preapical. Mid-tibia with one anterior and one posterior bristle, apicals and preapicals. Hind tibia with one anterior and three posterior bristles.

45. **Chætoptiliopsis burmanica** Baranoff.

Chætoptiliopsis burmanica Baran., Bull. Ent. Res. xxix, p. 411, 1938.
Type-locality: Burma. *Type* in the British Museum.

♂♀.—*Head*: frons black. Parafrontalia silvery-grey pollinose. Face grey pollinose. Parafacialia concolorous, but rather more silvery. Antennæ apparently greyish in male, ochreous in female. Palpi ochreous. *Thorax*: shining black, pleura concolorous. No markings. *Abdomen*: shining black. *Wings*: hyaline, slightly browned basally. Costal scale black. Vein IV with rather definite bend, but not angled.

First posterior cell well open. No costal bristle. Halteres and squamæ testaceous-yellow. Squamæ bare. *Legs*. all black.

Length 5 mm.

Bionomics.—Nothing is on record.

Distribution.—BURMA. Northern Shan States, Namtu, Panghai Reserve.

The types are the only specimens so far seen. They are in very bad condition owing to the growth of mould.

Genus 11. **BENGALIA** Robineau-Desvoidy.

Bengalia R.-D., Myodaires, p. 425, 1830.
Genotype, *B. labiata* R.-D.
Ochromyia Macq., Suit. à Buff. ii, p. 248, 1835.
Genotype, *Musca jejuna* Fab.
Anisomyia Walker, Proc. Linn. Soc. Lond. iv, p. 135, 1860.
Genotype, *Musca favillacea* Wlk.
Homodexia Bigot, Ann. Soc. Ent. Fr. (6) v, Bull. p. xxvi, 1885.
Genotype, *H. obscuripennis* Big.

Malloch has recently attempted to divide this genus into two subgenera, *Bengalia* and *Ochromyia*, on the shape of the small protuberance (sub-alar knob) below and slightly in front of the wing and the presence or absence of a pronounced submedian ventral bristle on the mid-tibia. This division is not accepted here.

Medium to very large flies, of a general velvety-brown colour. *Head*: eyes widely separated in both sexes. Frons a third of the breadth of the head, hairy. Two external fronto-orbitals in the female. Prelabrum (clypeus) in many species strongly projecting, triangular. The vibrissæ in one group situated far above the mouth-border. Antennæ with third segment long, arista strongly biplumose nearly to tip. Proboscis very stout, with some long hairs on its upper surfaces *Thorax*: about as wide as the head. Chætotaxy: hypopleurals 5–7, the row strongly angled; sternopleurals 1 : 1; propleurals 1 (sometimes accompanied by 1 or 2 hairs); mesopleurals 4–5; acrostichals prescutellars only; dorso-centrals usually 2 : 2 or 2 : 4; humerals 2; notopleurals 2; presuturals 1 pair; supra-alars 4 pairs; post-alar 2 pairs; scutellars 1 apical and 2 marginal pairs. *Abdomen*: always with marginal macrochætæ on apparent third and fourth segments, one section of the genus with discals on apparent fourth. *Wing*: venation normal, IV strongly angled and joining costa before apex of wing, first posterior cell almost closed in margin; III spinulose for varying distances up to cross-vein. Squamæ very large. *Legs*. in many species the front tibia is strongly armed on the ventral side in the male; the bristles on the ventral side of the mid-femur are of some

systematic importance; in some species the male hind tibia has a very noticeable hair-tuft.

Distribution and bionomics.—The genus is entirely Oriental and Ethiopian; in the latter region only that section in which the males have an unarmed front tibia and nearly always discals on fourth abdominal segment is found. Though the species are frequently quite common as adults, sitting on plants, usually in the shade, and not uncommonly entering houses, very little of the life-history is known. The adults are notable for their extremely silent flight. Almost the only thing known of their habits is that of pouncing on ants carrying larvæ on the march and of sucking termites, with which is correlated the strong raptorial and sucking proboscis described and figured in detail by Cragg (Ind. Journ. Med. Res. v, p. 516, 1918) for *jejuna* (?). Dissection shows that this species at least is oviparous, but nothing appears to be known of the breeding habits, though on one or two occasions adults have been bred from puparia found in soil.

Key to the Species of Bengalia.

1. Protuberance below base of wing gourd-shaped. Mid-tibia in both sexes without ventral submedian bristle. ♂ with a pair of long strong bristles on ventral side of abdomen ..... 2.
   Protuberance below base of wing rounded. Mid-tibia in ♀, and sometimes in ♂, with distinct median ventral bristle. ♂ abdomen without long ventral bristles.. 4.
2. Mesonotum centrally blackish. A small black pleural spot below wing. Abdominal tergites broadly bluish-black banded ..... *fabiata* R.-D., p. 85.
   Mesonotum greenish-grey. No black pleural spot ..... 3.
3. Abdominal tergites very narrowly black-banded ..... [p. 86. *hastativentris* Son.-Wh.,
   Third and fourth visible abdominal tergites shining black ..... *hobbyi*, sp. n., p. 88.
4. Abdomen without discal macrochætæ on fourth segment ..... 5.
   Abdomen with discal macrochætæ on fourth segment ..... 13.
5. Clypeus strongly projecting; vibrissæ far above mouth-margin ..... 6.
   Clypeus less strongly projecting; vibrissæ level with mouth-margin ..... 12.
6. Femora and tibiæ yellow ..... 7. [*tata* (Big.), p. 90.
   Femora more or less black..... *jejuna* var. *quadrino-*
7. Front tibia in ♂ with six or more strong spines ..... 8.
   Front tibia in ♂ armed 3 : 0 ..... 10.
8. Spines arranged in a continuous row..... 9.
   Spines arranged 5 : 2 ..... *jejuna* (Fab.), p. 88.

9.	Six strong spines on a protuberance on basal half of tibia	[Wh., p. 93. *martin-lealei* Sen -
	Seven less strong spines set at middle of a plain-margined tibia	[p. 93. *siamensis* Sen.-Wh..
10.	Accessory forceps with long narrow process on each side of broad central plate	*concava* Mall., p. 94.
	Accessory forceps without such processes	11.
11.	All pteropleural hairs yellow; mid-femur with not more than six stout spines apico-ventrally	*recurva* Mall., p. 92.
	Some pteropleural hairs dark; mid-femur with about a dozen stout spines apico-ventrally	*lateralis* Macq., p. 91.
12.	Femora with black rings	*escheri* Bezzi, p. 97.
	Femora all yellowish	*xanthopyga* Sen.-Wh.,
13.	Accessory forceps with free margin nearly straight	[p. 97. *bezzii* Sen.-Wh., p. 99.
	Accessory forceps deeply emarginate .. .	14.
14.	♂. Hind tibiæ not heavily fringed, small species	[p. 101. *surcoufi* Sen.-Wh.,
	♂. Hind tibiæ heavily fringed; large species	*varicolor* (Fabr.), p. 101.

46. **Bengalia labiata** Robineau-Desvoidy. (Fig. 39.)

Bengalia labiata R.-D., Myodaires, p. 426, fig. 2, 1830.
Type-locality: Bengal. *Type* lost.
Bengalia pallens R.-D., Myodaires, p. 426, fig. 3, 1830.
Type-locality: Bengal. *Type* lost.
Bengalia melanocera R.-D., Myodaires, p. 426, fig. 4, 1830.
Type-locality: Bengal. *Type* lost.

♂♀.—*Head*: frons sparsely haired, one-quarter head-width in ♂, one-third in ♀; when seen from in front much wider

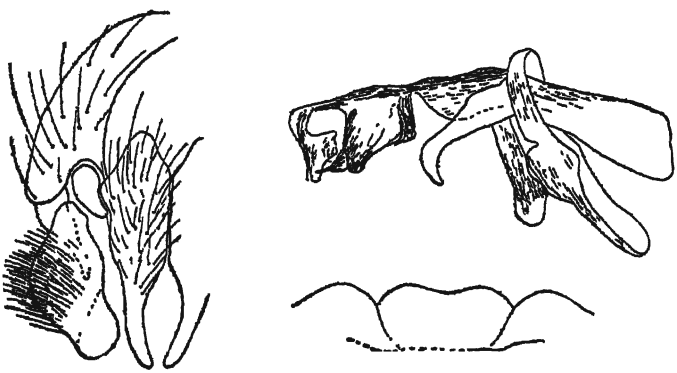


Fig. 39.—*Bengalia labiata* Robinson-Desvoidy: ♂ genitalia. (From Malloch.)

than high, especially in ♂. Clypeus much protruded, vibrissæ just above level of mouth-margin. Frons reddish, para-

frontalia brown. Antennæ brown. *Thorax* reddish-testaceous, with central area blackish-cyaneous. Dorso-centrals 2 . 4, only the two prescutellar pairs long. Centre of propleura bare. Prosternum, hypopleura and centre of post-alar declivity hairy. A small black spot on pleura below base of wing. *Abdomen*. yellowish-brown, usually with bluish-black fasciæ on apices of tergites, generally most or all of apical three tergites black. Fourth sternite with an apical pair of long, strong bristles. *Wings*. hyaline, III setulose basally. *Legs*: ♂, front tibia with 3 or 4 erect stout spines ventrally and 2 fine bristles anteriorly. Mid-femur with a double comb of erect stiff hairs at apex; ♀, no front tibial spines and no mid-femoral comb. ♂ *genitalia* (fig. 39): juxta with a square, upwardly directed projection.

Length 7–10 mm.

Bionomics.—Nothing is known.

Distribution.—Malay Peninsula; South Sumatra. Although originally described from "Bengal," this locality is very doubtful.

The recognition and synonomy of this species are due to Malloch (Ann. & Mag. Nat. Hist. (9) xx, p. 394, 1927), whose description has been used to supplement the original description. The type has disappeared, and if the identity of Malloch's species with that of Robineau-Desvoidy be once accepted, it cannot at any later date be overturned. As pointed out by Malloch, as the species is the genotype it is much to be desired that it should be recognized.

47. **Bengalia hastativentris** Senior-White. (Fig. 40.)

Bengalia hastativentris Sen.-Wh., Spol. Zeyl. xii, p. 305, pl. ii, figs. 8, 9, 10, 13, 14, & pl. vi, 1923.
Type-locality: Ceylon, Matale. *Type* in the British Museum.

♂♀.—*Head*: frons orange, darkened vertically, parafrontalia and margins of ocellar triangle silvery-grey, paler brownish-yellow below, where the frontalia are narrower. Face concolorous, yellowish, parafacialia and genæ whitish, the parafacialia below the eyes appearing narrowly pale yellowish by contrast. Frons one-quarter of head-width. Prelabrum strongly projecting, the vibrissæ convergent above it. *Thorax*: dorsum greenish-grey, with traces of median and admedian dark stripes; scutellum concolorous, sides of both edged pinky yellowish, and the whole of the humeral region thus coloured, the dorsal grey being greatly narrowed anteriorly. Pleura pale brownish. *Abdomen*: yellowish-brown, hind margins of apparent 2nd and 4th segments very narrowly black. Venter similar. In ♂ from hinder

margin of apparent 3rd segment, mid-ventrally, a pair of long, strong, black chætæ, closely appressed to venter and reaching to tip of apparent 4th segment. Male genital

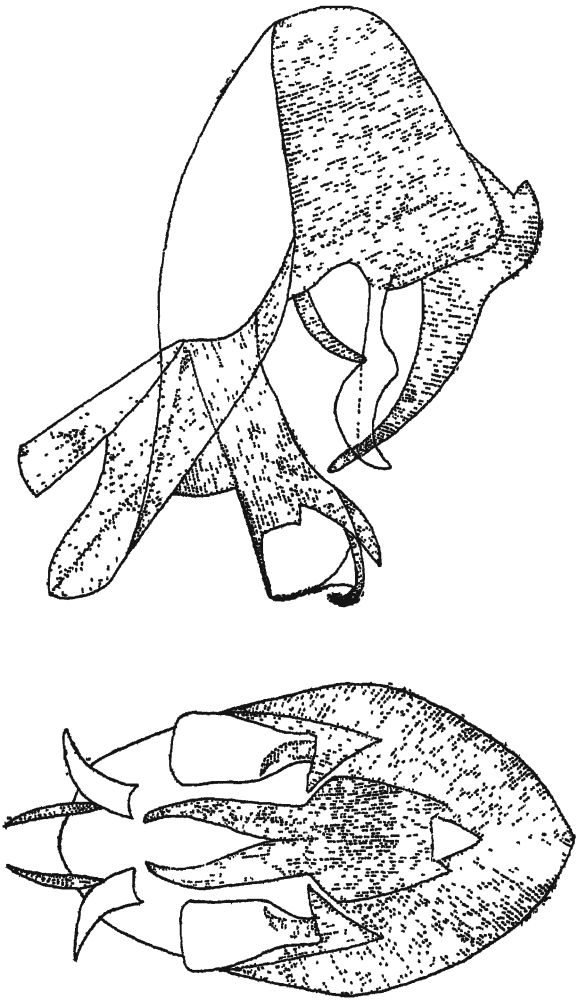


Fig. 40.—*Bengalia hastativentris* Senior-White : ♂ genitalia (From Senior-White.)

segments concolorous with abdomen. *Wings* : clear, slightly yellowish on fore border. Squamæ pale yellowish-white. *Legs* : yellow, tips of tarsi more or less blackened, hardly

so in ♀. ♂ front tibia with four small black spines near the middle. Mid-femora with a short range of densely set spines near the middle. ♂ *genitalia* (fig. 40): juxta a simple hook-like organ. Apex of sixth sternite more or less convex.

Length 6–8 mm.

Bionomics.—Recorded as pouncing on ants carrying brood (*Rutherford*).

Distribution.—CEYLON, Matale and Peradeniya; INDIA, Delhi.

48 **Bengalia hobbyi**, sp. n

Type-locality: Borneo, Sarawak. *Type* in the British Museum.

♂♀.—*Head*: frons orange, darkened vertically, about one-quarter the head-width. Ocellar triangle black. Parafrontalia concolorous above, slightly pollinose below, and therefore appearing paler than the adjacent frons. Face and parafacialia pale luteous. Pre-labrum strongly projecting. Antennæ with first two and base of third segment testaceous, remainder of third darkened, with bright yellowish pollen, so that it appears paler than the basal area. *Thorax*: in male pale greenish-grey, in female testaceous (probably all intermediate shades occur), with traces of median and admedian stripes. Scutellum in both sexes testaceous. Pleura pale testaceous. *Abdomen*: first two visible segments testaceous, no, or only a very narrow, dark hind marginal band on first, but from a quarter to a half of posterior area of second blackened. Third and fourth visible segments shining black, the colour extending not quite to the ventral margins of the tergites, which, with the sternites, are testaceous. Male with a pair of long ventral spines from apex of third segment, reaching apex of fourth. Genital segment 1 brownish. Genital segment 2 shining black. Apex of sixth sternite slightly concave. *Wings*: rather yellowish hyaline, definitely infuscated in front of vein III. Squamæ testaceous. *Legs*: testaceous. Tarsi appear darker owing to closely-set spinules.

Length 8–11 mm.

Bionomics.—Nothing is known.

Distribution.—Borneo: Sarawak; ♂, foot of Mt. Dulit, junction of Rivers Tuijar and Lojok, on undergrowth in secondary forest, 17. ix. 32 [type], ♀, Mt. Kalulong, 1800 ft., undergrowth primary forest, 4. xi. 32 (paratype).

49. **Bengalia jejuna** (Fabricius). (Figs. 41 & 42.)

Musca jejuna Fab., Ent. Syst. iv, p. 312, 1794.
Type-locality: Tranquebar. *Type*, ♀ at Keil.
Musca torosa Wd., Zool. Mag. iii, pp. 21–9, 1819.
Type-locality: Bengal. *Type* in the Vienna Museum.

Bengalia testacea R.-D., Myodaires, pp. 426, 1830.
Type-locality : "Nouvelle-Hollande et Cayenne." *Type* lost.

♂♀.—*Head* : frons in both sexes rather less than one-third width of head ; ochreous-brown, parafrontalia somewhat paler ; face, especially parafacialia, paler, their junctions with frons fairly distinct. Antennæ, first two segments ochreous, third darker ; base of flagellum ochreous, as is also the proboscis.

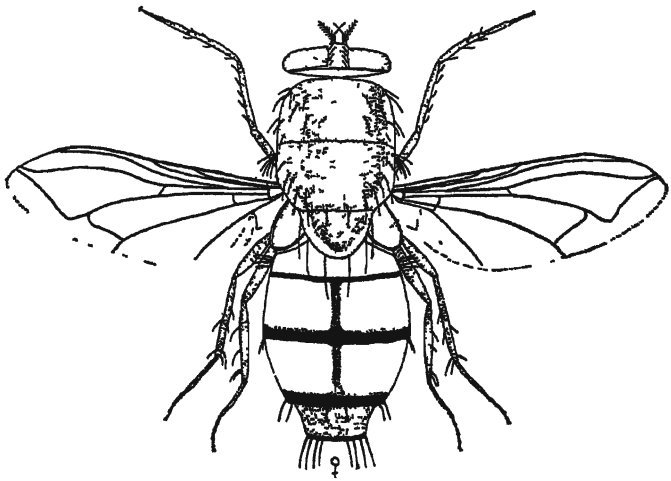


Fig. 41.—*Bengalia jejuna* Fabricius) : imago.
(From Senior-White.)

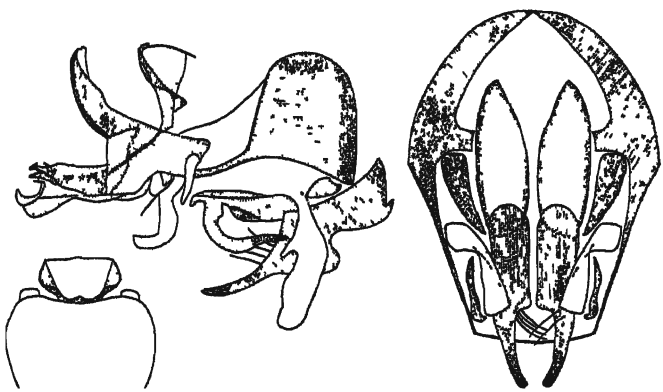


Fig. 42.—*Bengalia jejuna* (Fabricius) : ♂ genitalia.
(From Senior-White.)

Palpi pale yellowish-white, with black bristles. *Thorax* : mesonotum and scutellum ochreous-brown, with paler lateral margins varying greatly in width and distinctness. Pleura

paler. *Abdomen*: pale brownish ochreous, the hind margins of the segments black-banded, narrowly on apparent first and fourth, more broadly (but varying greatly in width and marginal sharpness) on second and third, which have a median black stripe which varies from quite distinct, through only a faint brown coloration, to practically absent. The lateral margins of the second and third and the whole of the fourth segment may be shimmering whitish. *Wings*: clear to slightly greyish. Squamæ yellowish-white, with white cilia. *Legs*: ochreous-yellow, the last three tarsal joints more or less blackened. Front tibia of ♂ with five pre- and two postmedian spines. Mid-femora below spinose in ♂ apically. ♂ *genitalia* (fig. 42) with a very distinct short thumb-like process on anterior margin of posterior claspers.

Length 11–13 mm.

Bionomics.—Oviparous. Life-history otherwise unknown, but probably covers a long period. Has been bred from a pupa in soil (*Ramakrishna*). Has been captured on animals.

Distribution.—Throughout the Plains of INDIA as far North as the Indus. Also in hill localities in South India and CEYLON; Siam; Java.

We have followed * Bezzi in the recognition of this species, arriving at diametrically opposite conclusions to Malloch, who has followed de Surcouf.

50. **Bengalia jejuna** var. **quadrinotata** (Bigot).

Ochromyia quadrinotata Big., Bull. Soc. Zool. Fr. p. 608, 1887.
Type-locality: Ceylon. *Type* lost ?.

♂♀.—*Head*: frons in both sexes about one-third the width of head, the parafrontalia more greyish; face paler, parafacialia shimmering whitish. First two antennal segments brownish-ochreous, third darker; base of flagellum ochreous, as is also the proboscis. Palpi pale yellowish-white with black bristles. *Thorax*: mesonotum and scutellum dull slaty-brown with very distinct pale lateral margins, with which the pleura are concolorous. *Abdomen*: pale yellowish-brown. Apparent first and second segments narrowly but distinctly black-banded posteriorly, the third broadly but irregularly so, the colour extending on to the anterior margin of the fourth. Sides of apparent second and third (sometimes all the latter) and all the fourth white shimmering. *Wings*: clear, squamæ

* For this discussion see Bezzi, Ent. Mitteil. ii, p. 74, 1913; Senior-White, Spol. Zeyl. xii, p. 295, 1923; de Surcouf, Arch. Mus. d'Hist. Nat. Paris (5), vi, p. 34, 1914; Malloch, Ann. Mag. Nat. Hist. (9) xx, p. 401, 1927. All the types involved, so far as they are still in existence, are females, so the matter can never be satisfactorily settled.

yellowish-white, with white cilia. *Legs*: femora greyish-black, the lower surface of the posterior pairs more or less yellowish. Remainder yellow with darkened tarsal tips. Armature of ♂ front tibiæ and mid-femora exactly as in type-form. ♂ *genitalia*: exactly as in *jejuna* F.

Length 10–13 mm

Bionomics.—Nothing is known, but it has been captured on animals.

Distribution.—From CEYLON and INDIA to the Indus; Java.

This is only a colour-variety.

51 **Bengalia lateralis** Macquart. (Fig. 43.)

Bengalia lateralis Macq., Mem. Soc. Roy. Sci. & Arts Lille, Année 1842, p. 277, id., Dipt. Exot. ii, pt 3, p. 120, fig. 1, pl. xiv, 1843 [nec *Ochromyia lateralis* Macq. 1843]
Type-locality. Pondicherry. *Type* ?.
Anisomyia favillacea Wlk., Proc. Linn. Soc. Lond. iv, p. 135, 1860.
Type-locality: Celebes. *Type* in the British Museum.
Homodexia obscuripennis Big., Ann. Soc. Ent. Fr. (6) v, Bull. p. xxvi, 1885.
Type-locality: Ceylon. *Type* in the British Museum.

♂♀.—*Head*: frons slightly less than one-third of head-width, just appreciably narrower in ♂, ochreous-brown, parafrontalia somewhat paler, face, especially parafacialia, paler. Antennæ with first two segments ochreous, third darker; base of flagellum ochreous, as is also the proboscis; palpi pale yellowish-white with black bristles. *Thorax*: mesonotum and scutellum ochreous-brown, with paler lateral margins varying greatly in width and distinctness; pleura paler. *Abdomen*: pale brownish-ochreous, hind margins of apparent second and third segments very narrowly reddish-brown, of third and fourth very narrowly black. A not very distinct median reddish line on second and third. The fourth segment may be shimmering whitish. *Wings*: clear to slightly greyish. Squamæ yellowish-white with white cilia. *Legs*: ochreous-yellow, the apical darkening of the tarsi less distinct than in *jejuna*. ♂ front tibia with three premedian spines only; mid-femora spinose below, the range extending further and the individual spines stronger than in *jejuna*. ♂ *genitalia* (fig. 43): the shape of the superior and posterior claspers amply distinguishes this species from *jejuna*.

Length 11–12 mm.

Bionomics.—The fly has been observed stealing pupæ from ants on the march.

Distribution.—CEYLON; INDIA, from Cochin to Mussooree and Naini Tal; Malay Peninsula; Philippine Islands; Celebes.

For reference to divergent views on the identity of this species see under *B jejuna*.

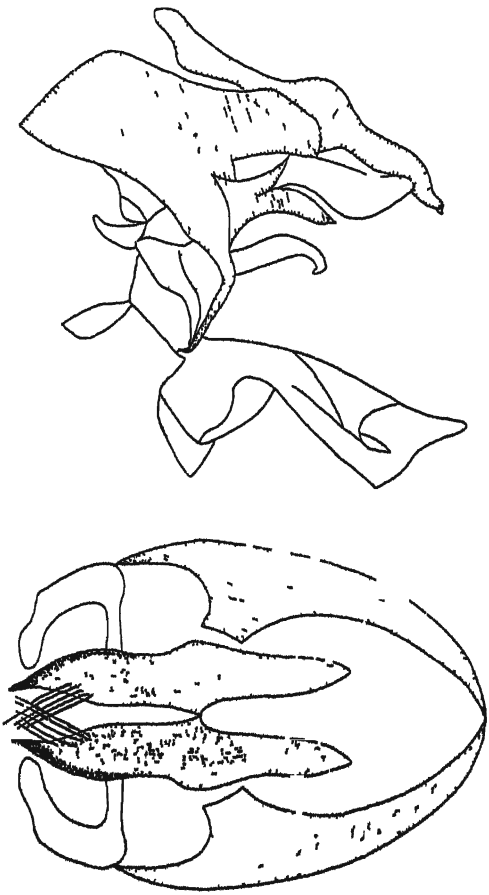


Fig. 43.—*Bengalia lateralis* Macquart: ♂ genitalia.
(From Senior-White.)

52. **Bengalia recurva** Malloch (Fig. 44)

Bengalia recurva Mall., Ann. Mag. Nat. Hist. (9) xx, p. 404, fig. 7, 1927.

Type-locality: Luzon, Philippine Islands. *Type* in Malloch's collection.

♂♀.—*Head*: frons ochreous-brown. Antennæ brownish. Palpi yellow. *Thorax*: brown. Hairs on mesopleura dark,

but all of those on pteropleura and surrounding stigmatal bristle yellow. *Abdomen*: pale brownish, bands on segments rather faint. *Wings*: hyaline. *Legs*: yellowish ♂ front tibia with three stout spines slightly basal of middle, beyond which the tibia is somewhat hollowed out, and there are a few much shorter black bristles. ♂ mid-femur with about

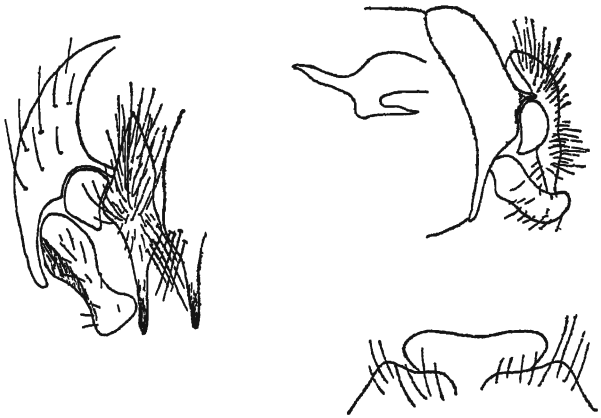


Fig. 44.—*Bengalia recurva* Malloch: ♂ genitalia. (From Malloch.)

four short stout apical spines. ♂ *genitalia* (fig. 44). The "posterior hypopygial" hook (*Malloch*) is very distinctive.

Length 13–14 mm.

Bionomics.—Nothing is known

Distribution.—Philippine Islands, Luzon and Mindanao; Federated Malay States, Pahang.

53 **Bengalia siamensis** Senior-White. (Fig. 45.)

Bengalia siamensis Sen.-Wh., Spol. Zeyl. xii, p. 106, fig. 1, 1924
Type-locality: North Siam, Chengmai. *Type* in the British Museum.

♂.—*Head*: frons grey with golden pollen, very sparsely haired Anteriorly a roughly square area, its upper edge produced medianally, shining brown, with antero-posterior striæ, all tending somewhat inwards to the lower edge, widely emarginate to fit the rather brighter brown lunule, not visible in certain lights Face as frons above, cheeks and genæ more silvery greyish. A large black fleck at top of parafacialia. Antennæ brown, basal half of shaft of arista yellow, remainder black. Prelabrum projecting, vibrissæ the length

of the first two antennal segments above it. Palpi brownish-yellow. Proboscis very dark brown. *Thorax*: dark brown with pale margins to dorsum, the usual traces of black dorso-central stripes. Scutellum concolorous, pale margined. Pleura brown, with blotches of golden pollen. Mesopleura with median stripe, broadened anteriorly. *Abdomen*: brown, with narrow marginal black bands. Apparent third segment with a median pair of marginals. Apparent fourth, with apical bristles but no discals. *Wings*: considerably infuscated, squamæ brownish with pale cilia. *Legs*. yellowish,

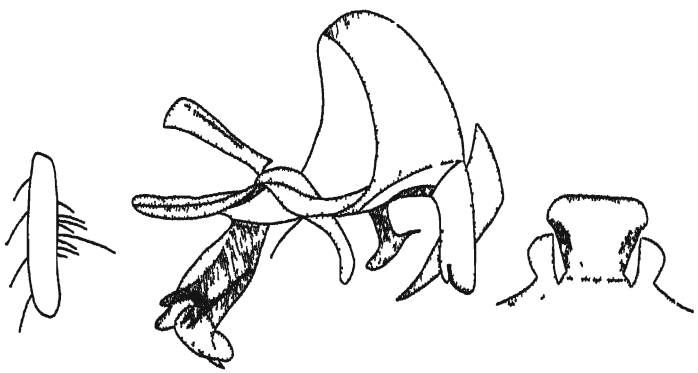


Fig. 45.—*Bengalia siamensis* Senior-White: ♂ genitalia and fore tibia. (From Senior-White.)

apical tarsal joints darkened. Front tibia of ♂ (fig. 45) with a premedian range of seven spines, of which the fifth is by far the longest. Mid-femora with a comb of short spines. Hind tibiæ unfringed. Claws stronger than in *jejuna* and its allies. ♂ *genitalia* (fig. 45): posterior claspers with a thumb-like sulcus preapically. Anterior claspers with a backwardly directed spur.

Length 12–13 mm.

Bionomics.—Nothing is known.

Distribution.—Known only from type-locality in North Siam.

54. **Bengalia concava** Malloch. (Fig. 46.)

Bengalia concava Mall., Ann. Mag. Nat. Hist. (9) xx, p. 407, fig. 6, 1927.

Type-locality: Malay Peninsula, Perak, Taiping. *Type* in the British Museum.

♂.—*Head*: frons ochreous-brown. Antennæ brownish. Palpi yellow. *Thorax*: brown. *Abdomen*: pale brownish, segments banded. *Wings*: hyaline. *Legs*: yellowish.

♂ front tibia armed 3 : 0. ♂ *genitalia* (fig. 46) : the accessory forceps have a long process on each side of the central plate, as in *siamensis* Sen.-Wh.

Length 13 mm.

Bionomics.—Nothing is known.



Fig. 46.—*Bengalia concava* Malloch : ♂ genitalia.
(From Malloch.)

Distribution.—Only known from type-locality in the Malay Peninsula.

55. **Bengalia martin-leakei** Senior-White. (Fig. 47.)

Bengalia martin-leakei Sen.-Wh., Rec. Ind. Mus. xxxii, p. 69, pl. ii, figs. 1, 2, 2 *a*, 1930.

Type-locality : Orissa, Jeypore Hills, Rayaghada. *Type* in the British Museum.

♂.—*Head* : frons orange-brown, parafrontalia paler, ashy, the whole rather less than one-third of the head-width. Parafacialia paler greyish, with black flecks opposite the antennal roots, at middle, and on each side of mouth-opening, these last being larger but less distinct. Antennæ dark brown, third segment grey pollinose. Palpi light yellow with black bristles. *Thorax* : mesonotum and scutellum light coffee-brown, without distinct paler lateral margins. Pleura almost concolorous. *Abdomen* : yellow, with black marginal posterior bands to segments, broad on apparent segments ii and iii. *Wings* : infuscated. Squamæ grey. *Legs* : brown, first tarsal joint paler, apical tarsal segments blackened. Front femora (fig. 43) armed with six closely-set spines on basal third, the first short, situated on a very prominent tuberosity. ♂ *genitalia* (fig. 47) : anterior claspers bifurcated.

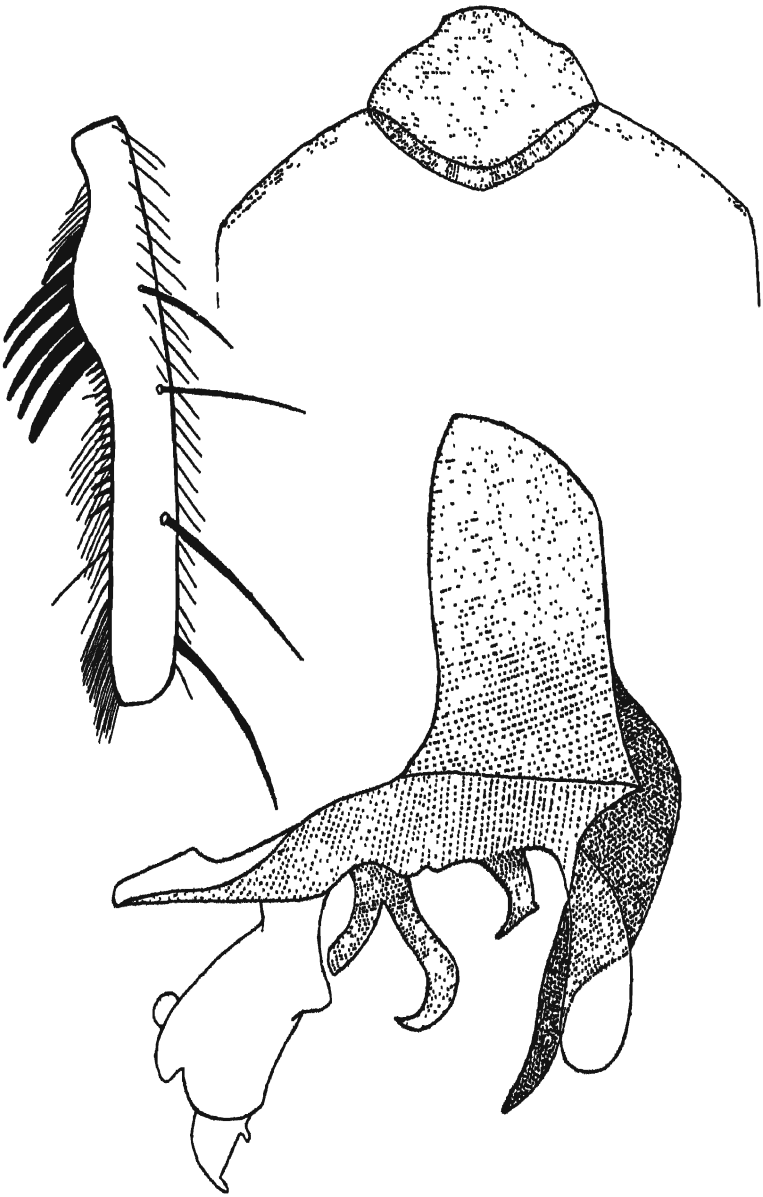


Fig. 47.—*Bengalia martin-leakei* Senior-White : ♂ genitalia and fore tibia. (From Senior-White.)

The posteriorly directed process on posterior claspers common to *lateralis* and *siamensis* reduced to a vestige.

Length 15 mm.

Bionomics.—Nothing is known.

Distribution.—Only known from the type-locality in the Jeypore Hills of Orissa.

56. **Bengalia escheri** Bezzi.

Bengalia escheri Bezzi, Ent. Mitteil. ii, p. 76, fig. C, 1913.
Type-locality: Formosa. *Type* in the Milan Museum.

♂.—*Head*: frons dull greyish-yellow, shortly and sparsely haired. Occiput blackish-grey, with a yellow vertical mark. Face grey, a broad black fleck at base of antennæ, which have the third segment yellow, darkened above and on outer side. Palpi yellow, slightly clavate. *Thorax*: brownish-black, with thick greyish-yellow tomentum, the short pubescence and the bristles all black. Dorso-centrals 1 : 4. Mesopleura on lower half with broad black fleck, broadly white-margined above, and in front and below bounded with a similar fleck above fore coxæ. Pleura all over fairly long black-haired. Scutellum paler (subopaque) marginally. *Abdomen*: blackish-brown, no discal macrochætæ on fourth segment. First segment with a yellow, transparent band, narrowed but not interrupted, in middle. Second segment with a similar band on fore margin, broadly interrupted in the middle. Third segment sometimes with such a band on the fore margin, sometimes all black, like the fourth. The whole abdomen with much shimmering white pollen forming bands on the anterior halves of the segments. Hypopygium black. *Wings*: considerably darkened, base and front margin somewhat yellowish. *Legs*: yellow, hind tibiæ whitish, with darker tips. Femora with broad black rings, least developed on the front and most on the mid-pair, but sometimes not distinct on any pair of legs. Front tibia with 6–7 strong bristles, mid-femora with apical comb of spines very strongly developed. Hind femora shortly but thickly haired, hind tibiæ with short, rather closely set pubescence.

Length 14–15 mm.

Bionomics.—Nothing is known.

Distribution.—INDIA: Assam, Khasi and Garo Hills; Formosa.

57. **Bengalia xanthopyga** Senior-White. (Fig. 48.)

Bengalia xanthopyga Sen.-Wh., Spol. Zeyl. xiii, p. 107, fig. 2, 1924.
Type-locality: Singapore. *Type* in the British Museum.

♂.—*Head*: frons orange-brown, parafrontalia more greyish. Frons with quite strong hairs. Face silvery yellowish-grey, parafacialia slightly darker. Hardly any parafacial spot, though a general indefinite darkening at this point. Antennæ, first two segments brownish-yellow, third concolorous with face, with dark anterior margin and apex. Shaft of arista brown throughout. Palpi luteous. Vibrissæ barely the length of the second antennal segment above the not very pronounced prelabrum. Proboscis brownish-yellow. *Thorax*: pale coffee-brown, unmargined, scutellum similar. Pleura still paler, unmarked. *Abdomen*: pale yellowish-brown with silvery shimmer and narrow posterior dark bands to segments. Apparent third segment with a pair of median marginals, apparent fourth segment with apical marginals but no discals. Hypopygium

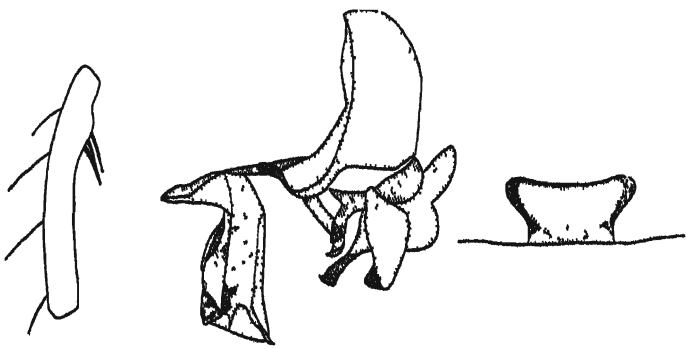


Fig. 48.—*Bengalia xanthopyga* Senior-White: ♂ genitalia and fore tibia. (From Senior-White.)

yellow. In female the second and third segments are very broadly black-banded. The fourth is grey, with apical black margin. *Wings*: yellowish-grey. Squamæ pale yellowish. *Legs*: yellowish, apical tarsal segments slightly darkened. Front tibia armed 2 : 0 or 3 : 0, the two lower spines very closely approximated. Mid-femur with a weak and widely spaced comb, only the last five bristles definitely engrossed and closer spaced. Hind tibiæ bare. ♂ *genitalia* (fig. 48): very similar to *lateralis*.

Length 13–15 mm.

Bionomics.—Nothing is known.

Distribution.—INDIA: Upper Punjab, Muktesar; Singapore; Java: Preanger, Moeria; Philippine Islands: Luzon, Ilacos Norte.

58 **Bengalia bezzii** Senior-White. (Fig. 49.)

Bengalia bezzii Sen.-Wh., Spol. Zeyl. xii, p. 306, pl. i, figs. 4, 5, pl. vii, 1923.
Type-locality: Ceylon, Matale district. *Type* in the British Museum.
Bengalia inermis Mall., Ann. Mag. Nat. Hist. (9) xx, p. 413. fig. 13.
Type-locality: Philippine Islands, Luzon. *Type* in the British Museum.

♂♀.—*Head*. frons less than one-third the head-width, brownish, lateral margins apparently paler, face similar. First two antennal segments brownish-yellow, third darker. Base of flagellum and proboscis brownish-yellow. Palpi pale with black bristles. Prelabrum only slightly projecting, vibrissæ on same level. *Thorax*: uniform ashy-grey, humeral

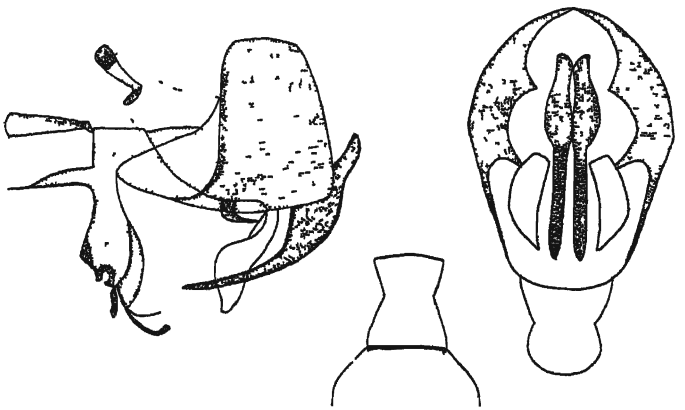


Fig. 49.—*Bengalia bezzii* Senior-White: ♂ genitalia. (From Senior-White.)

region normally brownish-yellow, but concolorous in certain specimens. Pleura pale greyish. There are traces of stripes on the mesonotum in some specimens. *Abdomen*: black, the whole except the posterior margins of all segments and base of apparent first shimmering greyish-white. Exceptionally the whole abdomen may be yellow, with little or no banding. *Wings*: greyish, squamæ yellowish. *Legs*: femora dark greyish, yellowish below, remaining joints pale yellowish with tarsal tips slightly blackened. ♂ front tibiæ with three premedian spines that may be very reduced. ♂ mid-femora spinose apically below. The fringe on the ♂ hind tibiæ varies from quite strong to almost complete reduction. ♂ *genitalia* (fig. 49): accessory forceps with free margin straight or slightly convex.

Length 8–16 mm.

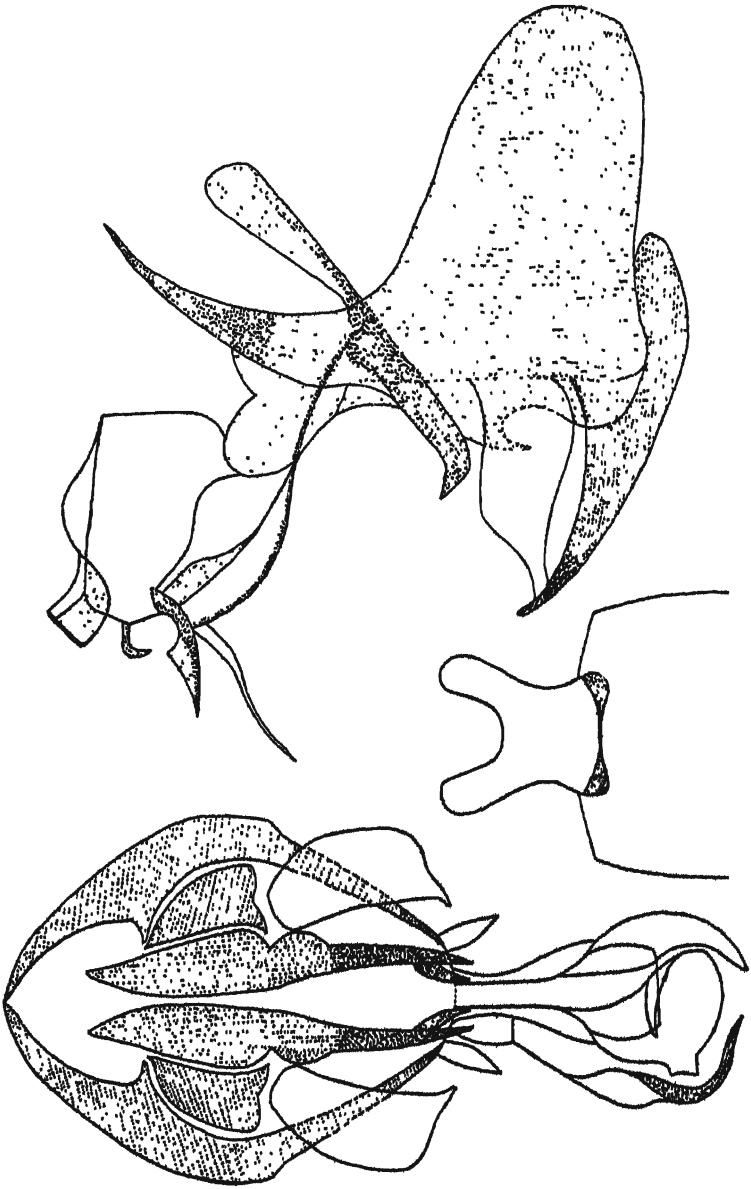


Fig. 50.—*Bengalia surcoufi* Senior-White : ♂ genitalia.
(From Senior-White.)

Bionomics.—Is recorded as sharing the general habit of the genus of preying on ant pupæ.

Distribution.—From CEYLON and INDIA to the Indus; Malaya; Singapore; Java, Moeria, 2000–4000 ft

Malloch's type is from the Philippine Islands, Luzon, Mt. Maquiling; the genitalia show it to be a synonym of *bezzii*.

59. **Bengalia surcoufi** Senior-White. (Fig. 50)

Bengalia surcoufi Sen. Wh., Spol. Zeyl xii, p. 306, pl. ii, figs. 11, 12, pl. viii, 1923.
Type-locality: Mungpoo, Darjeeling district. *Type* in the British Museum.

♂♀.—*Head* frons less than one-third head-width, brownish with grey parafrontalia; face paler. First two antennal segments reddish-brown, third darker. Base of flagellum and proboscis reddish-brown; palpi pale with black bristles. Prelabrum only slightly projecting, vibrissæ on same level. *Thorax*: greyish, unmargined; pleura concolorous. *Abdomen*: brown, all segments black-banded posteriorly, very narrowly on apparent first, a more or less well-defined median stripe on second and third. *Wings*: clear to very slightly greyish; squamæ pale yellowish. *Legs*: yellow, tips of tarsi darkened. ♂ front tibiæ with a premedian range of about four small spines, not at all conspicuous. ♂ mid-femora with a range of strong spines on apical third below. ♂ *genitalia* (fig. 50): accessory forceps very deeply bilobed, indicating the transition to the more complicated forms found in Rhiniinæ.

Length 9 mm.

Bionomics.—Nothing is known.

Distribution.—INDIA: the Himalayas (foot-hills), Assam Hills, Western Ghats.

60. **Bengalia varicolor** (Fabricius). (Fig. 51.)

Musca varicolor Fab., Syst. Antl. p. 296, 1805.
Type-locality: Tranquebar. *Type* ? Keil.
Bengalia latro de Meij., Tijd. v. Ent. liii, p. 336, 1910.
Type-locality: Java. *Type* ? Amsterdam.
Bengalia emarginata Mall., Ann. Mag. Nat Hist. (9) xx, p. 412, fig. 15, 1927.
Type-locality: Singapore. *Type* in the British Museum.

♂♀.—*Head*: frons one-third width of head, brownish with paler parafrontalia; face pale. First and second antennal segments reddish-brown, third darker; base of flagellum and proboscis reddish-brown; palpi pale with black bristles. *Thorax*: dorsum and scutellum brownish-grey, paler at sides; pleura greyish. *Abdomen*: varying from all black with grey shimmer, leaving only posterior bands to all segments

black, to a reddish-brown ground-colour covered with white shimmer, with black posterior bands, or, exceptionally, to yellowish. *Wings*: greyish, squamæ whitish. *Legs*: femora varying from black, with front pair more or less yellow below, to all yellow, the paler legs being correlated with a paler abdomen; remaining joints pale, with tarsal tips darkened. ♂ front tibiæ with middle third minutely spinulose, mid-femora spinose below at apex, and hind tibiæ fringed. ♂ *genitalia* (fig. 51): accessory forceps deeply emarginate, as in *surcoufi*, but the lobes acuminate, not rounded.

Length 12–13 mm.

Bionomics.—de Meijère (Tijd. v. Ent. liii, p. 328, 1910) states that it flies over ants that are on the move and with

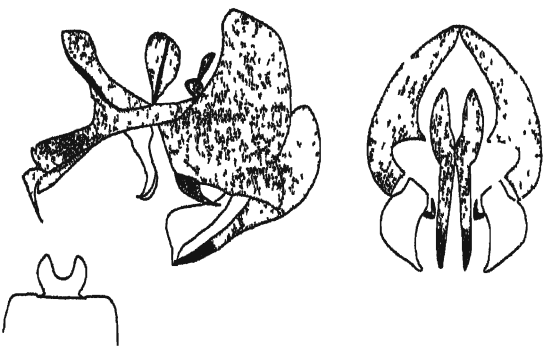


Fig. 51.—*Bengalia varicolor* (Fabricius): ♂ genitalia. (From Senior-White.)

great dexterity pounces on them and seizes their insect prey from them.

Distribution.—Ceylon; South India; Philippine Islands; Formosa.

Malloch, on the strength of a pair of specimens from Dutch East India that are neither types nor were even determined by de Meijère, would upset the whole synonomy in this group; with his conclusions we cannot agree. De Meijère did not figure the ♂ genitalia of his type.

Genus 12. **CATAPICEPHALA** Macquart.

Catapicephala Macq., Mem. Soc. Sci. & Arts Lille, Année 1850, p. 210, 1851; id., Diptères Exot., Suppl. 4, pt. 2, p. 237, 1851.
Genotype, *Catapicephala splendens* Macq.

Large metallic-coloured flies, often over 1 cm. in length.

Head: considerably compressed from back to front; frons slightly protruding; eyes rather widely separated in both

sexes, bristles extending up two-thirds total length of facialia ; third segment of antenna six to eight times as long as second, arista plumose ; fronto-orbital bristles present in both sexes. *Thorax* : dorso-centrals 2 or 3 : 4, posthumerals 3, supra-alars 1 : 3 ; post-alar declivity with a tuft of bristles ; convexity above posterior thoracic spiracle covered with short decumbent pubescence ; prosternum setulose. *Abdomen* : marginal macrochætæ on second, third, and fourth visible segments ; macrochætæ on sternites, but no discal macrochætæ on tergites. *Wings* : base of third longitudinal vein with a few bristles both above and below ; subcostal sclerite covered with soft decumbent pubescence. *Legs* : males with somewhat elongated pulvilli ; middle tibiæ in females with a varying number of antero-dorsal bristles ; tibiæ with the posterior surface sometimes forming a raised ridge covered with numerous small setulæ.

Bionomics.—Nothing is known of the life-histories in this genus.

Distribution.—Federated Malay States ; Java ; Sumatra ; Borneo ; Celebes ; Formosa.

Key to the Species of Catapicephala.

1.	Eyes hairy	*dasyophthalma* Vill.,
	Eyes bare	2. [p. 103.
2.	Tomentum on face golden ; antennæ orange.	*ruficornis* Vill., p. 106.
	Tomentum on face grey ; antennæ mainly dark brown	3.
3.	Abdomen with more or less obvious transverse bands of tomentum. Palpi dark brown	*ingens* (Wlk.), p. 104.
	Abdomen shining. Tomentum on venter only	4.
4.	Brilliantly shining species ; palpi orange to brown. Wings somewhat infuscated basally	*splendens* Macq., p. 106.
	Less shining, but without definite bands of tomentum. Palpi dark brown. Wings clear at base	*pattoni*, sp n., p. 105

Somomyia infumata Big. belongs to this genus. The type is a headless female in bad condition generally.

61. **Catapicephala dasyophthalma** Villeneuve.

Catapicephala dasyophthalma Vill., Rev. Zool. Afr. xv, p. 222, 1927.
Type-locality : Formosa. *Type* in the Deutsche Entomologische Institut, Berlin.

♂.—*Head* : eyes thickly covered with long pale hair, separated at vertex by distance equal to half width of one eye ; frons dark brown, about half width of one of the parafrontalia, bearing numerous fine brown setulæ ; parafrontalia silver-grey dusted, metallic-coloured towards vertex, bearing two

pairs of fronto-orbital bristles and fine black setulæ outside the frontal series; parafacialia silver-dusted, bare, jowls silver-dusted with fine black bristles, occiput pale-haired; face silver-grey dusted, becoming slightly rufous at oral margin; facialia strongly bristled on three-quarters of their length; vibrissæ inserted at level of oral margin, antennæ dark brown, third segment eight to ten times width of second; arista long-plumose; palpi dark orange, flattened and rather bare apically, with short black bristles towards base. *Thorax*: shining metallic blue-green with purple reflections, lightly silver-dusted. Chætotaxy. acrostichals 2 : 2, dorso-centrals 2 : 3, intra-alars 2, supra-alars 2, humerals 3, and post-humerals 3, presutural intra-alar absent; scutellum with three pairs of marginal bristles and one pair of discal, prostigmatic bristle present; sternopleurals 2 : 1; prosternum and post-alar declivity setulose, propleura and convexity above post-thoracic spiracle devoid of hairs; post-scutellum slightly developed. *Abdomen*: shining bluish-green with purple reflections, the ventral margins of the tergites silver-dusted, the dust spots on fourth visible segment sufficiently extensive to be seen from above; a pair of marginal macrochætæ on second visible segment and a row on third and fourth; each sternite with a row of strong marginal bristles. *Wings*: uniformly smoke-coloured, the veins dark brown; third longitudinal vein with setulæ above and below at base; basicostal scale dark brown; subcostal sclerite without upstanding bristles. Squama white with a dark brown margin. Halteres dark brown. *Legs*: black.

Length 11 mm.

Distribution.—Formosa, Kosempo; Sumatra, Gunung Singgalang.

62. **Catapicephala ingens** (Walker).

Musca ingens Wlk., Proc. Linn. Soc. Lond. iv, p. 134, 1860.
Type-locality: Celebes. *Type* in the British Museum.

♂.—*Head*: frons black, rather broader than one of the parafrontalia; eyes bare, separated at vertex by distance equal to half width of one eye; antennæ and palpi dark brown, the latter bristled except at tip. *Thorax*: shining bluish-purple, grey-dusted anteriorly and on pleura; acrostichals 2 : 3, dorso-centrals 3 : 4, posthumerals 3, intra-alars 1 : 3, supra-alars 1 : 3; prosternum setulose. *Abdomen*: shining bluish-purple with bands of silver tomentum anteriorly on second, third, and fourth visible segments, obvious at sides but almost disappearing in middle; first, second, and third sternites each with two rows of strong bristles. *Wings*: infuscated anteriorly and along wing-veins; squama white with faintly

yellow margin. Halteres dark brown. *Legs* : middle tibiæ with three or four antero-dorsal bristles.

Length 17 mm.

Distribution.—There are three females in the British Museum Collection, two labelled "Celebes" and one "Macassar," the latter being Walker's type.

63. **Catapicephala pattoni**, sp. n. (Fig. 52)

Type-locality: India. *Type* in the British Museum. *Type* ♂, Khalighat (ex coll. Brunetti), 10. ix. 1904. *Paratype* ♂ Mussoorie (*O. C. Ollenbach*), 12–25. vi. 1927.

♂.—*Head* : eyes bare, separated at vertex by a distance equal to one-third total head-width or slightly less; frons reddish-brown parallel-sided, slightly narrower than one of the parafrontalia , parafrontalia, parafacialia, face, and jowls covered with shining silver tomentum ; frontal bristles widely spaced, parafrontalia shining at vertex, with minute decumbent setulæ outside the frontal series; parafacialia bare; antennæ

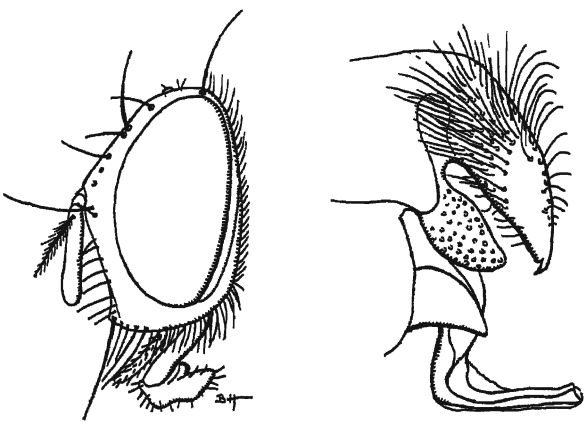


Fig. 52.—*Catapicephala pattoni*, sp. n. : head and ♂ genitalia.

and palpi dark brown. *Thorax*: shining bluish-green, white-dusted anteriorly and along margins of dorsum; acrostichals 2 : 2, dorso-centrals 2 : 4 ; pleura lightly and unevenly dusted ; propleura bare. *Abdomen* : shining bluish-purple, thinly and unevenly covered with greyish dust which is concentrated in rather more definite patches on the venter ; macrochætæ on sternites very fine ; hypopygium inconspicuous. *Wings* : yellowish hyaline ; squama white.

Halteres yellowish-brown. *Legs*. dark brown; hind tibia without a raised ridge.

Length 10–12 mm.

Distribution.—INDIA: Bengal, Calcutta, Khalighat; United Provinces, Mussooree (ca. 7000 ft.).

64. **Catapicephala ruficornis** Villeneuve.

Catapicephala ruficornis Vill., Rev. Zool. Afric. xv, p. 222, 1927. Type-locality: Formosa. *Type* in the Deutsches Entomologische Inst., Berlin.

♂♀.—*Head*: eyes bare, separated at vertex by half-width of one eye; frons black, rather broader than width of one of the parafrontalia; parafrontalia covered with silver-grey tomentum which becomes golden on face and parafacialia, antennæ and palpi bright orange, the latter bristled at base, bare at tips except for one or two bristles. *Thorax*: shining blue-green, lightly dusted anteriorly and on pleura; acrostichals 3 : 2, dorso-centrals 3 : 4, posthumerals 3, intra-alars 2, supra-alars 3; prosternum setulose. *Abdomen*: shining blue-green; strong bristles on margins of sternites. *Wings*: faintly tinged with orange-brown, especially along wing-veins; squama white with slightly yellow margin; halteres brown. *Legs*: black, middle tibia with three or four antero-dorsal bristles.

Length 18 mm.

Distribution.—Formosa: Anping, Kosempo, Fuhosho, Kanshirei.

65. **Catapicephala splendens** Macquart.

Catapicephala splendens Macq., Mem. Soc. Sci. & Arts Lille, Année 1850, p. 210, 1851; id., Diptères Exot., Suppl. 4, pt. 2, p. 237, 1851.

Type-locality: Java. *Type* in the Bigot Collection.

♀.—*Head*: eyes bare, separated at vertex by rather more than one-third width of one eye; frons dark reddish-brown, about equal in width to one of the parafrontalia, widening slightly anteriorly; parafrontalia and parafacialia covered with silver tomentum, the former with a few small decumbent bristles among frontal and fronto-orbital bristles; vibrissæ strong, ascending in uneven double row two-thirds of total length of facialia; antennæ dark brown, third segment slightly rufous at base, barely reaching upper margin of epistome, second segment with a remarkably long bristle; palpi orange to brown (variable), bases covered with black bristles, tips bare. *Thorax*: shining metallic green, lightly pale grey-dusted anteriorly and on pleura; acrostichals 2 : 3, dorso-centrals 3 : 4, posthumerals 3, intra-alars 1 : 3, supra-alars 1 : 3, three pairs marginal and one pair discal scutellar bristles; convexity above posterior thoracic spiracle without

long pubescence ; indication of a post-scutellum ; prosternum setulose. *Abdomen* : shining metallic green, slightly silver-dusted on venter ; second visible segment with a pair of marginal bristles, third and fourth visible segments with a complete row ; no discal bristles. *Wings* : greyish-hyaline, diffusely infuscated anteriorly and along veins ; basicostal scale black, subcostal sclerite covered with soft decumbent dark brown pubescence ; a few bristles both above and below at base of third longitudinal vein ; squama pure white with yellow rim, halteres dull brownish. *Legs* : dark brownish-black ; middle tibia with two antero-dorsal bristles.

Length 14 mm.

Male.—Frons narrow, about one-quarter width of one of the parafrontalia. Third segment of antenna slightly reddish basally. Hypopygium not markedly conspicuous. Mid-tibia with one antero-dorsal bristle. Claws and pulvilli very long.

Distribution.—BURMA : Tenasserim ; Malaya : Singapore ; Perak , Selangor ; Johore ; Kubuk ; Java , Borneo ; Sarawak.

Genus 13 **TERMITOLŒMUS** Baranoff.

Termitolœmus Baran., Ann. Mag. Nat. Hist. (10) xvii, p. 646, 1936
Genotype, *T. marshalli* Baran., the original species.

Head : occiput strongly developed, swollen in lateral view. Eyes small, in ♂ all facets equal, not more than half the head-height. Frons broad in both sexes, equal to quite half the head-width, nearly horizontal in side-view. Fronto-orbitals about 4, the two upper erect, the two lower inclined inwardly, none proclinate. An exterior row of about 6 small, irregularly placed bristles. Frontal stripe bare. Frons and face strongly angled at the insertion of the antennæ, face slightly retreating in profile, no carina. Facial ridges bare down to vibrissæ, which are placed at epistomal margin. Genæ with scattered bristles, those along lower margin strong. Antennæ short, not more than half an eye-height, third segment barely twice second. Arista quite equal to second and third segments together in length, microscopically pubescent. Palpi very broad apically, widening phylliform from a narrow base. Proboscis strongly developed, thickened, with large labellæ. *Thorax* : mesopleural and hypopleural bristles strong ; pteropleural very fine. Propleura centrally, prosternum, and post-alar declivity bare. Post-scutellum weakly developed. *Abdomen* : broad and flattened in female. All sternites free. In male lamellæ of fifth sternite very large. *Wings* : veins I and III bristled almost or quite to wing-tip both above and below. Vein IV curved, not angled, first posterior cell fairly narrowly open. Squamæ bare. *Legs* : femora swollen, flattened antero-posteriorly.

66. **Termitolœmus marshalli** Baranoff.

Termitolœmus marshalli Baran., Ann. Mag. Nat. Hist. (10), xvii, p. 647, 1936.
Type-locality: India, Cawnpore. *Type* in the British Museum.

♂♀.—*Head*: frons yellowish-brown. Ocellar area dark brown. A dark shining area on parafrontalia above, extending backwards on to upper side of occiput, where it is sharply defined from the paler vertical area. Face ochreous, unmarked. Genæ luteous. Antennæ, first and second segments ochreous, third dark brown. Palpi luteous, darkened apically. Proboscis testaceous. *Thorax*: mesonotum ochreous, with five darker vittæ. Pleura ochreous. Post-alar callosity darkened. Scutellum dark brown with median pale stripe, which may be obscured basally. Acrostichals 1 : 1, dorsocentrals, 2 : 3. Supra-alars 2. Posthumerals 1. Scutellum with long basals and apicals, with one shorter marginal and one prebasal. Sternopleurals 1 (2) . 1. Alar much shorter than thoracic squama. *Abdomen*: ochreous, with dark median triangular basal spots, extending almost two-thirds way to hind margins, extended, more narrowly, submedianly, and broadening laterally. The submedian darkening may be so narrow as to give the appearance of three rows of dark spots. Marginal macrochætæ on visible segments II to IV, and discals on III and IV, also on II in male. In male there are bristle-like microchætæ all over the abdomen, making discernment of macrochætæ difficult. *Wings*: hyaline. *Legs*: testaceous. Front tibia with a bristle at one-third and two-thirds its length, and one apically. Mid-tibia with two antero-dorsals, one antero-ventral, and five or six apicals. Hind femora antero-ventrally with four long bristles on the apical third. Hind tibia with longer and more hair-like bristles in the places of those described for the fore tibiæ. In the male the preapical bristle noticeably long, almost equal to the two first tarsal segments together. Claws and pulvilli short.

Length 3–4 mm.

Bionomics.—The adult is predaceous on worker termites.

Distribution.—INDIA: United Provinces, Cawnpore.

Genus 14. **TAINANINA** Villeneuve.

Tainanina Vill., Bull. Ann. Soc. Ent. Belge, lxvi, p. 217, 1926.
Genotype, *Tainanina pilisquama* Son.-Wh., by original designation (as *Tainanina grisella* Vill.).

Head: eyes widely separated by broad parallel-sided frons, which is only slightly broader in female than in male, head higher than broad when seen in profile, rather rectangular in appearance; female with, male with or without fronto-orbital bristles; parafacialia broad, covered with fine setulæ

vibrissæ inserted almost level with upper margin of epistome; facialia with a few minute bristles on lowest third; arista plumose, thickened for half its length in male, for less in female, ocellar and inner vertical bristles well developed in male, outer verticals also present in female. *Thorax*: chætotaxy, acrostichals 2 . 3, dorso-centrals 2 : 3; supra-alars 3; post-alars 2; humerals 3; posthumerals 2; presutural intra-alar absent; prostigmatic bristle strongly developed; sternopleurals 2 : 1; prosternum and propleura hairy. *Abdomen*: male hypopygium well developed. *Wings*: stem-vein bare; third vein with one or two bristles at base above and below; squama with a small patch of microscopic hairs on disc of lower lobe.

Distribution.—CEYLON; INDIA, Assam, Federated Malay States, Pahang; Formosa.

Key to the Species of Tainanina.

1. Male without fronto-orbital bristles, hairs on squama black .. .. *sarcophagoides* (Mall.), [p. 110.
Male with fronto-orbital bristles, hairs on squama white. .... *pilisquama* (Sen.-Wh.), [p. 109.

67. **Tainanina pilisquama** (Senior-White). (Fig. 53.)

Pollenia pilisquama Sen.-Wh., Rec. Ind. Mus. xxvii, p. 84, 1925.
Type-locality: Ceylon. *Type* in the British Museum
Tainanina grisella Vill., Bull. Ann. Soc. Ent. Belge, lxvi, p. 272, 1926.
Type-locality: Formosa. *Type* in the Deutsches Entomologische Inst, Berlin.

♂.—*Head*: in profile higher than broad, presenting rather a square appearance. Eyes bare, separated by a distance equal to one-quarter total head-width. Frons broad, parallel-sided, equal in width to half-length of third antennal segment, parafrontalia, upper part of parafacialia, and jowls dark greyish-silver. Lower part of parafacialia reddish. Antennæ dark brown, inserted above level of middle of eye, third segment six times as long as first and second together. Arista shorter than third segment, thickened for about half its length, long pectinate above, and with a few short, scanty hairs below. Palpi yellow. Vibrissæ inserted at level of epistome, not ascending the facialia. Frontal bristles reaching level of insertion of antennæ. One pair of fronto-orbitals. Ocellars, inner and outer postverticals present. Parafacialia covered with several rows of minute hairs. A second fronto-orbital may develop adventitiously. *Female*: eyes separated by rather less than one-third total head-width. Fronto-orbital bristles strongly developed. Antennæ lying on either side of a low, acuminate carina. Frons as wide as two-thirds length of third antennal segment. Third segment

of antenna about four times as long as second. *Thorax*: including scutellum, black, grey-dusted, with two thin, well-defined, presutural black stripes. Acrostichals 1 : 3 (first pair of postsuturals very weak), dorso-centrals 2 : 3, intra-alars 1 : 3; supra-alars 1 : 3, scutellum with three pairs of marginal and one pair of discal bristles; innermost marginals crossed. *Abdomen*: black, silver-dusted, so that it retains a central dark streak while it appears tessellated laterally. Second visible segment with a pair, third and fourth with a row, of marginal macrochætæ. Hypopygium

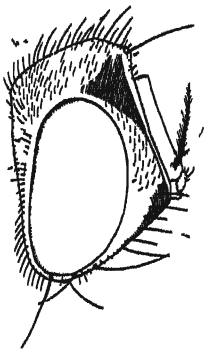


Fig. 53.—*Tainanina pilisquama* (Senior-White): head.

prominent, genital segment 1 shining, genital segment 2 dull, black. *Wings*: hyaline, basicostal scale pale yellow. Discal cell opening very near wing-tip. Angle of IV rounded. Squamæ white, the lower one with a few microscopic hairs in the centre of the disc. Halteres orange. *Legs*: brownish black.

Length 6 mm.

Distribution.—INDIA, Assam; CEYLON; Formosa.

68. **Tainanina sarcophagoides** (Malloch).

Calliphora sarcophagoides Mall., Ann. Mag. Nat. Hist. (10), vii, p. 192, 1931.

Type-locality: Federated Malay States, Pahang. *Type* in the British Museum.

♂.—*Head*: eyes bare, separated by distance equal to one-quarter total head-width; frons more or less parallel-sided, equal in width to one-half length of third antennal segment; parafrontalia, parafacialia, and jowls dark grey, the area around the vibrissæ being darker than the rest, reddish in certain lights; antennæ dark brown, inserted above level of middle of eye, third segment six times length of other two; arista about same length as third segment, proximal half thickened,

longer haired above than below; palpi yellow; vibrissæ inserted on a level with the epistome, not ascending facialia except for a few minute bristles. Frontal bristles descending to level of insertion of antennæ, ocellar, postvertical, and inner vertical bristles present; parafacialia covered with several rows of minute bristles. *Thorax*: black, grey-dusted with black stripes anteriorly. Acrostichals 1 : 3 (the anterior presutural pair weak); dorso-centrals 2 : 3; intra-alars 1 : 3, supra-alars 2 : 3; scutellum with three pairs of marginal and one pair of discal bristles, the inner marginals convergent. *Abdomen*: black, silver-dusted, so that it retains a longitudinal median black line but appears tessellated laterally; second visible segment with a pair, third and fourth with a row, of marginal macrochætæ. Hypopygium prominent, first segment shining, second dull, black. *Wings*: hyaline, slightly yellow; basicostal scale pale brown; discal cell opening very near tip of wing; squamæ pale testaceous, with a small patch of dark hairs in centre of lower lobe. Halteres yellow *Legs*: black.

Length 6 mm; length of wing 6 mm.

Distribution.—Federated Malay States, Pahang.

Genus 15. **MELINDA** Robineau-Desvoidy.

Melinda R.-D., Myiodaires, p. 439, 1830.
Genotype, *Musca cærulia* Mg., by designation of Coquillet as *M. cognata* Mg., 1910.
Neomelinda Mall., Suppl. Ent. xvi, p. 53, 1927.
Genotype, *N. sumatrana* Mall.

Head: eyes in male more or less approximated, but not holoptic, in female widely separated. Parafacialia hairy on upper half; facialia bristled on lower half; vibrissæ inserted slightly above epistomal margin; epistome directed inconspicuously forwards and downwards. Jowls one-third to one-half eye-height Arista long-plumose on one-third of its length. Palpi more or less filiform. *Thorax*: three posterior dorso-centrals; a presutural intra-alar bristle present, posthumerals 4; prosternum and propleura hairy; convexity above posterior spiracle bare. *Abdomen*: somewhat decumbent macrochætæ on second, third, and fourth visible segments. Male genitalia inconspicuous. *Wings*: base of third vein above and below bristly. Lower lobe of squamæ bare.

Distribution.—Palæarctic, Nearctic, and Oriental regions.

This generic description is drawn from specimens of the two Palæarctic species available to us. It has been left very indefinite in the hope that it will embrace the Oriental species, which we have not seen. The most striking thing about these species is that they have the sternopleural bristles 1 : 1,

whereas in the Palæarctic forms these are arranged 2 : 1. This character indicates a possible affinity of Malloch's species with the *Pollenia* group, but without examining the specimens it is impossible to make any further comment.

Key to the Species of Melinda

1. Mesonotum with distinct longitudinal stripes . . . . 2.
   Mesonotum with at most faint longitudinal stripes . . . . . *sumatrana* (Mall.), [p. 114
2. Frons, in side view, forward directed, so that anterior border of eye is widely separated from base of antennæ. 1st posterior cell narrowly open . . . . . *grisea* Mall., p. 113.
   Frons, in side view, more vertical, so that anterior border of eye approaches insertion of antennæ to a distance equal to the breadth of its third segment seen laterally. 1st posterior cell more widely open . . . . *kocki* Mall., p. 112

69 **Melinda kocki** Malloch (Fig. 54.)

Melinda kocki Mall., Suppl. Ent. xvi, p. 54, 1927.
Type-locality. Sumatra. *Type* in the Zool. Mus. Amsterdam.

♂.—*Head*: black, frontal orbits and parafacialia silvery-grey dusted. Frons at narrowest about as wide as third antennal

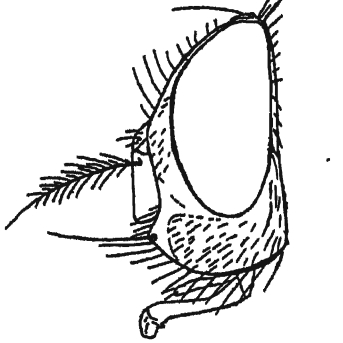


Fig. 54.—*Melinda kocki* Malloch: head. (From Malloch.)

segment, setulose to anterior ocellus. Parafacialia not as wide as third antennal segment in profile. Genæ as high as length of third antennal segment. Antennæ black, third segment fully two and a half times second. Arista plumose on basal two-thirds, bare apically. Palpi brownish. Cephalic hairs all black. *Thorax*: black, slightly shining, without metallic lustre, the dorsum slightly grey-dusted, with three broad dark vittæ, and between these narrow vittæ, when seen from behind.

Anterior spiracular covering black. Acrostichals 2 : 3, five bristles on the sublateral area ; sternopleurals 1 : 1. *Abdomen* : black, narrowly ovate ; quite densely blue-grey dusted, with a narrow dark dorso-central vitta and slight chequerings apically ; bristles on apices of tergites 2 to 4, inclusive, long. *Wings* : slightly brown-tinged basally. Calypters and halteres yellow. Lower calypter bare, with a few setulæ on ridge at its base. *Legs* : black.

Length 6 mm.

This species has the head more flattened antero-posteriorly than the typical species of *Melinda*, and the general colour and presence of the posterior sublateral bristle, as well as the open first posterior cell and black spiracular covering, should readily distinguish it from its allies.

Bionomics.—Nothing is known.

Distribution.—Sumatra, Fort de Kock.

70 **Melinda grisea** Malloch. (Fig. 55.)

Melinda grisea Mall., Suppl. Ent. xvi, p. 55, 1927.
Type-locality : Sumatra. *Type* in the Zool. Mus., Amsterdam

♀.—*Head* : rather large, black, with dense grey dust, that on the parafacialia slighly yellowish. All cephalic hairs black. Frons at vertex a little less than one-third of head-width,

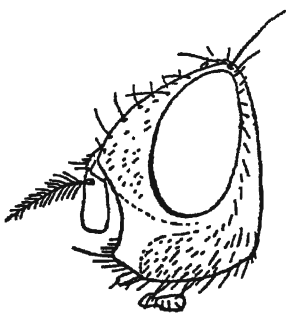


Fig. 55.—*Melinda grisea* Malloch : head. (From Malloch.)

widened to anterior margin ; each orbit with two upper, forwardly directed bristles and about six incurved inner marginal bristles. Inner verticals much longer than outer pair, the latter about as long as the ocellars. Orbits with few hairs. Parafacialia with short hairs. Vibrissæ comparatively weak and short. Antennæ fuscous, apex of second, base of third segment, and its inner and lower sides testaceous-yellow. Palpi testaceous-yellow. *Thorax* : black, not distinctly shining, with quite dense grey dust, mesonotum with four dark vittæ, most evident when thorax is viewed from

behind, and behind suture there is a rather less distinct broad central vitta between the two submedians, prothoracic spiracular covering fuscous. All hairs black. Dorsum with sparse short hairs. Acrostichals: one short and one long presutural, two long postsutural. The usual dorso-centrals, and only two bristles on the presutural area, the posterior sublateral and outer posthumeral lacking; pre-alar very short; posterior post-alar twice as long as the anterior. No hairs on the anterior extremity of the supra-squamal ridge Sternopleurals 1 : 1. *Abdomen* concolorous with thorax, the dusting more yellowish, and changeable according to angle of view. Second visible tergite with a pair of short central apical bristles, third with an apical series of bristles. *Wings*: greyish hyaline, calypters white, with a yellowish tinge. Bend of fourth vein rather broad, not evenly rounded, apical section almost straight. First posterior cell ending close to wing-tip, narrowly open. Halteres yellow.

Length 4·5 mm.

Bionomics.—Nothing is known.

Distribution.—Sumatra, Fort de Kock.

71. **Melinda sumatrana** (Malloch).

Neomelinda sumatrana Mall., Suppl. Ent. xvi, p. 53, 1927.
Type-locality: Sumatra. *Type*, "will be disposed of in accordance with his (Mr. E. Jacobsen's) desires."

♂.—*Head*: black, frons linear above, expanded into a broad triangle anteriorly, which alone is bristled. Parafrontalia and parafacialia grey-dusted, the latter with sparse, microscopic pale hairs above. Genæ about twice as high as width of third antennal segment, black-haired. Antennæ black, third segment about twice as long as second. *Thorax*: black, slightly shining, almost devoid of traces of longitudinal stripes. Acrostichals 1 : 2, dorso-centrals 2 : 3. Inner posthumeral slightly behind and distinctly interior to the other. Surface hairs on mesonotum sparse and fine. *Abdomen*: black, with faint traces of brownish dust. Tergal hairs erect and fine, bristles on sides, long bristles at apex of third segment, the discals and apicals on fourth shorter and weaker. *Wings*: smoky, calypters and knobs of halteres fuscous. Bend of vein IV not very broadly rounded. *Legs*: black, front tibia with one antero- and one postero-dorsal bristle, with some much shorter bristles basal to the antero-. Mid-tibia with a ventral bristle. Hind tibia with two antero-dorsal, two antero-ventral, and two postero-dorsal bristles.

Length 5 mm.

Bionomics.—Nothing is known.

Distribution.—Sumatra: West Coast, Gunung Singgalang, 5500 ft.

Genus 16 **POLLENIA** Robineau-Desvoidy.

Pollenia R.-D., Myodaires, p. 412, 1830. Genotype, *Musca rudis* Fab. by original designation
Nitellia R.-D., Myodaires, p. 417, 1830.
Cephysa R.-D., Hist. Nat. Dipt. II, p. 677, 1863
Orizia R.-D., Hist. Nat. Dipt. II, p. 678, 1863.
Polleniopsis Tnsd., Rec. Ind. Mus. XIII, p. 201, 1917.
Dexopollenia Tnsd., Rec. Ind. Mus. XIII, p. 201, 1917.
Lispopsarea Aldr., Rec. U. S. Nat. Mus. LXXVIII, Art. 1. p. 4, 1930.
Ocrisia Tnsd., Man. Myiol. II, p. 159, 1935.

Head: eyes more or less approximated in male, widely separated in female, rather small, occupying upper two-thirds

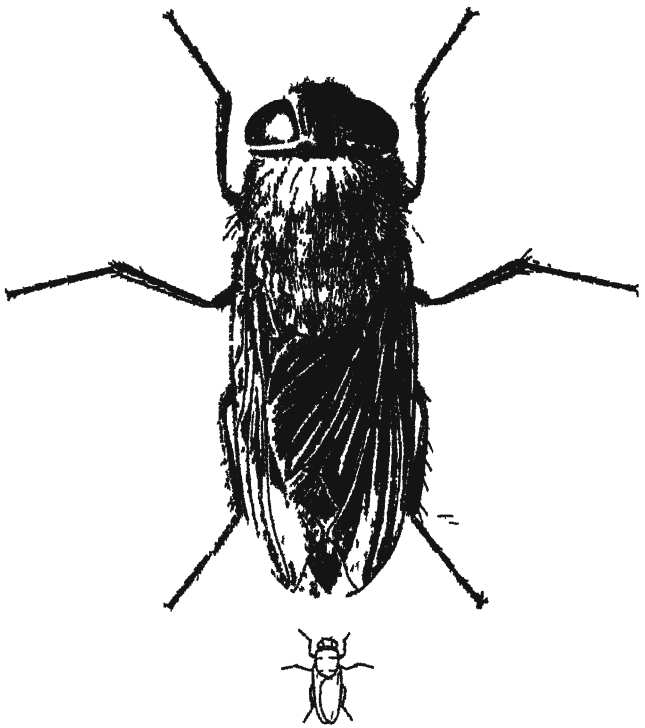


Fig. 56.—*Pollenia rudis* (Fabricius). Imago. (From Austen.)

or less of head. Parafacialia broad, setulose in greater or lesser degree, or bare. Face rather sunk between facialia, generally with some indication of a carina. Vibrissæ inserted more or less distinctly above epistomal margin. The lower part of the face runs vertically between, and level with, the

vibrissal angles to the oral margin. Genæ very broad. Ocellar bristles well developed. Males without, females with fronto-orbital bristles. Arista plumose. *Thorax*: dorso-centrals 2 : 3, prosternum and propleura hairy or bare. Sterno-pleurals 2 : 1 or 1 : 1. *Abdomen*: usually grey with changing tesselate pattern. Male hypopygium not very strongly developed. *Wings*: stem-vein bare. Vein IV bent forwards more or less at right angles. Subcostal sclerite with or without fine bristles. *Legs*: strongly bristled.

Distribution.—Holarctic and Oriental regions.

Key to the Species of Pollenia.

1.	Parafacialia with short hairs, sometimes very fine and sparse	2.
	Parafacialia absolutely without hairs	9.
2.	Squama bare	3.
	Squama with a patch of setulæ on lower lobe	5
3.	Propleura bare	4. [p. 119.
	Propleura with very fine pale hairs	*townsendi*, nom. nov.,
4.	Face covered with grey tomentum	*rudis* (Fab.), p. 117.
	Face black, epistomal margin yellow	*hazaræ* (Sen.-Wh.),
5.	Propleura hairy	6. [p. 124.
	Propleura bare	*inconclusa* (Wlk.), p. 123.
6.	Acrostichals only present as prescutellars	*pilosa* (Tnsd.), p. 121.
	More than one pair of acrostichals	7.
7.	Presutural intra-alars present. A strong facial carina, slightly flattened at level of second antennal segment	[p. 122. *toropei* (Sen.-Wh.),
	Presutural intra-alars absent	8.
8.	Thorax and abdomen black, blush-grey dusted. Wings hyaline	[p. 119. *khasiensis* (Sen.-Wh.),
	Thorax and abdomen silvery grey. Wings yellow. In ♂, at least, front tibia with a tuft of hairs on inner side	[p. 120. *mongolica* (Ség.),
9.	Wings strongly infuscated on anterior margin	[Wh.), p. 125. *argenticincta* (Sen.-
	Wings hyaline or with a uniformly yellowish tint	10.
10.	Facial carina low and rounded, sometimes almost unrecognizable	11.
	Facial carina broad, angular, and well developed	15.
11.	Abdomen without obvious tomentum	12.
	Abdomen more or less covered with tomentum	13.
12.	Abdomen entirely yellow	*flava* (Aldr.), p. 130.
	Abdomen mostly shining dark grey	*monedulita*, sp. n.,
13.	Carina almost unrecognizable	14. [p. 131.
	Carina distinct. Thorax covered with gold, crinkly hair	*luteola* Vill., p. 131.
14.	Abdomen, viewed from behind, with hind margin of first and all of the other visible tergites thickly covered with yellowish-silver tomentum	*bicolor* (Mall.), p. 128.

	Abdomen, viewed from behind, with third and fourth visible tergites thinly and unevenly covered with grey tomentum .	[p. 129. *luteventris* (Mall.),
15.	Legs testaceous to brownish, tarsi blackened	16.
	Middle and hind femora, at least, yellow; tibiæ and tarsi dark brown to black. Wings yellowish. Vibrissæ inserted, above oral margin by distance equal to length of third antennal segment	[p. 126. *bicoloripes* (Mall.),
16.	Wings yellow, abdomen entirely tessellated	*asiatica* (Sen.-Wh.),
	Wings hyaline. Third and fourth abdominal segments brown on posterior half.	[p. 126. *testacea* (Tnsd.), p. 129.

72. Pollenia rudis (Fabricius) (Figs. 56, 57, & 58)

Musca rudis Fab., Ent. Syst. iv. p. 314, 1794
Type-locality: Germany. *Type* at Kiel?

♂.—*Head*: eyes bare (under high magnification with very short and very sparse hairs), in male closely approximated, but

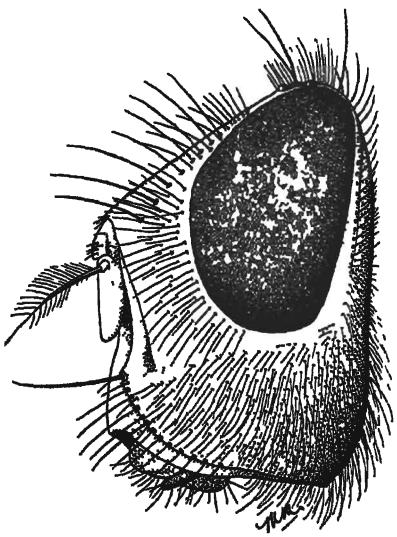


Fig. 57.—*Pollenia rudis* (Fabricius) head.

not actually touching, for short distance, in female separated at vertex by distance slightly less than one-third total head-width; frons dark reddish-brown, obliterated above in male, in female more or less parallel-sided, about four times as wide as one of the parafrontalia; parafrontalia yellowish-grey dusted, in male almost linear and touching for short distance above, broader below, in female at narrowest part about equal in

width to width of third antennal segment, male without, female with fronto-orbital bristles, parafacialia broad, grey-dusted, reddish below, a band of fine setulæ running down parallel to the eye-margin, jowls grey-dusted, reddish towards epistome, in male about two-thirds eye-height, in female equal to eye-height; facialia rather inflated, convergent below, the vibrissæ inserted well above upper margin of epistome; face grey-dusted, with indication of a low carina between bases of antennæ, lower part very slightly convex, passing vertically downwards between vibrissal angles; first and second antennal segments reddish, third dark brown, slightly reddish below, two-and-a-half to three times length of second;

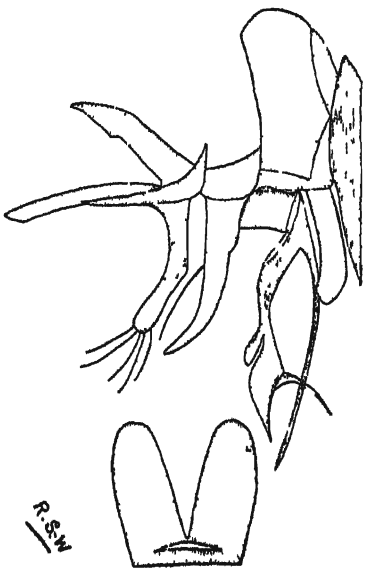


Fig. 58. *Pollenia rudis* (Fabricius): ♂ genitalia.
(From Senior-White.)

arista plumose, basal half thickened; palpi dark brown. *Thorax*: dark grey, thickly covered with crinkly golden hairs (these are very easily rubbed off, but vestiges of them can generally be seen); chætotaxy: acrostichals 2 : 3, dorsocentrals 2 : 3, intra-alars 2; supra-alars 3; post-alars 2; humerals 3; posthumerals 3; prostigmatic and presutural intra-alar bristles present; sternopleurals 1 : 1; prosternum and propleura bare; scutellum with four pairs of marginal and one pair of discal bristles; supra-squamal ridge bare; post-alar declivity with a tuft of golden hairs. *Abdomen*: dark grey, with changeable tesselated pattern; male hypopygium

inconspicuous. *Wings*: hyaline; stem-vein bare, third vein with five or six small setulæ on upper side at base; basicostal scale dark orange; subcostal sclerite with a few fine bristles. Squama bare, white with pale yellow margin. Halteres orange *Legs*: greyish-black, the tibiæ strongly bristled.

Length 7 mm. (very variable).

Bionomics.—Keilin (Bull. Sci. Fr. et Belg. xlix, p. 15, 1915) has described very fully the larval parasitism of this species in the earthworm *Allolobophora chlorotica* Savigny.

Distribution.—Palæarctic and Nearctic regions. Recorded from INDIA: Kashmir and Waziristan, and Chitral (Brit Mus. Coll.).

73. **Pollenia townsendi**, nom. nov.

Ocrisia testacea Tnsd., Man. Myiol. ii, p. 159, 1935; id., loc. cit. v p. 117, 1937 [first specific description].

Type-locality: India, Punjab, Simla. *Type* in the Paris Museum

The sinking of the original genus involves changing the specific name, as *testacea* is preoccupied by Townsend's species.

♂.—*Head*: frontalia pinched out, parafrontalia a sky-grey, parafacialia concolorous, below brownish-yellow, as is also the epistomal area of the grey genæ. Parafacialia with sparse, very pale hairs. Face grey-yellow below the antennæ, no carina. Antennæ, first and second segments testaceous, third pollinose. Palpi orange. Vibrissæ very strong, decumbent. *Thorax*: grey, with about four ill-defined dark stripes. Humerals yellowish. Acrostichals 2:3, dorso-centrals 2:3; humerals 3; posthumerals 2; a presutural intra-alar; supra-alars 3; post-alars 2; post-alar convexity bare. Sternopleurals 1:1; propleura with very fine hairs. *Abdomen*: yellow, a fine black median stripe on first to fourth visible segments. Hind margin of second very narrowly black; third with large dark submarginal patches; fourth with discals. *Wings*: hyaline, squama bare. *Legs*: femora and tibia yellow, tarsi darkened.

Length —Not stated in description

Bionomics.—Nothing known.

Distribution.—INDIA: Punjab, Simla.

74. **Pollenia khasiensis** (Senior-White).

Nitellia khasiensis Sen.-Wh., Mem. Dept. Agr. Ind., Ent. Ser. vii p. 49, 1923.

Type-locality: India, Assam, Karia Hills. *Type* and *paratypes* in the British Museum.

♀.—*Head*: eyes bare, separated at vertex by distance equal to one-third width of head; frons dark reddish, parallel-sided, about three times as broad as one of the parafrontalia; parafrontalia greyish-silver dusted, about one and a half times width of third antennal segment, almost bare except for fronta and

fronto-orbital bristles, parafacialia greyish-silver dusted, with a few minute setulæ on upper part; face and jowls greyish-silver dusted, the latter with short sparse bristles; medianæ slightly darker; face rather sunk, with a slight indication of a rounded keel at base of antennæ; first and second antennal segments dark brown, third brown, reddish at base, about two and a half times length of second, arista plumose, thickened at base, second segment clearly visible; palpi dark orange. *Thorax*: black, thickly covered with bluish-grey dust, with indications of four black stripes anteriorly. Chætotaxy: acrostichals, 1 : 3, dorso-centrals 2 3, intra-alars 2, supra-alars 3, humerals 2, posthumerals 2, presutural intra-alar absent, sternopleurals 2 : 1. Prosternum hairy; propleura hairy, post-alar declivity with one or two setulæ; post-scutellum slightly developed. *Abdomen* black, bluish-grey dusted, with an indeterminate pattern, second visible segment with a row of fine decumbent marginal bristles, third and fourth with normal erect marginals, the latter with one or two discals as well; sternites entirely exposed. *Wings*: hyaline; veins yellow; costal scale well developed; stem-vein bare, third longitudinal vein with one or two setulæ at base above and below; basicostal scale orange, subcostal scale without bristles; fourth longitudinal vein bent forward at an obtuse angle; first posterior cell narrowly open, just before tip of wing. Squama white, with a few setulæ on lower lobe. Halteres dark orange. *Legs*: brownish-black.

Length 5 mm.

Bionomics.—Nothing is known.

Distribution.—India: Assam, Shillong.

75. **Pollenia mongolica** (Séguy).

Polleniopsis mongolica Ség., Encycl. Entom. ix, p. 119, 1928.
Type-locality: China. *Type* in the Paris Museum.

♂.—*Head*: frons at narrowest broad, equal to the size of the ocellar triangle. Orbits, at the same level, as wide as the median frontal band. Ocellar triangle not outstanding. Frontal hairs weak. Orbits red, covered with thick, silvery pile, genæ with grey pruinosity with red reflections. Face greatly produced, red above, black below, with strong median carina as thick as an antenna. Palpi yellowish. Antennæ reaching the lower border of the eyes, red, infuscated apically. Arista red. Occipital pilosity yellow, longer below, the other hairs black. *Thorax* silvery grey, with fine, short, irregular pile. Chætotaxy: acrostichals 1 : 3; dorso-centrals 2 : 3; intra-alars 2; supra-alars 3; post-alars 2; humerals 2; posthumerals 1; sub-laterals 1; prothoracic 1; mesopleurals 4–5; sterno-pleurals 1–2 : 1. A pteropleural tuft formed of numerous appressed setæ. Propleuron haired. *Abdomen* concolorous

with thorax. *Wings* yellow, veins reddish. Apical cell open. Veins III and IV running almost straight in their apical lengths. Costal spine weak. Squamæ yellowish, thoracic squama discally with a tuft of appressed hairs. Tympanic depression with a tuft of appressed hairs on the alar squama. Halteres yellow. *Legs*: front tibia with a tuft of red hairs on the inner side, appressed, extending over the apical half.

Length 7·5–8 mm.

Bionomics.—Nothing is known.

Distribution.—Mongolia; China, Zi-Ka-Wei, Annam.

76. **Pollenia pilosa** (Townsend)

Polleniopsis pilosa Tnsd., Rec. Ind. Mus. xiii, p. 202, 1917.
Type-locality: India. *Type* in the Indian Museum, Calcutta.

♂♀.—*Head*: eyes bare, in female separated at vertex by distance equal to three-quarters an eye-width, frons reddish to brownish, in female parallel-sided, about four times the width of one of the parafrontalia, which are silvery-dusted with well developed fronto-orbitals, also with minute setulæ which run down on to the upper part of the parafacialia, which are broad, silver-grey dusted. Medianæ reddish; genæ silvery-grey dusted and covered with sparse black setulæ. Face grey-dusted with sharp central carina which merges imperceptibly into the upper margin of the epistome, which stretches vertically downwards between the vibrissal angles. Antennæ reddish-orange, third segment subfulvous to darker, about three times as long as second. Arista long-plumose, thickened basally. Palpi fulvous to orange. *Thorax*: grey. In male with five black vittæ, the middle one obsolete before suture in posterior view, the two inner ones before suture, narrow in posterior view, but forming one wide vitta in anterior view. In female the vittæ are very indistinct. Chætotaxy: acrostichals 0 : 1; dorso-centrals, 2 · 3; intra-alars 2; supra-alars 3; humerals 2; posthumerals 2; presutural intra-alar absent; prostigmatic bristle present, sternopleurals 1 : 1. Prosternum, propleura, and post-alar declivity hairy. *Abdomen*: dark grey, with patches of silver-grey tomentum making a shifting pattern, the fourth visible segment almost entirely silver-grey. *Wings*: hyaline, tinged yellow, in male faintly smoky on costa; the veins bright yellow. Costal spines small but recognizable, duplicated. Stem-vein bare, vein III with one or two setulæ at base above and below. Basicostal scale orange. Subcostal sclerite without bristles. Vein IV bent sharply forward at a right angle. Squamæ yellowish, lower lobe with a patch of small black hairs. Halteres orange. *Legs*: mainly brown, femora grey-dusted. Tarsi black.

Length 6–7 mm.

Bionomics.—Nothing is known.

Distribution. INDIA: Darjeeling; Bihar, Purnea; Assam, Shillong.

The females agree fairly well with Townsend's type-males, but until a pair can be obtained *in cop.* their identity is not quite certain.

77. **Pollenia toxopei** (Senior-White). (Fig. 59.)

Paratricyclea toxopei Sen.-Wh., Rec. Ind. Mus. xxviii. p. 35, 1926. Type-locality: Dutch East Indies, Buru Island. *Type* in the British Museum.
Pollenia (*Pollenioptera*) *carinata* Mall., Suppl. Ent. xvi. p. 53, 1927. Type-locality: Sumatra. *Type* in the Berlin Museum.

♀. *Head*: eyes bare, separated in male by twice width of third antennal segment, in female by about half an eye-width. Frons reddish-brown, narrowed towards vertex in male,

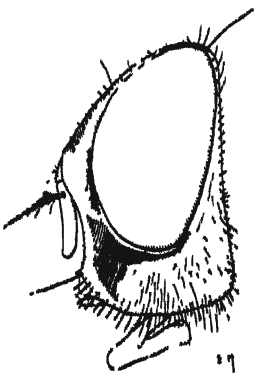


Fig. 59.—*Pollenia toxopei* (Senior-White): head.

in female widening slightly anteriorly, and about thrice width of one of the parafrontalia. Parafrontalia greyish-gold-dusted, in male narrow towards vertex, in female about twice the width of third antennal segment, bearing, in female, fronto-orbitals and fine setulæ outside the series of frontal bristles. Parafacialia fairly broad, dusted with greyish-gold tomentum, setulose above. Genæ grey, covered with fine black setulæ. Medianæ reddish, distance between bottom and lower margin of head equal to half an eye-height. Face grey-dusted, with a low, sharp carina, which is very slightly flattened between bases of antennæ. Vibrissal angles slightly approximated, the vibrissæ inserted above oral margin. First and second antennal segments dark brown, the latter with one strong bristle; third paler brown, rufous at base, very narrow, about twice length of second; arista long-plumose, thickened

on basal half. Palpi orange. *Thorax*: dark grey, silver-grey dusted, with traces of dark stripes anteriorly on dorsum. Chætotaxy: acrostichals 1 : 3; dorso-centrals 2 : 3; intra-alars 2 or 3; supra-alars 3; post-alars 2; humerals 3; post-humerals 2 or 3; presutural intra-alar present; sterno-pleurals 2 : 1, the lower anterior bristle very weak, often not distinct; prostigmatic bristle present. Prosternum, propleura, and post-alar declivity setulose; supra-squamal ridge with a patch of setulæ at anterior end, very difficult to distinguish; a patch of setulæ just underneath lower lobe of squama. *Abdomen*. dark grey with irregular patches of silver tomentum which forms a shifting pattern; marginal macrochætæ on second, third, and fourth visible segments; discals, a pair on third and generally scattered on fourth. Bristles in female fine and variable in number. Male hypopygium comparatively small. *Wings*: hyaline, slightly smoky-yellowish; vein 1 with small setulæ at base both above and below; fourth vein bent forward at right angle; basicostal scale orange, subcostal sclerite without upstanding bristles. Squamæ pale testaceous, with a small patch of fine setulæ on lower lobe. Halteres orange. *Legs*: dark grey. Front femora grey-dusted on posterior surface; front tibia a strong bristle on posterior surface; mid- and hind tibiæ strongly bristled.

Length 6-9 mm.

Bionomics.—Nothing is known.

Distribution.—Dutch East Indies; Buru Island; Java, Tjibodas; Sumatra; Admiralty Island.

78. **Pollenia inconclusa** (Walker).

Musca inconclusa Wlk., Proc. Linn. Soc. Lond. v, p. 160, 1861.
Type-locality: Amboina. *Type* in the British Museum.

♂.—*Head*: eye-facets all equal. Frons narrowed, but present throughout, black. Parafrontalia narrow, cinereous, darkened on outside on lower half in certain lights. Face concolorous, also parafacialia, which bear short hairs above. Facial carina strong. Vibrissæ at mouth-margin. Antennæ black, apex of first segment slightly and apex of second segment definitely, testaceous. Third segment about three and a half times the second. Arista strongly plumose. Anterior half of genæ castaneous, darker above. Posterior half cinereous, the junction of the two colours very distinctly defined. Genal bristles all on posterior half, except a few small ones which cross the line anteriorly below. Palpi black. *Thorax* black, all dusted with grey pollen, with traces of two pairs of narrow vittæ, one placed on dorso-central line, one midway between this and acrostichal line. Chætotaxy: acrostichals 1 : ? (type damaged); dorso-centrals 1 : 3; intra-alars 1 : 3; prae-alars 1; supra-alars 1; post-alars 2; sternopleurals

1 : 1 : propleura bare; supra-spiracular convexity bare; post-alar declivity bare; scutellum : 1 apical, 2 marginal, 1 preapical. Squamæ with a minute tuft of black hairs basally. *Abdomen* : obscurely and changeably chequered light and dark grey, with an obscure black median vitta; anterior borders of segments generally whitish-grey. Lateral marginals on all visible segments, median marginals and discals on third and fourth. *Wings* : costal scale yellow. Wing generally hyaline, base yellowish. Costal bristle strong. Vein III with two basal bristles above and four below. Halteres yellowish. *Legs* : dark brown. Front tibia with two small dorsal and one strong posterior bristle. Mid-femora with 2 strong posterior bristles on inner half and 2 3 strong preapicals. Mid-tibia with 1 dorsal, 2 postero-dorsals, and strong apicals. Hind femur with wide-spaced ventral row. Hind tibia with 2 antero-dorsals and 3 postero-dorsals.

Length 5·5 mm.

Bionomics. Nothing is known.

Distribution. Celebes, Makessar; Amboina.

79. **Pollenia hazaræ** (Senior-White).

Dexopollenia hazaræ Sen.-Wh., Mem. Dept. Agric. Ind., Ent. Ser. viii, p. 51, 1923.

Type-locality : India, Western Himalayas. *Type* at Imperial Agricultural Institute, Delhi ?.

♀. *Head* : frons one-third of head-width at level of antennæ, frontal stripe dark, with sparse scattered short black hairs; ocellar triangle and parafrontalia with dull bronzy-gold pile; parafacialia, facial ridges, and genæ similar, a large black fleck on first of these at half length and all with black hairs. Face black, epistomal margin yellow. Antennæ and palpi black, the latter subclavate. Epistome exceptionally developed, two-fifths of head-height viewed laterally. *Thorax* : dark grey, the fore margin narrowly shining black, and with four dorsal black stripes fading posteriorly. Scutellum and pleura concolorous, the whole thickly enveloped in dull golden woolly pile. Chætotaxy : acrostichals 2 : 3; dorso-centrals 2 : 3; equidistant and parallel to these is another row, 2 : 3 made up of interior presuturals and supra-alars; humerals 3 presuturals (in all) 4; alars (in all) 3, 1, 1, notopleurals 2 propleurals (strong) 2; mesopleurals 2; sternopleurals 1 : 1 scutellars, an apical, subapical, and three marginal pairs. *Abdomen* : grey-black tesselate, pattern changing according to light incidence. *Wings* : clear, veins bare, squamæ whitish. *Legs* : black, coxæ, especially front pair anteriorly, with pollen similar to thoracic pile.

Length 8 mm.

Bionomics. Nothing is known.

Distribution.—Described from an unique female in perfect condition, taken at Abbottabad, 4120 feet, October 1922 (*Dutt*).

80 **Pollenia argenticincta** (Senior-White).

Idiopsis argenticincta Sen.-Wh., Mem. Dept. Agric. Ind., Ent Ser. viii, p. 48, 1923.

Type-locality: India, Western Himalayas. *Type* in Imperial Agricultural Institute, Delhi ?.

♂♀.—*Head*: male: frons reduced to a line; ocellar triangle black, elongate, ocelli amber-colour. Frons dark brown, parafrontalia, below silvery-grey, pinched out above; face shining blackish, epistomal margin dull luteous; parafacialia silvery-grey, with a large dark brown spot on the middle. Facial ridges flattened; genæ dark grey, with a large yellowish spot anteriorly, but separated from the yellow of the epistomal margin by the dark grey of the peristomal border. Frontal bristles long but fine. Vibrissæ arising far above epistomal margin, nearly as high as tips of antennæ. Antennæ short, the distance from their tip to the epistome being more than their entire length; arista long-pubescent above, only a few short hairs in the middle below. Upper eye-facets enlarged. Palpi black, barely clavate apically. Female: frons exceeding an eye-width, the black parafacial fleck and yellow genal spot not prominent; upper half of parafrontalia shining black, the two together at least as broad as frontal stripe. Upper eye-facets not enlarged. Two or three proclinate exterior frontals. Otherwise as in male. *Thorax*: black with greyish pollen. A girdle of silvery pollen from sternopleuron, across mesopleuron, dorsally, interior to humeral region, narrowed to posterior half of presutural area, across from side to side. The prescutellar area has some silvery pollen dorsally. Chaetotaxy: acrostichals 1 : 1; dorsocentrals 2 : 3; humerals 2; prosuturals 2; notopleurals 2; alars 2 : 2 : 1; mesopleurals 4; sternopleurals 1 : 1. Hypopleurals strong. *Abdomen*: shining black, no discals except on fourth visible segment. *Wings*: infuscate along veins and with broad anterior dark stripe. Vein IV suddenly bent at a rounded angle, but its last portion parallel to vein III, which runs straight to margin, leaving first posterior cell well open. Anterior cross-vein below tip of vein I, but in one specimen there is a distinct adventitious cross-vein in both wings below tip of subcostal vein. Costal spine practically absent. No bristles on veins I and III. Squama pale. *Legs*: black, female tarsi barely widened, claws very strong, more so than in the male.

Length 5·5 mm.

Bionomics.—Nothing is known.

Distribution.—INDIA: Muktesar, Pusa, and Western Himalayas.

81. **Pollenia asiatica** (Senior White).

Paratricyclea asiatica Sen Wh., Mem Dept. Agric. Ind., Ent. Ser. VIII, p. 38, 1923.

Type locality: India, Western Ghats. *Type* in the National Hungarian Museum, Budapest.

♂. *Head*: eyes bare, in male almost completely approximated just below ocellar triangle, but below this point diverging rapidly. In female separated by one-third total head-width. Frons dark reddish brown, triangular in male, in female parallel sided, four times the width of one of the parafrontalia. Parafrontalia yellowish-silver, with dark reflections, much narrowed towards the vertex in male and contiguous for a short distance. In female about one and a half times width of third antennal segment, in both sexes sparsely covered with minute setulæ, outside a series of frontal bristles. Parafacialia broad, silvery above, reddish below, upper part covered with minute short setulæ; genæ silvery-grey, face testaceous-brown, very sparsely silver-dusted, with well-developed carina; vibrissæ approximated and inserted well above oral margin. Antennæ with first and second segments testaceous, also base of third, the lower two-thirds of which are brown. Arista plumose, more strongly so on upper than on underside. Palpi filiform, yellow. Succiput with a few pale hairs. *Thorax*: dark brownish, with testaceous scutellum, patchily covered with yellowish-grey dust which leaves traces of dark stripes on dorsum. Chætotaxy: acrostichals 0 : 1; dorso-centrals 2 : 3; intra-alars 1; supra-alars 2; posthumerals 2; prosternum and propleura hairy. Post-alar declivity with a few black setulæ. *Abdomen*: blackish, with a shifting pattern of yellowish tomentum. *Wings*: hyaline, with a distinctly yellowish tint. Vein IV bent forwards at an obtuse angle, first posterior cell rather widely open near tip of wing. Squamæ and halteres pale testaceous. Squama with a small patch of setulæ on lower lobe. *Legs*: mainly yellow, tarsi blackish.

Length 7 mm.

Bionomics. Nothing is known.

Distribution.—INDIA: Western Ghats, Matheran.

82. **Pollenia bicoloripes** (Malloch). (Figs. 60 & 61.)

Dexopollenia bicoloripes Mall., Ann. Mag. Nat. Hist. (10) vii, p. 199, 1931.

Type-locality: Federated Malay States, Selangor, Bukit Kutu. *Type* in the British Museum.

♂. - *Head*: eyes bare, almost touching at one point; frons dark reddish-brown, obliterated above, widening rapidly anteriorly; parafrontalia narrow, contiguous below ocellarium, golden-brown dusted, bearing a row of frontal bristles with a few fine setulæ outside them; parafacialia, face and genæ

orange-brown, thinly dusted with golden tomentum ; parafacialia very broad, bare ; genæ very deep, bare except towards lower hind margin of head ; face with a broad flat carina, slightly sulcate in the middle, which leaves a groove on each side underneath the antennæ, the lower part almost level with highest part of carina, running vertically downwards between approximated vibrissal angles ; facialia quite bare ; antennæ orange, third segment about twice length of second ; arista plumose, thickened on basal half ; palpi orange. *Thorax* : dorsum dark blackish-grey, more or less covered with crinkly gold hairs ; pleura orange, with tufts of golden hairs ; metanotum shining black, with a slight indication of a postscutellum ; prosternum and propleura bare ; supra-squamal ridge bare, post-alar declivity with a few hairs. Chætotaxy :

Fig. 60.

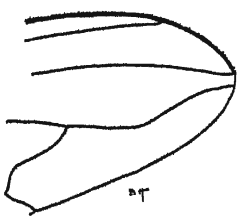


Fig. 61.

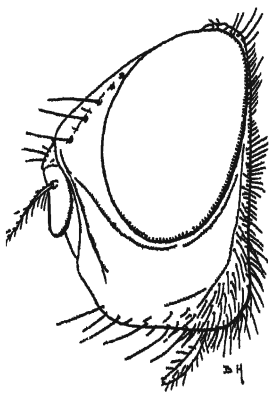


Fig. 60.—*Pollenia bicoloripes* (Malloch) : wing.
Fig. 61.—*Pollenia bicoloripes* (Malloch) : head.

acrostichals 1 : 2 ; dorso-centrals 2 : 3 ; intra-alars 2 ; supra-alars 2 ; post-alars 2 ; humerals 2 ; posthumerals 2 ; presutural intra-alar absent ; prostigmatic bristle present ; sternopleurals 1 : 1. *Abdomen* : mainly orange, covered with fine upstanding black bristles ; first visible segment orange, second orange with a black band posteriorly, broken in the middle ; a row of marginal macrochætæ, the central pair slightly inset ; third segment orange anteriorly, the posterior half broadly black, rather shining, with a row of strong marginal macrochætæ ; fourth segment black with orange mark anteriorly ; the tip of the abdomen has a truncated appearance, the last sternite has a V-shaped excision and lies like a shield over the hypopygium. *Wings* : hyaline, yellowish, the fourth longitudinal vein bent gently forward at a very obtuse angle and the first posterior cell rather widely

open at extreme tip of wing; stem-vein and third longitudinal vein bare; basicostal scale brown; subcostal sclerite without bristles. Squama bare, testaceous. Halteres orange. *Legs* (front pair missing in type): femora orange, tibiæ and tarsi black; strongly bristled.

Length. ·7 mm.

Bionomics. - Nothing is known.

Distribution. - Federated Malay States: Selangor, Bukit Kutu.

83. **Pollenia bicolor** (Malloch).

Dexopollenia bicolor Mall., Jour. F. M. S. Mus. xvii, p. 671, 1935. Type-locality: Malaya. *Type* in the British Museum.

♂. Eye-facets slightly smaller below than above. Eyes very closely approximated, the parafrontalia contiguous at one point. Ocellar triangle above this, and frons and parafrontalia below, black, the former rather more dull than the latter. About nine fronto-orbitals. Face very dark shining greyish, epistomal margin dull yellowish. A very weak, barely noticeable carina. Parafacialia cinereous, sharply defined from parafrontalia, quite bare. Vibrissæ arising halfway between epistomal margin and tip of antennæ. Antennæ greyish-black, base of third segment paler. Arista biplumose, thickened basally. Genæ castaneous anteriorly, shining cinereous posteriorly, the junction sharply defined; all but a few weak bristles on the posterior half. Palpi brown. *Thorax*: uniform dull black. Chætotaxy: acrostichals 0:1; dorso-centrals 2:3; intra-alar 1: supra-alars 2; pre-alar 1; post-alar 1; propleura bare; post-alar declivity bare. There are traces of longish pale pilose hairs, widely spaced, along sides of mesonotum, and more closely so along its hind margin. A longer tuft of pale hairs below the anterior spiracle, and a big tuft, black in front, golden behind, below wing-roots. *Abdomen*: 1st visible segment dark castaneous, the others light grey; both margins of second very narrowly, and posterior margin of third and tip of fourth more broadly, whitish. Traces of a brown median stripe visible on 2nd and 4th. Marginals to all segments. Discals on 2nd to 4th. Abdominal bristles long, strong, black. *Wings*: yellow, more so along costa. No bristles except on node, where there is one above and two below, all weak. Squamæ testaceous, the lower one bare. *Legs*: all black, bristly.

Length 6·5 mm.

Bionomics.—Nothing is known.

Distribution.—Federated Malay States: Perak, Larut Hills, 4500 ft.

84. **Pollenia hirtiventris** (Malloch).

Dexopollenia hirtiventris Mall., Jour. F. M. S. Mus. xvii, p. 669, 1935. Type-locality: Malaya. *Type* in the British Museum.

♂♀.—*Head*: frons in male reduced to a line, black, the lunula shining testaceous. Parafrontalia brownish-cinereous, about six fronto-orbitals. Face cinereous-grey, testaceous below. No carina. Epistomal margin paler yellowish. Parafacialia brownish-cinereous, paler than the parafrontalia, showing dull silvery in certain lights, bare. Vibrissæ far above mouth-margin. Genæ brownish, much darker anteriorly, the line of junction distinct, none of the smaller discal bristles on the anterior half. First two antennal segments brown, third very much darker, with grey pollen. Palpi testaceous. In the ♀: frontal width less than one-third of head-width. Frons dark castaneous, rather paler below. Parafrontalia dark cinereous. Face as in male, but with a distinct, low, very broad carina. Posterior half of genæ more cinereous. *Thorax*: very dark brown, covered with fine golden pile, some grey pollen anteriorly. A pair of presutural black vittæ, diverging posteriorly, more or less in the acrostichal position. Pleura with grey pollen and thick golden pile. Chætotaxy: acrostichals 0 : 1 (prescutellar); dorso-centrals 2 : 3; intra-alars 1 : 2; pre-alars 2; supra-alars 1; post-alars 1. Scutellum with long black pile, golden on the free margins, with a marginal and an apical pair of bristles. Propleura bare. Sub-alar convexity with fine golden upstanding hairs and one black bristle. Post-alar declivity bare. Sternopleurals 1 : 1. *Abdomen*: very dark grey, shining on 1st and 2nd, 3rd and 4th appearing lighter grey owing to pollen. A faint median stripe on IV. First segment bare, 2nd with a complete row of marginals. 3rd and 4th with marginals and discals. Venter brownish, with long black bristles, shorter and denser along margins of sternites. *Wings*: hyaline, yellowish basally and along veins. No bristles on any vein. Costal bristle very weak. Squamæ yellow, the lower one bare. Halteres yellow. *Legs*: all black in male, in female femora and tibiæ brown.

Length 8–9 mm.

Bionomics.—Nothing is known.

Distribution.—Federated Malay States: Pahang, Fraser's Hill, 4000 ft.; Perak, Larut Hills, 4500 ft.

85. **Pollenia testacea** (Townsend).

Dexopollenia testacea Tnsd., Rec. Ind. Mus. xiii, p. 201, 1917. Type-locality: Assam. *Type* in the Indian Museum, Calcutta.

♂♀.—Fulvo-testaceous, shaded to brown. *Head*: with pale

brown shading over face and cheeks; the parafrontalia dark brown, thinly silvery pollinose, leaving three main darker areas on vertex, middle, and opposite base of antennæ, the vertical area not showing in male. *Thorax* and scutellum mostly brown; the scutum blackish, but showing some silvery pollen. *Abdomen* with hind borders of segments brown, the third and anal brown on posterior half, or anal wholly brown. *Wings*: clear. Squamæ smoky. *Legs*: testaceous, tinged with brown; tarsi blackish.

Length of body 5·5 mm.; of wing 6 mm.

Bionomics.—Nothing is known.

Distribution.—INDIA: Assam-Bhutan frontier, Mangaldai District.

86. **Pollenia flava** (Aldrich).

Lispoparea flava Aldr., Proc. U.S. Nat. Mus. lxxviii, Art. 1, p. 5, 1930.

Type-locality: China. *Type* in the United States National Museum, Washington.

♂.—*Head*: eyes almost contiguous in front, separated by less than width of anterior ocellus, then diverging rapidly. Upper facets larger than lower. Frontal stripe yellow, a broad triangle, disappearing at narrowest part of front. No verticals. No reclinate frontals. Ocellars hair-like. Frontals beginning far forward, weak, about 10, barely reaching base of antennæ. Whole head rather dull yellow but not distinctly pollinose. Antennæ yellow, third segment rather more than twice second; arista short, plumose to tip. Palpi rather small, yellow. Proboscis slightly elongate. Genæ yellow, two-thirds an eye-height. *Thorax*: disc of mesonotum, except for the margins, and metanotum brown. Margins of mesonotum, scutellum, and pleura yellow. Chætotaxy: acrostichals 1 : 1 (?); dorso-centrals 2 : 3; humerals 2; posthumerals 1; presutural 1 (placed far forward); noto-pleurals 2; supra-alars 2; intra-alars 2; post-alars 2; sternopleurals 1 : 1. Scutellum with two lateral and one equally strong apical. Squamæ light yellow. *Abdomen*: wholly pale yellow, subshining, without distinct pollen. Genital segments concolorous. First visible segment with only lateral margins, others with complete row, but no discals. *Wings*: hyaline, with yellow veins. Vein IV converging to III quite gently. *Legs*: yellow, tarsi gradually browned to tip. Claws and pulvilli not enlarged. Front tibia with one bristle on outer hind side.

Length 6·5 mm.

Bionomics.—Nothing is known.

Distribution.—China: Szechuen Prov., Mt. Omei.

This species is quite possibly not Oriental.

87. **Pollenia monsdulitæ**, sp. n.

Type-locality: Borneo. *Type* and *paratype* in the British Museum.

♂♀.—*Head*: frons nearly one-third head-width, dark ashy-grey, ocellar triangle dark brownish. Parafrontalia dark grey pollinose, not well distinguished in colour from frons, very narrow. Lateral post-verticals present. Fronto-orbitals three, all strong, the uppermost reclinate, the two lower proclinate. Face yellowish-cinereous, carina only between the bases of the antennæ. Parafacialia more greyish, absolutely bare. Genæ brown anteriorly, posteriorly cinereous. Vibrissæ inserted above mouth-margin at a distance equal to nearly half length of third antennal segment. Antennæ, first two and base of third segment bright testaceous, remainder of third from a little beyond insertion of arista blackened. Bristle on second segment extremely long, nearly two-thirds length of arista, which has the shaft black. Palpi not clavate, dark brown, paler basally. *Thorax*: dorsum, ground-colour brown, with ill-defined paler areas, all covered with bright golden crinkly pile, which extends over the dark brown scutellum. Pleura testaceous, the pro-, meso-, and ptero-pleura with bright golden hairs. Centre of propleura bare. Chætotaxy: acrostichals 0 : 1; dorso-centrals 2 : 3; humerals 2; posthumerals 2; notopleurals 2; intra-alars 3; alars, pre- 2; supra- 2; post- 1. *Abdomen*: shining very dark grey, with covering of black microchætæ. There may be some testaceous on disc of first visible tergite, not extending to the front and hind margins, laterally first visible tergite definitely testaceous. *Wings*: yellowish, more infuscated beyond the anterior cross-vein and along costa beyond apex of vein I. Squamæ bright golden-yellow, bare. *Legs*: femora testaceous, tibiæ and tarsi darkened. Mid-tibia with two antero-dorsal and two postero-dorsal, hind tibia with two antero- and three postero-dorsal bristles from sub- to post-medianly. Tarsal apical spines strong.

Length 8·9 mm.; wing 9·10 mm., extending considerably beyond tip of abdomen.

Bionomics.—Nothing is known.

Distribution.—Borneo: Sarawak, Mt. Dulit, 4000 ft., moss forest.

88. **Pollenia luteola** Villeneuve.

Pollenia luteola Vill., Rev. Zool. Afr. xv, p. 393, 1927.
Type-locality: Formosa. *Type* in the Berlin Museum.

♀.—*Head*: eyes bare, separated at vertex by slightly less than one-third total head-width. Frons dark reddish-brown, thrice the width of one of the parafrontalia, broadening anteriorly;

ocellar triangle somewhat golden. Parafrontalia at narrowest part about twice width of third antennal segment, covered with golden tomentum, with decumbent setulæ outside the frontal series. Parafacialia fairly broad, covered with golden tomentum, and showing reddish reflections in certain lights, devoid of setulæ. Medianæ large, reddish. Genæ silvery-golden, covered with fine black setulæ. Facialia devoid of bristles except just above the vibrissæ, which are inserted slightly above the oral margin; face silvery-grey, carina broad, low and rounded, but well defined. Antennæ brown, third segment narrow, about thrice length of second, and reddish at base on outer side. Palpi dark brown, very slightly clavate, and rather strongly bristled. *Thorax*: black, pleura dark silvery-grey, the whole covered with long, soft, slightly curly golden hair. Chætotaxy: acrostichals 0:2 3(?); dorso-centrals 2:3; intra-alars 2; supra-alars 2 or 3; posthumerals 2; presutural intra-alar absent. Prosternum bare; sternopleurals 1:1. *Abdomen*: first and second visible segments testaceous, the first with a black mark centrally, the second with a black triangle, the base on the posterior margin, the apex reaching the anterior margin. Third and fourth segments blackish. The whole rather unevenly covered with golden tomentum. *Wings*: yellowish, the fourth vein rounded, making an obtuse angle, but the angle is less wide than usual in the genus. Basicostal scale black. Subcostal sclerite with golden hairs. Squamæ pale testaceous. Halteres orange. *Legs*: blackish brown.

Length 5 mm.

When redescribing the types, we were unable to see the male. Villeneuve's description states that the palpi are yellow, which must be a male character only. He states that in this sex there is a complete row of marginals on visible abdominal segments II, III, and IV, each preceded by a pair of median discals, and numerous disco-laterals, whereas the female has no abdominal bristles. The discrepancies suggest to us the possible grouping of two species under one name. The male, from the description, might almost be a Tachinid.

Bionomics.—Nothing is known.

Distribution.—Formosa, Kosempo and Tai-horinsho.

Genus 17. **WILHELMINA** Schmitz & Villeneuve.

Wilhelmina Schm. & Vill., Natuur. Maandblad, xxi, p. 116, 1932. Genotype, *W. nepenthicola* Schm. & Vill., the original species.

Head: vibrissæ at level of mouth-margin; parafacialia bare, except perhaps at extreme upper margin. Third antennal segment five to six times length of second. Arista short-plumose for three-quarters of its length. *Thorax*: sternopleurals 1:1. Convexity above posterior thoracic

spiracle with short hairs. *Wings*: first posterior cell closed in the wing-tip. Squama bare.

The genus was not properly characterized by its authors, but was erected in the specific description to cover the following aberrant species, of peculiar larval habitat. Its affinities in the subfamily are obscure.

89. **Wilhelmina nepenthicola** Schmitz & Villeneuve. (Fig. 62.)

Wilhelmina nepenthicola Schm. & Vill., Natuur. Maandblad, xxi, p. 116, 1932.

Type-locality: Borneo. *Type* in Villeneuve's collection.

♀.—*Head*: eyes bare, separated at vertex by a little less

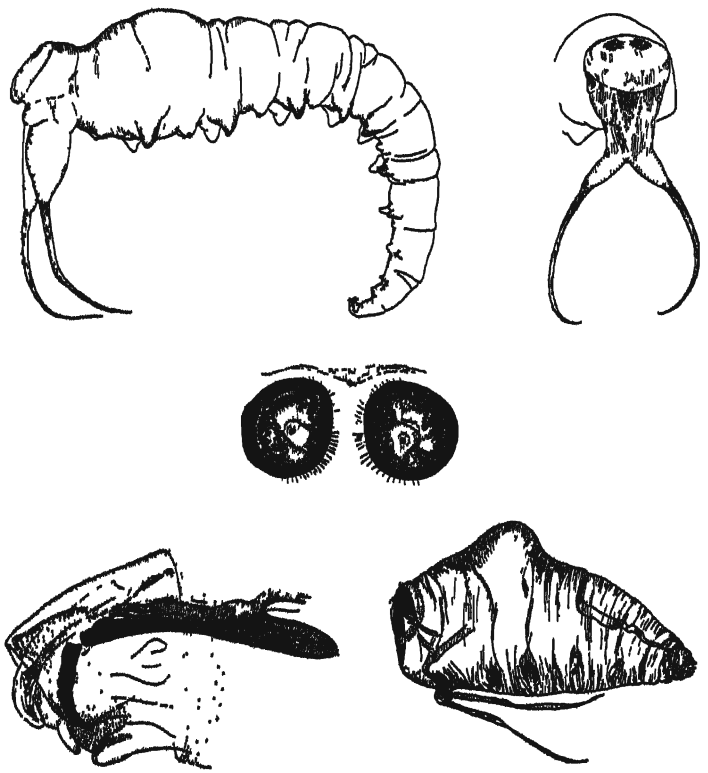


Fig. 62.—*Wilhelmina nepenthicola* Schmitz & Villeneuve: larva, details of larva and pupa. (From Schmitz & Villeneuve.)

than one-third total head-width. Frons reddish-brown, a good deal narrower than the parafrontalia, which are covered with silver-grey tomentum, with short, fine hairs reaching

to a little below point of insertion of antennæ, black towards vertex, pale lower down. Face, parafacialia, and genæ covered with silver-grey tomentum. Genæ one-quarter to one-third total eye-height, with pale hairs. Ocellar and inner and outer verticals present, the inner verticals decussate; there are also a pair of proclinate and a pair of reclinate bristles near vertex, outside the frontals; the upper frontals reclinate. Vibrissæ strong, at level of mouth-margin. Antennæ dark brown, third segment five times length of second, arista short-plumose on three-quarters of its length. Palpi dark brown. *Thorax*: heavily grey-dusted, with an indefinite dark mark across suture and base of scutellum. Chætotaxy: acrostichals 2 : 3; dorso-centrals 3 or 4 : 4; intra-alars 3; supra-alars 3; presutural present; humerals 3 or 4; sternopleurals 1 : 1, very strong; pteropleura with a little bunch of bristles. Pleura covered with soft pale hairs. Post-alar declivity long, setulose, where short black hairs replace some of the pale hairs below. Prosternum and propleura bare. *Abdomen*: testaceous, covered with golden tomentum, and with an indefinite median longitudinal dark line, extended laterally to hind margins of segments. Third and fourth visible segments with marginal macrochætæ, and a few on lateral margins of first two segments also. *Wings*: hyaline, vein III curved, ending almost at wing-tip. Squamæ large, waxy white. Halteres pale yellow. *Legs*: black. Mid-tibia with one medio-dorsal and one medio-central bristle.

Length 7–10 mm.

Bionomics.—Bred from larvæ found in the pitchers of a *Nepenthes*. The very peculiar larvæ are figured in fig. 62.

Distribution.—Borneo; Pontianak.

Subfamily CHRYSOMYIINÆ.

Flies of this subfamily are found only in tropical and subtropical climates, and more or less replace, ecologically, the common blow-flies, *Calliphora*, of more temperate regions. The larvæ develop in decaying animal matter, those of certain species being frequently found as the causative organisms of myiasis in man and animals.

Structurally the flies in this subfamily are compact, and form a single easily recognized genus, within which, however, there is a group (*Microcalliphora* Tnsd.) in which the flies are about one-third the size of those typical of the genus, but agree in other respects with their larger relatives.

The flies in this group are all metallic in coloration, the main characters of the subfamily being the presence of serial hairs on the posterior side of the stem-vein of the wing and the presence of fine hairs on some portion of the upper surface of the lower calypter. Macrochætæ are poorly developed, particularly on the dorsum of the thorax and round the oral region. The jowls are one-third to one-half the eye-height, and are sparsely haired, giving the head its characteristic appearance.

Only one genus occurs in the Oriental region.

Genus 18. **CHRYSOMYIA** Robineau-Desvoidy.

Chrysomyia R.-D., Myodaires, p. 444, 1830. Genotype, *Chrysomyia marginalis* Wd. (by designation of Rondani, Arch. Zool. Mod. iii, p. 27, 1864, as *C. regalis* R.-D.).
Somomyia Rond. (part), Atti Accad. Sci. Nat. Bologna, (3) ii, p. 4, 1861.
? *Compsomyia* Rond. (part), Ann. Mus. Gen. vii, p. 425, 1875.
Paralucilia B. & B., p.p., Zweifl. K. K. Mus. Wien, v, p. 391, 1891.
Pycnosoma B. & B., Denk. K. Akad. Wien, lxi, p. 623, 1894.
? *Paracompsomyia* Hough, P. Acad. Nat. Sci. Phil. p. 184, 1898.
Psilostoma Surc., Nouv. Arch. Mus. Hist. Nat. Paris, (5) vi, p. 58, 1914.
Microcalliphora Tnsd., Proc. U.S. Nat. Mus. xlix, p. 618, 1916.
Achostandrus Bezzi, Bull. Ent. Res. xvii, p. 235, 1927.
Cyaneosomyia Ség., Encyc. Ent. ser. B, Dipt. iv. p. 112, 1928.
Pycnosomops Tnsd., Ent. News, xlv, p. 277, 1934.
Callitraga Brauer, Denk. Akad. Wien, xlvii, p. 74, 1883.

Head: eyes in ♂ completely holoptic or separated, sometimes widely so, with or without enlarged facets on upper anterior areas, in ♀ always widely separated, the facets small and

uniform; ocellar bristles, if present, directed outwards and backward; one fine pair of fronto-orbitals which are directed outwards; face rather sunk between vibrissal angles, the upper margin of the epistome projecting slightly forwards and downwards; vibrissæ inserted somewhat above margin of epistome, sometimes rather near it; antennæ reaching to level of insertion of vibrissæ, arista plumose; jowls one-third to one-half eye-height; palpi well developed, slightly thickened distally. *Thorax*: chætotaxy: acrostichals 0 : 1; dorso-centrals 2 : 1–3; intra-alars 1; supra-alars 2; post-alars 2; presutural intra-alars absent; humerals 2; post-humeral 1; prostigmatic bristle absent or present; sterno-pleurals 1 : 1; hypopleurals very fine. All bristles on dorsum short and fine. Propleura and post-alar declivity hairy. *Abdomen*: broad-oval, the ♂ hypopygium sometimes strongly developed, but usually small and inconspicuous. *Wings*: stem-vein with a row of setulæ on upper posterior side; third vein bare above and below. Upper surface of lower lobe of squama hairy.

Distribution.—Ethiopian, Oriental, and Australian regions.

Key to the Species of Chrysomyia.

1.	Flies not more than 8 mm. in length; eyes widely separated in male; hypopygium inconspicuous	*nigripes* Aub., [p. 117.
	Flies 10 mm. in length or longer	2.
2.	Anterior border of wings deeply infuscated	*marginalis* (Wd.), [p. 137.
	Wings entirely hyaline	3.
3.	Prothoracic spiracle white	4.
	Prothoracic spiracle brown	5.
4.	Prostigmatic bristle absent	*albiceps* (Wd.), [p. 143.
	Prostigmatic bristle present	*rufifacies* (Macq.), [p. 141.
5.	Femora swollen in both sexes, but more noticeably so in male; distance between the eyes in both sexes equal to one-fifth total width of head	*villeneuvi* Patt., [p. 147.
	Femora normal	6.
6.	Eyes in the male more or less closely approximated; male hypopygium more or less inconspicuous	7.
	Eyes in male separated by four-fifths width of one eye; male hypopygium large	*phaonis* (Ség.), p. 146.
7.	Parafacialia and jowls brilliant orange, the latter clothed with golden hairs	8.
	Parafacialia never brilliant orange	9.
8.	Eye in male sharply demarcated, upper two-thirds with large facets, lower one-third with small facets; squama brown	*megacephala* (Fab.), [p. 138.
	Eye-facets in male small and uniform; squama more whitish	*bezziana* Vill., p. 140.
9.	Face covered with grey tomentum; male genitalia as in fig. 70	*defixa* (Wlk.), p. 145.
	Face dark reddish, jowls grey, black-haired; genitalia as in fig. 69	*pinguis* (Wlk.), p. 144.

90. **Chrysomyia marginalis** (Wiedemann). (Fig. 63.)

Musca marginalis Wd., Aussor. Zweifl. Insekt. ii, p. 395, 1830.
Chrysomyia regalis R.-D., Myodaires, p. 449, 1830.
Phumosia tessellata Big., Ann. Soc. Ent. Fr. (5) viii, p. 31, 1878.
Paracompsomyia nigripennis Hough, Proc. Acad. Philad. p. 184, 1898.
Pycnosoma marginale Wd., Austen, Ann. Mag. Nat. Hist. (7) xvii, p. 302, 1906.
Typo-localities: Africa and Arabia. *Co-types* in Copenhagen, Vienna, Berlin, and Frankfurt.

♂♀.—*Head*: eyes in ♂ holoptic, the upper facets enlarged and sharply demarcated from the lower; in ♀ eyes separated



Fig. 63.—*Chrysomyia marginalis* (Wiedemann): ♂ genitalia. (From Patton & Cushing.)

by a distance equal to one-third total width of head; parafrontalia, parafacialia, and jowls covered with golden tomentum and clothed with fine short golden hairs; antennæ and palpi orange. *Thorax*: blue-green to purple; dorsum silver-dusted in front of suture and in front of the scutellum, the intervening portion shining, giving in certain lights the appearance of a dark transverse band; prothoracic stigma white, rather large. *Abdomen*: shining green to purple, silver-dusted anteriorly, on the sides, tip and below, the

posterior margins of the segments generally dark-banded; venter and fourth visible segment clothed with short fine white hairs. *Wings*: hyaline, deeply infuscated basally and along anterior margin; basicosta black; subcostal sclerite covered with dark brown pubescence; upper squama white, the posterior margin dark brown, lower squama a translucent brown posteriorly, with brownish hairs. *Legs*: dark brown.

Length 12 mm; length of wing 11 mm.

Bionomics.—Apparently nothing is known.

Distribution.—Oriental region; Baluchistan: Quetta; Ethiopian region.

This species is widely spread in the Ethiopian region; it is very scarce in the Oriental region, only occurring west of the Indus, in a zone which belongs to the region more politically than geographically.

91. Chrysomyia megacephala (Fabricius). (Figs. 64 & 65 A.)

Musca megacephala Fab., Syst. Ent. iv, p. 317, 1784.
Musca dux Eschscholtz, Entomographien, i, p. 114, 1822.
Chrysomyia duvaucelii R.-D., Myodaires, p. 451, 1830.
Chrysomyia gratiosa R.-D., Myodaires, p. 451, 1830.
Musca flaviceps Macq. (*nec.* 1835), Dipt. Exot. ii, p. 145, 1843.
Musca remuria Wlk., List Dipt. Brit. Mus. iv, p. 871, 1849.
Musca bata Wlk., List Dipt. Brit. Mus. iv, p. 875, 1849.
Musca combrea Wlk., List Dipt. Brit. Mus. iv, p. 876, 1849.
Somomyia saffranea Big., Ann. Soc. Ent. Fr. (5) vii, p. 257, 1877.
Somomyia pfeifferi Big., Ann. Soc. Ent. Fr. (5) vii, p. 257, 1877.
Somomyia dives Big., Bull. Soc. Zool. Fr. p. 599, 1887.
Somomyia cyanea-cincta Big., Bull. Soc. Zool. Fr. p. 604, 1887.
Typo-locality: Guinea. *Type* in the Kiel Museum.

♂♀.—*Head*: eyes in ♂ holoptic, facets of upper two-thirds greatly enlarged and sharply demarcated from small facets

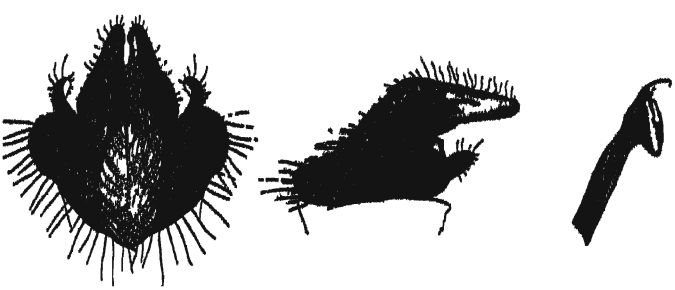


Fig. 64.—*Chrysomyia megacephala* (Fabricius): ♂ genitalia.

of lower third; in ♀ eyes separated by one-quarter total width of head, facets uniformly small. Parafrontalia in ♂ reduced to a very fine line, in ♀ each of the parafrontalia slightly

narrower than width of frons, covered with golden tomentum, but appearing black towards vertex in certain lights. Frons in ♂ almost entirely obliterated throughout its length, in ♀ approximately parallel-sided, reddish to black, with small hairs on the upper part. Parafacialia, jowls, face, and epistome orange, all except the last covered with golden tomentum and pubescence; antennæ, antennal arista, and palpi orange. *Thorax*: greenish-blue with purple reflections; two short, narrow, longitudinal black stripes anteriorly and

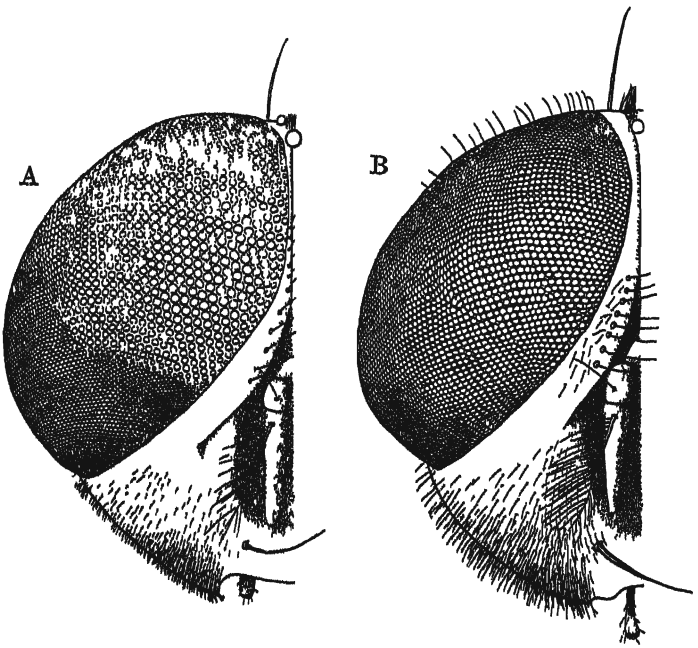


Fig. 65, A & B.—*Chrysomyia megacephala* Fab. and *Chrysomyia bezziana* Vill.: heads of males.

a small black triangle situated in a postero-medial position to each humeral callus; anterior thoracic spiracle dark brown. *Abdomen*: greenish-blue with purple reflections, the first visible segment black, second and third generally black-banded on posterior margins. Sternites and edges of tergites with inconspicuous golden hairs; hypopygium slightly projecting; ♂ genitalia as in fig. 64, the mesolobes much reduced, and very lightly chitinized. *Wings*: hyaline, slightly darkened at base; basicostal scale dark brown to black; subcostal sclerite covered with soft brown felted pubescence and a few fine short erect hairs; upper squama white, partly dark

margined, lower squama brown to very dark brown. *Legs*: black.

Length 11 mm; length of wing 10 mm.

Bionomics. Breeds mainly in decomposing animal matter, but to some extent in foodstuffs. An occasional breeder in diseased tissues of living animals. Adults swarm on meat and on sweets, and are recorded as sucking all the juice exuding from palm spathes tapped for toddy.

Distribution.—Very common in Oriental and Australian regions. There is a specimen in the British Museum from Yokohama. Also recorded from Mauritius. Fabricius's original "Guinea" label is an error.

92. **Chrysomyia bezziana** Villeneuve. (Figs. 65 B & 66.)

Chrysomyia bezziana Vill., Rev. Zool. Afr. iii, p. 430, 1914.
Type-locality: Africa. *Type* in Villeneuve's collection ?.

♂♀.—*Head*: eyes separated in ♂ by rather less than one-half width of third antennal segment, in ♀ by one-quarter total

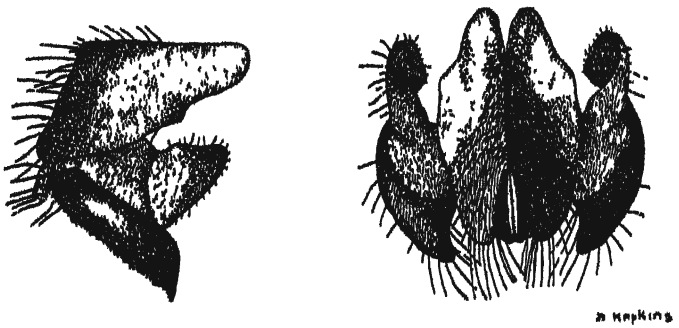


Fig. 66.—*Chrysomyia bezziana* Villeneuve: ♂ genitalia.

width of head; facets small and uniform in both sexes; frons obliterated for greater part of its length in ♂, in ♀ twice width of one of the parafrontalia, narrowing slightly anteriorly; parafrontalia much narrowed in ♂, but never reduced to a fine line, covered in both sexes with greyish-gold tomentum, black in ♀ towards vertex; parafacialia and jowls orange, covered with golden tomentum, the latter clothed with golden hairs; antennæ, face, epistome, and palpi orange. *Thorax*: green to bluish-purple, lightly silver-dusted anteriorly, prothoracic stigma dark brown; a prostigmatic bristle present. *Abdomen*: green to bluish-purple, the posterior margins of second and third visible segments generally dark-margined; hypopygium inconspicuous; male genitalia as in fig. 66, closely resembling those of *C. megacephala*, but rather less strongly chitinized, and exhibiting slight differences in the

proportions of the parts of the penis. *Wings*: hyaline; squama white, the lower lobe covered with white or black hairs. *Legs*: black.

Length 10–12 mm.

This species has repeatedly been confused with *Chrysomyia megacephala* (Fabr.), but is distinct both in structure and life-history. *C. bezziana* Vill. is largely responsible for the prevalence of myiasis in the Oriental region. The name *bezziana* was proposed by Villeneuve without a proper description, in a paper dealing with the identities of some types of Fabricius and of Wiedemann. Villeneuve discusses certain bred-out specimens received from Bezzi as *dux* Esch., and points out that they differ from that species by (*a*) the base of the wing infuscated instead of clear, (*b*) the upper eye-facets in the male are small instead of being enlarged as in *dux*.

He closes the discussion with the following sentence (trans.):—"It results from the foregoing that Bezzi's African species corresponds neither with *C. megacephala* of Fabricius nor of Wiedemann, and I propose for it the new name of *Chrysomyia bezziana* mihi."

As the principal separatory character from *megacephala*, the equal eye-facets in the male, is stressed, we conclude that *bezziana* was sufficiently characterized by Villeneuve, whose original description therefore holds good. Patton (Ind. Jour. Med. Res. viii, pp. 17–29, 1920) gave a very full description of all stages of this species, with a coloured plate. He was at this period in regular correspondence with Villeneuve, and there is no doubt that his description was based on specimens which had been recognized by Villeneuve as his own species.

Bionomics.—A definite myiasis-producing fly, both in man and animals; it can, however, only infect through a previous wound.

Distribution.—INDIA (general); CEYLON; Tong-king; Philippine Islands; Ethiopian region generally.

93. **Chrysomyia ruffacies** (Macquart). (Fig. 67.)

Lucilia ruffacies Guer. in Macq., Mem. Soc. Roy. Sci. Arts Lille, Année 1842, p. 303; id., Dipt. Exot. ii, pt. 3, p. 146, 1843.
Lucilia orientalis Macq., Mem. Soc. Roy. Sci. Arts Lille, Année 1842, p. 302; id., Dipt. Exot. ii, pt. 3, p. 145, 1843.
Lucilia pavonina Schin., Dipt. Novara Reise, p. 305, 1868.
Somomyia melanifera Big., Ann. Soc. Ent. Fr. (5) vii, p. 258, 1877.
Somomyia barbata Big., Ann. Soc. Ent. Fr. (5) vii, p. 39, 1877.
Somomyia micropogon Big., Bull. Soc. Zool. Fr. xii, p. 601, 1887.
Chrysomyia cordieri Ség., Encyc. Ent. sér. B, Dipt. ii, p. 303, 1925.
Chrysomyia putoria Ratt., *nec* Wd., Phil. Journ. Sci. xxvii, p. 193, 1925.
Chrysomyia albiceps plur auctt., *nec* Wd.
Type-locality: Australia. *Type* in the Paris Museum.

♂♀.—*Head*: eyes separated in ♂ by a distance approximately equal to width of third antennal segment, in ♀ by slightly more than one-quarter total head-width; facets in both sexes small and uniform; parafrontalia in ♂ narrowed, contiguous, black on upper half, covered with silver tomentum on lower half, which bears upstanding white hairs and a few very fine black bristles; frons more or less obliterated for greater part of its length, reddish above insertion of antennæ; in ♀ frons and parafrontalia approximately equal in width, the former greyish-black, the latter as in ♂ but without upstanding white hairs. Parafacialia and jowls reddish-yellow in ground-colour, but thickly covered with silver tomentum and white hairs; epistome and palpi orange; antennæ brown, sometimes reddish on second and innermost half of third segments. *Thorax*: greenish-blue with purple reflections, two short, narrow, longitudinal æneous stripes anteriorly and indefinite dark patches behind the humeral calli and along the

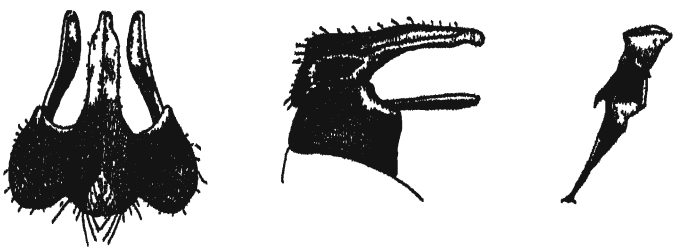


Fig. 67.—*Chrysomyia ruffacies* (Macquart): ♂ genitalia.

suture; prothoracic spiracles white; a prostigmatic bristle present. *Abdomen*: greenish-blue with purple reflections, the first visible segment black in ♂, greenish in ♀, second and third generally black-banded on posterior margins, hairs on venter short, fine, and golden; hypopygium inconspicuous; ♂ genitalia as in fig. 67, the two halves of the mesolobe fused together, the paralobes widely separated at their bases. *Wings*: hyaline, slightly infuscated at base of subcostal cell; basicostal scale dark brown to black; subcostal sclerite bare, except for a few minute soft hairs; upper and lower squama white, the latter sometimes lightly infuscated, hairs on lower squama white or occasionally black. *Legs*: black.

Length 10–12 mm.

Bionomics.—The first-stage larva is necrophagous. The later larval stages are predaceous on the larva of other necrophagous flies in the same carcase. There is a large Australian literature on this insect, where the larva is one of the main pests of sheep. The adult is not attracted in any degree to food.

Distribution.—Very common all over the Oriental and Australian regions ; Baluchistan, Ziarat, 2000 ft.

94. **Chrysomyia albiceps** (Wiedemann). (Fig. 68.)

Musca albiceps Wd., Zool. Mag. iii, p. 38, 1819.
Musca bibula Wd., Ausser. Zweifl. Ins. ii p. 672, 1830.
Musca elara Wlk., List. Dipt. iv, p. 870, 1849.
Musca emoda Wlk., List Dipt. iv, p. 872, 1849.
Musca himella Wlk., List Dipt. iv, p. 876, 1849.
Lucilia arcuata Macq., Mem. Soc. Sci. Lille, 1850, p. 220, 1851 ; id., Dipt. Exot., Suppl. 4, p. 247, 1851.
Lucilia testaceifacies Macq., ibid.
Musca felix Wlk., Ins. Saund. iv, p. 388, 1852.
Lucilia nigrofasciata Macq. (part), Mem. Soc. Sci. Lille, 1854, p. 132, 1855 ; id., Dipt. Exot., Suppl. 5, p.112,1855.
Somomyia nubiana Big., Ann. Soc. Ent. Fr. (5) vii, p. 38, 1877.
Type-locality : South Africa. *Type* in the Vienna Museum.

Can only be separated from *rufifacies* Macq. on external characters used in the key and on the genitalia (fig 68).



Fig. 68.—*Chrysomyia albiceps* (Wiedemann) : ♂ genitalia. (From Patton & Cushing.)

The species is extremely common in the subtropical parts of Africa, in Asia Minor, and Palestine, and around the shores of the Mediterranean Sea. We have seen in the British Museum collection a female from India, Karachi, Manora, which lacks the prostigmatic bristle and appears to belong to this species. There is in the collection a headless female from the Punjab, Lyallpur, which also appears to be *albiceps* ; also a male from Afghanistan, Chaman, is from the very boundary of the Palæarctic and Oriental regions.

95. **Chrysomyia pinguis** (Walker). (Fig. 69.)

Lucilia pinguis Wlk., Trans. Ent. Soc. Lond. iv, p. 213, 1858.
Chrysomyia nigriceps Patt., Ind. Journ. Med. Res. ix, p. 568, 1922.
Chrysomyia combrea Patt. (*nec* Walk.), Bull. Ent. Res. xiii, p. 122, 1922.
Type-locality: India. *Type* in the British Museum.

♂♀.—*Head*: eyes in ♂ holoptic for a short distance, the anterior facets more or less enlarged; in ♀ eyes separated by a distance equal to rather more than one-quarter total head-width; frons in ♀ approximately twice the width of one of the parafrontalia, black, narrowing anteriorly; parafrontalia covered with dull grey tomentum below, black towards vertex; parafacialia and epistome bare. *Thorax*: bluish-green with strong purple reflections; prothoracic stigma dark brown, a prostigmatic bristle present. *Abdomen*: bluish-green with purple reflections, the posterior margins of the segments sometimes



Fig. 69.—*Chrysomyia pinguis* (Walker): ♂ genitalia.

dark-banded; venter covered with short black hairs; hypopygium inconspicuous; male genitalia as in fig. 69. The two halves of the mesolobe connected by a distensible membrane, the paralobes rudimentary. *Wings*: hyaline, very slightly infuscated at the base, basicostal scale dark brown to black; subcostal sclerite covered with pubescence; squamæ infuscated, brown-haired, the margins dark brown with rather luxuriant brown fringes. *Legs*: dark brown. Front coxæ grey pollinose in certain lights.

Length 9 mm.

Bionomics.—The larvæ of this species have been found breeding in the bodies of birds and other small animals. The adult rarely enters houses in search of food.

A male collected in Ceylon by E. E. Green varies from typical specimens in having the facets of the upper two-thirds of the eye larger than, and distinctly demarcated from,

those of the lower third. In all other respects the two forms are similar.

It is possible that this character, the size of the upper facets of the eyes, may vary from specimen to specimen, and that all stages between complete uniformity and marked enlargement of the upper facets, and consequent division of the eye into two parts, may obtain. This may apply not only to this particular species but to other species in this or other genera.

Distribution.—INDIA: Simla, Darjeeling, N. Khasi Hills, Shillong, Mishmi Hills, Dalai V., Coonoor; CEYLON: Nuwara Eliya, Nalande, Peradeniya; Java, Buitenzorg; Siam, Talum, Bulait Besar; Malaya; China, Hong Kong.

96. **Chrysomyia defixa** (Walker). (Fig. 70.)

Musca defixa Wlk., Proc. Linn. Soc. Lond. i, p. 24, 1857.
Chrysomyia combrea Patt. (*nec* Wlk.), Bull. Ent. Res. xiii, p. 112, 1922.
Type-locality: Singapore. *Type* in the British Museum.

♂.—*Head*: eyes holoptic, the facets on upper anterior two-thirds larger than those on lower one-third, but not separated from them by any sharply demarcated line; frons

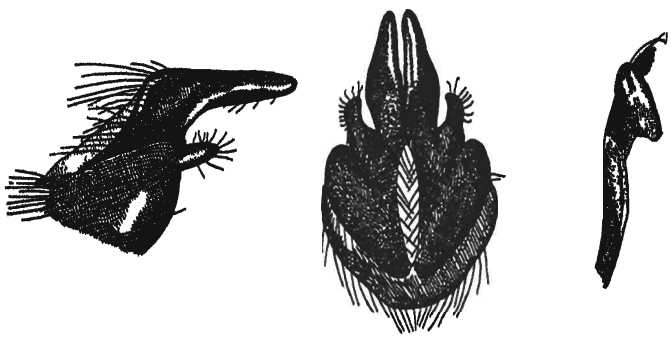


Fig. 70.—*Chrysomyia defixa* (Walker): ♂ genitalia.

obliterated; parafrontalia reduced to a fine line; parafacialia and jowls covered with dull grey tomentum, the latter clothed with fine dark hairs; antennæ tawny, the third segment darker and duller than the other two; epistome and palpi yellow. *Thorax*: shining blue-green with purple reflections; prothoracic stigma dark brown; prostigmatic bristle present. *Abdomen*: greenish-blue, the posterior margins of the segments darkened, venter dark-haired; hypopygium inconspicuous; male genitalia as in fig. 70. *Wings*: hyaline; basicostal scale dark brown; subcostal sclerite with a few

fine bristles; squama lightly and evenly infuscated. *Legs*: very dark brown.

Length 10–12 mm.

Bionomics.—Nothing is known.

Distribution.—Singapore.

97. Chrysomyia phaonis (Séguy). (Fig. 71.)

Cyaneosomyia phaonis Ség., Bull. Soc. Ent. Fr. p. 154, 1928.
Typo-locality: Yunnan, Yunnan Fu. *Type* in the Paris Museum.

♂.—*Head*: eyes separated at vertex by distance equal to four-fifths width of one eye; frons more or less parallel-sided, reddish-brown, about three times width of third antennal segment, with numerous fine setulæ scattered over it; parafrontalia silver-dusted, each as broad as, or slightly narrower than, width of frons, with well-developed frontal



Fig. 71.—*Chrysomyia phaonis* (Séguy): ♂ genitalia.

bristles, a pair of fine outwardly directed fronto-orbitals; inner and outer vertical and ocellar bristles well developed, and there is a pair of bristles lying in front of the inner verticals, which are directed outwards and backwards; parafacialia and jowls dull gold-dusted, the former with numerous setulæ on upper part, which are continuous with those on the parafrontalia; jowls covered with short black setulæ and pale sparse hairs; first and second antennal segments reddish, third brown; palpi orange. *Thorax*: shining metallic coloured, lightly grey-dusted. *Abdomen*: shining metallic, the hind margins of the segments sometimes dark-banded; hypopygium remarkably broad, shining, rounded; male genitalia as in fig. 71. *Wings*: hyaline, yellowish. Squamæ white, with black hairs. Halteres yellowish. *Legs*: black.

Length 7–8 mm.

Bionomics.—Nothing is known.

Distribution.—INDIA: Mussooree, Benares; China: Yunnan, Pekin.

We have seen the type-specimen and a specimen in the Dresden Museum; both of these are rather large flies, mainly green in coloration; we have also seen a series in the British Museum which are obviously teneral, being comparatively small, very lightly chitinized, and purple in colour, appearing quite brown in certain lights on pleura and abdomen.

98. **Chrysomyia villeneuvi** Patton.

Chrysomyia villeneuvi Patt., Ind. Journ. Med. Res. ix, p. 567, 1922.
Type-locality: South India. *Type* in Patton's collection ?.

♂♀.—*Head*: eyes in both sexes separated by distance equal to one-fifth total width of head, facets small and uniform; frons dark reddish-black, parallel-sided, twice as broad as one of the parafrontalia; parafrontalia black towards vertex but clothed with silver tomentum anteriorly; ocellar bristles very weak, fronto-orbital bristles absent in ♀, frontal bristles short, not very erect, and directed slightly backwards; parafacialia reddish, covered with silver tomentum; jowls dark grey, covered with fine gold hairs; face appears to be deeply sunk between somewhat inflated parafacialia; antennæ reddish-brown, the third segment sometimes darker; epistome and palpi yellow. *Thorax*: green to purple; prothoracic spiracle dark brown, rather lighter towards lower end; prostigmatic bristle present. *Abdomen*: green to purple, shining, oval, rather arched on dorsal surface, the hypopygium noticeable from ventral surface, which is clothed anteriorly with sparse fine golden pubescence. *Wings*: hyaline; basicostal scale dark brown to black; subcostal sclerite with a bunch of fine brown hairs at base and one or two distally; squama testaceous, black-haired. Halteres yellow, with rather large knobs and short stalks. *Legs*: dark brown; femora and tibiæ greatly swollen in ♂, less so in ♀, the former metallic in certain lights; segments of tarsi in ♂ clearly demarcated from one another.

Length 10–12 mm.

Bionomics.—The second and third larval instars are predaceous, even attacking other predatory larvæ, like *rufifacies*. Habits of adult unknown; is not a house or shop haunter.

Distribution.—INDIA: Kallar, 2000 ft., Coonoor; CEYLON; Siam; Central Borneo.

99. **Chrysomyia nigripes** Aubertin. (Fig. 72.)

Chrysomyia (*Microcalliphora*) *nigripes* Aub., Ann. Mag. Nat. Hist. (10) ix, p. 26, 1932.
Type-locality: Ceylon, Trincomali. *Type* in the British Museum.

♂♀.—*Head*: eyes separated in ♂ by distance equal to

length of third antennal segment, in ♀ by rather less than one-third total width of head; facets small and uniform; frons parallel-sided, dull dark red, in ♂ equal in width to one of the parafrontalia, in ♀ slightly narrower; parafrontalia covered with grey tomentum anteriorly, metallic at vertex; parafacialia covered with grey tomentum; jowls metallic, grey-dusted and clothed with soft grey hair; antennæ dark brown palpi yellow; vibrissæ on a level with oral margin. *Thorax* greenish-blue; prothoracic stigma white; a prostigmatic bristle present. *Abdomen*: greenish-blue, the hind margins of second and third visible segments dark-banded; hypopygium inconspicuous; male genitalia as in fig. 72. *Wings*:



Fig. 72.—*Chrysomyia nigripes* Aubertin: ♂ genitalia.
(From Aubertin.)

hyaline; basicostal scale dark brown; subcostal sclerite with a few pale hairs; squamæ white. *Legs*: dark brown.

Length 8 mm.

Bionomics.—Nothing is known.

Distribution.—Ceylon: Trincomali.

This species is the only known Oriental representative of the segregate which was given the generic name of *Microcalliphora* by Townsend. The allied species are found in the Australian region. All are small when compared with the other Oriental species of *Chrysomyia*.

Subfamily RHINIINÆ.

The flies of this subfamily are all distinguished by the strongly projecting epistome, which reaches its greatest development in the tribe Rhiniini, in which the prostigmatal bristle is absent (fig. 73). The species vary in colour from highly metallic to dull grey-brown, many of them being very beautifully coloured ; pilosity, especially on the pleura, is highly developed.

The arista varies from microscopically pubescent to strongly

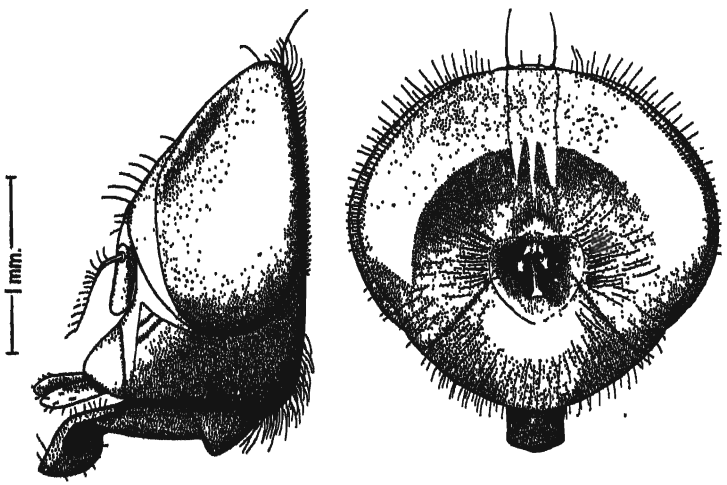


Fig. 73.—*Rhinia testacea* Robineau-Desvoidy : lateral and posterior veins.

biplumose, all intermediate forms occurring. The chætotaxy likewise varies, some species having no bristles on the thoracic dorsum at all.

The subfamily is almost entirely Oriental and Ethiopian. It appears to be absent from the New World faunas.

Very little is known of the life-histories. The adults are mainly flower visitors. Some species hover in swarms at certain seasons, like Syrphidæ. Opening up a termitarium attracts others that are otherwise seldom seen, but of not a single species is the life-history completely known. The very little on record will be found under the descriptions

of individual species. The subfamily appears to be of no economic importance. They do not frequent food or filth, but it is not impossible that some of them are, in their larval stages, parasitic. An enormous field for research is open to every field-worker in the Orient who has the opportunity of working in uncultivated, preferably hilly areas, where the majority of the species abound.

Key to the Genera of Rhiniinæ.

1.	Prostigmatic* bristle present	2.
	Prostigmatic bristle absent	12.
2.	Eyes in both sexes separated by ½ head-width	Sumatria Mall., p. 186.
	Eyes in ♂ subholoptic, or at least not widely separated	3.
3.	Arista plumose or long pubescent above and below	4.
	Arista bare, at most microscopically pubescent	10.
4.	Arista strongly plumose, generally practically to tip	5.
	Arista pubescent only for about two-thirds its length	[p. 179. Metalliopsis Trsd.,
5.	Prosutural acrostichals inconspicuous	6.
	All acrostichals strong	7.
6.	Two posthumeral bristles	Cosmina R.-D., p. 171.
	One posthumeral bristle	Alikangiella Vill.,
7.	No parafacial hairs	8. [p. 176.
	Parafacial hairs present	9.
8.	Scutellar disc bare between discal and apical bristles	[p. 170. Chloroidea Trsd.,
	Scutellar disc uniformly setulose	Malayomyza Mall.,
9.	♂: ptilinal angle strongly projecting. ♀: parafrontalia each wider than frons. Epistome projecting well below vibrissæ.	[p. 169. Thoracites B. & B.,
	♂: ptilinal angle not strongly projecting. ♀: parafrontalia each narrower than frons. Epistome only slightly projecting below vibrissæ	[p. 168. [p. 151. Strongylonevra Big.,
10.	Prosutural acrostichals wanting	Rhynchomyopsis
	Prosutural acrostichals present	11. [Trsd., p. 184.
11.	Antennæ separated at base by distinct broad carina	[p. 179. Metallea v. d. W.,
	Antennæ not so separated	Rhynchomyia R.-D., [p. 183.
12.	Arista plumose, ciliate above and below	Borbororhinia Trsd.,
	Arista plumose on upper side only	13. [p. 187.
13.	Apical cell open	Stomorhina Rond.,
	Apical cell petiolate, in line with vein III	14. [p. 190.
14.	Anterior posthumeral present, epistome very prominent; partially testaceous flies.	Rhinia R.-D., p. 204.
	Anterior posthumeral absent; epistome barely projecting beyond vibrissal angle; metallic flies	[p. 206. Chlororhinia Trsd.,

* Beware of confounding propleural bristles with prostigmatic bristles which lie immediately behind the former.

Genus. 19. **STRONGYLONEURA** Bigot*.

Strongyloneura Big., Bull. Soc. Ent. Fr. p. xiv, 1886. Genotype, *S. prasina* Big.
Thelychæta B. & B., Wiss. Denk. Kais. Akad. p. 390. Genotype, *Tachina viridaurea* Wd.

Medium to large flies, all metallic green or blue, often rather variable within the species.

Head: ♂ subholoptic or at least frons considerably narrowed. ♀ with lateral verticals. Ocellars strong, proclinate. A single row of frontals in both sexes, but in ♀ there may be some much shorter inwardly directed bristles on inner margin of parafrontalia. Genals strong. Arista biplumose nearly to tip. A facial carina is often present, separating the antennæ. *Thorax*: chætotaxy: generally, acrostichals 1 : 2 or 2 : 4; dorso-centrals 2 : 4. Scutellum with basals, discals, submarginals, and apicals. Sternopleurals 1 : 1. *Abdomen*: apparent 4th segment with strong discals. ♂ genital segment concolorous with abdomen, not very conspicuous. *Wings*: vein I at base above with row of black bristles (subfamily character.) Vein I at base below with or without a row of much shorter bristles that lie in a hollow of the wing-membrane and are very difficult to see. Vein III above with bristles on the node or beyond it; below on node. Vein IV varying from evenly rounded and apically nearly parallel to III (like *Pyrellia*) to quite sharply angled, but all intermediate stages occur. *Legs*: ♂ with or without submedian ventral mid-tibial bristle. No other distinctive characters.

The adults are found at flowers and on leaves; nothing whatever is known of their life-history. The genus is Ethiopian, Oriental, and reaches the Palæarctic in Japan.

Key to the Species of Strongyloneura.

1.	Vein I setulose below basally	2.
	Vein I not setulose below basally	6.
2.	Vein I with upper and lower basal hairs yellow, one or more black bristles in upper row also	[p. 154. *cupreoviridis* Mall.,
	Vein I with upper and lower basal hairs all black	3.
3.	Three well-defined black vittæ on thoracic dorsum postsuturally	[p. 152. *malayensis* (Tnsd.),
	Thoracic dorsum without well-defined black stripes	4.
4.	♂ mid-tibia without strong postmedian ventral bristle. Wing very deeply infuscated	[p. 156. *ditissima* (Wlk.),

* Properly the name of this genus is *Isomyia* Wlk., genotype *delectans* Wlk. The genotype is a female, and as, sooner or later, the genus will need complete revision on the male genitalia, we have decided to neglect the priority.

♂ mid-tibia with strong post-median ventral bristle. Wing infuscated, but less strongly	5.
5. Sternopleura with pale hairs	*nebulosa* Tnsd., p. 155
Sternopleura with black hairs	*dotata* (Wlk.), p. 155.
6. Lower calypter produced lobe-like, its margin lying close against basal lateral angle of scutellum. Post-alar declivity generally haired, at least in part	7.
Lower calypter not so produced. Post-alar declivity bare	11. [p. 157.
7. Scales at base of costa yellow	*viridaurea* (Wd.),
Scales at base of costa brown or black	8.
8. Post-alar declivity with some hairs, often fine and pale	9. [p. 158.
Post-alar declivity bare	*pseudolucilia* Mall.,
9. Squamæ luteous to pale fuscous. Wings basally yellowish. No apical dark cloud	[p. 159. *delectans* (Wlk.),
Squamæ dark brown	10.
10. Acrostichals, 1 : 3. ♂ eye-facets equal throughout. Wings generally quite infuscate	*æstracea* Ség., p. 161.
Acrostichals, 2 : 4. ♂ eye-facets much larger above than below. Wings with a definite apical cloud	[p. 161. *chrysoides* (Wlk.),
11. In ♂ facials and mesopleurals all black	12.
In ♂ facials yellow	14.
12. Posterior claspers broad, fringed posteriorly. Anterior claspers fringed anteriorly	*tibialis* Vill., p. 167.
Posterior claspers normally narrow	13.
13. Posterior claspers apically truncate. Accessory forceps with two clavate lobes	*yerburyi* sp. n., p. 166.
Posterior claspers normally acuminate. Accessory forceps normally V-shaped	[p. 165. *pseudocærulana*, sp. n.,
14. In ♂ mesopleural hairs all black	*zeylanica*, sp. n., p. 164.
In ♂ mesopleural hairs, except on upper border, pale	15. [p. 163.
15. Accessory forceps normally V-shaped	*pseudonebulosa*, sp. n.,
Accessory forceps at free margin truncate or anteriorly concave	[p. 162. *pseudocephalana*, sp. n.,

100. **Strongyloneura malayensis** (Townsend). (Fig. 74.)

Strongyloneuropsis malayensis Tnsd., Phil. Journ. Sci. xxxiv, p. 376, 1927.

Type-locality: Singapore. *Type* in the United States National Museum, Washington.

Eucosmina vittigera Mall., Ann. Mag. Nat. Hist. (10) i, p. 493, 1928.

Type-locality: Federated Malay States: Selangor; Bukit Kutu. *Type* in the British Museum.

♂♀.—*Head*: ♂ subholoptic. Female frons at vertex one-fourth head-width, broadened below. Four verticals. Parafrontalia together about one-half width of frontal stripe. Head generally black, anterior third of frons, face except

a line on lower half of each facial ridge, genæ except a large submedian mark, and lower occiput testaceous-yellow. Genæ nearly one-third eye-height. Genal hairs mixed black and yellow. A conspicuous white pollinose spot on middle of each frontal orbit, and another near middle of each parafacialia. Occiput lightly grey-dusted. Antennæ and palpi testaceous yellow, third segment of antennæ browned above. Arista plumose. *Thorax*: black, with distinct traces of greenish-

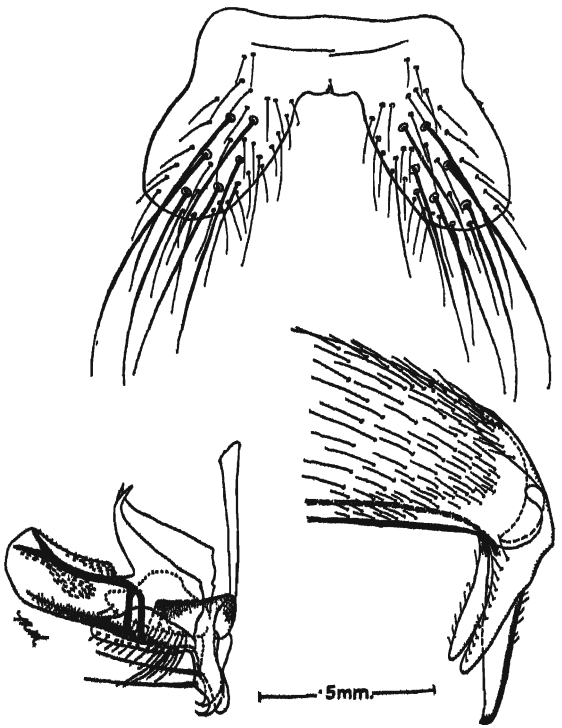


Fig. 74.—*Strongyloneura malayensis* (Townsend): ♂ genitalia. (Drawn from the type of *E. vittigera* Malloch.)

cupreous, humeral angles, propleura, a small portion of pleura at base of wings, and the covering of both spiracles yellow. Propleura bare centrally. Mesonotum and pleura grey-dusted, the former with five black vittæ, the outer one on each side on lateral margin. Scutellum with three medial vittæ continued on to it, covered with decumbent hairs. Humeral and pleural hairs yellow, mesonotal hairs black. *Abdomen*: black, first tergite and sides of second anteriorly yellow. *Wings*:

yellowish-hyaline, inner cross-vein a little beyond middle of discal cell. First posterior cell with short neck. Calypters and halteres yellow. *Legs*: fuscous, coxæ and femora yellow, bases of tibiæ and tarsi dark yellow. Front tibia with an antero-dorsal and one posterior bristle. Mid-tibia with one ventral, one antero-ventral, and three posterior bristles. Hind tibia with two antero-dorsal, one antero-ventral, and two postero-dorsal bristles.

Length 6 mm.

Bionomics.—Nothing known.

Distribution.—Malaya: Selangor, Bukit Kutu, and Gombak Valley; Singapore. The genitalia of the types in Washington and London have been compared by means of exchanged sketches, leaving no doubt of their conspecificity.

101. **Strongyloneura cupreoviridis** Malloch.

Strongyloneura cupreoviridis Mall., Ann. Mag. Nat. Hist. (10) i, p. 480, 1928.

Type-locality: Federated Malay States, Kuala Lumpur. *Type* in the British Museum.

♂♀. *Head*: eye-facets in ♂ normal, eyes subholoptic. Head testaceous-yellow, frons brownish-fuscous, upper occiput black, glossy except on margin and below, cheeks brownish on a small part at middle above, the entire orbits, parafacialia, and cheeks densely yellow dusted, former with fine black hairs. Antennæ a little over half the length of the face, their bases separated by a narrow carina, testaceous-yellow, third segment slightly browned above. Arista fuscous, yellow basally. Palpi testaceous-yellow. *Thorax*: metallic-green, with greyish dusting, most dense on pleura, with coppery reflections, especially on anterior half of mesonotum. Scutellum unicolorous green. Pleural hairs yellow, upper margin of mesopleuron with black hairs. A few pale hairs among the black ones on lateral margins of mesonotum. Chætotaxy: acrostichals 1 : 4; pre-alar less than half as long as anterior supra-alar; pteropleural a single black bristle. Scutellars, six long marginals and two discals. *Abdomen*: metallic-green, with a diffuse blackish central vitta and apical marginal bands on each tergite, except sometimes the first, which is black basally; the whole surface white-dusted, changeable by light incidence, in ♂ a very pronounced coppery tinge on the two apical segments. Fourth tergite with strong median discals. Hairs black on dorsum, yellow on venter. *Wings*: yellowish-hyaline, faintly browned apically on costa. Squamæ and halteres yellow. Number of black bristles in upper basal yellow row on stem-vein variable. IV angled fairly sharply. *Legs*: black, femora cupreous tinged, tibiæ and bases of tarsi brownish-yellow. Fore femora black-haired on posterior

surface. Mid-tibia of ♂ without, of ♀ with, a strong submedian ventral bristle. Hind coxæ with pale hairs above at apices.

Length 8–9 mm.

Bionomics.—Nothing known.

Distribution.—Siam, Biserat; Malay Peninsula, several localities.

102. **Strongyloneura dotata** (Walker).

Lucilia dotata Wlk., Proc. Linn. Soc. i, p. 25, 86, 1857.
Type-locality: Singapore. *Type* in the British Museum.
Cosmina micans Big., Ann. Soc. Ent. Fr. (v) iv, p. 241, 1874.
Type-locality: Pulo Pinang. *Type* ?.

♂♀.—*Head*: fuscous, occiput glossy except on margin and lower part. Orbits, parafacialia, and cheeks yellowish-grey dusted, cheeks yellow on upper and lower margins and in front. Face testaceous. Antennæ and palpi testaceous, third segment of former brownish above; hairs on cheeks black, some of those on lower part of occiput alone yellow. *Thorax*: brilliant blue-green, occasionally deep violet-blue, metallic, mesonotum with slight grey dusting in front of suture viewed from behind, in ♀ only with noticeable dark vittæ anteriorly, though there are traces of two coppery submedian vittæ in front of suture. Scutellum undusted. Sternopleura lightly white-dusted. All pleural hairs black. Acrostichals usually 1 : 2. *Abdomen*: coloration as thorax, white dusting more evident, especially below and on lateral anterior angles of tergites; each tergite with a diffuse central vitta and apical black bands, sometimes forming a large triangular patch. Abdominal hairs black. Pale hairs confined to second sternite. *Wings*: greyish, a very dark brown patch commencing below middle of first cell and extending to just below vein V, and thence along posterior cross-vein to apex of vein II, leaving fourth cell clear except along vein III, exterior to this. Squamæ white in ♀, in ♂ lower one brownish, upper white. Halteres yellow. *Legs*: black, fore femora greenish, tibiæ and bases of tarsi usually brownish-yellow.

Length 8–9 mm.

Bionomics.—Nothing is known.

Distribution.—Upper Burma, Maymyo; Peninsular Siam, Khao Ram; Java; Philippine Islands, Mindanao, and Luzon.

103. **Strongyloneura nebulosa** Townsend.

Strongyloneura nebulosa Tnsd., Rec. Ind. Mus. xiii, p. 199, 1917.
Type-locality: Assam, Margherita. *Type* in the Indian Museum, Calcutta.

♂.—*Head*: subholoptic. Parafacialia dull pale golden-yellow. Parafacial hairs black. Face orange-yellow, carina

distinct. Antennæ and palpi deep orange, former with no darkening on third segment. Eye-margins as parafacialia. Occiput black. *Thorax*: dark cupreous-purplish. Sternopleura grey-dusted, with fine pale hairs. No dusting on scutellum. Chætotaxy: acrostichals 1 : 2; dorso-centrals 2 : 4. *Abdomen*: concolorous with thorax. *Wings*: some infuscation in extreme basicostal region. A distinct but ill-defined infuscation apically, starting beyond the end of I, to posterior cross-vein, and more or less extending to wing-tip. Squamæ orange. *Legs*: black.

Length: 7–7·5 mm.

Bionomics.—Nothing is known.

Distribution.—ASSAM, Margharita.

The foregoing is a redescription of Townsend's type, now in very bad and greasy condition and lacking the abdomen, with colour-notes from his original description. The ♀ allotype belongs to the next species.

104. **Strongyloneura ditissima** (Walker). (Fig. 75.)

Lucilia ditissima Wlk., Proc. Linn. Soc. Lond. v, p. 244, 1861.
Type-locality: New Guinea. *Type* in the British Museum.
Strongyloneura apicipennis Sen.-Wh., Spol. Zeyl. xiii, p. 116, 1926.
Type-locality: Philippine Islands, Calayan. *Type* in the Government Laboratory, Manila.
Strongyloneura philippinensis Mall., Ann. Mag. Nat. Hist. (10) i, p. 482, 1928.
Type-locality: Philippine Islands. *Type* in Malloch's collection.

♂♀.—*Head*: ♂ subholoptic, but less so than *nebulosa* Tnsd. ♀, frons not more than one-fourth head-width. Frontal stripe rusty-brown, parafrontalia grey. Face and genæ brownish-yellow, parafacialia and a large patch covering all but anterior limits of genæ greyish-shimmering in certain lights. Basal segments of antennæ orange-brown, third segment greyish-silvery pollinose. Palpi yellowish, apically spatulate. *Thorax*: in ♂ green, with large cupreous patch on disc, narrowed anteriorly. In ♀ dark metallic-blue, with patches of green in certain lights. Chætotaxy: acrostichals 1 : 2; dorso-centrals 2 : 3 or 4. Sternopleuron not or hardly pollinose, its hairs black. *Abdomen*: similar to thorax in both sexes, in ♀ a rather darker blue, unbanded. Discals on apparent fourth segment strong, erect. *Wings*: apical half dark, the inner margin of the infuscation running from beyond the tip of I and beyond anterior cross-vein to lower end of posterior cross-vein. Vein IV not evenly rounded. Squamæ fuscous. *Legs*: black, front femora slightly shining, but hardly metallic. ♂ *genitalia* figured in fig. 75.

Length 8 mm.

Bionomics.—Unknown.

Distribution.—Lower Burma, Mergui (Townsend's allotype of *S. nebulosa*) ; Siam ; Mabete ; Philippine Islands, Calayan and Luzon ; New Guinea.

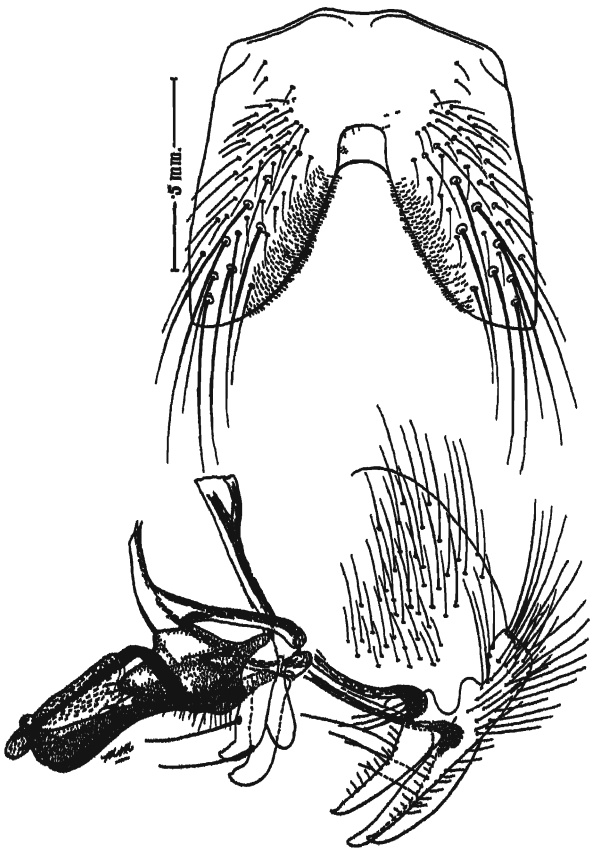


Fig. 75.—*Strongyloneura ditissima* (Walker) : ♂ genitalia. (Drawn from the type.)

105. Strongyloneura viridaurea (Wiedemann).

Tachina viridaurea Wd., Anal. Ent. xliii, p. 82, 1824.
Type-locality : "East India." *Type*, Vienna ?.
Musca munda Wd., Auss Zweifl. Ins. ii, p. 398, 23, 1830.
Type-locality : Java. *Type* in Westermann's collection at Copenhagen.
Pollenia reflectans Wlk., Proc. Linn. Soc. i, p. 24, 1857.
Type-locality : Malaya. *Type* in the British Museum.
Somomyia rubiginosa Big., Ann. Soc. Ent. Fr. (5) vii, p. 41, 1879.
Type-locality : Burma. *Type* in the British Museum.

Thelychxta chalybea B. & B., Denk. K. Akad. Wien, lviii, p. 390, 1890.
Type-locality: Borneo. *Type* in the Vienna Museum.

♂♀.—*Head*: ♂ frons reduced to a line, parafrontalia narrowly present. ♀ frons three-fifths an eye-width, the parafrontalia dull ashy-yellow. Face dull yellowish-brown. Genæ as face. Parafrontal bristles run down to the parafacialia, in two rows, black. Antennæ dark brownish-yellow, third segment grey pollinose, widely separated by short tubercular carina. Palpi yellow, apically spatulate. *Thorax*: golden-green, with very little white pile. Pleura with long, soft, sparse golden hairs. Upper angle of mesopleuron with a bunch of small black bristles. Acrostichals 1 : 2–3. *Abdomen*: golden-green, with some white pilose tesselation. Segments 1 to 3 black-banded posteriorly. A median blackish stripe on segments 2 to 4, broad only on 2. *Wings*: costal margin a little yellowish, including the two basal scales. There may be some infuscation preapically. III bristly on node and a little beyond it on both sides. *Legs*: femora metallic, tibiæ brown, with broad black tips, tarsi black.

Length 11–15 mm.

Bionomics.—Nothing is known.

Distribution.—Owing to misidentifications in this species it is only safe to accept type-localities and those of very recent identification. These are: Java, Borneo, and the Philippine Islands.

106. **Strongyloneura pseudolucilia** Malloch.

Strongyloneura pseudolucilia Mall., Ann. Mag. Nat. Hist. (10) i, p. 482, 1928.
Type-locality: Szechuen Prov., China. *Type* in the United States National Museum, Washington.

♂♀.—*Head*: ♂ frons about twice as wide as the rather narrow third antennal segment. Head generally testaceous-yellow, frons and occiput fuscous, latter grey-dusted, rest yellow-dusted. Orbits and parafacialia with quite strong, short, black hairs. Hairs on lower part of cheeks and occiput yellow. Face slightly rounded but not carinate, cheek as high as length of antenna. Antennæ and palpi testaceous-yellow, third segment of former slightly browned, fully twice as long as second and not as wide as a parafacialia. Arista fuscous, paler at base. *Thorax*: bright metallic green, with slightly coppery reflections and light white dorsal dusting. A faint pair of submedian dark stripes presuturally; some pale hairs around notopleural, all pleural hairs yellow except on upper two-thirds of mesopleura. Anterior spiracular covering brown. Chætotaxy: acrostichals 2 : 3; dorso-centrals, 2–3 : 4; post-alar declivity bare. *Abdomen*: stout,

concolorous with thorax, lightly white-dusted. A distinct purplish median dorsal stripe. Apices of first three apparent tergites purplish, of fourth deep blue. Hairs strong, fourth tergite with a transverse series of strong bristles. ♂ hypopygium stout. *Wings*: slightly brownish, more so basally. Squamæ whitish-yellow. Halteres yellow. Bend of IV subangular. Lower squama basally lobulate on inner side. *Legs*: black, femora blue-tinged. Tibiæ sometimes brownish. ♂ without, ♀ with, a mid-tibial ventral submedian bristle.

Length 8–9 mm.

Bionomics.—Unknown.

Distribution.—Only known from the type-locality: China, Szechuen Province, Mt. Omei. Possibly not Oriental.

107. **Strongyloneura delectans** (Walker).

Isomyia delectans Wlk., Proc. Linn. Soc. Lond. iv, p. 134, 1860.
Type-locality: Celebes, Macassar. *Type* in the British Museum.
Isomyia conflagrans Wlk., Proc. Linn. Soc. Lond. v, p. 261, 1861.
Type-locality: Celebes, Menado. *Type* in the British Museum.
Somomyia cæruleocincta Big., Ann. Soc. Ent. Fr. (5) vii, p. 43, fig. 14, 1877.
Type-locality: Pulo Pinang. *Type* in the British Museum.
Somomyia pictifacies Big., Ann. Soc. Ent. Fr. (5) vii, p. 45, 1877.
Type-locality: Java. *Type* in the British Museum.

♂♀.—*Head*: in ♂ subholoptic, eye-facets not noticeably differing in size. ♀ frons broad, the brown frontal stripe broader than one of the yellowish to greyish parafrontalia, which show black where rubbed. Parafacialia concolorous. Face yellowish to brown, carina distinct. Antennæ testaceous, short, not nearly reaching level of bottom of eye. *Thorax*: the usual bright metallic green wth some reddish reflections. No traces of vittæ. Chætotaxy: acrostichals 3 : 4, the first presutural weak; dorso-centrals 2 : 4. Scutellum brighter coloured than mesonotum, sometimes with cupreous reflections. Mesopleura with soft grey hairs on posterior margin, among the usual black bristles, more prominent in female than in male. Post-alar declivity weakly pale-haired. *Abdomen*: green, with red or cupreous reflections. Anterior half of first visible segment black. Hind margins of first three segments brown or black-banded. Fourth segment less distinctly apically darkened. *Wings*: vein 1 bare below. Basicostal scale black. Base of wing yellowish to fuscous. *Legs*: femora metallic-green to black, tibiæ and tarsi tending to be paler, a dark brown.

Length 12–15 mm.

Bionomics.—Nothing is known.

Distribution.—Celebes, including a female labelled "*dilutens*" in Walker's writing. This is apparently only a manuscript

name. A female labelled "Sulu" (Sulu Islands) also has a Walker label "*pertinens*," an apparently unpublished name. A female from Assam, Sadiya, bears a label "*nigrofasciata*, Malloch." This is also apparently unpublished. Burma (*sine loc.*); French Indo-China: Laos; Philippine Islands:

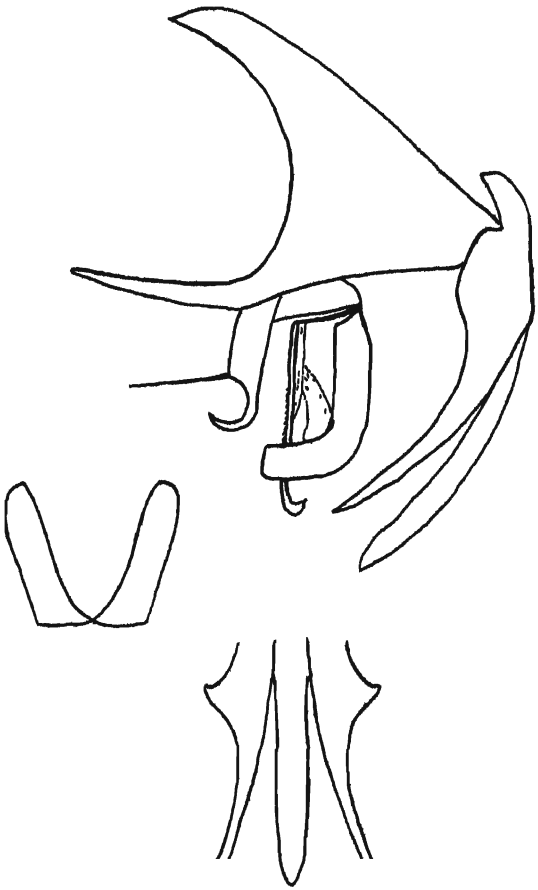


Fig. 76.—*Strongyloneura ostracea* Séguy: ♂ genitalia.

Mindanao. INDIA: Himalayan foothills, Mussoorie, a pair in the British Museum. The black posterior bands to the abdominal segments are very indistinct.

Pachycosmina phenice Séguy (Encycl. Brit. Dipt. vii, p. 21 (1933)), described from a specimen now nearly forty years old, is probably the female of *delectans*.

108. **Strongyloneura œstracea** Séguy. (Fig. 76)

Strongyloneura œstracea Ség., Encycl. Entom. B. ii, Dipt. vi, p. 18, 1933.
Type-locality: China, Kowling. *Type* in the Paris Museum.

♂♀.—*Head*: ♂ subholoptic, parafrontalia dark grey. Parafacialia fuscous-yellow, face brown, carina present. Genæ fuscous, epistome reddish-yellow. ♀ frons less than one-third of head-width, frontal stripe brown or black, with a very elongate ashy-grey circum-ocellar triangle. Four exterior fronto-orbitals. Antennæ varying from second segment dark yellow and third brown pollinose to all reddish, separated basally by more than twice their breadth, not reaching vibrissæ by a distance equal to twice their breadth. Palpi brownish. Decrease in size of eye-facets in ♂ is gradual and not sharply marked. *Thorax*: from greenish to deep blue with violet reflections, scutellum often brighter. Pubescence fine, black or brown. Prosternum with yellowish pubescence. Pleura thickly short black-haired, very conspicuous from above. Acrostichals variable, 0 : 4 to 1 : 3, the first two posterior pairs often reduced; dorso-centrals 2 : 4. *Abdomen*: concolorous with scutellum, unbanded, there may be red reflections at the sides of the tergites. *Wings*: grey, costa indefinitely more brownish. Vein III bristly on node only. Squamæ brown. Halteres yellow. *Legs*: black, tibiæ somewhat paler. ♂ genitalia are shown in fig. 76.

Length 12–13 mm.

Bionomics.—Nothing known.

Distribution.—INDIA, Khasi Hills; Malaya, Penang; Java; China: Kouling, Chekiang, Hangchow.

109. **Strongyloneura chrysoides** (Walker).

Lucilia chrysoides Wlk., Proc. Linn. Soc. Lond. i, p. 23, 1857.
Type-locality: Malaya. *Type* in the British Museum.

♂.—*Head*: eyes subholoptic, parafrontalia above antennæ dark grey pollinose. Parafacialia ashy, black-haired, the yellow of the genæ running up their inner margins in a gradually narrowing streak. Face yellowish. Antennæ and palpi yellow. Eye-facets in two distinct sets, much larger above than below. *Thorax*: blue-green. Pleura with yellow hairs. Chætotaxy: acrostichals 1 : 2; dorso-centrals 2 : 4. *Abdomen*: concolorous with thorax, hind margins of segments blackened. Fourth with strong discals. *Wings*: greyish, somewhat infuscated basally, an apical dark cloud. Vein III bristly to somewhat beyond node. Squamæ dark brownish. *Legs*: femora black, tibiæ and tarsi dark brown.

Length 10 mm.

Bionomics.—Unknown.

Distribution.—Redescribed from a ♂, S. Annam, Phanrang Prov., Daban, 600 ft., March 1918 (*Boden Kloss*), sent by Zoological Survey of India. Java. Preanger, Soekaboemi Moeria.

110. Strongyloneura pseudonepalana*, sp. n. (Fig. 77.)

Strongyloneura nepalana Sen.-Wh. (*nec* Tnsd.), Mem. Dept. Agric. Ind., Ent. Ser. vii, p. 100, 1922, and viii, p. 47, 1923.

Type-locality: Ceylon, Kokinawa, N.C. Prov. *Type* in the British Museum.

♂.—*Head*: frons very narrow, frontalia reduced to a line. Parafrontalia and parafacialia seen from side grey, the latter

Fig. 77. Fig. 78.

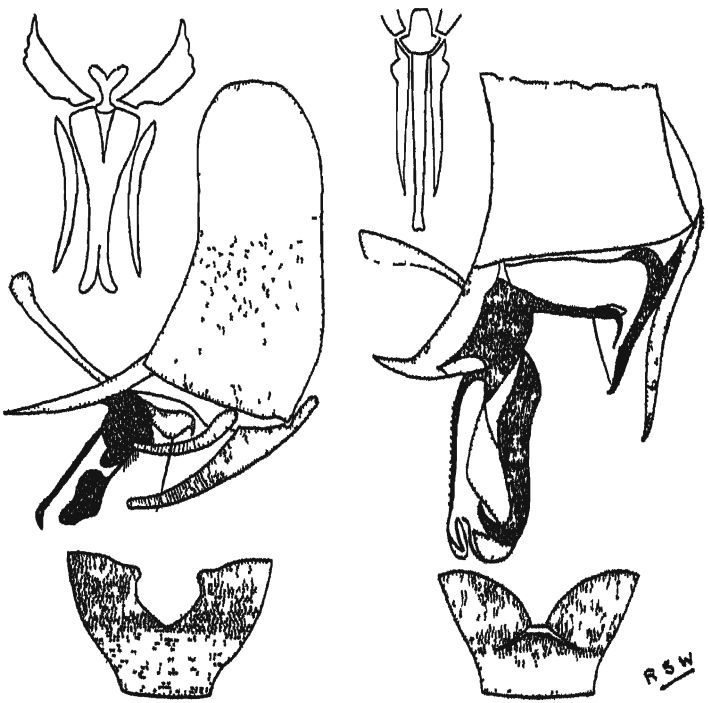


Fig. 77.—*Strongyloneura pseudonepalana*, sp. n.: ♂ genitalia. (From Senior-White.)

Fig. 78.—*Strongyloneura pseudonebulosa*, sp. n.: ♂ genitalia. (From Senior-White.)

* Of the six species that follow three were originally ascribed to certain species of Townsend, all with ♀ types, whereas distinction is only possible on ♂ genitalia. The senior author (R. Senior-White) formerly considered

below with golden glints; from above they appear white. Parafacial hairs yellow, except the top one or two in each row. Face dull yellowish, no carina. Antennæ and palpi orange, base of arista darkened. *Thorax*: green with coppery reflections. Chætotaxy. acrostichals 1 : 2; dorso-centrals 2 : 4. Mesopleuron with yellow hairs except on upper margin. Scutellum green. *Abdomen*: green, with traces of dark posterior bands on apparent second and third. *Wings*: vein III bristly on node only, IV evenly rounded. Veins yellow, also costal margin to some extent indefinitely. Squamæ yellow. *Legs*: femora metallic-green, tibiæ and tarsi brownish. ♂ *genitalia* figured in fig 77.

Length 8 mm.

Bionomics.—Unknown.

Distribution.—CEYLON: N.C. Prov., Kekirawa; C. Prov., Matale; N. Prov., Pankulam; W.P. Heneratgoda, INDIA: Assam, Khasi Hills, Shillong

111. **Strongyloneura pseudonebulosa**, sp. n (Fig. 78.)

Strongyloneura nebulosa Sen.-Wh. (*nec* Tnsd.), Mem. Dept. Agric. Ind. viii, p. 47, 1923.

Type-locality: Ceylon, Trincomali. *Type* in the British Museum.

♂.—*Head*: parafrontalia and parafacialia leaden-grey, latter more silvery below, with pale hairs. Antennæ and palpi brownish-yellow. *Thorax*: green, with much white pile anteriorly. Traces of dark vittæ in certain lights. Scutellum green. Mesopleural hairs pale except on upper margin. Acrostichals 2 : 4; dorso-centrals 2 : 4. *Abdomen*: green, traces of broad dark margins to segments. *Wings*: III spinulose above well beyond node. Costal margin yellowish. IV evenly rounded. Squamæ pale fuscous. *Legs*: femora metallic, tibiæ and tarsi brownish. ♂ *genitalia* figured in fig. 78.

Length 7–8 mm.

Bionomics.—Nothing is known.

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that he had satisfactorily associated these descriptions with corresponding ♂♂, whose genitalia were figured and identified accordingly. Examination of the actual types in preparing this work showed that neither the number of acrostichals nor the extent of bristling on vein III is a constant character, and therefore these ♀ types cannot be associated with their corresponding ♂♂. Under *viridana*, Townsend's ♀ type does not correspond with his description, as the parafacial hairs are yellow, not black as stated—though they are black in the ♀ from Calcutta, Sept. 27th, 1907, which was also seen by Townsend. Under these circumstances the only safe course appears to be to drop Townsend's names altogether. The specimens returned by R. Senior-White in collections determined prior to 1934 as *nebulosa* Tnsd. are all *pseudonebulosa*, sp. n. Specimens sent out with the Townsend names should also all be re-labelled with the affix "*pseudo-*" and treated as *spp. n.* described in the present volume.

Distribution.—CEYLON: Trincomali; INDIA: Wynaad, Cherambadi; Calcutta; Assam, Gauhati and Haflong; Darjeeling Dist., 1000–4000 ft.; Chota-Nagpur, Goilkera, 1300 ft.; Bombay; Malaya: Penang, Taiping.

112 **Strongyloneura zeylanica**, sp. n (Fig. 79.)

Type-locality: Ceylon, Malay Cave, Trincomali. *Type* in the British Museum.

♂.—*Head*: frons narrow, parafrontalia nearly pinched out, dark ashy metallic-grey, from above brilliant silvery. Parafacialia lighter ashy-grey, hairs black. Antennæ and

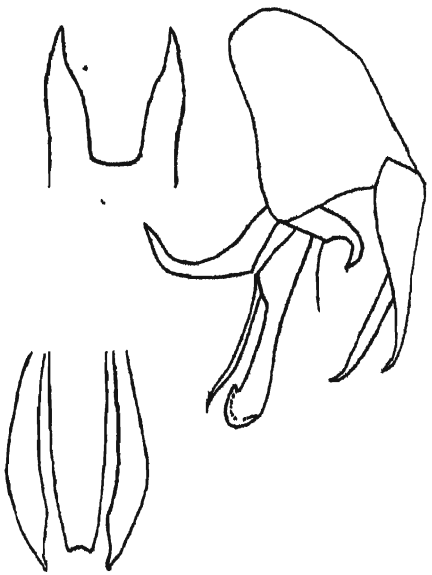


Fig. 79.—*Strongyloneura zeylanica*, sp. n. ♂ genitalia.

palpi yellow-brown. *Thorax*: brilliant metallic-green with blue reflections. Scutellum concolorous. Mesopleural hairs black. Acrostichals 1:2; dorso-centrals 2:4. *Abdomen*: green, posterior borders of segments darkened. *Wings*: dark hyaline, basicosta rather darker. III bristly on node only. Squamæ whitish. *Legs*: femora black, tibiæ pale brownish. ♂ *genitalia* figured in fig. 79.

Length 8 mm.

Bionomics.—Nothing known.

Distribution.—Type ♂ from Ceylon, Trincomali, Malay Cave, 21. xii. 90 (*Yerbury*). Another ♂ (paratype) from Assam, Khasi Hills (*Chennell*).

113. **Strongyloneura pseudocærulana**, sp. n. (Fig. 80.)

Strongyloneura cærulana Son.-Wh. (*nec* Tnsd.), Ind. Mem. Dept. Agric., Ent. Ser. viii, p. 47, 1923.

Type-locality: Matale District, Ceylon. *Type* in the British Museum.

♂.—*Head*: parafrontalia plumbeous, parafacialia concolorous with black hairs, paler below. Face brown. Antennæ

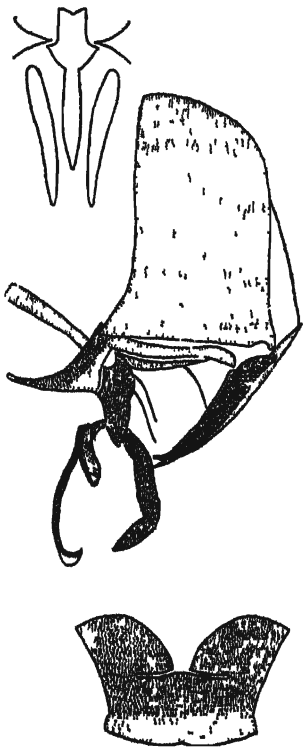


Fig. 80.—*Strongyloneura pseudocærulana*, sp. n. ♂ genitalia. (From Senior-White.)

brown. *Thorax*: green with cupreous reflections, exceptionally all purplish-cupreous. Scutellum green. Mesopleura outstandingly black-haired. Acrostichals 2 : 4. *Abdomen*: green. *Wings*: clear, III bristly beyond node. Squamæ whitish. *Legs*: femora metallic, tibiæ and tarsi brownish. ♂ *genitalia* figured in fig. 80.

Length 8 mm.

Bionomics.—Nothing known.

Distribution.—CEYLON: C. Prov., Matale District, 1300 ft.; N.C. Prov., Anuradhapura; N. Prov., Pankullam; E. Prov., Trincomali. INDIA: Calcutta; Chota Nagpur, Goilkera, 1300 ft.; Assam; Shillong and North Khasi Hills; Philippines; Mindanão.

114. **Strongyloneura yerburyi**, sp. n. (Fig. 81.)

Type-locality: Ceylon, Perivipencheram. *Type* in the British Museum.

♂.—*Head*: eyes quite widely separated for the group. Frontal stripe black. Parafrontalia and parafacialia silvery, latter with black hairs. Face pale brownish-grey. Antennæ yellowish-brown. Palpi pale yellow. *Thorax*: bright green

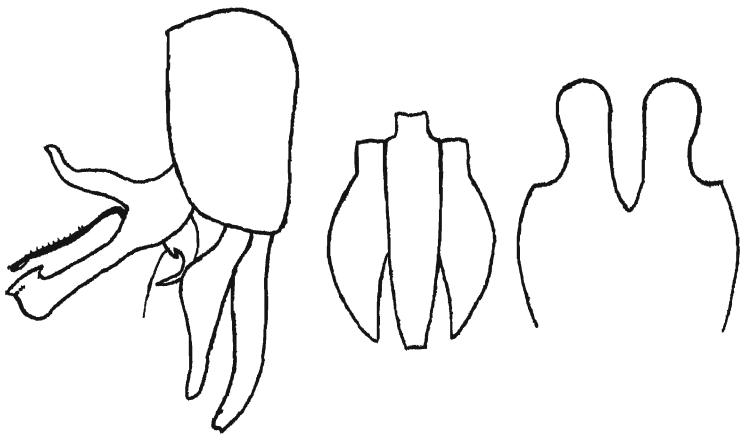


Fig. 81.—*Strongyloneura yerburyi*, sp. n.: ♂ genitalia.

with bluish reflections and silvery pollen on anterior margin. Scutellum bright blue. Mesopleural hairs black. *Abdomen*: blue, with some silvery pollen on anterior lateral angles of each segment, the greater part of each segment dorsally covered by ill-defined black triangular patches, reaching from hind margin, the apices anteriorly directed. *Wings*: rather smoky hyaline, III bristly on node only. Squamæ yellowish-white. *Legs*: black throughout. ♂ *genitalia* figured in fig. 81.

Length 10 mm.

Bionomics.—Nothing is known.

Distribution.—Only known from CEYLON, N.P. and E.P., where it appears to be widely distributed.

115. **Strongyloneura tibialis** (Villeneuve). (Fig. 82.)

Thelycha ta tibialis Vill., Rev. Zool. Afr. xv, p. 218, 1927.
Type-locality : Formosa. *Type* in the British Museum.
Strongyloneura viridana Sen.-Wh. (*nec* Tnsd.), Mem. Dept. Agric. Ind., Ent. Ser. vii, p. 100, 1922.

♂. – *Head*. parafrontalia dark grey. Parafacialia above concolorous, below ashy, with black hairs. Face dull testaceous.

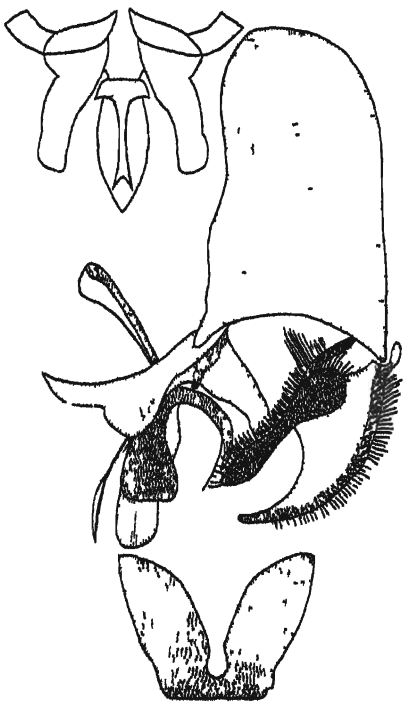


Fig. 82.– *Strongyloneura tibialis* (Villeneuve) : ♂ genitalia. (From Senior-White.)

Antennæ testaceous, apical half of third segment darkened. *Thorax* : green with some coppery reflections. Scutellum green. Mesopleura black-haired. Acrostichals 1 : 2 ; dorsocentrals 2 : 4. *Abdomen* : green. *Wings* : fuscous-yellow, vein III bristly on node only. IV evenly rounded. Squamæ yellowish. *Legs* : femora green, tibiæ and tarsi yellowish. ♂ *genitalia* figured in fig. 82.

Length 7–10 mm.

Bionomics.—Nothing is known.

Distribution.—INDIA: Assam; Khasi Hills, Shillong Kumaon, Muktesar, 7000 ft., Madras, Jeypore Hills, Artham; Formosa.

The following species belong to the section with non-produced lower calyptor and bare post-alar declivity, in which separatory characters are only found in the male genitalia The types of these species being females, they are unrecognizable:—*Pyrellia sivah* Bigot, *Somomyia versicolor* Bigot, *Strongyloneura nepalana* Townsend, *Strongyloneura viridana* Townsend, *Strongyloneura cærulana* Townsend, *Strongyloneura formosæ* Villeneuve, *Strongyloneura electa* Villeneuve.

Genus 20. **THORACITES** Brauer & von Bergenstamm.

Thoracites B. & B., Denk. K. Akad. Wien, lviii, p. 361, 1891. Genotype, *Musca abdominalis* Fabricius.

Epistome produced forward, very narrow. No facial carina. Arista biplumose to tip. ♂ eyes as far apart as length of second antennal segment. Macrochætæ marginal on sides of second abdominal segment, discal and marginal on sides of second and third, strong marginally on fourth. ♀ frons narrower than usual, with one reclinate and two proclinate fronto-orbitals. ♀ abdomen with strong marginals. Apical cell narrowly open.

The genus is monotypic.

116. **Thoracites abdominalis** (Fabricius).

Musca abdominalis Fab., Syst. Antl. p. 294, 1805.
Type-locality: "East India." *Type* in the Copenhagen Museum.
Cosmina varia Wlk., Dipt. Saund. p. 350, 1856.
Type-locality: Ceylon. *Type* in the British Museum.
Rhynchomyia plumata Schiner, Dipt. Reise 'Novara,' p. 315.
Type-locality: Ceylon. *Type* in the Vienna Museum.

♂♀.—*Head*: ♂ frons rather wide, ♀ frons one-third of head-width, the eyes sharply diverging from the vertex. Frontal stripe dark yellow, parafacialia not distinguished. Genæ and occiput concolorous. Antennæ and palpi slightly darker yellow. *Thorax*: pale metallic-green, with a varying amount of pale yellowish pile, sometimes appearing greyish-bronze. No pilose pleural stripe. *Abdomen*: brownish-yellow, darkened apically. *Wings*: brownish, infuscated along costa. *Legs*: front femora metallic-green, posterior pairs black. Tibiæ brown, tarsi black.

Length 7–8 mm.

Bionomics.—Apparently confined to the sea-coast.

Distribution.—The coast from Colombo (Ceylon) to Puri (Orissa). Probably will prove to be more widely distributed if searched for.

Genus 21. **MALAYOMYZA** Malloch

Malayomyza Mall., Ann. Mag. Nat. Hist. (10) i, p. 491, 1928. Genotype, *M. humeralis* Mall.

No parafacial hairs. ♀ without fronto-orbitals. Presutural acrostichal and dorso-central well developed. Lower squama narrow and rounded apically. Anterior cross-vein well beyond middle of wing. Bend of IV rounded, tip of first posterior cell with a short neck. The genus is monotypic

117. **Malayomyza humeralis** Malloch.

Malayomyza humeralis Mall., Ann. Mag. Nat. Hist. (10) i, p. 492, 1928 (♀); (10) xvi, p. 217 (♂).

Type-locality: Kuala Lumpur, Malaya. *Type* in the British Museum.

♂♀. —*Head*: in ♂ frons about one-sixth the head-width, in ♀ a full one-third. Vibrissal angle not conspicuously produced forward, the parafacialia almost invisible below middle, face pronouncedly concave in profile. General colour black, anterior third of each orbit testaceous-yellow, the frontalia not yellow in front, face and cheeks testaceous-yellow, the latter with a large subquadrate black mark extending from eye to lower margin, the orbits each with a grey-dusted spot near middle, and each of the parafacialia with a similar median mark. Upper occiput blackish, grey-dusted. Antennæ and palpi testaceous-yellow. *Thorax*: black, very slightly grey-dusted, the dorsum shining and slightly æneous, without distinct vittæ; humeral angles, propleura, and a broad vitta along upper margin of pleura to wing-base testaceous-yellow. Chætotaxy: acrostichals 1 : 1; dorso-centrals 2 : 4, the two anterior postsutural pairs short. Anterior notopleural present. *Abdomen*: black, basal two tergites testaceous-yellow, black-banded apically, narrowest on first, where it is not carried over the lateral curve. *Wings*: yellowish hyaline. Squamæ and halteres yellow. *Legs*: fuscous, coxæ yellow, bases of tibiæ and of tarsi dusky yellow. Two antero-ventral bristles on hind tibia, but weak and short.

Length 3–5 mm.

Bionomics.—Unknown.

Distribution.—Malaya: Gombak Valley, Kuala Lumpur.

Genus 22. **CHLOROIDIA** Townsend

Chloroidia Tnsd., Rec. Ind. Mus. xiii. p. 196, 1917. Genotype, *Idia prolata* Wlk.

Epistome produced forward. Facial carina absent. Arista biplumose. ♂ subholoptic. Proboscis very enlarged. Ab-

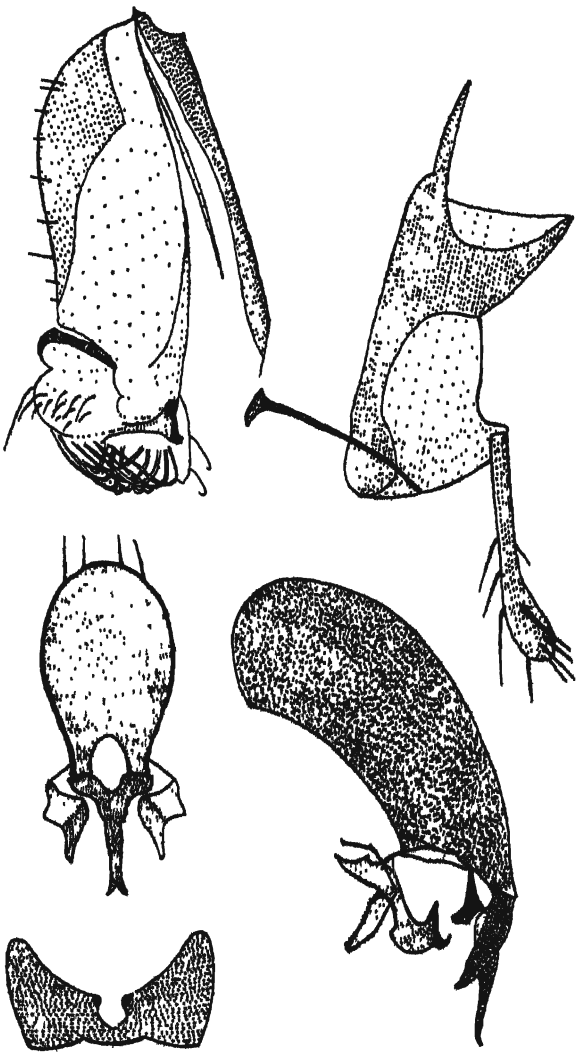


Fig. 83.—*Chloroidia prolata* (Walker): ♂ genitalia and proboscis. (From Senior-White.)

dominal macrochætæ bristle-like on margins of last two segments. ♂ with intermediate abdominal segments extremely shortened, the genital segment greatly enlarged and almost as long as the four preceding segments. ♂ fifth sternite with a spine-brush, sixth sternite excessively broadened, and with spine-brushes on each side. ♀ hypopygium large and broad. Apical cell of wing very narrowly open.

The genus is monotypic.

118. **Chloroidia prolata** (Walker). (Fig. 83.)

Idia prolata Wlk., Proc. Linn. Soc. Lond. iv, p. 133, 1860.
Type-locality: Celebes. *Type* in the British Museum.
Chloroidia flavifrons Tnsd., Rec. Ind. Mus. xiii, p. 196, 1917.
Type-locality: Chalakudi, Cochin State. *Type* in the Indian Museum, Calcutta.

♂♀.—*Head*: light golden-pollinose, parafrontalia more deeply golden; frontalia and a large spot on each cheek brown or black. Antennæ and palpi fulvous-yellow. Face shining, parafacialia pollinose, face may be tinged black in centre of clypeus and on vibrissal angles. *Thorax*: a very bright burnished emerald-green, thinly yellow-pollinose. Scutellum concolorous. *Abdomen*: nearly as bright green, in ♀ shading to cupreous at tip and more or less blackish on disc of tergum, in ♂ dusky on tergal disc. ♂ hypopygium wholly purplish, that of ♀ nearly black, with some purplish tinge. *Wings*: faintly infuscate, or at least so along costa and apically. Squamæ pale yellowish-white. *Legs*: subfulvous, front femora bright green, others more black; tarsi apically darkened.

Length 5–5·5 mm.

Bionomics.—The structure of the proboscis suggests that the species is predaceous.

Distribution.—INDIA: Cochin State, Chalakudi; LOWER BURMA: Mergui; CEYLON, wet and dry zones; Celebes.

Genus 23. **COSMINA** Robineau-Desvoidy.

Cosmina R.-D., Myodaires, p. 423, 1830. Genotype, *Musca punctulata* Wiedemann.
Seseromya Rond., Arch. Zool. Modena, iii, p. 32, 1863. Genotype, *Idia punctulata* Mq.
Synamphoneura Big., Bull. Soc. Ent. Fr. (6) vi, p. xiv, 1882. Genotype, *Idia bicolor* Wlk., as *S. cuprina* Big.
Synamphoneuropsis Tnsd., Rec. Ind. Mus. xiii, p. 199, 1917. Genotype, *C.ænea* Fab., as *S. viridis* Tnsd.

Head: vibrissal angle produced forward rather than downward. Parafacialia distinct on their entire length, and face not concave in profile. Facial carina weak or absent. Arista

biplumose, nearly to tip. ♂ subholoptic. *Thorax* : two noto pleurals, the anterior quite close to humeral callus, and lateral of the posterior one. *Abdomen* : macrochaetæ on apical segment variable in strength. ♂ hypopygium large. *Wings* : apical cell varying, in some species, from narrowly open to closed petiolate.

Key to the Species.

1.	Face shining black	2.
	Face yellowish	*ænea* (Fab.), p. 172.
2.	Antennæ yellow-brown.....	3. [p. 175.
	Antennæ black or dark brown	*biplumosa* (Sen.-Wh.),
3.	Proploura haired in centre. ♀ hypopygium unspined	*bicolor* (Wlk.), p. 173.
	Proploura bare in centre. ♀ hypopygium with strong spines	*confusa* Mall., p. 175.

119. **Cosmina ænea** (Fabricius). (Fig. 84.)

Dictya ænea Fab., Syst. Antl. p. 328, 1805.
Type-locality : W. Africa. *Type* ?
Phumosia fulvicornis Big., Bull. Soc. Zool. Fr. p. 661, 1887.
Type-locality : Java. *Type* in the Paris Museum.
Synamphoneuropsis viridis Tnsd., Rec. Ind. Mus. xvi, p. 199, 1917.
Type-locality : Allahabad, United Provinces. *Type* in the Indian Museum, Calcutta.
Cosmina indica Sen.-Wh., Mem. Dept. Agric. Ind., Ent. Ser. viii, p. 42, 1923.
Type-locality : Allahabad, United Provinces. *Type* in the Imp. Agri. Dept, Delhi.

♂♀.—*Head* : frontal stripe rich brown, parafrontalia and ocellar triangle yellowish-grey with black spots. ♂ frontalia reduced to a line, parafrontalia distinct, width of frons overall at narrowest about that of second antennal segment. In ♀ frontal width at root of antenna a full third of head-width, not greatly narrowed above. Face and parafacialia ashy-yellowish, the former shining, the latter often with dark spots, which also occur on genæ, especially in ♂. Vibrissæ considerably above mouth-border. Antennæ fulvous, third joint grey-dusted, arista with yellow shaft, broadly biplumose to two-thirds its length. Palpi luteous, spatulate. Occiput black, post-ocular margin pale greyish. *Thorax* : dorsum dully greenish-cupreous, almost hidden beneath whitish pollen, the whole thickly stippled with black dots. A pair of black dorso-central stripes, indistinct and more or less interrupted and displaced exteriorly behind suture. Scutellum more shining green. Pleura as dorsum. Chætotaxy : acrostichals 0 : 2 ; dorso-centrals 2 : 4 ; pteropleural strong ; sternopleural 1 : 1 ; scutellars 6, apicals crossed. *Abdomen* : purplish-cupreous, greyish-pollinose, black-stippled, with an obscure black median vitta. Apparent fourth segment with irregular discals.

Wings. greyish, infuscated along costa, especially apically. Squamæ pale yellowish. *Legs*: femora black, tinged metallic-green; tibiæ yellowish-brown, tips black; tarsi variable, yellowish-brown to black.

Length 5 6·5 mm.

Bionomics.—Nothing known.

Distribution.—Nigeria: Gold Coast, Northern Territories. INDIA: Punjab, Lyallpur, Jullundur; United Provinces, generally; Bihar; Himalayas; Java; Borneo, Pulo Pinang.

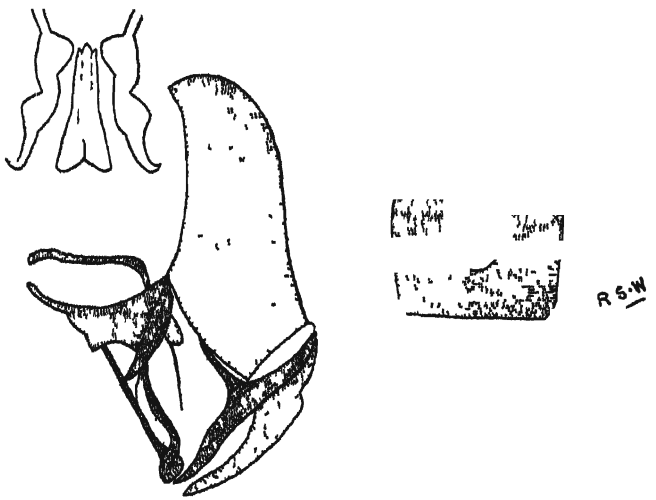


Fig. 84.—*Cosmina senea* (Fabricius): ♂ genitalia. (From Senior-White.)

120. **Cosmina bicolor** (Walker). (Fig. 85.)

Idia bicolor Wlk., Proc. Linn. Soc. i, pp. 23, 77, 1857.
Type-locality: Malacca. *Type* in the British Museum.
Cosmina pinangiana Big., Ann. Soc. Ent. Fr. (5) iv, p. 241, fig. 3, 1874.
Type-locality: Pulo Pinang (Borneo). *Type* in the Paris Museum.
Synamphoneura cuprina Big., Bull. Soc. Ent. Fr. (6) vi, Bull. p. xiv, 1882.
Type-locality: Java. *Type* in the British Museum.

♂♀.—*Head*: ♂ subholoptic, ♀ frons nearly one-third of head-width. Frontal stripe pinched out in ♂, in ♀ chestnut-brown. Parafrontalia ashy with shining black spots. Parafacialia silvery-white, with two shining black patches. Face shining black, separated from the similar genæ by a yellowish stripe which seems silvery in certain lights. Antennæ yellow-brown. Palpi black, paler at extreme tips, apically spatulate

base is bright yellow. *Thorax*: shining coppery-green, with whitish pollen and black spots, with four darker non-pollinose stripes. Propleura haired in centre, sometimes very indistinctly so in small specimens. *Abdomen*: concolorous with thorax, with a dark median stripe. ♂ with a single series of strong bristles close to apex of fifth visible sternite, anterior to these a few much weaker setulose hairs. ♀ hypopygium without strong spines. *Wings*: costa deeply infuscated up

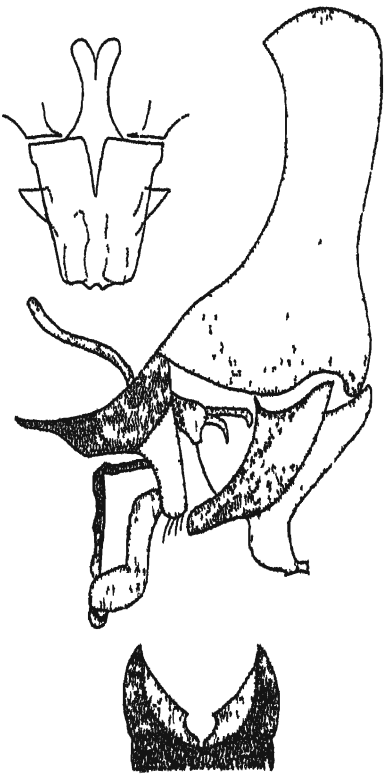


Fig. 85.—*Cosmina bicolor* (Walker): ♂ genitalia.
(From Senior-White.)

to II, and broadly but less deeply over apex to bend of IV. Apical cell open or closed petiolate in varying degree, not always constant in opposite wings of same specimen. *Legs*: femora metallic-green, tibiæ brownish, tarsi brown on basal, black on apical segments.

Length 6–8 mm.

Bionomics.—Unknown.

Distribution.—Ceylon: Andankulam. India: Assam; Indo-Gangetic Plain; Coorg; Nilgiris. Burma; Malaya: Malacca, Kuala Lumpur; Borneo (Pulo Pinang); Java: Soekaboemi; Siam: Nglirof, Biserat; Tongking, Hoabinh.

121. **Cosmina confusa** Malloch.

Cosmina confusa Mall., Ann. Mag. Nat. Hist. (x) 1, p. 339, 1928.
Type-locality: Langkawi Island, Malaya. *Type* in the British Museum.

♂♀.—*Head*: ♂ subholoptic, ♀ frons nearly one-third of head-width. Frontal stripe pinched out in ♂, in ♀ chestnut-brown. Parafrontalia ashy, with shining black spots. Parafacialia silvery-white, with two shining black patches. Face shining black, separated from the silvery genæ by a yellowish stripe which seems silvery in certain lights. Antennæ yellow-brown. Palpi black, pale at extreme tip, apically spatulate. *Thorax*: shining coppery-green, with whitish pollen and black spots, with four darker non-pollinose stripes. Propleura bare in centre. *Abdomen*: concolorous with thorax, with a dark median stripe; ♂ with several series of almost equally long bristles on entire exposed surface of fifth visible sternite; ♀ hypopygium with three or more strong, laterally directed, curved spines on each side. *Wings*: costa deeply infuscated up to II, and broadly but less deeply over apex to bend of IV. Apical cell open or closed petiolate in varying degree, not always constant in opposite wings of same specimen. *Legs*: femora metallic-green, tibiæ brownish, tarsi brown on basal, black on apical segments.

Length.—5–6·5 mm.

Bionomics.—Unknown.

Distribution.—Langkawi Island, west coast of Malaya.

We have examined both Walker's type of *bicolor* and Malloch's of this species. The propleural hairs appear deciduous. The validity of Malloch's species appears doubtful.

122. **Cosmina biplumosa** (Senior-White).

Stomorhina biplumosa Sen.-Wh., Spol. Zeyl. xiii, p. 110, 1924.
Type-locality: N. Siam, Chengmai. *Type* and *paratype* in the British Museum.
Cosmina nigrocærula Mall., Ann. Mag. Nat. Hist. (9) xviii, p. 519, 1926.
Type-locality: Malaya, Pahang. *Type*, location not stated.

♂♀.—*Head*: frons dull black, longitudinally striate, parafrontalia dark grey, shining in places, especially at the level of the lunule, which is shining black. Face shining black, base of carina brown, parafacialia similar, with a large upper and small lower patch of shimmering white pile. Cheeks

black, less shining, with a trace of white pile in upper angle. Antennæ black or dark brown, paler on second, third segment grey pollinose, arista plumose on basal two-thirds above and much more shortly on basal half below. Palpi black. Epistome strongly directed forward. ♂ subholoptic, the frontalia reduced to a line, parafrontalia distinct throughout. ♀ frons less than a third of head-width, grey pubescent, with numerous setigerous, shining black spots. Frontal lunule and tip of second antennal segment reddish-brown. A good deal of white pile around vertex, almost wanting in ♂. Facial carina broad, tuberculous, fading below. *Thorax*: dully shining, greenish or bluish with coppery reflections, with black setigerous spots closely scattered all over the disc; pleura with soft black hairs. Viewed from above and behind the disc of thorax with white pile. Macrochætæ not well distinguished from the general chætal covering, but one distinct pair of prescutellar dorso-centrals and a still stronger post-alar on callus. Sternopleurals 1 : 1. Four marginal scutellars. *Abdomen*: concolorous with thorax, rather more noticeably metallic, with black microtrichial spots, and white pollen visible in certain lights. ♂ hypopygium fairly prominent. *Wings*: slightly smoky, front margin and apex, especially the latter in ♀, deeply infuscated. First posterior cell well open. Squamæ dark smoky-brown.

Length 10 mm.

Bionomics.—Nothing is known.

Distribution.—Siam: Doi Chom Chang, near Chiengmai, Maluk; Malaya, Mt. Ophir.

Genus 24. **ALIKANGIELLA** Villeneuve.

Alikangiella Vill., Rev. Zool. Afric. xv, p. 389, 1927. Genotype, *A. flava* Vill.

Eucosmina Mall., Ann. Mag. Nat. Hist. (10) i, p. 492, 1928. Genotype, *E. vittigera* Mall.

Head: vibrissal angle not conspicuously produced forward. Parafacialia almost invisible below the middle. Face pronouncedly concave in profile. Frontal orbits in ♀ bare exteriorly to the incurved bristles. Arista biplumose. *Thorax*: anterior notopleural wanting.

Key to the Species of Alikangiella.

Dorsum of thorax black, with longitudinal silver-grey stripes ..... *vittigera* (Mall.), p. 177.

Dorsum of thorax brownish-orange, no stripes. Wings yellowish, with definite infuscation on part of anterior margin ..... *rufithorax* (Mall.), [p. 178.

Dorsum of thorax orange, with paired narrow longitudinal brownish stripes. Wings hyaline, with faint yellowish tint..... *flava* Vill., p. 177.

123. **Alikangiella vittigera** (Malloch).

Mucosmina vittigera Mall., Ann. Mag. Nat. Hist. (10) i, p. 493, 1928.
Type-locality: Malaya, Selangor. *Type* in the British Museum.

♀.—*Head*: black, anterior third of frons, the face except a line on lower half of each facial ridge, cheeks except a large submedian mark, the lower occiput, testaceous-yellow; a conspicuous spot of white dust near middle of each frontal orbit, and another near middle of each of the parafacialia, occiput lightly grey-dusted. Frons at vertex fully one-fourth of head-width; all four vertical bristles distinct; parafrontalia about one-fourth as wide as the frontal stripe. Frons at base of antennæ projecting as far as width of third antennal segment. Parafacialia at lower part of eye almost invisible from side. Genæ nearly one-third an eye-height, its hairs mixed black and yellow. Antennæ and palpi testaceous-yellow, third segment of former browned above. Arista plumose. *Thorax*: black, humeral angles, propleura, a small portion of pleura at wing-base, and the coverings of both spiracles, yellow. Mesonotum and pleura grey-dusted, the former with five broad black stripes, the outer one on each side on lateral margin. Scutellum with traces of three dark marks continuous with mesonotal stripes. Mesonotal hairs black. Humeral and pleural hairs yellow. One strong and one very weak pair of prescutellar dorso-centrals, and one pair of strong prescutellar acrostichals. Propleura bare in centre. Prosternum haired. Scutellum with six marginals and quite dense decumbent hairs. *Abdomen*: tergites without any strong apicals, black, first segment yellow dorsally, also sides of second in front. *Wings*: yellowish-hyaline. Squamæ and halteres yellow. Anterior cross-vein a little beyond middle. Bend of IV rounded. Tip of first posterior cell with a short neck. *Legs*: fuscous, coxæ and femora yellow, bases of tibiæ and tarsi dusky yellow. Front tibia with one antero-dorsal and one posterior bristle; mid-tibia with antero-dorsal, one ventral, and three posterior bristles; hind femur with one preapical and antero-ventral bristle; hind tibia with one antero-ventral, two antero-dorsal, and two postero-dorsal bristles.

Length 6 mm.

Bionomics.—Nothing is known.

Distribution.—Malaya: Selangor, Bukit Kutu, and Gombak Valley.

124. **Alikangiella flava** Villeneuve.

Alikangiella flava Vill., Rev. Zool. Afric. xv, p. 390, 1927.
Type-locality: Formosa, Chip Chip. *Type* in the Deutsche Entomologische Institut.

♀.—*Head*: eyes bare, separated by a quarter the head-width at vertex. Frons orange, broad, narrowing slightly anteriorly, about thrice width of third antennal segment. Parafrontalia narrow, at narrowest about one-half width of third antennal segment, dark brown, slightly shining on upper half, anteriorly orange, with a glaucous spot in the middle; parafacialia, face, jowls, and medianæ yellow, the parafacialia bare, with a glaucous spot just below level of insertion of antennæ; face shining, concave in profile; antennæ orange, arista moderately long, haired to tip. Vibrissæ slightly above epistomal margin. Palpi orange. Occiput black. *Thorax*: orange, dorsum with a slightly red tinge, and with paired, narrow, brownish-red longitudinal stripes not reaching the anterior margin of the scutellum. Chætotaxy: acrostichals 0 : 1; dorso-centrals 1 : 4 (only the presutellars well developed); posthumerals 2 (weak); presuturals present; intra-alars 1, supra-alars 2; humerals 1; prostigmatic and propleural present. *Abdomen*: yellow anteriorly, apparently darker posteriorly (third and fourth segments damaged). *Wings* hyaline. IV with rounded curve; first posterior cell opening very near wing-tip. Squamæ testaceous, semi-transparent. Halteres orange. *Legs*: yellow.

Length 6 mm.

Bionomics.—Nothing is known.

Distribution.—Formosa, Chip Chip.

125. Alikangiella rufithorax (Malloch).

Eucosmina rufithorax Mall., Ann. Mag. Nat. Hist. (10) xvi, p. 236, 1935.

Type-locality: Borneo. *Type* in the British Museum.

♂♀.—*Head*: brownish-yellow, in male usually almost entirely infuscated, in female usually darkened only on the orbits; face and genal flock in male usually blackish, rarely evident in female. Upper half of occiput blackened in both sexes. Male frons at vertex one-fifth of head-width, female about one-fourth. *Thorax*: dull brownish or reddish-yellow, mesonotum with black hairs. Pleura partly yellow-haired. Postnotum rather broadly black in centre. *Abdomen*: basally semipellucid, blackened apically. Marginals on segments distinct. *Wings*: brownish-hyaline, costal margin with a distinct elongated brown cloud throughout. *Legs*: concolorous with thorax, apical segment of tarsi infuscated. Female with one or more well-developed postero-ventral bristles.

Length 5·5–6·5 mm.

Bionomics.—Nothing is known.

Distribution.—Borneo, Mt. Kinabalu, various localities.

Genus 25. **METALLIOPSIS** Townsend.

Metalliopsis Tnsd., Rec. Ind. Mus. xiii, p. 198, 1917. Genotypo, *M. setosa* Tnsd.
Chlororhynchomyia Tnsd., Journ. N.Y. Ent. Soc. xl, p. 440, 1932. Genotypo, *C. clausa* Tnsd.

Head: epistome produced anteriorly. Facial carina weak, flattened. Arista short-plumose on basal two-thirds. ♂ subholoptic. ♀ frons rapidly widening from vertex, parafrontalia thickly bristled outside of frontal row. Parafacialia hairy above. The genus is monotypic.

126. **Metalliopsis setosa** Townsend.

Metalliopsis setosa Tnsd., Rec. Ind. Mus. xiii, p. 198, 1917.
Type-locality: E. Himalaya. *Type* in the Indian Museum, Calcutta.
Rhynchomyia setipyga Vill., Bull. Ann. Soc. Ent. Belg. lxix, p. 185, 1929.
Type-locality: Formosa. *Type* in Villeneuve's collection.
Chlororhynchomyia clausa Tnsd., Journ. N.Y. Ent. Soc. xl, p. 440, 1932.
Type-locality: Ceylon. *Type* in the Berlin Museum.

♂♀.—*Head*: reddish-yellow, the parafrontalia showing obscurely green beneath the yellowish pollen. Parafacialia with black spot. Third antennal segment and extreme tips of palpi dusky. *Thorax*: bright metallic-green, with a thin coat of silvery pollen; scutellum concolorous. Some long, thin, yellow pile on humeri and pleura. *Abdomen*: yellowish-red, with black median stripe; anal segment metallic cupreous-green. Edge of third segment and a spot on side of second segment greenish. *Wings*: smoky-yellowish. Squamæ concolorous. *Legs*: femora black with metallic-green tinge, especially the front pair. Remainder reddish-brown.

Length 7–7·5 mm.

Bionomics.—Nothing is known.

Distribution.—INDIA: Eastern Himalayas, Kurseong and Siliguri; BURMA, Mondaung; Malaya, Singapore; Formosa.

Genus 26. **METALLEA** v. d. Wulp.

Metallea v. d. Wulp, Tijd. v. Ent. xxiii, p. 174, 1880. Genotypo, *M. notata* v. d. Wulp.
Trichometallea Tnsd., Rec. Ind. Mus. xiii, p. 194. Genotypo, *T. pollinosa* Tnsd.

Head: epistome somewhat forwardly produced. Arista bare or finely pubescent. ♂ subholoptic. *Thorax*: propleura haired in centre. *Abdomen*: macrochætæ bristle-like, marginal on last two or three segments. *Wings*: apical cell well open.

Key to the Species.

1.	Arista nearly or quite bare	*pollinosa* (Trasd.), p. 183.
	Arista distinctly pubescent	2. [p. 182.
2.	Femora with basal half yellow-brown	*flavibasis* Sen.-Wh.,
	Femora all black	3. [p. 180.
3.	Abdomen towards apex with metallic-green lateral patches	*notata* v. d. Wulp,
	No such abdominal patches	*divisa* (Wlk.), p. 180.

127. **Metallea notata** v. d. Wulp.

Metallea notata v. d. Wulp, Tijd. v. Ent. xiii, p. 175, 34, pl. x. figs. 10–12, 1880.
Type-locality: Java. *Type*, Amsterdam?.

♂♀.—*Head*: pale ochreous-yellow, frontal stripe orange, very narrow, terminating in a shining spot above antennæ, the middle of the face and the mouth-edge very shining. Antennæ and palpi orange, the latter pale brown at extreme tip. Epistomal hairs whitish-yellow. *Thorax*: metallic-green, yellowish-grey dusted. Scutellum concolorous. Laterally thorax ashy, but not entirely obscuring the ground-colour, the chætæ arising from small black papules. *Abdomen*: first three segments clear yellow, the third with a posterior band of metallic-green covering almost half its length, not always fully developed. Second and third, and sometimes fourth segment with dark brown dorsal flecks, second, in addition, with brown side-patches, more or less visible ventrally. Fourth segment with metallic-green patches, yellow-pollinose, and with black hair-papules. *Wings*: hyaline, slightly yellowish basally. *Legs*: femora black, front pair with metallic-green reflections; tibiæ brownish-yellow with black tips; tarsi dark brown, somewhat lighter basally.

Length 7 mm.

Bionomics.—Nothing is known.

Distribution.—Ceylon: Mahagani, Trincomali, Nilaveli. India: Orissa, Puri; United Provinces, Allahabad; Assam, Shillong; Andaman Islands, Port Blair; China, Foo Chow Foo; East Africa; (?) South Africa.

128. **Metallea divisa** (Walker). (Fig. 86.)

Musca divisa Wlk., Dipt. Saund., p. 333, 1856.
Type-locality: East India. *Type* in the British Museum.
Musca cuprea Wlk., Dipt. Saund. p. 331, 1856.
Type-locality: S. Australia. *Type* in the British Museum.
Musca collecta Wlk., Proc. Linn. Soc. Lond. iv, pp. 139, 145, 1860.
Type-locality: Makassar, Celebes. *Type* in the British Museum.
Rhynchomyia pallicepe Big., Bull. Soc. Zool. Fr. p. 594, 1887.
Type-locality: "Hindostan." *Type* in the Paris Museum.

Metallea nigrofemorata Sen.-Wh., Mem. Dept Agric. Ind., Ent. Ser. viii (4), p. 46, 1923.
Type-locality: Matale, Ceylon. *Type* in the British Museum.

♂♀.—*Head*: ♂ subholoptic; ♀ frons one-third of head-width. Frons and face shining yellowish; in ♀ ocellar triangle, parafrontalia, and upper part of parafacialia silvery-yellow pollinose, much paler than the rest; genæ concolorous, with pale hairs. Antennæ yellowish-brown, second segment brighter than the third, arista microscopically pubescent. Palpi yellow. *Thorax*: brownish, tinged with green or purplish, the green more distinct on the scutellum, the whole silvery-pollinose. Pleura similar, but more silvery. *Abdomen*: apparent first three segments yellow, with an obscure median dark stripe, fourth segment purplish in certain lights, in others dark, with some white pollen. If there are brown lateral

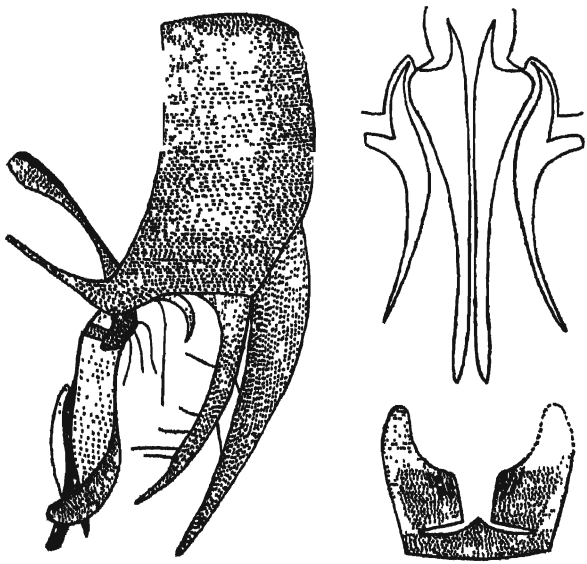


Fig. 86.—*Metallea divisa* (Walker): ♂ genitalia.
(From Senior-White.)

patches these are never metallic. Discals lateral except on fourth, where they occur, irregularly, medianly. *Wings*: hyaline, sometimes lightly yellowish on front margin. Squamæ pale yellowish. *Legs*: black, all tibiæ and first tarsal joints yellowish-brown, tips of former blackened.

Length 6–8 mm.

Bionomics.—Nothing is known.

Distribution.—CEYLON: Matale, Colombo, Trincomali. INDIA: Punjab, Jullundar; C.P., Jubbulpore; U.P., Allahabad; E. Himalayas, Kurseong, 5000 ft.; Bihar, Chapra;

Chota Nagpur, Jeraikela, Patna State, Titilagahr; Celebes, Makassar; Australia, Northern Territory and Queensland

129. **Metallea flavibasis** Senior-White.

Metallea flavibasis Sen.-Wh., Mem Dept. Agric. Ind., Ent. Ser vii (9), p. 168, 1922.
Type-locality: Matale, Ceylon. *Type* and *paratypes* in the British Museum.

♀.—*Head*: frontalia brown above, shading to orange at lunule, containing an elongate triangle of shimmering pale golden pollen, the base of which contains the ocelli, its apex reaching halfway down frons. Parafrontalia of a similar shimmering pale golden pollen. Frontal width one-quarter of the head, slightly but distinctly more narrowed at vertex than in genotype. Face yellow with a little grey pollen below antennæ. Parafacialia concolorous with parafrontalia. Genæ similar, with white hairs. Occiput black on upper, yellow on lower half. A yellow triangle, its base uppermost, from vertex to neck. Upper hind margins of eye narrowly grey. Epistome pale shining yellow, palpi concolorous, black-tipped. Proboscis black. Antennæ orange, third segment white-dusted, arista black with orange base, apparently bare, but microscopically pubescent under a high power. *Thorax*: dorsum metallic-green, so thickly dusted with yellow pollen as to hide the ground-colour entirely unless rubbed, the whole appearing dull olive. Black spots at the bases of the bristles. Scutellum and pleura concolorous, but when rubbed ground-colour appears blackish. *Abdomen*: first apparent segment pale yellow, the next two either similar or reddish-brown with their hind margins narrowly pale-banded. Second segment sometimes with subapical transverse brown flecks laterally, third with a sometimes obscure, sometimes clear-cut, greyish, apical black band. Fourth and sides of second and third with black chetiferous spots. A median black stripe throughout, not always present on first, or sometimes broadened subapically, but always interrupted when it crosses the apical yellow bands. Venter yellow, with lateral grey spots, small on second and large on third, fourth all grey. *Wings*: clear, squamæ white. Halteres pale yellow. *Legs*: coxæ dark grey-pollinose, femora yellow, their apical halves blackened to a varying width, but extreme tips yellow. Tibiæ yellow, tips more or less darkened. First tarsal joint yellow, others blackened.

Length 5–6·5 mm.

Bionomics.—Nothing is known.

Distribution.—INDIA: United Provinces, Allahabad; CEYLON: Matale District, Kandy.

130. **Metallea pollinosa** (Townsend).

Trichometallea pollinosa Tnsd., Rec. Ind. Mus. xiii, p. 194, 1917.
Type-locality: Umballa, Punjab. *Type* in the Indian Museum, Calcutta.

♂♀.—*Head*: pale luteous, antennæ, frontalia, and palpi fulvous. The whole thinly silvery-pollinose. *Thorax*: greenish-cupreous, pleura thickly pale yellowish-pollinose, dorsum and scutellum rather thickly silvery-pollinose *Abdomen*: pale yellowish, a median stripe and hind margins of segments blackish, varying greatly in width, the whole pollinose, varying from silvery to pale golden. *Wings*: clear. Squamæ whitish. *Legs*: blackish or brownish. Hind tibiæ fulvous.

Length 5–6 mm.

Bionomics.—Nothing is known.

Distribution.—INDIA: Punjab, Umballa; United Provinces, Gonda District, Agra; Bombay Presidency, Dhond; Madras Presidency, Trichinopoly; CEYLON: Haputale; China, Foo Chow Foo.

Genus 27. **RHYNCHOMYIA** Robineau-Desvoidy.

Rhynchomyia R.-D., Myodaires, p. 424, 1830. Genotype, *Musca rufipes* Fabr.

Head: ♂ eyes closely approximated, ♀ frons very broad, more than one-third head-width. Fronto-orbitals few and not extending more than halfway to antennæ. Face absolutely bare, the single vibrissa well above mouth-margin. Genæ broad, bare of bristles except for peristomal row. Antennæ with arista bare or at most microscopically pubescent. No carina between antennæ. *Thorax*: presutural acrostichals present. *Abdomen*: only weak discals on fourth visible segment. *Wings*: vein IV angled not far beyond posterior cross-vein and then running straight to margin, leaving first posterior cell fairly narrowly open, with a long neck.

The above characterization is drawn up to fit the single species known to enter the Oriental region. Townsend's definition, that the fronto-orbitals descend below the level of the antennæ and that the parafacialia are setose, do not apply to this species.

131. **Rhynchomyia callopis** Loew.

Rhynchomyia callopis Loew, N. Beitr. iv. p. 49, 1856.
Type-locality: Egypt. *Type* in the Berlin Museum.

♂♀.—*Head*: ♂ eye-facets larger above than below, but no sharp line of demarcation. Frons shining yellow, in ♂

reduced almost to a line, in ♀ less than one of the parafrontalia, and narrowed anteriorly. ♂ parafrontalia with silvery pile, which in ♀ is barely noticeable, the parafrontalia being practically concolorous with the frons. A brown spot at about two-thirds distance from ocellar triangle to antennæ, close against orbit. Face and parafacialia shining yellow, bare. Antennæ closely approximated basally, without facial carina. A brown spot on parafacialia about midway between base of antennæ and lower orbit, close against eye. Antennæ chrome-yellow, arista bare under ordinary magnifications, basal portion thickened and orange, remainder thin and black. Palpi chrome-yellow. Genæ shining yellow, bare except for soft concolorous hairs near occipital angle. A brown spot on genæ below eye. The frontal, facial, and genal spots vary in size and depth of colour, and the two former are often absent in the ♂. *Thorax*: mesonotum and scutellum ground-colour green, but so thickly pollinose as to appear grey. Chætotaxy: acrostichals 2 : 2; dorso-centrals 2 : 4; humerals 2; posthumerals 2; pre-alars 2; supra-alars 3; post-alars 2; proploura bare; sternopleurals 1 : 1; pleura equally heavily pollinose, with concolorous long pile. *Abdomen*: all testaceous, with grey shimmering pollen, no pattern. Fourth visible segment may be darkened. *Wings*: hyaline. Squamæ pale. Halteres nearly whitish. *Legs*: pale brown, tarsi rather darker.

Length 5–8 mm.

Bionomics.—Nothing is known. Some of the species in this genus are parasites on termites.

Distribution.—Sahara Desert; Egypt; Arabian Desert; India: Baluchistan, Quetta; Karachi, Manora.

Genus 28. **RHYNCHOMYIOPSIS** Townsend.

Rhynchomyiopsis Tnsd., Rec. Ind. Mus. xiii, p. 195, 1917. Genotype, *R. indica* Tnsd.

Head: ♀ frons wider than an eye, no fronto-orbitals except small reclinate ones. Facial carina not developed. All head macrochætæ very weak. Arista microscopically pubescent. *Thorax*: no presutural acrostichals, all other macrochætæ very weak, and indistinguishable from the general bristle covering. Sternopleurals 1 : 1. Propleura haired in centre. *Abdomen*: weak marginals on apparent third and fourth segments. *Wings*: apical cell almost closed in margin before wing-tip. Costal bristle strong. *Legs*: front tarsi not widened.

This genus cannot be sunk in *Rhynochomyia* R.-D., owing to the genotype having the propleura haired in centre.

Key to the Species of Rhynchomyiopsis.

First anterior half of second abdominal segment fulvous, remainder reddish	*indica* Tnsd., p. 185.
First three abdominal segments yellow, with black median stripe, fourth nearly all black.....	*sarotes* Ség., p. 185.

132. **Rhynchomyiopsis indica** Townsend.

Rhynchomyiopsis indica Tnsd., Rec. Ind. Mus. xiii, p. 195, 1917.
Type-locality: Karachi. *Type* in the Indian Museum, Calcutta.

♀.—*Head*: generally pale fulvous, parafrontalia, parafacialia, and genæ very thinly silvery. Three shining black spots near eye on each side, the largest about middle of parafacialia and the smallest one on genæ. Antennæ apically acuminate, these and palpi pale fulvous. *Thorax*: light metallic golden-green, the humeri fulvous. *Abdomen*: pale fulvous on apparent first and anterior half of second, the latter, and third and fourth, reddish. *Wings*: almost clear. Squamæ whitish. *Legs*: pale fulvous.

Length 6 mm.

Bionomics.—Nothing is known.

Distribution.—The unique type is from INDIA: Sind, Karachi.

133. **Rhynchomyiopsis sarotes** Séguy.

Rhynchomyiopsis sarotes Ség., Encycl. Ent., Dipt. iv, (4) p. 190, 1928.
Type-locality: India, Trichinopoly. *Type* in the Paris Museum.

Head: ♂ frons brown, rather shining, practically pinched out below the ocellar triangle. Parafrontalia dark golden-pollinose, blackened around ocellar triangle and at point where eyes approximate. Face luteous. Parafacialia concolorous with parafrontalia. Genæ greyish-yellow. Facial ridges with only a few weak bristles above the vibrissæ. Antennæ, second and base of third segment castaneous, remainder of third black. Arista minutely plumose, black. Palpi yellow, extreme tips blackened. Proboscis, haustellum black. *Thorax*: shining green with cupreous reflections. White pollen on humeri, narrowly but distinctly on lateral margins of notum, and more broadly around free margin of concolorous scutellum. Pleura greyish-coppery, more thickly covered with white pile, especially on lower half of sternopleura. Some long golden hairs among black chætæ on hind margin of mesopleura. Chætotaxy: acrostichals 2 : 4; dorso-centrals 2 : 4; no presutural intra-alar. *Abdomen*: first three visible segments and base of fourth darkish yellow. An irregular black median stripe, not quite reaching the hind margins and thus interrupted, which on fourth broadens

laterally to cover the whole segment except the anterior lateral margins. The stripe appears green, in certain lights, on fourth segment. Venter yellow on first to third; on fourth the greenish colour spreads over the side-margins. Genital segment 1 shining green. Genital segment 2 black. *Wings* quite distinctly yellowish-tinged. First posterior cell well open. *Legs*: femora dark metallic green. Tibiæ brown. Tarsi in the unique type damaged, but at least front tarsi are black, with apparently only one very long claw, the pulvilli very long, with a furry appearance.

Length 7·5–8 mm.

Bionomics.—Nothing is known.

Distribution.—South India: Trichinopoly.

Genus 29. **SUMATRIA** Malloch.

Sumatria Mall., Ann. Mag. Nat. Hist. (9) xviii, p. 512, 1926. Gen. type, *S. latifrons* Mall.

Head: eyes in both sexes separated by about one-fourth the head-width. Parafrontalia narrow, supra-orbital bristles in same line as infra-orbital series, face not carinate. Parafacialia narrow and bare. Vibrissæ short and strong, vibrissal angle slightly produced. Arista distinctly though shortly haired above and nearly bare below. *Thorax*: dorso-centrals 1 : 2. Stigmatal bristle weak but distinct. *Wings*: anterior cross-vein beyond apex of I. 1 and subcostal vein entering costa at same angle. Bend of IV rounded, its apex running parallel to apex of III for a short distance. *Legs*: front tibia without any median bristles. Hind tibia with a rather long postero-dorsal bristle close to middle.

134. **Sumatria latifrons** Malloch.

Sumatria latifrons Mall., Ann. Mag. Nat. Hist. (9) xviii, p. 512, 1926.

Type-locality: Sumatra. *Type*, location not stated.

♂♀.—*Head*: shining bronzy-black. Parafrontalia, occipital region and posterior part of gena white-dusted. A spot on parafacialia below antennal roots. Parafrontalia almost linear, bare except for the bristles along their inner margins, the uppermost reclinate, second proclinate, the others inward-directed. Antennæ brownish, hairs on upper side of arista not as long as width of third antennal segment basally, and ceasing near middle. Palpi fuscous, slightly widened. *Thorax*: shining bronzy-black, sometimes grey dusting anteriorly. Chætotaxy: acrostichals 0 : 1; dorso-centrals 1 : 2. Dorsal and pleural hairs black. *Abdomen*: shining bronzy-black, without notable dusting, elongate-ovate; genital segments

of ♂ of moderate size. Posterior claspers slender and curved, widely separated at their bases. Processes of sixth sternite widely divergent. *Wings*: brownish, conspicuously so apically. Squamæ and halteres brown. *Legs*: brown, but coxæ and femora, basal half of posterior femora, and tarsi yellowish. Mid-femur without a preapical comb in either sex. ♂ hind femur with a few fine bristles on basal half of postero-ventral surface and one strong pre-apical antero-ventral bristle. ♀ hind femur without the postero-ventral bristles, or a few setulæ. Hind tibia with one antero-ventral, one antero-dorsal, and one postero-dorsal bristle, the pre-apical dorsal bristle quite long and fine.

Length.—4–5 mm.

Bionomics.—Nothing is known.

Distribution.—Sumatra; Malaya, Pahang.

Genus 30. **BORBORORHINIA** Townsend.

Borbororhinia Tnsd., Rec. Ind. Mus. xiii, p. 188, 1917. Genotype, *Idia bivittata* Wlk.; as *B. pubescens* Tsnd.

Alikangia Vill., Rev. Zool Afric. xv, p. 589, 1927. Genotype, *A. flava* Vill.

Head: ♂ eyes widely separated, frons broad, parafrontalia narrow but distinct. Facial carina very weak. Epistome produced forward, but projected only a little below vibrissæ. Arista thinly plumose, ciliate above and below. Palpi phylliform. *Thorax*: covered with short, black, soft, fine pubescence, the macrochætæ reduced to one presutural with a shorter one just in front of it, and one posterior acrostichal. *Abdomen*: covered with similar pubescence to thorax, and with very fine hair-like marginals. *Wings*: apical cell narrowly open, very narrowed in terminal portion. *Legs*: ♂ front tarsi very slightly widened.

Key to the Species of Borbororhinia.

Thorax and palpi obscurely fulvous ..... *bivittata* (Wlk.), p. 187.
Thorax and palpi black ..... *pulchella* (Vill.), p. 189.

135. **Borbororhinia bivittata** (Walker). (Fig. 87.)

Idia bivittata Wlk., Proc. Linn. Soc. Lond. i, pp. 128-9, 1857.
Type-locality: Borneo. *Type* in the British Museum.
Borbororhinia pubescens Tnsd., Rec. Ind. Mus. xiii, p. 183, 1917.
Type-locality: Cochin State. *Type* in the Indian Museum, Calcutta.

♂.—*Head*: frons fulvous, parafrontalia and upper half of parafacialia thinly silvery, lower half of latter shining black. Face and facialia polished pale testaceous, the latter with large shining black area confluent with that of parafacialia.

Epistome testaceous, shading to brown laterally. Genæ generally testaceous, with shining dark brown or black area. Antenna with first two segments absolutely fulvous, the third paler. Palpi obscurely fulvous. *Thorax*: fulvous, more or less shaded with fuscous, thinly silvery-pollinose, with four brown or black stripes, the two inner ones widely separated. Scutellum fulvous, shaded fuscous. Pleura very pale yellow or luteous. *Abdomen*: fulvous, shaded fuscous, anterior half of venter luteous. Genital segments rather prominent. *Wings*. slightly tinged smoky-yellow, more

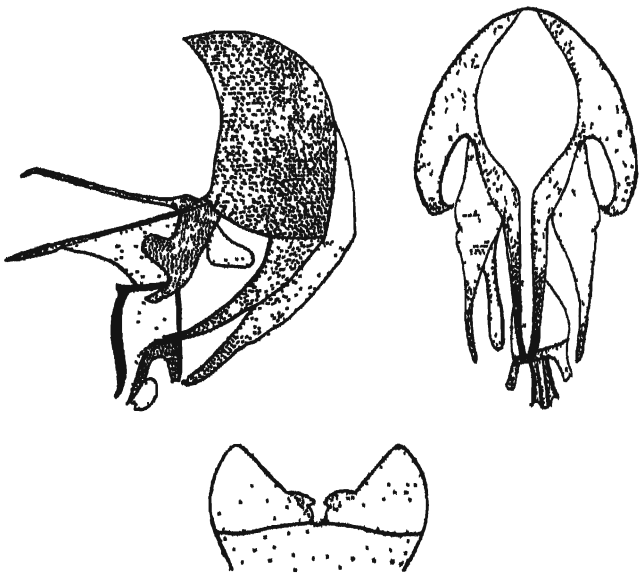


Fig. 87.- *Borbororhinia bivittata* (Walker): ♂ genitalia. (From Senior-White.)

so along costa. Squama smoky-yellow. *Legs*: pale fulvous, first tarsal joint whitish, remainder dusky.

Length 5–6 mm.

Bionomics.—In Ceylon and the various hills of southern India the species can be obtained in quantity at any time by cutting into the nest of any of the mound-building termites. In the South Indian records the genus *Eutermes* is specially stated. Otherwise it is only obtained as a great rarity at flowers. When opening a termitarium males are chiefly attracted, but with them come a few females, which are quickly seized on by the former. They fly readily *in cop*. The species is oviparous, the eggs white and large for the size of

the fly, hatching in twenty-four hours, indicating considerable embryonic development prior to oviposition. The larvæ have not been induced to feed, and no trace of larvæ or puparia have been found in the fungus combs or galleries of the termites. After a few hours the exposed combs and fresh-cut earth cease to attract specimens, but if a further fresh layer of the termitarium be exposed by further digging specimens again appear in quantity.

Distribution.—INDIA: the hills of Assam, Southern India, and CEYLON; Java; Borneo; Sarawak, Buru Island.

136 **Borbororhinia pulchella** (Villeneuve)

Alikangia pulchella Vill., Rev. Zool. Afric. xv, p. 390, 1927.
Type-locality: Formosa, Alikang. *Type* in the Deutsch Entomologische Institut.

♀.—*Head*: eyes bare, separated by one-third head-width at vertex. Frons dark reddish-brown, parallel-sided, slightly broader than twice width of one of the parafrontalia. Parafrontalia narrow, shining, black towards vertex, reddish-brown anteriorly, with an oblong patch of silver-grey tomentum opposite base of antennæ, below this shining black. Facialia and jowls shining black; face, epistome, and medianæ dark reddish-brown. Antennæ reddish-brown, arista long-plumose on both sides; palpi black. Epistome somewhat protruding between vibrissæ. Occiput black except a reddish-brown area at vertex. *Thorax*: dorsum and scutellum reddish-brown, the former with narrow longitudinal paired silver stripes not reaching the scutellum. Pleura brownish-yellow. Acrostichals 0 : 1 (prescutellar); dorso-centrals 0 : 1 (prescutellar), traces of a very fine presutural pair; 2 posthumerals, a very faint indication of a third. The presutural intra-alars 1, supra-alars 2 or 3. Prostigmatic bristle absent, propleural present. Sternopleurals 1 : 1. Prosternum hairy, propleura bare. *Abdomen*: flattened dorso-ventrally, rather broader than thorax; dorsum subshining bluish-black, with patches of orange on centre of apparent first segment, and, ill-defined, on second medio-anteriorly, also narrowly on margins, and forming two lateral patches on fourth. Venter orange-brown. Erect macrochætæ entirely absent. *Wings*: hyaline, anteriorly brownish, the colour fading gradually towards hind margin. IV forming an obtuse S-shaped curve. First posterior cell just open at wing-margin. Squamæ testaceous. Halteres yellow. *Legs*: testaceous orange-yellow, front tarsi darkened.

Length 7–8 mm.

Bionomics.—Nothing is known.

Distribution.—Formosa: Alikang and Toyenmongai.

31. Genus **STOMORHINA** Rondani.

Stomorhina Rond., Dipt. Ital. Prodr. iv, p. 9, 1861. Genotype, *Musca lunata* Fab.
Idia Mg., Syst. Beschr. v, p. 9, 1826 [*praeocc.* Lamarck, 1816, Pol.].
Stomatorhina Kertesz, Cat. Pal. Dipt. iii, p. 523, 1907 [emend.].
Idiella B. & B., Denk. K. Akad. Wien, lvi, p. 154, 1889. Genotype, *Idia mandarina* Wied.
Idiellopsis Tnsd., Rec. Ind. Mus. xiii, p. 190, 1917. Genotype, *Idia xanthogaster* Wied. (as *I. similis* Tnsd.).
Eudiella Tnsd., Rec. Ind. Mus. xiii, p. 192, 1917. Genotype, *Musca discolor* Fab.

Head: ♂ subholoptic or frons fairly wide. Facial carina present. Arista ciliate above only. *Thorax*: in the genotype and a few other species the ♂ has the thorax and scutellum covered with thick, short, upright black pile, wanting in the ♀. *Abdomen*: varying from elongate to ovate. Some sexual colour dimorphism occurs. Macrochaetæ varying from none to marginal on last two segments. ♂ genitalia small or prominent. *Wings*: apical cell varying from quite widely open to closed petiolate.

None of the segregates made out of the original genus appear to us to have more than "Key" value.

Key to the Species of Stomorhina *.

1.	Abdomen with definite yellow and black pattern	2.
	Abdomen yellow, through orange to brown usually darkened apically, without a definite pattern. Sometimes with metallic reflections	3.
	Abdomen entirely metallic	9
2.	All of first abdominal segment black	*lunata* (Fab.), p. 191.
	Hind margins of first and second abdominal segments black-banded	*discolor* (Fab.), p. 192.
3.	Small species, 5–8 mm. long	4.
	Larger species, 8–14 mm. long	7.
4.	Abdomen entirely yellow. First posterior cell widely open	[p. 197. *luteigaster* (de Meij.),
	Abdomen dark brownish	6.
5.	Paired yellow spots, which may be confluent, always present on abdominal segment II, and often on I or III or both.	[p. 194. *quadrinotata* Big.,
	Pleura sparsely grey-pilose	
	Abdomen with only anterior angles indefinitely paler than rest. Pleura whitish-yellow piled	[p. 196. *cuidielloides* Sen.-Wh.,
6.	Humeri concolorous with rest of mesonotum	6. [p. 195.
	Humeri sharply colour differentiated	*fulvohumera*, sp. n.,

* *Idiella orientalis* Mall. is not included here, as it may be a purely Palæarctic species. If found in the Oriental portion of China, it would run to couplet 4, and separate on the reddish abdomen with metallic blue-green reflections.

7.	First posterior cell petiolate, in line with vein IV	[p. 197. *xanthogaster* (Wd.),
	First posterior cell open or closed marginally	8.
8.	Mid-tibia of ♂ with tuft of hairs distally	[p. 199. *mandarina* (Wd.),
	Mid-tibia of ♂ with no such tuft	*sternalis* (Mall.), p. 200.
9.	Abdomen with no metallic pattern. Pleural stripe greyish or yellow	10.
	Hind margins of abdominal segments darker, also a median dark stripe, leaving a distinct metallic pattern. Pleural stripe grey and very faint	*nila* (Sen.-Wh.), p. 200.
10.	Abdomen green	11.
	Abdomen black or purple	12.
11.	Second abdominal segment with trace of yellowish flecks anteriorly Segments black-banded	[p. 201. *unicolor* (Macq.),
	Second abdominal segment with no trace of yellow flecks. Abdominal colour uniform	*simplex* (Wlk.), p. 202.
12.	Thorax greenish. Abdomen bright purple.	*melanostoma* (Wd.),
	Thorax and abdomen black, former with at most a greenish, latter with a purplish tinge	[p. 202. 13.
13.	First segment of front trasus yellow. Squamæ basally golden-yellow	*bipartita* (Mall.), p. 203.
	First segment of front tarsus black. Squamæ all fuscous	*mallochi*, sp. n., p. 204.

137. **Stomorhina lunata** (Fabricius). (Fig. 88.)

Musca lunata Fab., Syst. Antl. p. 292, 1805.
Type-locality: Madeira. *Type* at Kiel?.
Idia fasciata Mg., Syst. Beschr. v, p. 9, 1826.
Type-locality: "The Cape." *Type* at Paris?.
Idia cinerea R.-D., Myodaires, p. 422, 1830.
Type-locality: "Isles of S. Atlantic." *Type* lost.
Stomorhina maculata Rond., Atti Soc. Ital. Sci. Nat. viii, p. 228, 1865.
Type-locality: Italy. *Type*?

♂♀.—*Head*: ♂ subholoptic, parafacialia silvery, with a large shining black spot. Face shining black, epistome brown. Occiput and genæ pale ashy, with long concolorous hairs. Antennæ black, third segment dark grey-pollinose. *Thorax*: pale blackish-grey, with three dark greenish-grey stripes. In ♂ covered with thick, short, upright black pile, not so in ♀. Pleura thickly pale whitish-yellow or golden-haired. *Abdomen*: apparent first segment all black, second and third bright yellow with hind margins narrowly black, and a broad median black stripe, fourth black with patches of grey shimmer as in a *Musca*. *Wings*: clear. IV very obtusely angled at bend, leaving apical cell fairly widely open. *Legs*: femora and tibiæ brown, appearing greyish in certain lights, tarsi darkened.

Length 7 mm.

Bionomics.—Has been bred from locusts' eggs in Baluchistan, and from beneath termite infested cow-dung in Rhodesia.

Distribution.—Occurs throughout the Palæarctic and Ethiopian regions, reaching Rodriguez Island. In the Oriental

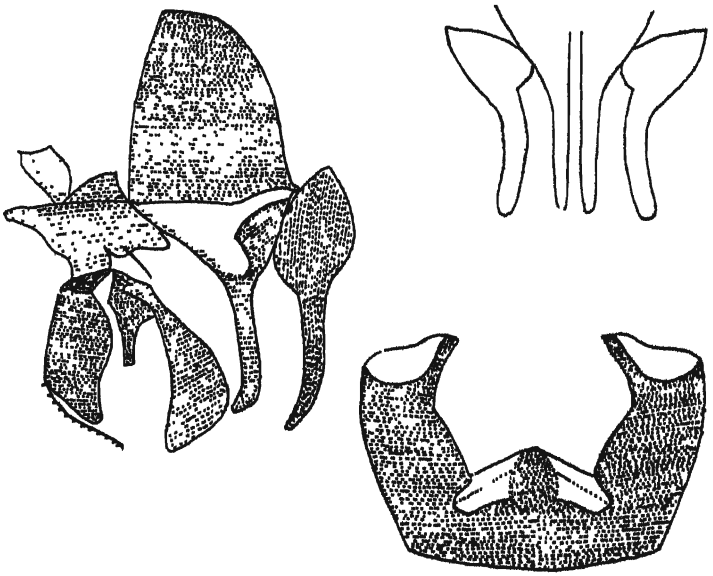


Fig. 88.—*Stomorhina lunata* (Fabricius): ♂ genitalia. (From Senior-White.)

region is recorded from Baluchistan, Bostan; the Himalayas, Naini Tal, Nepal, Sukwani and Darjeeling; the Nilgiris, Coonoor. Federated Malay States.

138. **Stomorhina discolor** (Fabricius). (Fig. 89.)

Musca discolor Fab., Ent. Syst. iv, p. 320, 1794.
Type-locality: "Ind. Or." *Type*?
Idia metallica Macq., H. N. Dipt ii, p. 246, 1835.
Type-locality: Bengal. *Type* not in Paris Museum [considered only as a possible var. by the senior author].
Idia cincta Big., Ann. Soc. Ent. Fr. (5) iv, p. 283, 5, 1874.
Type-locality: Ceylon. *Type* lost.
Stomorhina muscina Rond., Ann. Mus. Civ. Genova, vii, p. 429, 1875.
Type-locality: Borneo. *Type*?
Eudiella discolor var. *nigripes* Sen.-Wh., Mem. Dept. Agric. Ind., Ent. Ser. vii, p. 167, 1922.
Type-locality: Ceylon. *Type* in the British Museum.

♂♀.—*Head*: ♂ subholoptic, ♀ frons nearly one-third of head-width. Frontal stripe dark brown, parafrontalia whitish,

with shining black spots. Parafacialia similar. Face, epistome, and anterior half of genæ shining black. Posterior half of genæ and occiput yellowish-white with concolorous hairs. Antennæ brown, thickly grey-dusted. Palpi brown. *Thorax*: ground-colour green, thickly grey-dusted, covered with small black spots. Pleura with whitish or golden-yellow pile, forming a stripe. *Abdomen*: luteous, the segments with black hind margins, and with a median black stripe of varying width and extent, sometimes interrupted on second

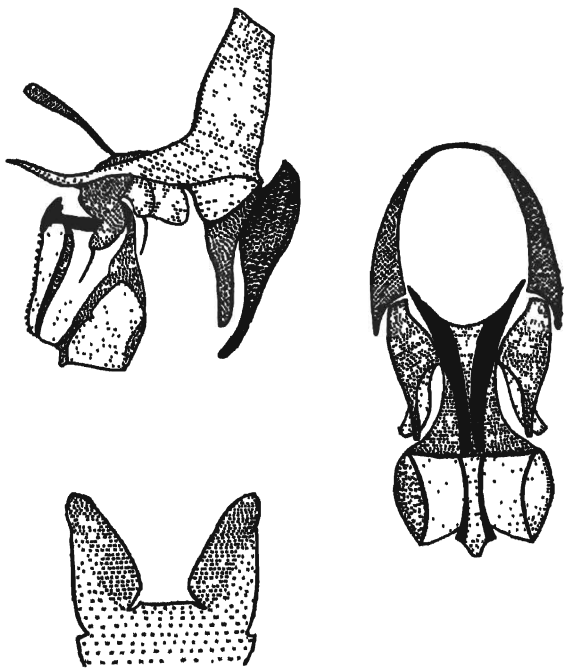


Fig. 89.—*Stomorhina discolor* (Fabricius): ♂ genitalia. (From Senior-White.)

segment, sometimes the stripe so extensive as to quite alter the superficial appearance of the specimen. *Wings*: clear, apex more or less infuscated, never extensively. Apical cell narrowly open. *Legs*: front coxæ yellow, posterior pairs black. Anterior femora all black, hind pair with basal third brownish-yellow, save very exceptionally, remainder black. Tibiæ brownish-yellow, front and hind pairs darkened apically. Tarsi brownish-yellow, apical segments black.

Length 6–7 mm.

Bionomics.—Reared from the nest of ant, *Camponotus angusticollis* Jerd., among the roots of a *Hevea brasiliensis* affected by the fungus *Botryodiplodia theobromæ*, and riddled with small boring beetles. The larvæ and pupæ of the ant were among loose pebbly soil between the tree-roots. In the earth were found two Muscid larvæ, yellow-brown in colour, the posterior end with a crown of fleshy tubercles. Pharyngeal skeleton large and heavily chitinized. Larva strongly negatively heliotropic. Placed in earth with ant larvæ and pupæ, three imagines of *discolor* emerged eleven to twelve days later. Puparia smooth, brown-red, with traces of the posterior processes of the larva. Apparently the larvæ had fed on the ant material. The imago is occasionally attracted by the opening up of an ant's nest. There is one record, "Telinkheri, Nagpur, from white-ant's nest." The males are often found "hovering" in small swarms under a tree.

Distribution.—INDIA generally, from as far west as Abbottabad to Assam; CEYLON; Malaya; Java; Borneo; the Philippine Islands; Hong Kong; Buru Island; North Australia; New Caledonia; Fiji.

139. **Stomorhina quadrinotata** Bigot.

Stomorhina quadrinotata Big., Ann. Soc. Ent. Fr. (5) iv, p. 238, 1874.
Type-locality: Borneo. *Type* lost.

♂♀.—*Head*: ♂ subholoptic, ♀ frons nearly one-third of head-width. Frontal stripe black, parafrontalia dark grey with black spots, parafacialia similar. Face grey beneath antennæ. Genæ and epistome shining black. Occiput ashy-grey. Antennæ and palpi black. *Thorax*: very dark green, with greyish-white pile and numerous small black spots, with traces of a median and two subdorsal black stripes. Pleura with an ashy-grey, not thickly pilose, stripe. *Abdomen*: dark brownish-black, with a pair of ochreous side-spots on dorsum always present on apparent second, and sometimes on first and/or third segments. The extent of these spots is variable; they may be confluent, and thus there is the appearance of the whole of the first segment except the hind margin, and the margins of the second, all yellow. *Wings*: clear. None to a very distinct apical infuscation. Apical cell narrowly open. *Legs*: femora black, tibiæ and first two tarsal segments brown, apical tarsal segments black.

Length 5·5 mm.

Bionomics.—Unknown.

Distribution.—INDIA: Dehra Dun, Darjeeling, Himalayas; Assam; Borneo; Philippine Islands; China, Tientsin; Buru Island; Queensland, Brisbane.

140. Stomornina fulvohumera, sp. n.

♀.—*Head*: frons rather less than one-third head-width, dark brown above, castaneous along antennæ, somewhat broadly. Parafrontalia together less than breadth of frons, shining black, with a patch of brilliant silver pile about their middle; the castaneous frontal area continued on lowest part, but the upper margin not smoothly continuous with that on front, and the black colour carried down against the orbits. Face shining brownish-yellow, facial ridges black. Parafacialia more castaneous, with a patch of brilliant silvery pile approximately opposite second antennal segment. Genæ castaneous, shining, a large blackish shining central area immediately below eye. Succiput yellowish-white pollinose, with thin pale hairs. A shining black band on the occiput above the neck. Antennæ, first two segments castaneous, third brownish pollinose, infuscated anteriorly, about twice length of second. Arista basally castaneous, darkened on apical two-thirds, rather weakly pectinate above. Palpi phylliform, castaneous. Haustellum shining black above. Inner and outer occipitals present, frontals continued down to level of apex of second antennal segment, the uppermost reclinate, the rest decussate. No proclinate fronto-orbitals. *Thorax*: mesonotum and scutellum, whether viewed from in front or from behind, blue-grey, the microchætal covering not arising from black tubercles, with a broad median and two dorso-central black stripes, not continued on to the scutellum. Outside the latter the general colour is rather darker grey. Humeri and anterior half of posthumeral presutural area bright fulvous-yellow, continued as an anterior pleural stripe on to front coxæ. Propleura bare. Rest of pleura plumbeous, no pile. Chætotaxy: acrostichals, even prescutellars, wanting; dorsocentrals, only a prescutellar pair; humerals 1; post-humerals 1; notopleurals 2; a weak presutural intra-alar; pre-, supra-, and post-alars one each. *Abdomen*: first and second visible segments brownish-yellow, the first with a narrow, the second with a broad (breadth probably variable) black band not reaching the dorsal margins, third and fourth segments shining black, the former with a suggestion of bluish in it. Ventrally the yellow of the first two tergites continued, without the black posterior bands. Sternal margin of third concolorous yellow, remainder of this and all of fourth black. *Wings*: all pale yellowish, though less pronounced posteriorly, and more deeply basally. Vein IV evenly rounded and bent outwards in a neck, leaving first posterior cell fairly widely open. Squamæ and halteres yellow. *Legs*: coxæ and trochanters brownish-yellow; femora very dark greyish-black, testaceous at apices; tibiæ very dark brown; tarsi, first

two segments pale brown, apical three darkened. Mid- and hind tibiæ with the median antero-dorsal and antero-ventral bristle.

Length 6 mm.

Bionomics.—Nothing is known.

Distribution.—Borneo: Sarawak; Mt. Dulit, 4000 ft., moss-forest, in light traps, 17 & 19. x. 32. *Type* and paratype in the British Museum.

141. **Stomorhina euidielloides** Senior-White.

Stomorhina euidielloides Sen.-Wh., Mem. Dept. Agric. Ind., Ent. Ser. vii, p. 166, 1923.
Type-locality: Assam. *Type* in the British Museum.
Idiella pilitibia Mall., Ann. Mag. Nat. Hist. (9) xviii, p. 508, 1926.
Type-locality: Java. *Type*, location not stated.
Idiella nigritibia Mall., Ann. Mag. Nat. Hist. (9) xviii, p. 509, 1926.
Type-locality: Malaya. *Type*, location not stated.

♂♀.—*Head*: frontalia black in ♂, very dark brownish in ♀. Parafrontalia greyish-silvery, with a black spot around the base of each frontal; these may be nearly confluent. ♂ frontalia at narrowest about as wide as first antennal segment, ♀ one-fifth of head. Face and epistome shining, very dark brown. Occiput black, genæ yellow, with long soft concolorous hairs, at base of each of which there is a small black dot. Proboscis and palpi black. Antennæ black, third segment grey-dusted. Arista black, with base yellowish, rays long. *Thorax*: ground-colour of dorsum dark metallic-green with grey pollen, closely covered with black setiferous dots. Viewed from in front there are indistinct black median and dorso-central stripes. Scutellum concolorous with mesonotum, the apical margin shimmering silvery. Pleura whitish-yellow, with long soft hairs of the same colour, arising from small black dots. Chætotaxy: 4 prescutellars, a humeral, 2 posthumerals, 1 anterior supra-alar, posterior supra-alars 1 : 3 (the latter on post-alar callus), 2 mesopleurals, pteropleural weak. Sternopleurals 0 : 1. Scutellars 6. *Abdomen*: shining dark brown, with basal lateral margins of first three segments paler brown, of remainder of third and of fourth, also tip of latter, dark metallic-green. The pale lateral coloration may spread all over the first three segments or leave a median dark stripe on first two. *Wings*: costa infuscated in front of II, extending subapically outwards and downwards to bend of IV, fading away below, the apex, below tip of IV and exterior to it, clear. Squamæ white, margin of lower somewhat darkened. Halteres orange-yellow. *Legs*: femora black with dark green reflections, tibiæ yellow, darkened to a varying extent apically, sometimes

over all the apical two-thirds. First joint of fore and first two joints of posterior tarsi whitish-yellow, remainder black.

Length 5–7 mm.

Bionomics.—Attracted to flowering trees.

Distribution.—INDIA: Sikkim, Gantok; Darjeeling; Assam. CEYLON: Central Province, Matale District. Malaya; Java; Philippine Islands; Timor.

142. **Stomorhina luteigaster** (de Meijère).

Idia luteigaster de Meij., Tijd. v. Ent. liii, p. 339, 1910.
Type-locality: Java. *Type*, location not stated. ? Amsterdam.
Euidiella termitophila Sen.-Wh., Mem. Dept. Agric. Ind., Ent. Ser. viii, p. 45, 1923.
Type-locality: Upper Burma. *Holotype*: non. lect. *Co-types* in Imperial Agric. Dept. Collection, Pusa, and the British Museum.

♀.—*Head*: frons about one-quarter of head-width; frontal stripe black, parafrontalia silvery, nearly obscured by black spots; parafacialia similar, face shining black. Genæ grey, with long pale pubescence. Antennæ dark brown, third segment thickly grey-dusted. Palpi dark brownish. *Thorax*: obscurely metallic-blue, with black setiferous spots. Pleura similar, sternopleura grey-pollinose. A few conspicuous pale hairs on hinder margin of mesopleura and on pteropleura. *Abdomen*: basally yellow, completely so when unstained, in most specimens a varying extent posteriorly appears black, apparent fourth always darkened. *Wings*: clear, veins yellow. Squamæ yellowish-white. Halteres yellow. *Legs*: yellow, tips of hind femora darkened.

Length 4·5–5 mm.

Bionomics.—Recorded as being attracted to opened nest of *Eutermes*.

Distribution.—UPPER BURMA: Lashio; Java.

143. **Stomorhina xanthogaster** (Wiedemann). (Fig. 90.)

Idia xanthogaster Wd., Nov. Dipt. Gen. p. 21, 1820.
Type-locality: Java. *Type*?
Idia australis Wlk., List Dipt. B. M. iv, p. 809, 1852.
Type-locality: Aru Islands. *Type* in the British Museum.
Idiellopsis similis Tnsd., Rec. Ind. Mus. xiii, p. 190, 1917.
Type-locality: India. *Type* in the Indian Museum, Calcutta.

♂♀.—*Head*: ♂ broadly subholoptic, ♀ frons one-fifth of head-width. Frontal stripe dark brown to black, parafrontalia white, with shining black spots. Face shining black, parafacialia white, with shining black spots, a very large one just before lower margin. Genæ shining black, separated from face by a brownish spot above. Occiput on lower

half thickly golden-haired. Antennæ brown. Palpi black. *Thorax*: dorsum and scutellum quite distinctly dark green, somewhat greyish-white dusted, with black spots. Pleura throughout thickly golden-haired. *Abdomen*: reddish-orange, in ♂ with a black median stripe, and posterior half of third and fourth segments blackened, this blackening almost or quite absent in ♀. *Wings*: basally yellow, a small apical infuscation. Apical cell closed petiolate, in line with final

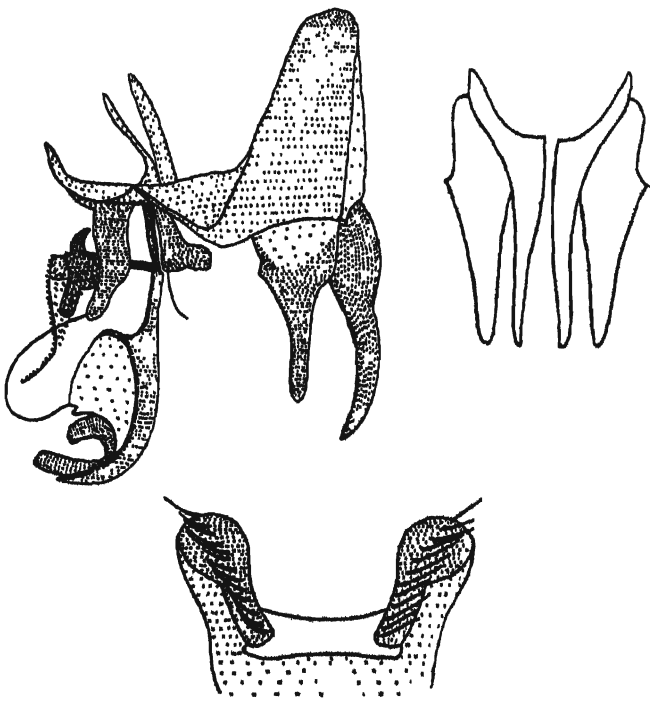


Fig. 90.—*Stomorhina xanthogaster* (Wiedemann): ♂ genitalia. (From Senior-White.)

course of IV. Squamæ deep yellow. *Legs*: brown to black, bases of tibiæ and first tarsal joints paler brown.

Length 9–10 mm.

Bionomics.—Nothing is known.

Distribution.—INDIA: Naini Tal District; Sikkim, Gantok; Bihar, Katihar; Chota Nagpur, Paresnath Hill; Assam, Mangaldai District. Java; Celebes; Kei Islands; Aru Islands; Australia; Solomon Islands. Kertesz records it as *xanthogastra* (sic) from Arabia.

144. **Stomorhina mandarina** (Wiedemann). (Fig. 91.)

Idia mandarina Wd., Ausser. Zweifl. Ins. ii, pp. 350–4, 1830.
Type-locality: China. *Type*?
Idia bengalensis R.-D., Myodaires, pp. 421–4, 1830.
Type-locality: India. *Type* in the Paris Museum.
Idia nigricauda Big., Ann. Soc. Ent. Fr. (5) iv, p. 237, fig. 3, 1874.
Type-locality: Burma. *Type* lost.
Stomorhina bivittata Big., Bull Soc. Zool. Fr. p. 592, 1887.
Type-locality: "Hindostan." *Type* lost.
Idiella floccosa Vill., Rev. Zool. Afr. xv, p. 395, 1927.
Type-locality: Formosa. *Type* in the Berlin Museum.

♂♀.—*Head*: ♂ broadly subholoptic, ♀ frons one-fifth of head-width. Frontal stripe dark brown to black, parafrontalia white, with shining black spots. Face shining

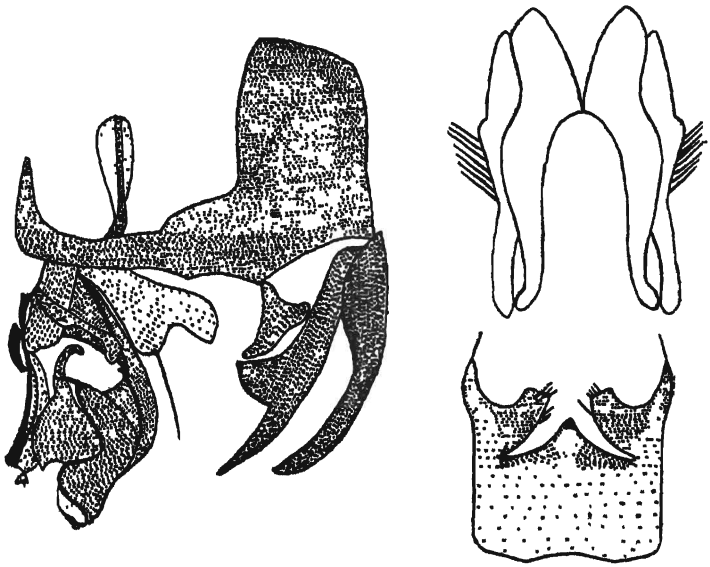


Fig. 91.—*Stomorhina mandarina* (Wiedemann): ♂ genitalia. (From Senior-White.)

black, parafacialia white, with shining black spots, a very large one just before lower margin. Genæ shining black, separated from face by a brownish spot above, but not so from epistome. Occiput on lower half thickly golden-haired. Antennæ brown. Palpi black. *Thorax*: green, thickly greyish-white dusted, so as nearly to obscure the ground-colour, with black spots. In certain lights three obscure darker stripes are visible. Pleura throughout thickly golden-haired. *Abdomen*: the two basal segments normally orange, sometimes darkened. Apical segments blackened, the tip

of abdomen shining blackish-green. *Wings*: yellow basally, a small apical infuscation. *Legs*: femora black, tibiæ and first tarsal joints light brownish, rest of tarsi black. ♂ mid-tibiæ with dense soft black hairs ventro-apically.

Length 8 mm.

Bionomics.—Unknown.

Distribution.—INDIA: Umballa, Bombay, Baroda State, Jubbulpore, Allahabad, Bihar, Chota Nagpur, Nagpur, Bengal, Assam, Wynaad, Shevaroys, Cochin; BURMA; North Siam; China, from Hong Kong to Tientsin; Formosa; Kei Islands.

145. **Stomorhina sternalis** (Malloch).

Idiella sternalis Mall., Ann. Mag. Nat. Hist. (9) xviii, p. 508, 1926.
Type-locality: Philippine Islands. *Type*, location not stated.
Idiella pleuro-foveolata Vill., Rev. Zool. Afr. xv, p. 395, 1927.
Type-locality: Formosa. *Type* in the Berlin Museum.

♂♀.—*Head*: ♂ subholoptic, ♀ frons not very broad. Occiput yellowish-white pilose. Antennæ black. *Thorax*: greenish-olivaceous, with black spots, and with three darker stripes. Scutellum green. Pleura covered with whitish-yellow pile. Meso- and sternopleura covered with black stippling. *Abdomen*: reddish-testaceous, with a median blackish stripe and side-margins to the segments, the latter interrupted narrowly at the segmental junctions. Last segment blackish, with greenish marginal reflections, the darkening more or less extending on to the third segment. *Wings*: grey-hyaline, the anterior margin yellowish, apically darkened. Squamæ yellowish. *Legs*: anterior femora yellowish, tibiæ reddish-testaceous, first tarsal joint of all legs pale yellow, also the next two joints in ♂. In ♀ these, and in both sexes the two apical joints darkened.

Length 7–8 mm.

Bionomics.—Unknown.

Distribution.—Philippine Islands, Benguet and Manila; Formosa, various localities.

146. **Stomorhina nila** (Senior-White).

Euidiella nila Sen.-Wh., Mem. Dept. Agric. Ind., Ent. Ser. vii, p. 168, 1922.
Type-locality: Coonoor, Nilgiris. *Type* in the British Museum.

♂.—*Head*: black, parafacialia with some grey shimmering spots. Genæ and a narrow postocular margin whitish-grey, the former with long concolorous hairs. Antennæ black, the third segment grey-dusted. Palpi dark brownish. Proboscis black. *Thorax*: very dark blue, with a little whitish pollen and numerous black setiferous spots. Indistinct median and dorso-central black stripes. Scutellum very dark blue, the apical margin shimmering silvery. Pleura obscurely

blackish with greenish-brassy reflections, hairs sparse though long, black, whitish above base of front coxæ and on sternopleura. Chætotaxy: humeral 1; presutural 1; supra-alars 2 : 3; prescutellars 4; notopleurals 2; a mesopleural fan. Sternopleurals 1 : 1; scutellars 6. *Abdomen*: dully shining greenish-blue, with grey pollen, the first segment blackish. There may be yellow to very dark brownish dorso-lateral patches on any of first three segments. Second and third broadly black-banded on fore and hind margins, and with a median black stripe. Fourth segment similar, but the basal band, except laterally, and median stripe narrow. *Wings*: very slightly smoky, but not definitely infuscated except around the humeral cross-vein. Squamæ fuscous, halteres orange-yellow. *Legs*: front coxæ black, grey-dusted, posterior coxæ yellowish-brown. All femora, the front tibiæ, and tarsi black, posterior tibiæ and tarsi dark brownish.

Length 6·5 mm.

Bionomics.—Unknown.

Distribution.—South India, Nilgiri and Palni Hills.

147. **Stomorhina unicolor** (Macquart).

Idia unicolor Macq., Dipt. Exot. Supp. 4, p. 240, 1852.
Type-locality: Java. *Type*?
Stomorhina veterana Vill., Rev. Zool. Afric. xv, p. 395, 1927.
Type-locality: Formosa. *Type* in the Berlin Museum.

♂♀.—*Head*: ♂ subholoptic; frons black, parafrontalia grey. Face shining dark green. Genæ pale, with a long median shining black spot. Antennæ and palpi black. *Thorax*: dark bluish-green, strongly black punctate. In ♂ with thick black erect pile, wanting in ♀, which has three black stripes. Pleura slightly whitish pilose, in ♂ mainly localized on posterior border of mesopleura, on the sternopleura, and in the region of the prothoracic spiracle. Mesopleural hairs black in ♂, in ♀ more or less replaced by white hairs. *Abdomen*: in ♂ blackish, apparent segments ii and iii with along their anterior margins and laterally a yellow band, interrupted medianly, but continued on to venter on each side, giving the appearance of a black median stripe and black transverse bands. Segment iv more brilliant green. In ♀ as in ♂ to entirely dark greenish, with a median black stripe and marginal bands to the first three segments, but towards their sides and on the last segment the colour is more brilliant green. Segments not punctate in ♂, strongly so in ♀, dorsally. *Wings*: greyish-hyaline, with a darkened spot apically. Apical cell rather widely open. *Legs*: black, except tibiæ and tarsi, reddish. Half of front tibia, all the front tarsi, and last segments of posterior tarsi are darkened.

Length 5–7 mm.

Bionomics.—Unknown.

Distribution.—INDIA: Assam, Mishmi Hills, Dalai Valley, 4000 ft.; Malaya; Java; Formosa; China: Foo Chow.

148. **Stomorhina simplex** (Walker)

Idia simplex Wlk., Trans. Ent. Soc. Lond. n. s., iv, p. 212, 1857.
Type-locality: "India" *Type* in the British Museum.
Idiella cyanea Stein, Trans. Linn. Soc. Lond. xvi (1), p. 163, 1910.
Type-locality: Seychelles. *Type* in the British Museum.
Eudiella unicolor Tnsd. (*nec* Macq.), Rec. Ind. Mus. xiii, p. 193, 1917.
Type-locality: Sarawak. *Type* in the Indian Museum, Calcutta.

♀.—*Head*: frons rather variable in width. Frontal stripe black. Parafrontalia grey with black spots. Antennæ and palpi black. *Thorax*: very dark bluish-green, thickly black punctate, with greyish pile. Pleura with thin ashy pile-stripe. *Abdomen*: wholly dark green, rather more elongate than in related species. *Wings*: clear, there may be an apical infuscation. *Legs*: blackish.

Length 5–7 mm.

Bionomics.—Unknown.

Distribution.—Seychelles Islands; INDIA, Cochin State and Assam-Bhutan Frontier; Sumatra, Korinchi Peak; Borneo, Sarawak.

149. **Stomorhina melanostoma** (Wiedemann). (Fig. 92.)

Idia melanostoma Wd., Ausser. Zweifl. Ins. ii, p. 353, 1830.
Type-locality: Java. *Type*?
Eudiella purpurea Tnsd., Rec. Ind. Mus. xiii, p. 193, 1917.
Type-locality: India. *Type* in the Indian Museum, Calcutta.

♂♀.—*Head*: generally shining black, parafrontalia thickly yellow pollinose, parafacialia with a silvery or yellowish

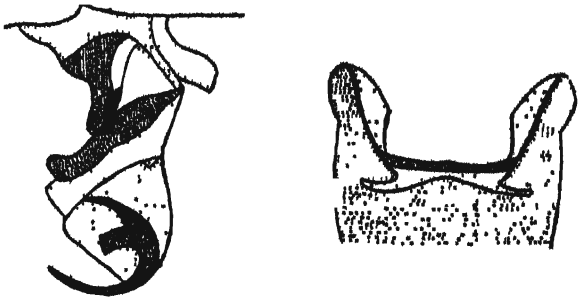


Fig. 92.—*Stomorhina melanostoma* (Wiedemann): ♂ genitalia. (From Senior-White.)

bar across upper end, extending over upper part of face; a yellowish fleck on epistome next to eye. Genæ yellow

pollinose. Antennæ light brownish. ♂ eyes subholoptic. *Thorax*: metallic greenish-cupreous, black punctate and lightly golden pollinose. Scutellum similar. Pleura thickly golden pilose. *Abdomen*: purplish-cupreous throughout. *Wings*: nearly clear, somewhat infuscate basally and around apex. Squamæ smoky-yellow. *Legs*: femora black with purplish tinge, especially front pair; tibiæ and tarsi yellowish, tips of latter darkened.

Length 8–9 mm.

Bionomics.—In Ceylon the males appear in swarms, hovering like Syrphidæ, annually at the time of the flowering of *Hevea brasiliensis*, March to April.

Distribution.—INDIA; Simla; Buxar Duars, Sidapur; CEYLON, Matale District. "At sea," Straits of Malacca; Java; Buru Island.

150 **Stomorhina bipartita** (Malloch).

Idiella bipartita Mall., Ann. Mag. Nat. Hist. (10) iv, p. 335, 1929. Typo-locality: North Borneo. *Type* in the British Museum.

♂.—*Head*: frons linear; ocellars short, inner verticals of moderate length, outer pair absent. General colour black, posterior half of genæ yellow pollinose and pilose; post-ocular orbits grey-dusted. Eyes with transverse stripes in life, the upper facets slightly enlarged. Facial carina present, broad. Antennæ black, base of arista pale, third segment of antennæ about thrice second. Palpi black, much widened. *Thorax*: glossy black, with slight greenish tinge, densely covered with black setiferous dots. Scutellum concolorous, lower portion of its apical edge densely white-dusted. Upper half of pleura, including entire mesopleura and upper edge of sternopleura, from anterior extremity to in front of posterior spiracle, yellow-dusted and with long golden hairs; sternopleural hairs pale but not so conspicuously as those above them. Posthumeral and presutural present but weak, prescutellars: acrostichals 1; dorso-centrals 2; mesopleura with the usual two upper hind marginal bristles; sternopleurals 1 : 1. *Abdomen*: glossy black, with purplish tinge. No noticeable dusting or spots, the hairs on incurved portion of apparent first tergite and on second sternite yellow, other hairs black. Hypopygium small. *Wings*: first posterior cell narrowly open; greyish-hyaline, a fuscous cloud apically from above level of posterior cross-vein to tip, and extending backwards to IV, most distinct along costa. Squamæ basally golden-yellow, in line with the yellow pleural stripe, remainder blackish. Halteres black. *Legs*: black, first joint of front tarsus except its apex, and first three joints of posterior tarsi except narrowly at their apices, yellow. Fore tarsi slightly widened; mid-tibia with one antero-dorsal, one

postero-dorsal, and two postero-ventral bristles; hind femur with one strong pre-apical antero-ventral and about three weaker bristles on basal half of postero-ventral surface; hind tibia with one antero-ventral bristle, the antero-dorsal surface with well-developed fringe, a few setulæ beyond middle.

Length 7 mm.

Bionomics.—Unknown.

Distribution.—North Borneo, Sandakan.

151. **Stomorhina mallochi,** sp. n.

Type-locality: India, Calcutta. *Type* in the British Museum.

Differs from *bipartita* Malloch only by the first segment of front tarsi being dark and the first three segments of the posterior tarsi not being darkened apically. The squamæ are uniformly fuscous and lack the bright golden basal colour so distinctive in *bipartita*.

Bionomics.—Nothing is known.

Distribution.—Unique type from INDIA, Calcutta (*Brunetti*).

Genus 32. **RHINIA** Robineau-Desvoidy.

Rhinia R.-D., Myodaires, p. 422, 1830. Genotype, *R. testacea* R.-D.

Beccarimyia Rond., Ann. Mus. Gen. iv, p. 287, 1873. Genotype, *R. testacea*, as *B. glossina* Rond.

Head: epistome strongly warped forward. Facial carina broad. ♂ subholoptic, the frontalia practically pinched out and the parafrontalia reduced almost to a line. Arista ciliate above only. Palpi phylliform. *Thorax*: anterior post-humeral bristle present. *Abdomen*: without macrochætæ. ♂ hypopygium small. *Wings*: apical cell petiolate, in line with III. *Legs*: front tarsi widened in both sexes.

152. **Rhinia testacea** Robineau-Desvoidy. (Figs. 73 & 93.)

Rhinia testacea R.-D., Myodaires, p. 423, 1830.
Type-locality: Mauritius. *Type* lost.
Idia flavipennis Macq., Dipt. Exot. ii, pt. 3, p. 125, pl. xv, fig. 2, 1842.
Type-locality: Java. *Type*?
Idia tripartita Big., Ann. Soc. Ent. Fr. (5) iv, p. 236, 1874.
Type-locality: East India. *Type* lost.
Rhinia fulvipes Big., Ann. Soc. Ent. Fr. (5) iv, p. 239, 1874.
Type-locality: Ceylon. *Type* lost.
Beccarimyia glossina Rond., Ann. Mus. Gen. iv, p. 287, 1873.
Type-locality: Abyssinia. *Type*?

♂♀.—*Head*: ♂ subholoptic, ♀ frons one-fifth head-width. Frontal stripe linear, black, parafrontalia narrow, white with closely-set shining black spots; parafacialia similar. Face, epistome, and genæ shining black. Occiput black above, covered with bright golden pile below. Antennæ and palpi

brown. *Thorax*: dark green, so thickly covered with black spots as to appear, with the thin white pile with which it is also covered, dark grey. Traces of a median and subdorsal pair of black stripes sometimes apparent. Pleura with stripe of thick golden pile. *Abdomen*: orange, sometimes apically

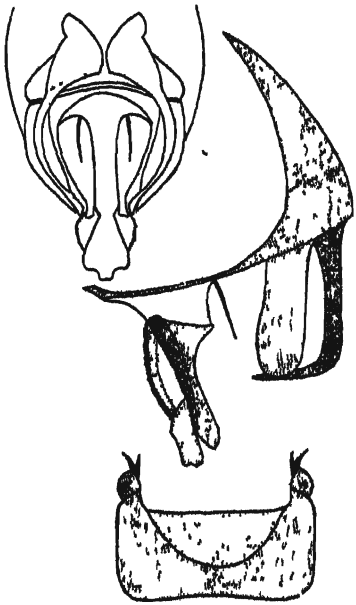


Fig. 93.—*Rhinia testacea* Robineau-Desvoidy: ♂ genitalia. (From Senior-White.)

infuscated. *Wings*: clear, with or without a small apical infuscation. *Legs*: all brownish-yellow, except tips of tarsi, blackened.

Length 6 mm.

Bionomics.—Unknown.

Distribution.—Chagos Islands; CEYLON; INDIA: Bombay, Darjeeling Himalayas; Baroda; Khasi Hills; Nicobar Islands; Cocos, Keeling Island; Java; Philippine Islands; Hong Kong; Buru Island; Tahiti; Hawaii.

[Malloch considers that there are two closely allied species in the Orient, differing in ♂ genitalia, but from his figures (Ann. Mag. Nat. Hist. (9) xviii, p. 503, fig. 2 *a*, *b*) we are quite unable to appreciate the distinction. The Ethiopian species, *apicalis* Wied., is shown by the same author to be distinct on ♂ genitalia. Former references to the occurrence of this species in the islands of the Indian Ocean are therefore doubtful.]

Genus 33. **CHLORORHINIA** Townsend.

Chlororhinia Tnsd., Rec. Ind. Mus. xiii, p. 191, 1917. Genotype, *Idia exempta* Wlk., as *C. viridis* Tnsd.

Head: ♂ subholoptic. Epistome not greatly produced. Facial carina narrow, weak. Arista little more than pubescent, on upper side only. *Thorax*: anterior posthumeral bristle absent. *Abdomen*: ovoid. *Wings*: apical cell petiolate, in line with vein III. *Legs*: front tarsi not widened.

Key to the Species of Chlororhinia.

Female frons very little broader than one of the parafrontalia. Bright green species *exempta* (Wlk.), p. 206.
Female frons twice as broad as one of the parafrontalia. Dark blue-green species.. *fuscohirta* Mall., p. 206.

153. **Chlororhinia exempta** (Walker).

Idia exempta Wlk., Journ. Linn. Soc. Lond. i, p. 128, 1857.
Type-locality: Borneo. *Type* in the British Museum.
Chlororhinia viridis Tnsd., Rec. Ind. Mus. xiii, p. 191, 1917.
Type-locality: Assam. *Type* in the Indian Museum, Calcutta.

♂♀.—*Head*: ♂ subholoptic. ♀ frontal width about one-quarter of head. Frons black. Parafacialia silvery pollinose above, opposite antennal roots. Rest of head brilliant metallic-green. Antennæ fulvous, third segment pollinose. Palpi blackish. Base of haustellum metallic-green. Occipital hairs yellow. *Thorax*: bright metallic-green to blackish-blue, covered with black setiferous dots. No stripes. Pleural hairs tawny. *Abdomen*: bright metallic-green, covered with black setiferous spots. *Wings*: hyaline, basally slightly infuscated. *Legs*: femora brownish except the front pair, which are metallic. Tibiæ fulvous to brownish. Front tibia with a bristle near middle of postero-ventral surface and a series of short setulæ ventrally from middle to tip.

Length 4–7 mm.

Bionomics.—Nothing is known.

Distribution.—INDIA: Assam Hills, Shillong and Manipur; Borneo, Sarawak.

154. **Chlororhinia fuscohirta** Malloch.

Chlororhinia viridis var. *fuscohirta* Mall., Ann. Mag. Nat. Hist. (9) xviii, p. 498, 1926.
Type-locality: Malaya, Pahang. *Type* in the British Museum.

♀.—*Head*: frons not quite one-third width of head. Frons practically double one of the parafrontalia in width, dull black, with or without striæ. Parafrontalia shining black, a silvery

fleck at their junction with the parafacialia, which, with the face, are shining black. Genæ similar. Antennæ brownish, third segment pollinose. Palpi black. *Thorax*: dark green, so covered with black setiferous spots as to appear dark blue. Scutellum concolorous. Pleura shining dark green. Prescutellar acrostichals and dorso-centrals only. *Abdomen*: shining darkish green, segments with black posterior margins. *Wings*: hyaline, costa infuscated from base to apex in front of vein 1. *Legs*: femora black or very dark brown, the anterior pairs slightly metallic. Tibiæ definitely brown: in front legs the first three, and in posterior legs the first four, tarsal segments pale brownish yellow.

Length 4–7 mm.

Bionomics.—Nothing is known.

Distribution.—Malaya, Pahang; Borneo, Sarawak.

Subfamily SARCOPHAGINÆ.

Arista varying from pubescent to plumose on basal two-thirds, never to tip. All the known Oriental species are greyish, the thorax with longitudinal black stripes, the abdomen either with a grey and black tesselate pattern which varies with the light incidence, or with fixed black markings on a grey ground. The species of *Agria* are brownish. Wing with stem-vein setulose on posterior upper side of its basal section. Posthumerals or notopleurals almost invariably three to four. The two anterior bristles on the area between the presuturals dorso-centrals and the notopleurals are either in a longitudinal line or the anterior one is situated nearer the mid-line than the posterior.

Most of the species of this subfamily are breeders in decaying matter, but a few are definite myiasis-producers. Details will be found under the various species.

Key to the Genera of Sarcophaginæ.

1.	Abdominal markings variable with light incidence	2.
	Abdominal markings fixed in position	3.
2.	Arista plumose on basal two-thirds. Sternopleurals 1 : 1 : 1 or 1 : 1	[p. 208. SARCOPHAGA Mg.,
	Arista pubescent. Sternopleurals 1 : 1....	SARCOPHILA Rond.,
3.	♂ without external fronto-orbitals. Sternopleurals 1 : 1	[p. 278. AGRIA Macq., p. 280.
	♂ with external fronto-orbitals. Sternopleurals 2 : 1	[p. 282. WOHLFARTIA B. & B.,

Genus 34. SARCOPHAGA Meigen.

Sarcophaga Mg., Syst. Besch. v, p. 14, 1826. Genotype, *Musca carnaria* Linn.

Blæsoxipha Loew, Wien. Ent. Monat. v, p. 384, 1861. Genotype, *B. grylloctona* Lw.

Ravinia R.-D., Dipt. Env. Paris, ii, p. 434, 1863. Genotype, *S. hæmatodes* Mg.

Helicobia Coq., Proc. Acad. Nat. Sci. Phil. 1895, p. 317, 1895. Genotype, *S. helicis* Tnsd.

Böttcheria Parker, Proc. Bost. N. H. S. xxxv, p. 65, 1914. Genotype, *B. latisterna* Parker.

Glaucosarcophaga Tnsd., Proc. Biol. Soc. Wash. xxx, p. 191, 1917. Genotype, *S. knabi* Park.

Paraësarcophaga Johnston & Tiegs, Proc. Roy. Soc. Queensland, xxiii, p. 78, 1921. Genotype, *S. omega* J. & T.

Small to very large flies, all the known Oriental species grey, with a median and a pair of dorso-central black thoracic

stripes, the former continued to tip of scutellum, and, save with a very few exceptions, a shifting grey and black tesselate pattern on the abdomen.

Head: eyes well separated in both sexes, frons narrower in ♂ than in ♀, in neither surpassing an eye-width in breadth. Lateral verticals present or absent in ♂, always present in ♀. Frontals variable in number, in typical species numerous and closely set. Exterior frontals absent in ♂, three in ♀, the upper one reclinate, the two lower proclinate. Vibrissal ridges bare. Facials varying from weak to strong. Genals usually more or less bristly. Postocular cilia in one to three rows, in the former case the occiput with confused mass of black bristles. Antennæ with proportion of second segment to third very variable. Arista long-plumose on basal two-thirds. *Thorax*: acrostichals varying from none to 5 : 2; dorso-centrals always 2 anteriorly and from 2 to 6 posteriorly. Propleura hairy or bare. Scutellum with two marginals, an apical and a preapical pair, the apical always absent in the ♀, sometimes so in the ♂. Sternopleurals arranged 1 : 1 : 1, or 1 : 1. *Abdomen*: apparent second segment sometimes, apparent third always, with a pair of median marginal bristles, in the ♂ the first genital segment with or without a hind row of strong marginals. Sternites either appressedly or outstandingly haired. *Wing*: a costal bristle present or absent. Vein I bare or bristly. Vein III always bristly at least as far as halfway to anterior cross-vein. The apex of Vein II varies in position, making the proportion of segment iii to segment v of the costa variable. *Legs*: in the ♂ the posterior pairs bear various adornments. The mid-femora below on apical half has a row of strong short bristles, often closely approximated and thickened and forming a regular comb; the inner half nearly always with a fringe of long soft hairs. Hind femora with or without a similar fringe and with anterior and posterior rows of long macrochætæ below, often hidden in the fringe, and with the posterior pair sometimes wanting. Hind tibiæ with inner and outer fringes of long hairs, or the outer or both may be absent.

Distribution and Bionomics.—The genus is universally distributed throughout every faunal region, the total number of species being very large. Most if not all of the known species are larviparous, the larva being born in the first instar. Though all the species are apparently polyphagous in their breeding habits, detailed observation shows that this is not really so, experimental work (Senior-White, Spol. Zeyl. xiv, p. 77) showing that species that breed in decaying snail tissues are not always attracted for this purpose to human excrement, and that in decaying material there is apparently a species succession varying seasonally in the same material.

TABLE. —*Materials from which* Sarcophaga

Species.	Decaying vegetable matter.	Dead Mollusca.	Dead Insecta.
albiceps Mg.			
annandalei Sen.-Wh.		*Achatina fulica.*	
aspinata Sen.-Wh.			
bainbriggei Sen.-Wh.			
barbata Thoms.			
calcifera Bott.		Gastropod.	
dux Thoms. and vars.	Cucumber, *Cajanus indicus.*	Gastropod, Oyster, *Achatina fulica*, *Indoplanorbis exustus.*	Beetle, *Achæta* sp
fuscicauda Bott.	Unopened coconut leaflets.	*Achatina fulica.*	*Lepidiota pruinis.*
hirtipes Wd. and var.	Melon.	*Achatina fulica* (experimental only).	
karnyi Hardy			*Xylotrupes*, *Gryllotalpa.*
kempi Sen.-Wh.		*Achatina fulica.*	Sphingid larva.
knabi Parker			
martellata Sen.-Wh. .			
orientaloides Sen.-Wh.		*Achatina fulica.*	Grasshopper, Sphingid larva, *Lepidiota* larva.
patloni Sen.-Wh.			
ruficornis Fb. ,,		*Achatina fulica* (experimental only).	Grasshopper.
valangæ Aldr.			

has been bred in the Oriental Region.

Dead non-mammal Vertebrata.	Dead Mammalia.	Excrement.	Parasitic.	Myiasis (tissue).	Myiasis (intestinal).
....	Rabbit.	Human.	*Nonagria* sp.	Bull.	
...	Rabbit, Bat.				
....	....	Manure pit water.	*Acrotyla* sp.		
....	....	Human.			
....	Meat.	....	*Lachnosterna.*		
....	Meat.				
Toad, snake, eggs of *Corvus.*	Squirrel, Beef.	....	"Locust."	Human, Bull.	
....	Rabbit, Meat.	....	Lumbricid worm.	Human.	
....	....	Human.	....	....	Human.
....	Rabbit.	Human.			
....	....	Human.			
....	Beef.	Human.	Wax of Fulgorid, Noctuid.		
....	Rabbit.				
Snake.	Squirrel, Rat, Beef.	....	....	Dog.	
....	....	....	*Valanga nigricornis.*		

There is also a definite seasonal fluctuation in the percentage of various species in the Sarcophagid fauna of an area, apparently dependent on the rainfall. The table on pp. 210 & 211 summarizes our knowledge of the breeding places of the Oriental species, and reveals how very little is really known, and how much research remains to be done along these lines. Some of the species have a restricted distribution in the Orient, being confined to mountains or desert regions, and in one case at least it appears that forest-shade governs the distribution. Further notes will be found under the descriptions of individual species. Howlett did some work on chemotropisms. When he added to meat vanillin or papain plus HCl *dux* only was attracted and bred, but when he added borneol *dux* and *orientaloides* were attracted and bred in equal numbers.

Key to the Species of Sarcophaga *.

(Applicable to males only.)

1.	Posterior dorso-centrals 3	2.
	Posterior dorso-centrals 4	15.
	Posterior dorso-centrals 5–6	42.
2.	Acrostichals only present as prescutellars..	3.
	Acrostichals also present presuturally ...	9.
3.	Segment iii of costa much shorter than v; vein 1 bristly	*calcifera* Bott., p. 216.
	Segment iii of costa equal to or longer than v; vein I bare	4.
4.	Frons less than half an eye. Genital segment 2 black	5.
	Frons greater than half an eye. Genital segment 2 variously coloured	7.
5.	Hind tibiæ bare. Præputium elongate, encircling end of hypophallus.....	*caudagalli* Bott., p. 217.
	Hind tibiæ fringed	6.
6.	Second abdominal segment with marginals.	7.
	Second abdominal segment without marginals, hypophallus hooked apically, broad-ended	*josephi* Bott., p. 217. | p. 218.
7.	Præputium trilobate, narrowed basally ..	*pea-helicis* Sen.-Wh.,
	Lateral apophysis elongate, filiform	*sera* Rohd., p. 220.
8.	Gena and genital segment 2 black. Superior claspers acuminate	*melanura* Mg., p. 221.
	Gena white. Genital segment 2 reddish. Superior claspers apically truncate ...	*barbata* Thoms., p 222.
9.	Frons narrow, third antennal segment five times as long as second	10.
	Frons of varying width, third antennal segment not more than twice second....	11.
10.	Wings basally deep yellow. Posterior claspers apically furcate	*basalis* Wlk., p. 223.

* Three species (*serrata*, *auricauda*, and *walshi*) described in 1938 by Ho are included in this Key. Ho's original paper should be consulted for figures of the genitalia, etc. (see Appendix, p. 282).

	Wings basally only slightly infuscated. Posterior claspers acuminate	[p. 224. *gravelyi* Sen.-Wh.,
11.	Frons broad. Apical scutellars absent. Genital segment 2 red. Posterior claspers anteriorly serrate	*hæmatodes* Mg., p. 225.
	Frons not exceeding half an eye-width. Apical scutellars present. Genital segment 2 black	12.
12.	Superior claspers smooth or normally haired laterally	13.
	Superior claspers laterally spinulose	14.
13.	Accessory forceps normal	*valanga* Aldr., p. 227.
	Accessory forceps not spinulose in the fork	[p. 226. *aspinata* Sen.-Wh.,
14.	Superior claspers spinulose right up to basal hair-tuft	*kastneri* Baran., p. 229.
	Superior claspers only spinulose on apical half	[p. 228. *baranoffi*, nom nov.,
15.	Prescutellar acrostichals wanting	16.
	Prescutellar acrostichals present	17. [p. 230.
16.	Coloration normal	*valayari* Sen.-Wh.,
	Hinder abdominal segments bright golden.	*doleschalli* J. & T.,
17.	Prosutural acrostichals present	18. [p. 231.
	Prosutural acrostichals absent	31.
18	Prosutural acrostichals 4 or 5	19.
	Prosutural acrostichals 1	24.
19.	Elongate species, face silvery	20.
	Shape normal, face golden	22.
20.	Superior claspers spinulose on hind margin, viewed from side	21.
	Superior claspers bare on hind margin, viewed from side	[p. 232. *banksi* Sen.-Wh.,
21.	Accessory forceps normally V-shaped	*henryi* Sen.-Wh., p. 233.
	Accessory forceps with inwardly projecting apical lobes	[p. 233. *pusana* Sen.-Wh.,
22.	Superior claspers with marginal spines	23.
	Superior claspers bare	24.
23.	Superior claspers with separated strong spines	*antilope* Bott., p. 235.
	Superior claspers with closely set fine spines	[p. 235. *ontindica* Sen.-Wh.,
24.	Face distinctly golden. Vesica blunt	*basiseta* Baran., p. 237.
	Face hardly yellowish. Vesica acuminate	[p. 237. *kankaucnsis* Baran.,
25.	Third antennal segment four times second. Abdominal stripes complete. Genital segment 2 red. Mid-tibiæ fringed	[p. 238. *annandalei* Sen.-Wh.,
	Third antennal segment not more than thrice second. Pattern of abdomen normal. Mid-tibiæ bare	26.
26.	Frons, face, and genæ bright golden. General colour yellowish-grey. Genital segment 2 black	27.
	Frons and face at most yellowish. Usually darker grey species	28. [p. 239.
27.	With gold-shimmering body tomentum	*prosheliina* Baran.,
	Without gold-shimmering body tomentum.	*knabi* Parker, p. 240.
28.	Palpi and genital segment 2 black. Horn on vesica strongly recurved	*albiceps* Mg., p. 242.
	Palpi yellow	29.

29. Mid-tibiæ fringed. Superior claspers sharply angled towards tip and with spine-fringe ..... [p. 245. *phœnicopterus* Bott.,
Mid-tibiæ bare. Horn on vesica very strongly recurved ..... 30.
30. Genital segment 2 red ..... *hirtipes* Wd., p. 243.
Genital segment 2 black..... *hirtipes* var. *orchidea*
31. Third antennal segment four times second 32. [Bott., p. 244.
Third antennal segment two-and-a half times second ..... 37.
Third antennal segment not more than twice second ..... 30.
32. Hind tibiæ bare. Anterior process of vesica claw-like ..... [p. 246. *talonata* Sen.-Wh.,
Hind tibiæ fringed ..... 33.
33. Mid-tibiæ fringed. Genital segment 2 black. Superior claspers evenly covered throughout ..... *krameri* Bott., p. 247.
Mid-tibiæ bare. Genital segment 2 variously coloured ..... 34.
34. Frons broader, three-fifths an eye-width. Genital segment 2 black. Ædeagus very massive and complex..... [p. 248. *becconi* Sen. Wh.,
Frons narrower, not exceeding half an eye-width ..... 35.
35. Genital segment 2 red. Superior clasper, spined posteriorly ..... [p. 248. *pattoni* Sen.-Wh.,
Genital segment 2 black. Superior claspers bare ..... [p. 250. *formosana* Sen.-Wh.,
36. Mid-tibiæ fringed. Superior claspers with a tuft ..... 37.
Mid-tibiæ bare, at least in inner half .... 38. [p. 251.
37. Superior claspers with a tuft ..... *orientalis* Parker,
Superior claspers without a tuft ..... *serrata* Ho, p. 283.
38. Frons very narrow, one-third an eye-width. Ædeagus with three porrect processes, one below the other ..... *tristylata* Bött., p. 254.
Frons broader. Ædeagus hook-like, two median rod-like processes ..... *crinita* Parker, p. 254.
39. Mid- and hind femora fringed ..... 40.
Mid-femora unfringed ..... 41.
40. Ædeagus ending in upcurved point ..... *hui* Ho, p. 260.
Ædeagus of *duo* form ..... *brevicornis* Ho, p. 262.
41. Mid-tibiæ fringed on outer half..... *similis* Mead, p. 261.
Mid-tibiæ bare ..... *hainanensis* Ho, p. 262.
42. Prescutellar acrostichals present ..... 43.
Prescutellar acrostichals absent ..... 58.
43. Third antennal segment three to four times second ..... 44.
Third antennal segment not exceeding two and a half times second ..... 45.
44. Third antennal segment thrice second, but passing lower eye-margin. Palpi black, second abdominal segment without marginals. Superior claspers minutely serrate at bend ..... [p. 255. *khasiensis* Sen.-Wh.
Third antennal segment four times second, but not passing lower eye-margin. Palpi yellow. Second abdominal segment with strong marginals. Superior claspers with strong spines ..... *futilis* Sen.-Wh., p. 257.

45. Hind tibiæ well fringed ..... 46.
Hind tibiæ hardly or not at all fringed .. 53.
46. Mid-tibiæ fringed. Superior claspers with spines and a hair-tuft ..... 47.
Mid-tibiæ bare ..... 48.
47. Mid-femur with comb. Wing clear. Abdominal stripes complete. Bristles on superior claspers above hair-tuft..... [p. 251. *orientaloides* Son.-Wh.,
Mid-femur with long bristles. Wing infumate. Abdominal pattern normal. No bristles on superior claspers above hair-tuft ..... *sinica* Rohd., p. 253.
48. Antennæ yellowish-red ..... 49.
Antennæ black, third segment grey pollinose ..... 50.
49. Superior claspers with outstanding lobe towards base .. .. [p. 259. *martellatoides* Baran.,
Superior claspers basally normally curved. *martellata* Son.-Wh.,
50. Frons narrow, half an eye-breadth ..... 51. [p. 258.
Frons broader, two-thirds an eye-breadth. 52.
51 Accessory forceps with internal apical serrate lobes ..... *kempi* Son. Wh., p. 264.
Accessory forceps normally V-shaped and spined ..... [p. 265. *tsushimæ* Son.-Wh.,
52. Præputium with upper prong of apical fork longer and stronger than lower.... *dux* Thoms., p. 266.
Præputium with prongs of apical fork equal and more sharply incised ..... [p. 267. *dux* var. *harpax* Pand.,
53. Antennæ red. Mid-femoral comb distinct. *ruficornis*(Fab.),p. 270.
Antennæ black. Mid-femoral comb distinct ..... 54.
Antennæ black. Mid-femora with only widely spaced bristles ..... 55.
54. Mid-femur with short fringe and comb ... *lineensis* Ho, p. 271.
Mid-femur with comb only ..... *walshi* Ho, p. 283.
55. Colour dark slaty-grey. Anterior appendage of aedeagus with margins serrated. Superior claspers very truncate ..... 56.
Colour lighter grey. Aedeagus and superior claspers not so formed ..... 57.
56. Main sheath of aedeagus with a hood posteriorly. Anterior claspers simple .. [p. 272. *fuscicauda* Boett.,
Main sheath of aedeagus without a hood. Anterior claspers furcate ..... *kanoji* Hardy, p. 274.
57. No præputium. Aedeagus with many rod-like appendages ..... [p. 275. *bainbriggei* Son.-Wh.,
Præputium ending bifid, lower prong longer and stronger ..... [Son.-Wh., p. 269. *dux* var. *scoparii formis ballardi* Son.-Wh.,
58. Antennæ red. Accessory forceps V-shaped 59. [p. 276.
Antennæ black ..... [p. 276. *hæmorrhoidalis* (Fall.),
59. Accessory forceps with spined apical lobes ..... *auricauda* Ho, p. 283.
Accessory forceps normally furcate, strong spined .....

155. **Sarcophaga calcifera** Böttcher. (Fig. 94.)

Sarcophaga calcifera Bott., Ent. Mitteil. i, p. 169, fig. 7, 1912
Type-locality: Formosa. *Type* in the Berlin Museum.

♂.—*Head*: frons equal to half an eye-width. No lateral verticals. Fronto-orbitals very few, not diverging. Facials weak, except lowest. Genals represented by only scattered black bristles. Three rows black postocular cilia. Frontal stripe black, fading above to orange. Each of the parafrontalia as broad as the frontal stripe. Parafrontalia and face shining

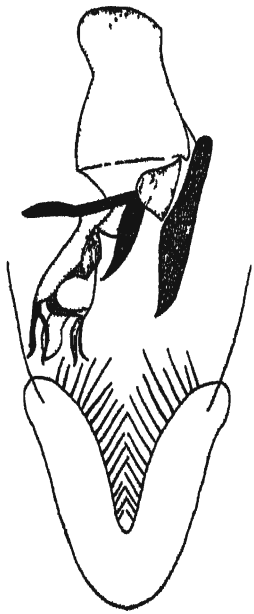


Fig. 94.—*Sarcophaga calcifera* Böttcher: ♂ genitalia.
(From Senior-White.)

silvery. Antennæ black, third segment two and a half times second. Palpi black. *Thorax*: ground-colour whitish-grey. Proploura bare. Acrostichals 0 : 1. Posterior dorso-centrals 3. *Abdomen*: second segment with marginals. Genital segment 2 black. *Wings*: I bristly. Costal bristle strong. Segment iii of costa much shorter than v. *Legs*: mid-femora with some weak bristles arranged comb-like, no basal fringe, only a few long hairs. Mid-tibiæ bare. Hind femora with fore and hind rows of sparse macrochætæ only. Hind tibiæ with about six long fringe-hairs towards apex, on inside only. ♂ *genitalia* are shown in fig. 94.

Length 5 mm.

Female.—Frontal width equals that of an eye.

Bionomics.—Has been bred from a "gastropod" and in meat.

Distribution.—INDIA: Bihar, Pusa; Nilgiris, Coonoor: CEYLON; Formosa; Philippine Islands.

156. **Sarcophaga josephi** Böttcher. (Fig. 95.)

Sarcophaga josephi Bott., Ent. Mitteil. i, p. 168, fig. 6, 1912.
Type-locality: Formosa. *Type* in the Berlin Museum.

♂.—*Head*: frons equal to two-thirds an eye-width. No lateral verticals. Frons and face whitish-grey with dark reflections. Antennæ black, third segment equal to twice the second. Palpi black. *Thorax*: ground-colour pale yellowish-grey. Propleura bare. Acrostichals only present as prescutellars. Three pairs posterior dorso-centrals. *Abdomen*: second segment without marginals. Genital segment 2 black.



Fig. 95.—*Sarcophaga josephi* Böttcher: ♂ genitalia.
(From Senior-White, after Böttcher.)

Wings: I bare. *Legs*: mid-femora with a comb of widely-spaced bristles. Mid-tibiæ bare. Hind femora with lower macrochætal rows. Hind tibiæ on inner side with long and thick but somewhat shorter hairs. ♂ *genitalia* figured in fig. 95.

Length 8 mm.

Bionomics.—Nothing is known.

Distribution.—Formosa.

157. **Sarcophaga caudagalli** Böttcher. (Fig. 96.)

Sarcophaga caudagalli Bott., Ent. Mitteil. i, p. 167, fig. 4, 1912.
Type-locality: Formosa. *Type* in the Berlin Museum.

♂.—*Head*: frontal width two-fifths that of an eye. Frontals hardly diverging. Facials numerous and strong. Genals strong, black. Three rows postocular black cilia. Frontal stripe black, parafrontalia together barely half as wide,

these and the face dull golden, with black reflections above. Antennæ black, third segment barely twice as long as second. Palpi black. *Thorax*: ground-colour pale yellowish-grey. Propleura bare. Acrostichals only present as presutellars. Three pairs posterior dorso-centrals. *Abdomen*: ground-colour as thorax. Second segment without marginals. Genital segment 2 black. Sternites outstandingly haired. *Wings*: I bare. Costal bristle strong. Segments iii and v of costa subequal. *Legs* mid-femora without comb but with wide-spaced bristles, no fringe. Mid-tibiæ bare. Hind femora with lower macrochætal row and no fringe. Hind tibiæ bare. ♂ *genitalia* shown in fig. 96.

Length 7 mm.

Bionomics.—Nothing is known.

Distribution.—INDIA: Nilgiris, Kotagiri; Jeypore Hills, Ambadola; CEYLON, Pattipola (6000 ft.); Formosa.

158. **Sarcophaga pes-helicis** Senior-White. (Fig. 97.)

Sarcophaga pes-helicis Sen.-Wh., Rec. Ind. Mus. xxxii, p. 71, pl. ii, fig. 3, 1930.

Type-locality: Darjeeling. *Type* in the British Museum.

♂.—*Head*: frontal width about half an eye-breadth. Frontals diverging. Facials numerous and strong. Genals strong, black. Three clear rows of black postocular cilia. Frontal stripe dark brown. Parafrontalia together about as wide as frontal stripe, these and face dark silvery-grey with dark reflections at their junction. Antennæ black, third segment about two and a half times second. Palpi black. *Thorax*: ground-colour bluish-grey, more yellowish-grey marginally. Propleura bare. Acrostichals a weak presutellar pair only, dorso-centrals 2:3. *Abdomen*: ground-colour as thorax, the black spots rather elongate. Second segment with marginals. Genital segment 1 black, with strong apicals. Genital segment 2 black. Sternites outstandingly haired. *Wings*: I bare, segments iii and v of costa subequal. *Legs*: mid-femora with comb and fringe of short hairs. Mid-tibiæ bare. Hind femora with long sparse fringe on posterior aspect. Hind tibiæ with sparse double fringe. ♂ *genitalia* shown in fig. 97.

Length 9 mm.

Bionomics.—Nothing is known.

Distribution.—Only known from the unique type from Darjeeling.

Fig. 97

Fig. 96.

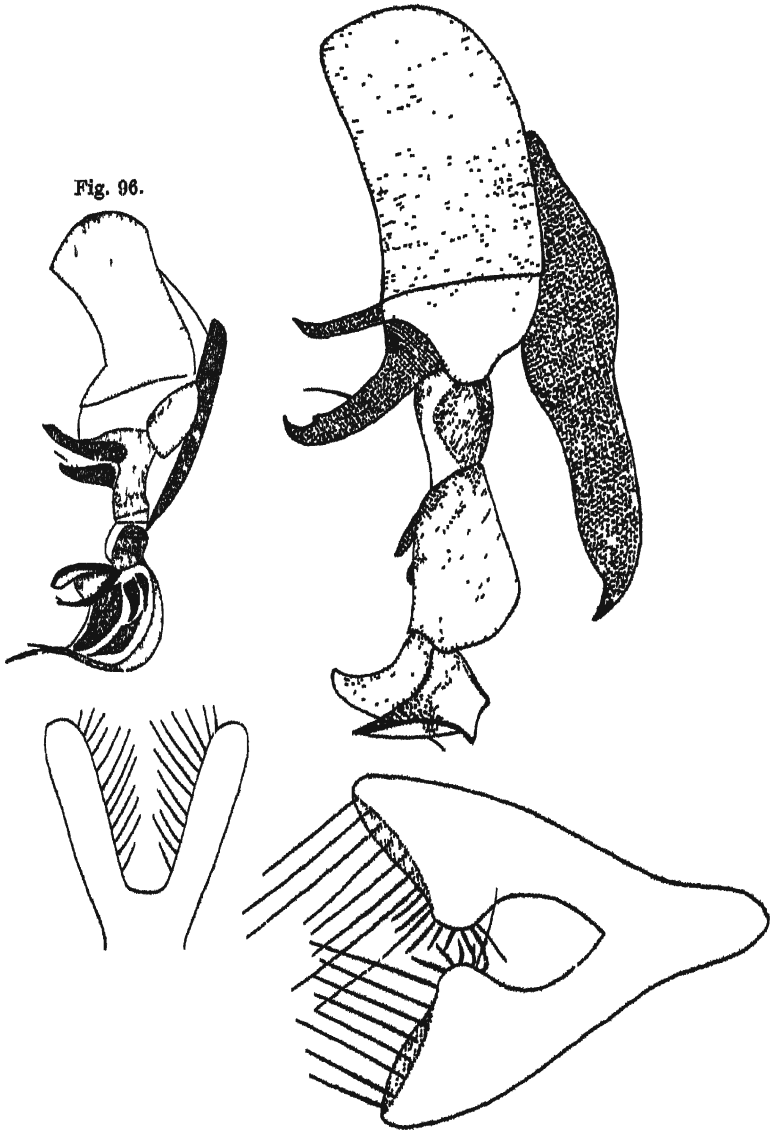


Fig. 96.—*Sarcophaga caudagalli* Böttcher: ♂ genitalia.
(From Senior-White.)
Fig. 97.—*Sarcophaga pes-helicis* Senior-White: ♂ genitalia.
(From Senior-White.)

159. **Sarcophaga sera** Rohdendorff. (Fig. 98.)

Sarcophaga sera Rohd., Bull. Ent. Ros. xxi, p. 316, figs. 2 & 3, 1930.
Type-locality: China, Foo Chow. *Type* in the British Museum.

♂.—*Head*: frons one-fifth of head-width. No lateral verticals. Frontals strong, crossed. Facials weak above, stronger below.

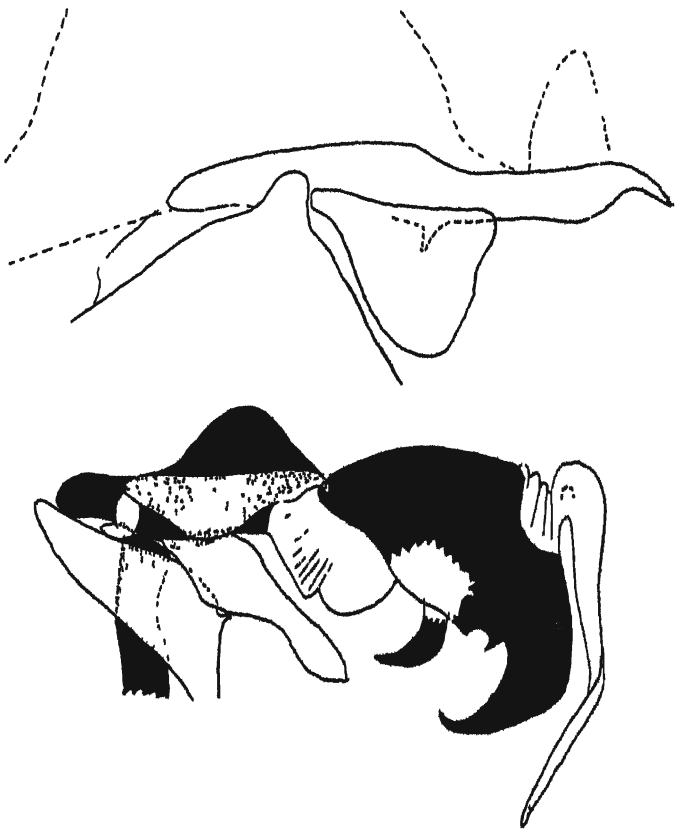


Fig. 98.—*Sarcophaga sera* Rohdendorff: ♂ genitalia.
(From Rohdendorff.)

Genals black. Three rows black postocular cilia, inmost not well defined. Frontal stripe black, a little wider than one of the parafrontalia; these and face rather smoky-grey. Antennæ black, third segment two and a half times length

of second. Palpi black. *Thorax*: bluish-grey, paler laterally. Propleura bare. Acrostichals 0 : 1; posterior dorso-centrals 3, the two anterior weak. *Abdomen*: second visible segment with one lateral marginal only. Genital segment 1 grey pollinose. Genital segment 2 shining black. *Wings*: vein 1 bare. A weak costal bristle. Segment iii of costa a little longer than v. *Legs*: mid-femur with basal fringe and apical comb. Mid-tibiæ bare. Hind femur with lower hind macrochætal row and fringe. Hind tibiæ double fringed. ♂ *genitalia* shown in fig. 98.

Length 10·5 mm.

Bionomics.—Nothing is known.

Distribution.—China, Foo Chow; Hainan Island.

160. **Sarcophaga melanura** Meigen. (Fig. 99.)

Sarcophaga melanura Mg., Syst. Beschr. v, p. 23, 1826.
Type-locality: Europe. *Type* in the Paris Museum.
Sarcophaga striata Schin. (*nec* Meig.), F. Austriaca, i, p. 570, 1862.
Type-locality: Austria. *Type* in the Vienna Museum.

♂. —*Head*: frons equal to an eye-breadth. Lateral verticals strongly present. Frontals strongly diverging. Facials weak. Genals black. Three rows of postocular cilia. Frontal

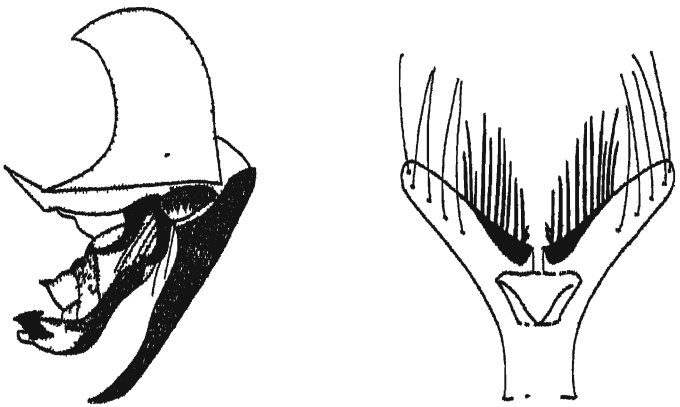


Fig. 99. *Sarcophaga melanura* Meigen: ♂ genitalia.
(From Senior-White.)

stripe black, parafrontalia together rather broader, these and the face dull silvery-yellowish with darker reflections. Antennæ black, third segment twice as long as second. Palpi black. *Thorax*: darkish-grey. Propleura bare. Acrostichals only present as prescutellars. Three posterior dorso-centrals. *Abdomen*: second segment without marginals. Genital

segment I black, with rather strong hind marginals. Genital segment 2 black. *Wings*: I bare. Costal bristle present. Segment iii of costa longer than v. *Legs*: mid-femora with fringe and rather widely spaced comb. Mid-tibiæ bare. Hind femora with lower hind macrochætal row and fringe. Hind tibiæ fringed. ♂ *genitalia* shown in fig. 99.

Length 10–14 mm.

Bionomics.—Nothing is known.

Distribution.—The Palæarctic region generally. In the Oriental region this species is recorded from Kashmir and Formosa. It extends to China and Japan.

161 **Sarcophaga barbata** Thomson. (Fig. 100.)

Sarcophaga barbata Thoms., Eugen. Reis. p. 533, 1869.
Type-locality: Honolulu. *Type* in the Stockholm Museum.
Sarcophaga falculata Pand., Rev. Ent. xv, p. 185, 1896.
Type-locality: Southern France. *Type* in Paris Museum.
Sarcophaga falculata var. *persica* Sen.-Wh., Rec. Ind. Mus. xxvi, p. 228, pl. xi, fig. 14, 1924.
Type-locality: Bushire. *Type* in the Indian Museum, Calcutta.

♂.—*Head*: frontal width equal to three-quarters of an eye. Lateral verticals wanting. Frontals diverging. Facials very weak, almost absent. Genals white. Frontal stripe dark brown. Parafrontalia each equal to it, these and face dull silvery. A single row of postocular black cilia. Antennæ black, in the Orient the third segment is two and a half times the second, but in more northern regions it tends to be somewhat shorter. Palpi black or yellow. *Thorax*: very pale whitish-grey. Propleura bare. Acrostichals only present as prescutellars. Posterior dorso-centrals in the Orient three, sometimes only two, but in Europe a weak fourth is sometimes present. *Abdomen*: ground-colour as thorax, but except for the median stripe the chequered pattern is brown. Second segment without marginals. Genital segment 1 dark brown or black, with fairly strong marginals. Genital segment 2 red. *Wings*: I bare. Costal bristle very weak. Segment iii of costa longer than v. *Legs*: mid-femora with comb and weak fringe. Mid-tibiæ bare. Hind femora with lower hind macrochætal row and fringe. Hind tibiæ with double fringe. ♂ *genitalia* shown in fig. 100.

Length 11–14 mm.

Bionomics.—It has been reared from *Lachnosterna* and bred in decaying meat in America.

Distribution.—Palæarctic region. Eastern United States of America, various localities from Pennsylvania to Texas. Hawaian Islands. In the Oriental region it is only recorded from India: Mussoorie (West Himalaya) and Ambala (on the plains at the foot of the range).

162 **Sarcophaga basalis** Walker (Fig. 101)

Sarcophaga basalis Wlk., Proc. Linn. Soc. Lond. iii, p. 129 (ex S., 1859).
Type-locality: Kei Islands. *Type* in the British Museum.
Sarcophaga flavicornis Sen.-Wh. (*nec* R.-D., 1867), Rec. Ind. Mus. xxvi, p. 220, pl. viii, fig. 4, pl. xvii, figs. 1, 3, 1924.
Type-locality: "India." *Type* in the Indian Museum, Calcutta.
Sarcophaga senior-whitei Ho, Ann. Trop. Med. Paras. xxxii, p. 117, 1938 (nom. nov.).

♂.—*Head*: frontal width equal to fifth that of an eye. Lateral verticals wanting. Frontals diverging. Facials

Fig. 100.



Fig. 101

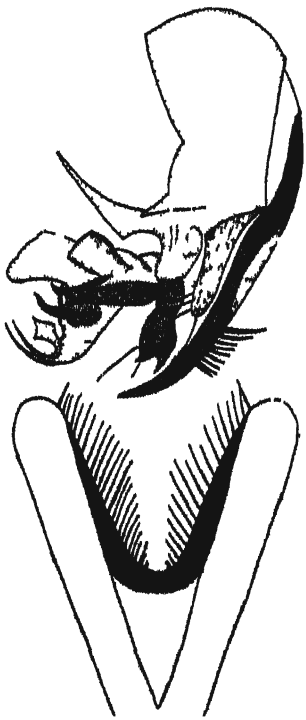


Fig. 100.—*Sarcophaga barbata* Thomson: ♂ genitalia. (From Senior-White.)
Fig. 101.—*Sarcophaga basalis* Walker: ♂ genitalia. (From Senior-White.)

strong. Genals weak and black. Postocular cilia irregular. Frontal stripe black, parafrontalia together as wide as this. Thorax and face golden. Antennæ black, third segment five times

as long as second, but not much passing the lower eye-margin. Palpi black. *Thorax*: pale yellowish-grey. Chætotaxy: propleura hairy; acrostichals 1 : 1; posterior dorso-centrals only two pairs present in the specimens so far seen, all of which are in bad order, probably three pairs in life. *Abdomen*: rather darker grey than the thorax, second segment bare. Genital segment 1 grey pollinose, without marginals, genital segment 2 black. *Wings*: the membrane basally and along the costa, and the veins, bright yellow. I bare. No costal bristle. Segment iii of costa longer than v. *Legs*: mid-femora with comb, mid-tibiæ bare. Hind femora with fringe. Hind tibiæ double fringed, neither very long, but the inner rather more so than the outer. ♂ *genitalia* shown in fig. 101.

Length 15–16 mm.

♀.—Frons equal to two-thirds an eye-breadth. In 1 from Chota Nagpur there are four posterior dorso-centrals. Second abdominal segment with quite strong marginals. Fourth segment with very noticeable golden tinge to lateral grey patches.

Bionomics.—Unknown.

Distribution.—INDIA: N.E. Frontier, Sadiya; Chota Nagpur, Sarandah Forests; Java; "E. India"; Kei Islands.

163. **Sarcophaga gravelyi** Senior-White. (Fig. 102.)

Sarcophaga gravelyi Sen.-Wh., Rec. Ind. Mus. xxvi, p. 229, pl. ix, fig. 5, 1924.

Type-locality: Kulla, India. *Type* in Prof. Patton's collection.

♂.—*Head*: frons equal to half an eye-width. No lateral verticals. Frontals straight. Facials strong. Genals weak and black. Two rows black postocular cilia. Frontal stripe black, parafrontalia together hardly as wide, these and face dirty golden. Antennæ black, third segment five times the second. Palpi black. *Thorax*: dark bluish-grey. Propleura bare. Acrostichals apparently 2 : 1 (the latter very strong). Posterior dorso-centrals 3, all placed on anterior two-thirds of distance from the suture. *Abdomen*: second segment without marginals. Genital segment 2 brown. *Wings*: I bare. No costal bristle. Segment iii of costa longer than v. Humeral and inner third of first basal cells infuscated. *Legs*: mid-femora with comb and fringe. Mid-tibiæ bare. Hind femora with lower basal macrochætal row. Hind tibiæ double fringed, that on the inside much the strongest. ♂ *genitalia* shown in fig. 102.

Length 11 mm.

Bionomics.—Nothing is known.

Distribution.—INDIA: East Godavery District, Kulla.

164. Sarcophaga hæmatodes Meigen. (Fig. 103.)

Sarcophaga hæmatodes Mg., Syst. Beschr. v, p. 29, 1826.
Type-locality: Europe. *Type* in the Paris Museum.

♂.—*Head*: frons equal to four-fifths an eye. No lateral verticals. Frontals quite straight. Facials strong. Genals black, sparse and bristly. Frontal stripe fuscous, the margins indistinct, very broad, the parafrontalia together not as wide,

Fig. 102. Fig. 103.

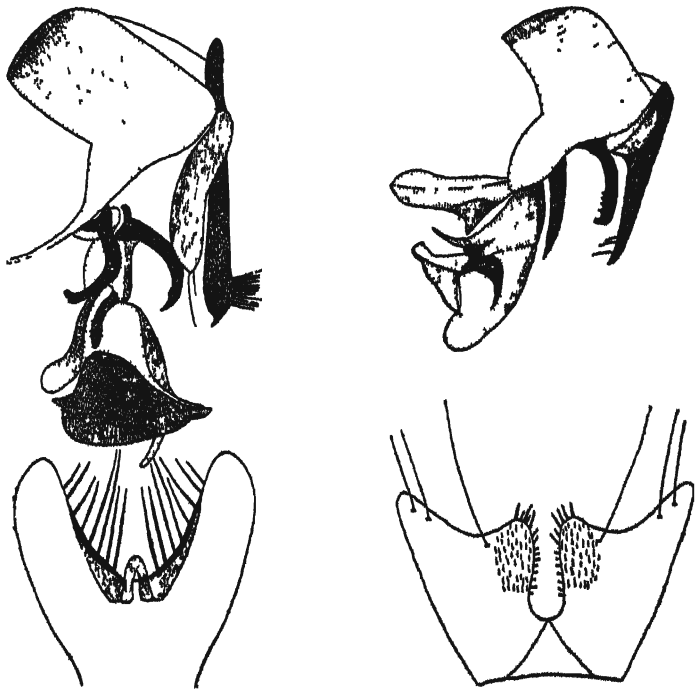


Fig. 102.—*Sarcophaga gravelyi* Senior-White: ♂ genitalia. (From Senior-White.)
Fig. 103.—*Sarcophaga hæmatodes* Meigen: ♂ genitalia. (From Senior-White.)

these and face dirty whitish-yellow. Antennæ black, third segment barely twice the second. Palpi black. *Thorax*: pale yellowish-grey. Chætotaxy: propleura bare; acrostichals 2 : 1; posterior dorso-centrals 3. Scutellar apicals wanting. *Abdomen*: second segment without marginals, all sternites outstandingly haired. Genital segment 1 grey pollinose, with strong marginals. Genital segment 2 red. *Wings*: I bare. Costal bristle very small. Segment iii of

costa not quite as long as v. Veins pale yellowish-brown. *Legs*: mid-femora with comb and a few long basal hairs. Mid-tibiæ bare. Hind femora with lower hind macrochætal row, but no fringe. Hind tibiæ bare. ♂ *genitalia* shown in fig. 103. The Oriental specimens differ from the European by having the posterior claspers only serrate towards the apex and the superior claspers with a greater extent black.

Length 6–7 mm.

Bionomics.—Nothing is known.

Distribution.—A Palæarctic species entering the Oriental region in Kashmir, and passing along the Himalayas as far east as Darjeeling.

165. **Sarcophaga aspinata** Senior-White. (Fig. 104.)

Sarcophaga aspinata Sen.-Wh., Rec. Ind. Mus. xxvi, p. 230, pl. x, fig. 12, 1924.

Type-locality: Coimbatore. *Type* in the Madras Department of Agriculture, Coimbatore.

♂.—*Head*: frontal width one-third that of an eye. No lateral verticals. Frontals diverging. Genals black anteriorly,



Fig. 104.—*Sarcophaga aspinata* Senior-White: ♂ genitalia. (From Senior-White.)

very strong and bristly. Two rows black postocular cilia. Frontal stripe black, indistinctly margined, the parafrontalia together nearly as wide, these and face whitish-grey. An-

tennæ black, third segment only as long as second. Palpi yellowish. *Thorax*: ground-colour dull dark grey. Propleura bare. Acrostichals 1 : 2. Posterior dorso-centrals 3, all very strong. *Abdomen*: second segment without marginals. Genital segment 2 black. *Wings*: I bare. Costal bristle present. Segment iii of costa as long as or longer than v. Veins very pale yellow. *Legs*: mid-femora without true comb, only 4–5 small bristles below apically, basal fringe wanting, in its place about four long, widely spaced bristles only. Mid-tibiæ bare. Hind femora with a few long bristles, forming the lower rows, no fringe. Hind tibiæ bare. ♂ *genitalia* shown in fig. 104.

Length 5–6 mm.

♀.—Frons equal to three-fifths an eye. Third antennal joint one and a half times second.

Bionomics.—Is apparently parasitic on *Acrotyla* sp., and has been bred from stagnant water in a manure-pit.

Distribution.—Only known from Madras, Coimbatore, the type-locality.

166. **Sarcophaga valangæ** Aldrich. (Fig. 105.)

Sarcophaga valangæ Aldr., Proc. U.S. Nat. Mus. lxxxi, p. 15, fig. 1, 1932.

Type-locality: Central Java. *Type* in the United States National Museum, Washington.

♂.—*Head*: frons less than one-quarter head-width, ocellars normal, proclinate; outer verticals not differentiated; two upper fronto-orbitals reclinate, but second pair partly convergent; parafrontalia narrow, brownish above, sub-silvery below; frontal stripe brown; parafacialia sub-silvery, a changeable dark spot in the pollen at lowest fronto-orbital. Parafacial hairs rather numerous and bristly below; middle of face blackish; cheek two-fifths an eye-height, with black hair except on hind edge. Antennæ black, third segment one and a half times second. Arista with rather short plumosity for less than half its length. Palpi black. *Thorax*: grey. Chætotaxy: propleura bare. Acrostichals 3 : 4, prosutural pairs strong and somewhat irregular. Posterior dorso-centrals 3. Sternopleurals 1 : 1 : 1. *Abdomen*: a median black stripe. Second segment with marginals. Genital segments both brownish. *Wings*: subhyaline. Segment iii of costa equal to v. III with bristles more than halfway to cross-vein. Squamæ distinctly fuscous. *Legs*: front tibia with one bristle on hind side. Mid-tibia with one on outer front. ♂ *genitalia* shown in fig. 105.

Length 6–7 mm.

♀.—*Head*: frons one-third head-width. *Thorax*: appearance pale grey, the black stripes much narrower, the median

one hardly visible on scutellum. *Abdomen*: more tessellate, median stripe less distinct, laterals hardly noticeable. Terminal ventral sclerite yellowish.

Bionomics.—Bred from the locust, *Valanga nigricornis* Burm.

Distribution.—Central Java, Gedangan.

167. **Sarcophaga baranoffi,** nom nov. (Figs. 106 & 107 *a*.)

Blæsoxipha formosana Baran. (*nec* Senior-White, 1924), Konowia, (2) x, p. 110, fig. 1, 1931.
Type-locality: Formosa. *Type* in the Berlin Museum.

♂.—*Head*: frons not exceeding two-fifths an eye, dark brown, slightly broader than one of the parafrontalia. Orbits, genæ, and occiput bluish. Genal width one-third an eye-height. No lateral verticals. Two reclinate, two proclinate

Fig. 105.

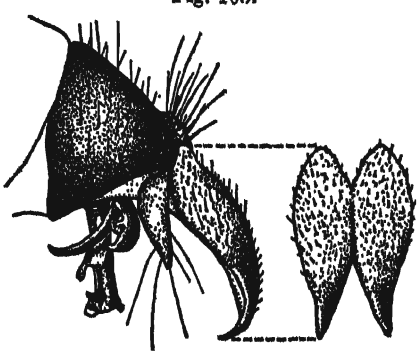


Fig. 106.

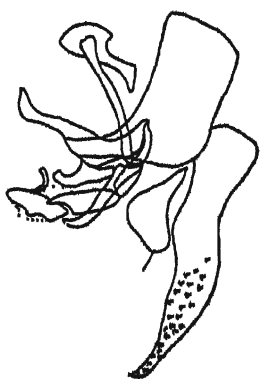


Fig. 105.—*Sarcophaga valangæ* Aldrich: ♂ genitalia. (From Aldrich.)
Fig. 106.—*Sarcophaga baranoffi*, nom. nov.: ♂ genitalia. (From Baranoff.)

fronto-orbitals. Antennæ and third segment twice second. Palpi black. *Thorax*: chætotaxy: propleura bare. Acrostichals 2 : 3, dorso-centrals 3 : 3, sternopleurals 1 : 1. Scutellar laterals very fine. *Abdomen*: long, with well-marked segmental bands and a median stripe. Third segment without discal marginals, but well-marked lateral marginals on this and on second. Sternites outstandingly haired. Genital segments both black, the first without strong marginals. *Wings*: brownish. III with only a single bristle at the base. *Legs*: mid-femora with a row of very fine bristles only on apical half. Hind femora with only two bristles on inside. Hind tibiæ with two bristles each on front and hind sides.

♂ *genitalia* shown in figs. 106 and 107 *a*. Superior claspers with short sensory spines on apical half only.

Length 8·5 mm.

Bionomics.—Nothing is known.

Distribution.—Formosa, Sukutsu.

168. **Sarcophaga kästneri** Baranoff. (Fig. 107 *b*.)

Sarcophaga kästneri Baran., Misc. Zool. Sumatrana, (3) lxvi, p. 3, fig. 1, 1932.

Type-locality: Sumatra. *Type* in the Stettin Museum.

♂.—*Head*: frons half an eye-width, each of the parafrontalia half this width. Parafacialia twice as wide as third antennal

Fig. 107 *a*.

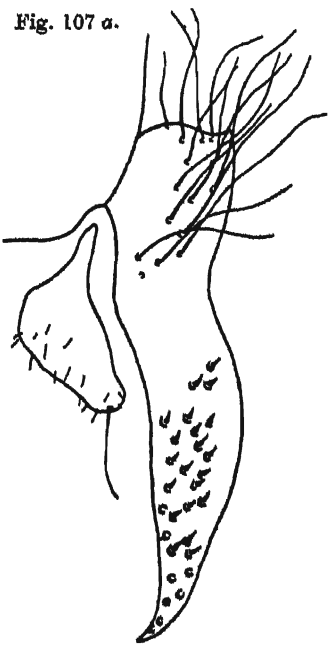


Fig. 107 *b*.

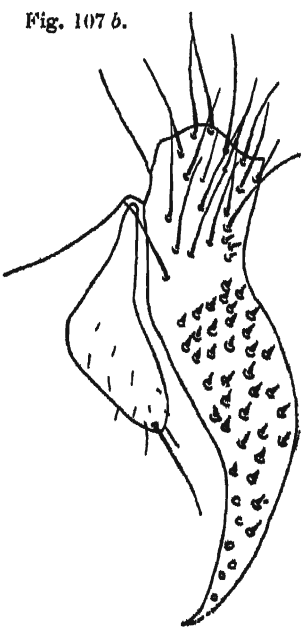


Fig. 107 *a*. *Sarcophaga baranoffi*, nom. nov.: ♂ genitalia.
Fig. 107 *b*. *Sarcophaga kästneri* Baranoff: ♂ genitalia.
(From Baranoff.)

segment, which is twice second. Palpi black. *Thorax*: acrostichals 3 : 2, scutellar laterals weak. *Abdomen*: third segment with a pair of marginals. Genital segments both black. *Wings*: nothing noted. *Legs*: mid-femora with a comb of three bristles only. ♂ *genitalia* shown in fig. 107 *b*. Superior claspers covered with short sensory spines from tip to base.

Length 7 mm.

Bionomics.—Nothing is known.

Distribution.—Sumatra, Soekaranda.

169 **Sarcophaga walayari** Senior-White. (Fig. 108)

Sarcophaga walayari Sen.-Wh., Rec. Ind. Mus. xxvi, p. 231, pl. x, fig. 9, 1924

Type-locality: Walayar Forests, Western Ghats. *Type* in the Madras Department of Agriculture, Coimbatore.

♂.—*Head*: frons equal to half an eye-width. Lateral verticals present or absent. Frontals strongly diverging.

Fig. 108.

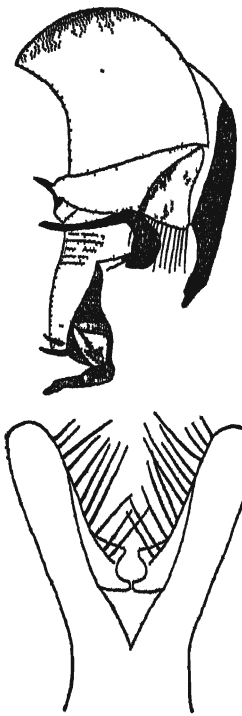


Fig. 109.



Fig. 108.—*Sarcophaga walayari* Senior-White: ♂ genitalia. (From Senior-White.)

Fig. 109.—*Sarcophaga dolescalli* Johnson & Tiegs: ♂ genitalia. (From Senior-White.)

Facials weak. Genals black. Three rows postocular black cilia. Frontal stripe black, parafrontalia together rather wider, these and face bright golden. Antennæ black, third segment equal to two and a half times the second. Palpi black. *Thorax*: pale greyish. Chætotaxy: propleura bare. No acrostichals, posterior dorso-centrals 4. *Abdomen*: second

segment bare, third with strong marginals. Genital segment 2 black. *Wings*: I bare, no costal bristle. Segment iii of costa equal to or rather more than v. *Legs*: mid-femur with comb, interior to which there is a row of rather wide-spaced long macrochætæ. Mid-tibiæ bare. Hind femur with lower hind macrochætal row and weak fringe. Hind tibiæ double fringed, the inner much the strongest. ♂ *genitalia* shown in fig. 108.

Length 12 mm.

Bionomics.—Apparently restricted to forest areas.

Distribution.—INDIA: Madras, Walayar Forests (Western Ghats); Chota Nagpur, Posoita.

170. **Sarcophaga doleschalli** Johnson & Tiegs. (Fig. 109.)

Sarcophaga aurifrons Dolsch. (*nec* Macq.), Nat. Tijd. Ned. Ind. xvii, p. 109, 1858.

Type-locality: Amboina. *Type* in the Vienna Museum.

Sarcophaga doleschalli J. & T., Proc. Roy. Soc. Q. xxxiii, (4) p. 73, 1921 (nom. nov. for *aurifrons* Dol., preocc.).

♂.—*Head*: frontal width half that of an eye. Lateral verticals weak or absent. Frontals diverging. Facials strong. Three rows black postocular cilia. Genals black and bristly. Frontal stripe black, parafrontalia together about as broad, these and face bright golden. Antennæ black, third segment from base thrice to three and a half times the second. Palpi black. *Thorax*: chætotaxy: propleura bare. No acrostichals, not even prescutellar. Posterior dorso-centrals 4; the two anterior weak, or there may be the appearance of 5. *Abdomen*: the median stripe is continuous from edge to edge of the anterior segments, the subdorsal stripes weak. Most of third and all of apparent fourth usually covered with bright golden pubescence, but this may be almost wanting. Fourth segment without black markings, or at most a trace of the median stripe. Second segment bare. Genital segment 1 dark yellowish-grey pollinose, without marginals. Genital segment 2 shining black. *Wings*: I bare. No costal bristle. Segment iii of costa longer than v. *Legs*: mid-femur with comb and basal fringe. Mid-tibiæ bare. Hind femur with lower hind macrochætal rows and fringe. Hind tibiæ double fringed. ♂ *genitalia* shown in fig. 109.

Length 10–15 mm.

♀.—Frontal width equal to two-thirds an eye. Segment iv of abdomen even more brightly golden than in ♂; the gold may reach up to the second segment, obliterating the black stripes.

Bionomics.—Nothing is known: apparently a mountain species.

Distribution.—Java: Tengger Mts., 4000 ft., Gedeh Mt., 8000 ft.; Tong-king, "Manson Mts., 2000–3000 ft.; Amboina.

Sarcophaga aurata Wlk., also described from Amboina, is a separate species. The genitalia are quite different and the propleura are haired. Otherwise the two species have a very similar facies. *Sarcophaga aurata* appears not to be Oriental.

171. **Sarcophaga banksi** Senior-White. (Fig. 110.)

Sarcophaga banksi Sen.-Wh., Spol. Zeyl. xiii, (1) p. 117, fig. 4, 1924. Type-locality: Manila, Philippine Islands. *Type* in the Bureau of Science, Manila.

♂.—*Head*: frontal width one-quarter of an eye. No lateral verticals. Frontals diverging suddenly below. Facials

Fig. 110.

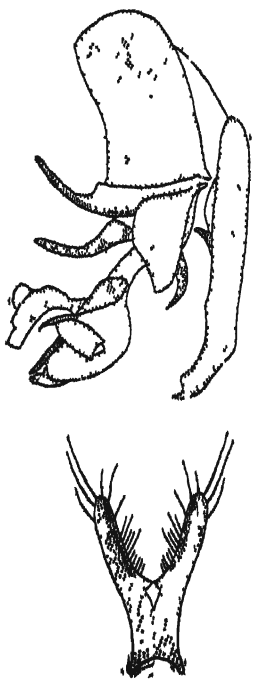


Fig. 111.

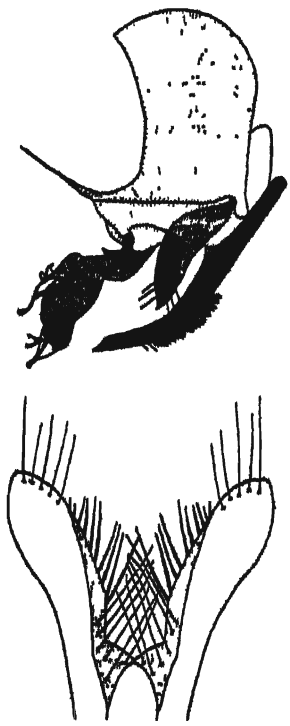


Fig. 110.—*Sarcophaga banksi* Senior-White: ♂ genitalia. (From Senior-White.)

Fig. 111.—*Sarcophaga henryi* Senior-White: ♂ genitalia. (From Senior-White.)

long. Genals pale. Three rows postocular black cilia. Frontal stripe dark chestnut-brown, the parafrontalia together

as broad, silvery with dark reflections. Parafacialia bright silvery. Antennæ black, third segment thrice as long as second. Basal half of arista only pumose. Palpi black. *Thorax*: whitish-grey. Chætotaxy: propleura bare, acrostichals 5 : 1, dorso-centrals 4 : 4. Scutellar apicals lightly crossed. *Abdomen*: lateral stripes brownish, spot-like. Genital segments both dark brown, first without macrochætæ. *Wings*: 1 bare. Costal bristle weak. Segment iii of costa as long or slightly longer than v. *Legs*: mid-femora with bristles only, no true comb. Mid-tibiæ bare. Hind femora weakly fringed, lower hind macrochætal row not well developed. Hind tibiæ bare. ♂ *genitalia* shown in fig. 110. Superior claspers spinulose laterally, viewed from behind.

Length 8 mm.

♀.—Frontal width three-quarters of an eye. Otherwise as in ♂, except for usual sexual differences.

Bionomics.—Nothing is known.

Distribution.—Philippine Islands: Manila, Luzon.

172. **Sarcophaga henryi** Senior-White. (Fig. 111.)

Sarcophaga henryi Sen.-Wh., Rec. Ind. Mus. xxvi, p. 232, pl. viii, fig. 1, 1924.

Type-locality: Colombo, Ceylon. *Type* in the Colombo Museum.

♂.—*Head*: frontal width equal to half an eye. No lateral verticals. Frontals diverging. Facials strong. Genals white and weak, anteriorly a few black. Three rows irregular black postocular cilia. Frontal stripe black. Parafrontalia together rather wider. These and face silvery with black reflections. Antennæ black, third segment three and a half times the second. Palpi black. *Thorax*: elongate, clear grey. Chætotaxy: propleura hairy; acrostichals 4 : 1. Posterior dorso-centrals 4. *Abdomen*: very elongate, second segment bare. Genital segment 2 red. *Wings*: vein 1 bare. No costal bristle. Segment iii of costa longer than v. *Legs*: mid-femora with comb and weak fringe. Mid-tibiæ bare. Hind femora with lower hind macrochætal row and fringe. Hind tibiæ fringed. ♂ *genitalia* shown in fig. 111.

Length 13 mm.

Bionomics.—Nothing is known.

Distribution.—Only known from the unique type from CEYLON, Colombo.

173. **Sarcophaga pusana** Senior-White. (Fig. 112.)

Sarcophaga pusana Sen.-Wh., Rec. Ind. Mus. xxvi, p. 245 pl. xiii, fig. 23, 1924.

Type-locality: Pusa, Bihar. *Type* in the Imperial Agric. Dept. collection.

♀.—*Head*: frontal width one-third that of an eye. No lateral

verticals. Frontals diverging. Facials strong. Genals white. Two rows black postocular cilia. Frontal stripe black, as wide as one of the parafrontalia. These and face bright silvery. Antennæ black, third segment two and a half times the second. Palpi black. *Thorax*: clear grey. Chætotaxy: propleura hairy. Acrostichals 4 : 1. Posterior dorso-centrals 4. *Abdomen*: second segment bare. Genital segment 2 red. *Wings*:

Fig. 112.



Fig. 113.



Fig. 112.—*Sarcophaga pusana* Senior-White: ♂ genitalia.
Fig. 113.—*Sarcophaga ostindica* Senior-White: ♂ genitalia.
(From Senior-White.)

I bare. Costal bristle present or absent. Segment iii of costa equal to v, or rather longer than it. *Legs*: no true comb on mid-femur, but some long bristles in its place, fringe weak. Mid-tibia with trace of an apical fringe. Hind tibia double fringed. ♂ *genitalia* shown in fig. 112. There may be

one hair on superior claspers two-thirds as long as the organ itself.

Length 9–13 mm.

Bionomics.—Nothing is known.

Distribution.—INDIA: Bihar, Pusa; CEYLON, C. Prov., Matale.

174. **Sarcophaga ostindicæ** Senior-White. (Fig. 113.)

Sarcophaga ostindicæ Sen.-Wh., Rec. Ind. Mus. xxvi, p. 233, pl. ix, fig. 7, 1924.
Type-locality: "East India." *Type* in the Vienna Museum.

♂.—*Head*: frontal width half that of an eye. Frontals diverging. Facials, the lower very strong. Genals black and bristly. Three rows black postocular cilia. Frontal stripe broader than both parafrontalia together, these and face golden with dark reflections. Antennæ black, third segment three and a half times the second. Palpi black. *Thorax*: ground-colour dark. Chætotaxy: propleura bare, acrostichals 4 : 1. Posterior dorso-centrals 4. *Abdomen*: second segment bare. Genital segment 1 dark brownish, hind marginals longer but no stronger than other chætæ. Genital segment 2 black. *Wings*: I bare. Costal bristle very weak. Segment iii of costa equal to segment v. *Legs*: mid-femora with basal fringe and apical rather widely spaced comb. Mid-tibiæ bare. Hind femora with lower hind macrochætal row and fringe. Hind tibiæ double fringed, the outer consisting of only about four long hairs, evenly wide-spaced, towards the middle. ♂ *genitalia* shown in fig. 113. Ho points out that his Hainan specimen has the posterior claspers with short minute hairs on its outer surface, not shown in our figure.

Length 10 mm.

Bionomics.—Nothing is known.

Distribution.—The only certain locality is Hainan (*Ho*).

175. **Sarcophaga antilope** Böttcher. (Fig. 114.)

Sarcophaga antilope Bött., Ann. Mus. Nat. Hung. xi, p. 374, fig. 3, 1913.
Type-locality: Formosa. *Type* in the Hungarian National Museum.
Sarcophaga antilopoides Hardy, Proc. Linn. Soc. N.S.W. lii, p. 448, fig. 1, 1927.
Type-locality: Java.

♂.—*Head*: frontal width half that of an eye. No lateral verticals. Frontals diverging. Facials weak. Genals weak and black anteriorly, posteriorly strong and white. Three rows black postocular cilia. Frontal stripe black, parafrontalia together not as wide, these and face pale silvery-golden.

Antennæ black, third segment three and a half to four times the second. Palpi black. *Thorax*: dark yellowish-grey. *Chaetotaxy*: propleura hairy. Acrostichals 4 : 1. Posterior dorsocentrals, 4. *Abdomen*: second segment with weak marginals. Genital segment 1 dark brown, no marginals. Genital segment 2 red. *Wings*: 1 bare. Costal bristle weak or wanting. Segment iii of costa one and a half times v. *Legs*: mid-femora with comb and weak fringe. Mid-tibiæ almost bare. Hind

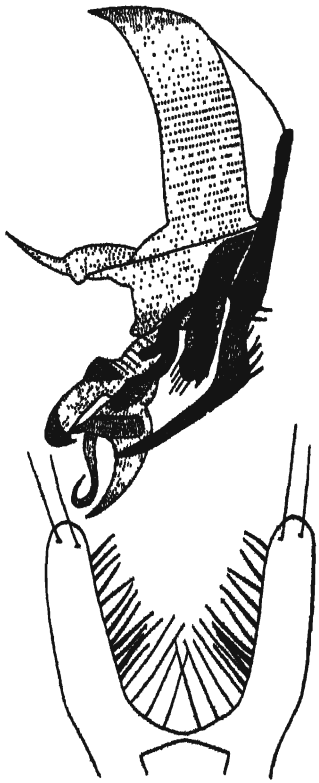


Fig. 114.—*Sarcophaga antilope* Böttcher: ♂ genitalia. (From Senior-White.)

femora with lower macrochætal rows and fringe. Hind femora double fringed. ♂ *genitalia* shown in fig. 114.

Length 13–14 mm.

Bionomics.—Has been taken at light.

Distribution.—INDIA: Assam, Margherita, and Sadiya; CEYLON, Matale; Formosa; Java; Solomon Islands.

176. **Sarcophaga basiseta** Baranoff. (Fig. 115.)

Sarcophaga basiseta Baran., Konowia, x, (2) p. 111, fig. 2, 1931. Type-locality: Formosa. *Type* in the Berlin Museum.

♂.—*Head*: yellowish, frontal width half that of an eye, broader than one of the parafrontalia. Two rows of postocular cilia. Hairs on genæ fine, but fairly long. Antennæ black, third segment thrice second. Palpi black. *Thorax*: tomentum yellowish-shimmering. Chætotaxy: propleura bare. Acrostichals present presuturally, only one prescutellar; dorsocentrals 4. *Abdomen*: third tergite with strong marginals. Genital segments both black, the first without marginals.

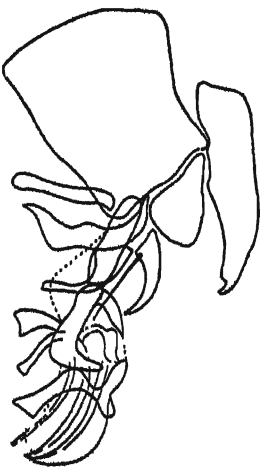


Fig. 115.—*Sarcophaga basiseta* Baranoff: ♂ genitalia. (From Baranoff.)

Wings: no costal bristle. Squamæ brownish. *Legs*: mid-femora without comb, only a row of fine hairs apically. Hind femora bristled interiorly. Hind tibiæ unfringed. ♂ *genitalia* shown in fig. 115. A very long and strong bristle on the posterior claspers basally.

Length 10 mm.

Bionomics.—Nothing is known.

Distribution.—Formosa, Toa-Tsui-Kutsu.

177. **Sarcophaga kankauensis** Baranoff. (Fig. 116.)

Sarcophaga kankauensis Baran., Konowia, (2) x, p. 113, fig. 4, 1931. Type-locality: Formosa. *Type* in the Berlin Museum.

♂.—*Head*: frons half an eye-breadth, broader than one of the parafrontalia. Generally only a little yellowish shimmer.

Antennæ black, third segment twice second. Palpi black. Two rows postocular cilia. *Thorax*; propleura bare. Acrostichals 4 : 1. Posterior dorso-centrals 4. *Abdomen*: genital segments both black, first without marginals. *Wings*: no distinct costal bristle. *Legs*: mid-femora without comb. Hind femora interiorly with bristles. Hind tibiæ unfringed. ♂ *genitalia* shown in fig. 116.

Length 6 mm.

Bionomics.—Nothing is known.

Distribution.—Formosa, Kankau (Koshun).



Fig. 116.—*Sarcophaga kankauensis* Baranoff: ♂ genitalia. (From Baranoff.)

178. **Sarcophaga annandalei** Senior-White. (Fig. 117.)

Sarcophaga annandalei Sen.-Wh., Rec. Ind. Mus. xxvi, p. 233, pl. xv, figs. 32, 32 *a*, 1924.
Typo-locality: Matale, Ceylon. *Type* in the British Museum.

♂♀.—*Head*: ♂ frontal width three-fourths that of an eye. ♀ frontal width equal an eye. Lateral verticals weak. Frontals diverging. Facials strong. Genals white and soft. One row black postocular cilia, occiput otherwise nearly bare. Frontal stripe black, parafrontalia together rather wider, these and face golden. Antennæ black, third segment four times the second, palpi black. *Thorax*: clear grey. Chætotaxy: propleura bare; acrostichals 1 : 1; posterior dorso-centrals, 4, the two anterior weak. *Abdomen*: stripes continuous. Second segment bare. Genital segment 1 yellowish-grey pollinose, without marginals. Genital segment 2 red. *Wings*: I bare, costal bristle very weak. Segment iii of costa twice v. *Legs*: mid-femur with comb and fringe. Mid-tibiæ strongly fringed. Hind femur strongly and hind tibiæ double fringed. ♂ *genitalia* shown in fig. 117.

Length 10–15 mm.

Bionomics.—Has been bred from dead snail, *Achatina fulica*, and dead rabbit and bat.

Distribution.—INDIA: United Provinces, Dehra Dun; Bengal; Chota Nagpur; Madras Presidency, Nilgiri Hills, Coonoor, Coimbatore; CEYLON, Matale.

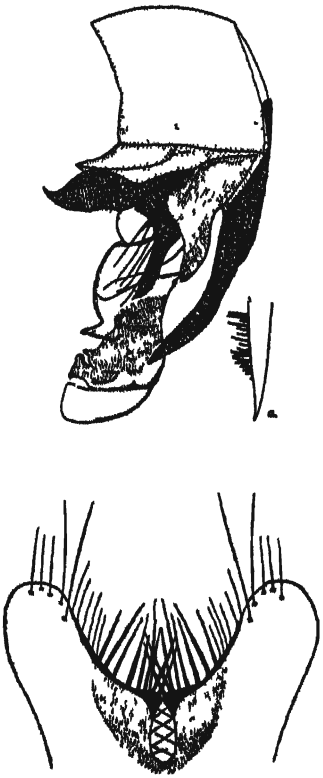


Fig. 117.—*Sarcophaga annandalei* Senior-White; ♂ genitalia.
(From Senior-White.)
a. Left superior clasper from behind.

179. Sarcophaga prosballina Baranoff. (Fig. 118.)

Sarcophaga prosballina Baran., Konowia, (2) x, p. 112, fig. 3, 1931.
Typo-locality: Formosa. *Type* in the Berlin Museum.

♂.—*Head*: golden, the orbital bristles continued as strong genals. Occiput with brownish hairs. Third antennal segment two and a half times as long as second. *Thorax*: the whole golden pollinose. Chætotaxy: propleura bare; a pair of presutural acrostichals. *Abdomen*: no marginals. *Wings*: no description. *Legs*: mid-femora with apical fine bristles.

Hind tibia on the inner side with longish hairs, but no typical fringe. ♂ *genitalia* shown in fig. 118.

Length 10·5 mm.

Bionomics.—Nothing is known.

Distribution.—Formosa : Toa-Tsui-Kutsu.

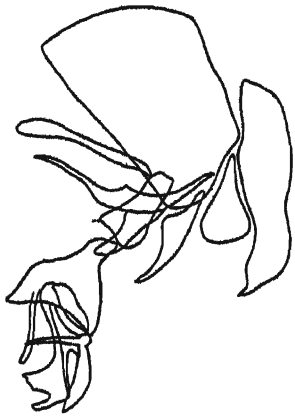


Fig. 118.—*Sarcophaga prosbaliina* Baranoff : ♂ genitalia. (From Baranoff.)

180. **Sarcophaga knabi** Parker. (Fig. 119.)

Sarcophaga knabi Parker, Proc. U.S. Nat. Mus. liv. p. 96, fig. 4, 1917.

Type-locality : Philippine Islands. *Type* in the United States National Museum, Washington.

Sarcophaga knabi var. *flavipalpis* Sen.-Wh., Rec. Ind. Mus. xxvi, p. 235, 1924.

Type-locality : Banhar, Bihar. *Type* in the British Museum.

♂.—*Head* : ♂ frontal width three-fifths that of an eye. No lateral verticals. Frontals diverging. Facials weak. Genals bright golden, thickly soft-haired. One row postocular cilia. Frontal stripe black, parafrontalia together rather wider, these and face pale bright golden. Antennæ black, third segment about twice second. Palpi black or yellow, all stages of intermediate mixed shading occurring. *Thorax* : ground-colour pale yellowish-grey. Chætotaxy : propleura bare ; acrostichals only distinct as prescutellars, but presuturally they are more or less developed ; posterior dorsocentrals 4, the two anterior weak. *Abdomen* : ground-colour as thorax, second segment without noticeably stronger marginals. Genital segment 1 grey pollinose, without stronger marginals. Genital segment 2 normally black, but exceptionally red ; both segments with long hairs. *Wings* : I bare. No costal bristle. Segment iii of costa one and a half times v.

Legs: mid-femora with comb and basal fringe. Mid-tibiæ bare. Hind femora without lower hind macrochætal row, and with short fringe. Hind tibiæ double fringed, weakly in small specimens. ♂ *genitalia* shown in fig. 119.

Length 6–12 mm.

♀.—Frons slightly exceeding an eye-width.

Bionomics.—Is the common breeder in human excrement in the Orient; has also been bred from dead rabbit. It is attracted to *Aristolochia ridicula*.

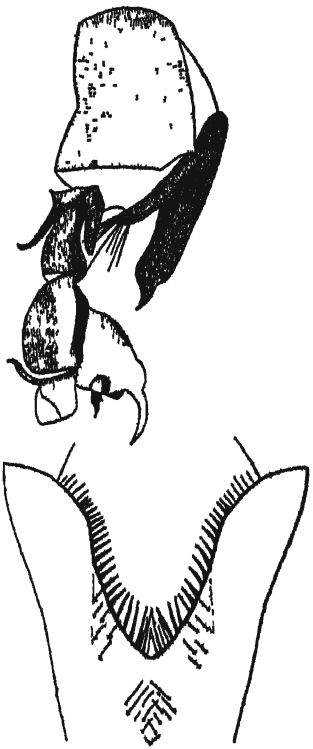


Fig. 119. *Sarcophaga knabi* Parker: ♂ genitalia.
(From Senior-White.)

Distribution.—Generally distributed from the Punjab (Umballa) eastwards throughout INDIA to CEYLON, BURMA, the ANDAMAN ISLANDS, Malaya, Java, Bali, Riouw Archipelago, and the Philippine Islands. It occurs in Palæarctic China, Peking. Its occurrence in Australia is uncertain, depending on its debatable conspecificity with *froggatti* Taylor and *omega* J. & T.

181. **Sarcophaga albiceps** Meigen. (Fig. 120.)

Sarcophaga albiceps Mg., Syst. Besch. v, p. 22, 1826
Type-locality: Europe. *Type* in the Paris Museum.
Sarcophaga cyathisans Pand., Rev. Ent. xv, p. 191, 1896.
Type-locality: southern France. *Type* in the Paris Museum.
Sarcophaga pauciseta Kram. (*nec* Pand.), Zeit. Hym. Dipt. v, p. 331, 1905.
Type-locality: not stated. *Type* at Copenhagen.

♂♀.—*Head*: ♂ frons equal to three-fifths an eye-width ♀ frontal width that of an eye. Lateral verticals wanting

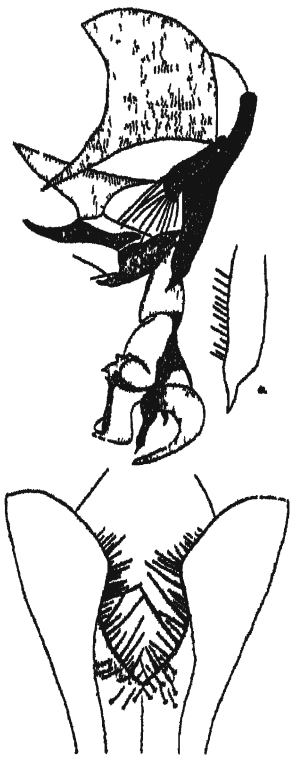


Fig. 120.—*Sarcophaga albiceps* Meigen: ♂ genitalia.
(From Senior-White.)
a. Left superior clasper from behind.

Frontals nearly straight. Facials weak. Genals golden. Postocular cilia, except outer row, irregular. Frontal stripe black, parafrontalia together not as wide, these and the face strongly to slightly golden, the frons with black reflections. Antennæ black, third segment two and a half to three times the second. Palpi black. *Thorax*: ground-colour dark grey. Propleura bare. Acrostichals 1 : 1. Posterior dorso-centrals 4.

Abdomen: second segment bare. Genital segment 1 black, no marginals. Genital segment 2 black, exceptionally red. *Wings*: I bare. No costal bristle. Segment iii of costa twice v. *Legs*: mid-femur with comb and long basal fringe. Mid-tibiæ bare. Hind femur with lower hind macrochætal row and fringe. Hind tibiæ double fringed. ♂ *genitalia* shown in fig. 120.

Length 8–11 mm.

Bionomics.—Has been bred from a dead rabbit and human excrement. It is recorded as parasitic on *Nonagria* sp., and as the cause of tissue myiasis in a bull. The ♂ is attracted to *Aristolochia* sp.

Distribution.—Europe, Palestine, and North China in the Palæarctic region. Throughout the Oriental region, the westernmost records being Abbotabad and Kulu, throughout INDIA, including the hills up to 6000 ft., CEYLON, BURMA, Tong-king, Formosa, Sumatra, Java, Lombok, and New Guinea in the Australian region.

182 *a*. **Sarcophaga hirtipes** Wiedemann.

Sarcophaga hirtipes Wd., Auss. Zweifl. Ins. ii, p. 361, 1830.
Type-locality: Egypt. *Type* in the Vienna Museum.
Sarcophaga rufipes Wd., Auss. Zweifl. Ins. ii, p. 362, 1830.
Type-locality: not stated. *Type* in the Vienna Museum.

♂.—*Head*: frontal width equal to four-fifths an eye. Lateral verticals present. Lower frontals straight. Facials weak. Genals sparse, yellowish-white. One row black postocular cilia. Frontal stripe black, occasionally brownish, the parafrontalia together hardly twice as wide, these and face golden, the former with dark reflections. Antennæ black, tip of second joint sometimes reddish-brown. Third segment rather more than twice the second. Palpi yellow. *Thorax*: ground-colour pale whitish-grey. Chætotaxy: propleura bare. Acrostichals 1 : 1, the presutural pair not very distinct; posterior dorso-centrals 4, only the last two pairs prominent. *Abdomen*: ground-colour as thorax. Second segment with median hind marginals, often very weak. Genital segment 1 grey pollinose. Genital segment 2 red. *Wings*: I bare. Costal bristle present but small. Segment iii of costa longer than v. *Legs*: mid-femur with comb and some sparse basal fringing. Mid-tibia fringed apically in large specimens only. Hind femora with lower hind macrochætal row and fringe. Hind tibia double fringed. The *rufipes* form is very pale, with brown legs. ♂ *genitalia*: except that the horn of the vesica is not quite as elongate as in var. *orchidea* the genitalia are the same as in the variety, *q.v.* (p. 244).

Length 7–12 mm.

Bionomics.—Has been bred in melons.

Distribution.—Africa: Gold Coast, Northern Territories; North Africa; Asia Minor; Iraq. In the Oriental region is recorded from INDIA at Ludhiana, Ajmir, Ahmedabad, Dharwar, and Coimbatore.

182 *b* **Sarcophaga hirtipes** Wiedemann var. **orchidea** Böttcher. (Fig. 121.)

Sarcophaga orchidea Bött., Ann. Mus. Nat. Hung. xi, p. 375, fig. 1, 1913.

Type-locality: Formosa. *Type* in the Hungarian National Museum.

♂.—*Head*: differs from the type form as follows: Lateral

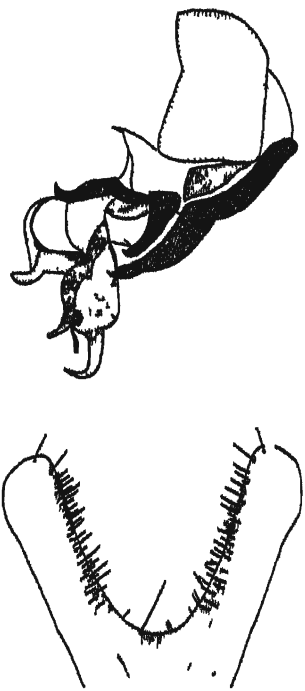


Fig. 121.—*Sarcophaga hirtipes* Wiedemann var. *orchidea* Böttcher: ♂ genitalia.
(From Senior-White.)

verticals wanting. Palpi normally yellow, occasionally black. Frons and face silvery-white. Genital segment 2 black. ♂ *genitalia* shown in fig. 121.

♀.—*Head* frontal width exceeding that of an eye. *Abdomen* : second segment without hind marginals.

Bionomics.—Breeds in human excrement, and has been found in human intestinal myiasis. Experimentally it has been reared on dead *Achatina fulica* : ♂ is attracted to *Aristolochia ridicula*.

Distribution.—In western India overlaps that of the type-form, being recorded from Scinde, Rohtak. Occurs generally throughout INDIA, BURMA, and CEYLON, passing east to the Philippines and Formosa, and into the Palæarctic in North China. In the Australian region occurs in Lombok, New Guinea, Pago Pago, Samoa, and the New Hebrides.

183 **Sarcophaga phœnicopterus** Bottcher. (Fig. 122.)

Sarcophaga phœnicopterus Bott., Ann. Mus. Nat. Hung. xi, p. 376, fig. 2, 1913.

Type-locality Formosa. *Type* in the Hungarian National Museum

♂.—*Head* : frontal width half an eye. Lateral verticals scarcely present, facials thin but fairly long. Genals black. Occiput with fawn hairs that extend on to the genæ. Frontal

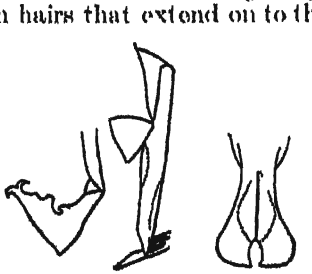


Fig. 122. *Sarcophaga phœnicopterus* Böttcher : ♂ genitalia. (From Senior-White, after Böttcher.)

stripe brownish-black, the parafrontalia together about as wide, these and face yellow. Antennæ black, third segment only as long as second, but reaching to level of lower eye-margin. Palpi thin, black. *Thorax* : chætotaxy : presentellar acrostichals only ; posterior dorso-centrals 4 or 5, of which the first two or three anterior pairs are weak. *Abdomen* : second segment bare. Genital segment 1 grey pollinose, without hind marginals. Genital segment 2 shining black. *Wings* : I bare, no costal bristle. *Legs* : mid-femur with strong macrochætæ forming a wide-spaced comb. Mid-tibia fringed, in which the equally long but weak bristles of the lower macrochætal rows are almost hidden. Hind tibia double fringed. ♂ *genitalia* shown in fig. 122. Böttcher states that the shape of the superior claspers resembles that

of some Neotropical forms, but of no Oriental or Palæarctic species.

Length 16 mm.

Bionomics.—Unknown.

Distribution —Only known from the type-locality, Formosa.

184 **Sarcophaga talonata** Senior-White (Fig. 123.)

Sarcophaga talonata Sen.-Wh., Spol. Zeyl. xiii, p. 211, pl. vii, figs. 4, 5, 1925.

Type-locality: Ceylon, N.P. *Type* in the Colombo Museum.

♂.—*Head*: frons narrow, less than half an eye-width, frontal stripe brownish-grey, ill-defined, parafrontalia together



Fig. 123.—*Sarcophaga talonata* Senior-White: ♂ genitalia. (From Senior-White.)

rather wider than frontal stripe. Frontals diverging. Parafrontalia and parafacialia silvery, the bristles on latter well-developed. Face grey. Genæ silvery-grey. Occiput grey, with three rows of postocular cilia. Lateral verticals absent. Antennæ, second segment yellowish-brown, the third grey pollinose, about three and a half times the second. Palpi

yellow, darkened basally. *Thorax*: very light bluish-grey. Chaetotaxy. propleura bare; acrostichals, a prescutellar pair only, posterior dorso-centrals 4. Scutellar apicals crossed. *Abdomen*: second segment bare. Genital segment 1 dark, without marginals. Genital segment 2 brownish-black. *Wings*: 1 bare. Costal bristle strong. Segment iii of costa barely as long as v. *Legs*: mid-femora with some long apical bristles below, not forming a true comb, unfringed. Mid-tibiae bare. Hind femora with lower hind macrochaetal row, but hardly any trace of fringe, except basally. Hind tibiae bare. ♂ *genitalia* shown in fig. 123. The very short posterior bristles on superior claspers are hardly to be distinguished from the main pubescence

Length 6·5 mm.

Bionomics. Nothing is known

Distribution. The unique type is from CEYLON, N. Prov., Murunkan.

185 **Sarcophaga krameri** Böttcher. (Fig. 124.)

Sarcophaga krameri Bött., Ent. Mitteil. i, p. 165, fig. 1, 1912.
Type-locality: Formosa. *Type* in the Berlin Museum.

♂.—*Head*: frons from one-third to two-fifths an eye-width. Lateral verticals weak or absent. Facials weak. Antennae



Fig. 124. *Sarcophaga krameri* Böttcher: ♂ genitalia.
(From Senior-White, after Böttcher.)

black, third segment more than thrice the second. Palpi black. *Thorax*: propleura bare. Acrostichals only present as prescutellars. Posterior dorso-centrals 4, the two anterior weak. *Abdomen*: second segment exceptionally only with marginals. Genital segment 1 grey pollinose, without stronger marginals. Genital segment 2 black. *Wings*: 1 bare. *Legs*: mid-femora with strong comb and strong basal fringe. Mid-tibiae fringed, weakly in small specimens. Hind femora well fringed. Hind tibiae double fringed. ♂ *genitalia* shown in fig. 124.

Length 10–15 mm.

♀.—What Böttcher considers to be the ♀ of this species is distinguished by the peculiar genital opening. The first genital segment is very marked, apically truncate, without dorsal marginal bristles. The genital cleft is horse-shoe-shaped, the curve upwards, with strong macrochætæ in the middle of the dorsal margin. The corresponding ventral plate is conspicuous. The identity is not certain, as a pair *in cop.* has not been taken.

Bionomics.—Nothing is known.

Distribution.—The ♂ is recorded from Formosa and Singapore. The ♀ is recorded from Formosa, Malacca, and CEYLON, Colombo.

186. **Sarcophaga beesoni** Senior-White. (Fig. 125.)

Sarcophaga beesoni Sen.-Wh., Rec. Ind. Mus. xxvi, p. 242, pl. xiv, fig. 28, 1924.

Type-locality: Upper Burma. *Type* in the Imperial Forest Inst., Dehra Dun.

♂.—*Head*: frontal width three-fifths an eye. Lateral verticals wanting. Frontals straight. Facials strong. Genals sparse, black. Three rows black postocular cilia. Frontal stripe black, parafrontalia together about as broad, these and face dirty golden. Antennæ black, third segment four times second. Palpi black. *Thorax*: dark grey-blue. Chætotaxy: propleura bare; prescutellar acrostichals only; posterior dorso-centrals 4. *Abdomen*: second segment without marginals. Genital segment 2 black. *Wings*: I bare. No costal bristle. Segment iii of costa longer than v. *Legs*: mid-femora with comb and weak basal fringe. Mid-tibiæ bare. Hind femora with lower hind macrochætal row and fringe. Hind tibiæ double fringed. ♂ *genitalia* shown in fig. 125.

Length 13 mm.

Bionomics.—Unknown.

Distribution.—Only known from the unique type from UPPER BURMA, Móhnyin.

187. **Sarcophaga pattoni** Senior-White. (Fig. 126.)

Sarcophaga pattoni Sen.-Wh., Rec. Ind. Mus. xxvi, p. 242, pl. x, fig. 10, 1924.

Type-locality: Coonoor, Nilgiri Hills. *Type* in Prof. Patton's collection.

♂.—*Head*: ♂ frontal width equal to half an eye. No lateral verticals. Frontals diverging. Facials strong. Genals thin, black anteriorly and white posteriorly. Three rows black postocular cilia. Frontal stripe black. Parafrontalia together not as broad, these and face white with black reflections. Antennæ black, third segment four times the second.

Palpi black. *Thorax*: dark bluish-grey. Chætotaxy: propleura hairy; acrostichals 0 : 2; posterior dorso-centrals 4. *Abdomen*: second segment bare. A trace of red on hind margin of apparent fourth. Genital segment 1 yellow pollinose. Genital segment 2 red. *Wings*: 1 bare. No costal bristle. Segment iii of costa longer than v. *Legs*: mid-femur with

Fig. 125. Fig. 126.

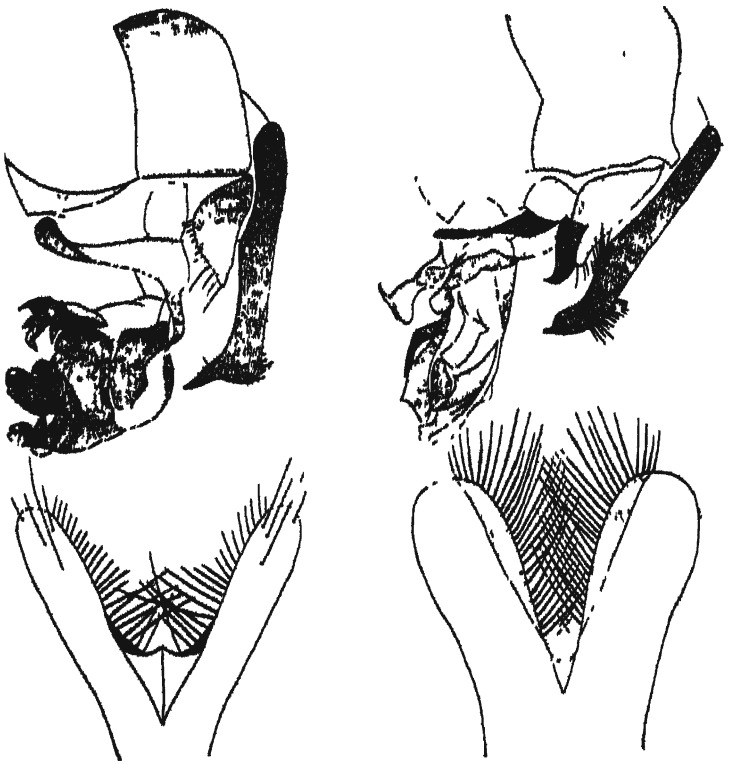


Fig. 125. *Sarcophaga beesoni* Senior-White: ♂ genitalia. (From Senior-White.)
Fig. 126. *Sarcophaga pattoni* Senior-White: ♂ genitalia. (From Senior-White.)

comb and basal fringe. Mid-tibiæ bare. Hind femur with lower hind macrochætal row and fringe. Hind tibiæ double fringed. ♂ *genitalia* shown in fig. 126.

Length 13 mm.

♀. –Frons two-thirds of an eye-width.

Bionomics. –Bred in decomposing rabbit.

Distribution. –Only known from the Nilgiri Hills, Coonoor.

188. **Sarcophaga formosana** Senior-White. (Fig. 127.)

Sarcophaga longicornis Bott., 1912 (*nec* Macquart), Ent. Mittoil. i, p. 166, fig. 2.
Type-locality: Formosa. *Type* in the Berlin Museum.
Sarcophaga formosana Sen.-Wh., Rec. Ind. Mus. xxvi, p. 243, pl. xvi, fig. 36, 1924, nom. nov.

♂.—*Head*: frons one-third to two-fifths an eye-width. Lateral verticals weak or absent. Facials weak. Antennæ

Fig. 128.

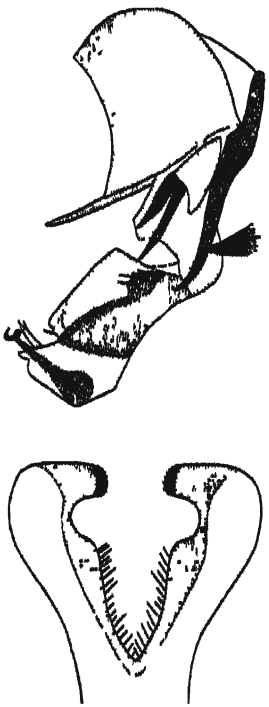


Fig. 127.



Fig. 127.—*Sarcophaga formosana* Senior-White: ♂ genitalia. (From Senior-White, after Böttcher.)
Fig. 128.—*Sarcophaga orientalis* Parker: ♂ genitalia. (From Senior-White.)

black, third segment five times the second and almost reaching to mouth-border. Palpi black. *Thorax*: chætotaxy: propleura bare; prescutellar acrostichals only; posterior dorsocentrals 4, the first two pairs weak. *Abdomen*: second segment bare. Genital segment 1 grey pollinose, without stronger hind marginals. Genital segment 2 black. *Wings*: I bare. *Legs*: mid-femora with widely-spaced comb of strong

bristles. Mid-tibiæ bare. Hind femora fringed. Hind tibiæ double fringed. ♂ *genitalia* shown in fig. 127.

Length 13 mm.

Bionomics. —Nothing is known.

Distribution. Only known from Formosa.

189. **Sarcophaga orientalis** Parker. (Fig. 128.)

Sarcophaga orientalis Parker, Proc. U.S Nat. Mus. liv, p. 94, fig. 3, 1917.

Type-locality: Philippine Islands. *Type* in the United States National Museum.

♂. *Head*: frons equal to half an eye-width. Lateral verticals present or absent. Frontals diverging. Facials weak except lowest. Genals weak and black anteriorly, white, soft and thick posteriorly. Three rows postocular cilia, of which only one is definite. Frontal stripe black, the parafrontalia together about as wide, these and face pale dull golden. Antennæ black, third segment twice to two and a half times second. Palpi black. *Thorax*: yellowish-grey. Chætotaxy: propleura bare; prescutellar acrostichals only; posterior dorso-centrals 4, the two anterior weak. *Abdomen*: stripes brownish, complete, outwardly angled along hind margin of apparent second segment, which is bare. Genital segment 1 black, brownish pollinose, without marginals. Genital segment 2 black. *Wings*: I bare. Costal bristle present. Segment iii of costa equal to v. *Legs*: mid-femur with comb and basal fringe. Mid-tibiæ fringed on apical half. Hind femora fringed, with lower hind macrochætal row not noticeable therein. Hind tibiæ double fringed. ♂ *genitalia* shown in fig. 128.

Length 10 mm.

Bionomics. - Unknown.

Distribution. Java; Philippine Islands; Bali.

190. **Sarcophaga orientaloides** Senior-White. (Fig. 129.)

Sarcophaga orientaloides Sen.-Wh., Rec. Ind. Mus. xxvi, p. 214, pl. xv, fig. 31, 1924.

Type-locality: Matale, Ceylon. *Type* in the British Museum.

♂. - *Head*: frontal width three-fifths of an eye. Lateral verticals absent. Frontals diverging. Facials weak. Genals weak, black anteriorly, white posteriorly. Three rows postocular cilia. Frontal stripe black, parafrontalia together rather wider, these and face golden. Antennæ black, third segment twice second. Palpi black. *Thorax*: clear grey. Chætotaxy: propleura bare; prescutellar acrostichals only; posterior dorso-centrals 5. *Abdomen*: stripes usually complete, occasionally spot-like. Second segment without marginals. Genital segment 1 grey pollinose, no marginals.

Genital segment 2 black. *Wings*: I bare. Costal bristle small. Segment iii of costa longer than v. *Legs*: mid-femora with comb and heavy fringe. Mid-tibiæ fringed. Hind femora strongly fringed, hiding the macrochætal rows. Hind tibiæ double fringed. ♂ *genitalia* shown in fig. 129.

Length 7–15 mm.

Bionomics.—Has been bred from dead *Achatina fulica*, grasshoppers, Sphingid, and other lepidopterous larvæ,

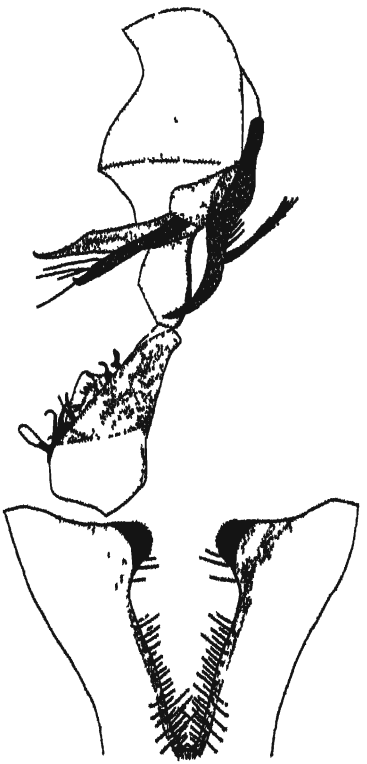


Fig. 129.—*Sarcophaga orientaloides* Senior-White: ♂ genitalia. (From Senior-White.)

Lepidiota larvæ, in beef and in human excrement; and is recorded as parasitic, the larva feeding on the waxy secretion of a Fulgorid and on a Noctuid. The ♂ is attracted to *Aristolochia ridicula*, and the addition of borneol to meat caused this species to larviposit when it did not do so without the addition of the chemical.

Distribution.—In INDIA: United Provinces, Dehra Dun; Bihar, Chapra; Bombay; Madras Presidency, several

localities; Orissa, Barkuda Island; Assam, several localities; CEYLON, several localities; BURMA, Maymyo; Siam, Hinlap; Malaya.

191. **Sarcophaga sinica** Rohdendorf. (Fig. 130.)

Sarcophaga sinica Rohd., Bull. Ent. Res. xxi, p. 315, fig. 1, 1930. Typo-locality: China, Foo Chow. *Type* in the British Museum.

♂.—*Head*: frontal width one-fifth of head. Lateral verticals present. Frontals strong, crossed. Facials weak, longer below. Frons and face pale dull golden pollinose. Frontal stripe black. Antennæ black, third segment twice second. Palpi black. *Thorax*: black, dusted with brownish-grey. Chætotaxy: propleura bare; prescutellar acrostichals

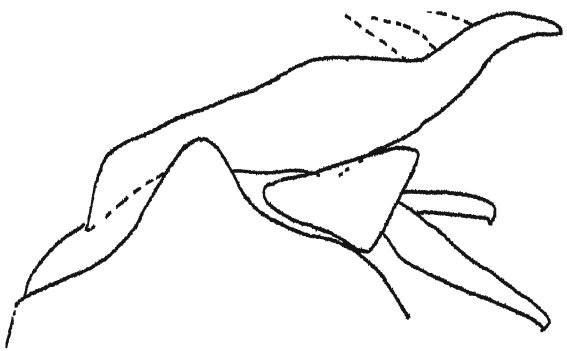


Fig. 130. *Sarcophaga sinica* Rohdendorf: ♂ genitalia. (From Rohdendorf.)

only; posterior dorso-centrals 5, only the last two pairs strong. *Abdomen*: colour and pattern normal. Apparent third segment without median marginals. Genital segment 1 brown or yellow-brown pollinose. No marginals. Genital segment 2 black. *Wings*: infumate. I bare. Costal bristle very short. Segment iii of costa one and a half times v. *Legs*: mid-femur and tibia fringed. ♂ *genitalia* shown in fig. 130, very similar, apparently, to *orientalis* Park. Differs from *orientaloides* Son.-Wh. by having no bristles above the hair-tuft on superior clasper.

Length 14 mm.

Bionomics.—Unknown.

Distribution.—China, Foo Chow.

192. **Sarcophaga tristylata** Böttcher. (Fig. 131.)

Sarcophaga tristylata Bött., Ent. Mitteil. i, p. 167, fig. 3, 1912.
Type-locality: Formosa. *Type* in the Berlin Museum.

♂.—*Head*: frontal width one-third to two-fifths that of an eye. Lateral verticals sometimes present, but never strong. Facials weak. Parafrontalia and face yellowish. Antennæ, third segment two and a half times the second. Palpi black. *Thorax*: chætotaxy: propleura bare; prescutellar



Fig. 131.—*Sarcophaga tristylata* Böttcher: ♂ genitalia.
(From Senior-White, after Böttcher.)

acrostichals only; posterior dorso-centrals 4, the two anterior weak. *Abdomen*: second segment bare. Genital segment 1 grey pollinose. Genital segment 2 black. *Wings*: I bare. *Legs*: mid-femur with strong comb. Mid-tibia bare. Hind femur with lower row of strong macrochætæ. Hind tibiæ bare, only on the inner side with sparse long hairs. ♂ *genitalia* shown in fig. 131.

Length 10–14 mm.

Bionomics.—Unknown.

Distribution.—Only known from Formosa.

193. **Sarcophaga crinita** Parker. (Fig. 132.)

Sarcophaga crinita Parker, Proc. U.S. Nat. Mus. liv, p. 92, fig. 2, 1917.
Type-locality: Philippine Islands. *Type* in the United States National Museum, Washington.

♂.—*Head*: frontal width three-fifths of an eye. No lateral verticals. Frontals diverging. Facials strong. Genals black. Three rows black postocular cilia. Frontal stripe very dark brownish-black, parafrontalia together rather broader, these and face silvery-white. Antennæ black, third segment two and a half times the second. Palpi black. *Thorax*: dark slaty-grey. Chætotaxy: propleura bare; prescutellar acrostichals only; posterior dorso-centrals 4. *Abdomen*: second segment with marginals. Genital segment 2 black. *Wings*: I bare. Costal bristle strong. Segment iii of costa equal to v. *Legs*: mid-femur with comb, but no true fringe.

Mid-tibiae bare. Hind femora with lower hind macrochaetal row, hardly any fringe. Hind tibia bare. ♂ *genitalia* shown in fig. 132.

Length 7–9 mm.

Bionomics.—Nothing is known.

Distribution.—Formosa. In INDIA known from Bihar, Pusa, Chapra; Chota Nagpur; Bengal, Calcutta; Madras Presidency, Kodaikanal and Kazanthum; BURMA, Mandalay.



Fig. 132. *Sarcophaga crinita* Parker: ♂ genitalia.
(From Senior-White.)

194. **Sarcophaga khasiensis** Senior-White. (Fig. 133.)

Sarcophaga khasiensis Sen.-Wh., Rec. Ind. Mus. xxvi, p. 246, pl. xi, fig. 15, 1924.

Type-locality: Cherrapunji, Khasi Hills. *Type* in the British Museum.

♂.—*Head*: frontal width three-fifths an eye. Lateral verticals absent. Frontals hardly outwardly directed. Facials weak. Genals black, bristly. Three rows postocular cilia.

Frontal stripe black, parafrontalia together not as wide, dirty yellowish-white, with black reflections. Face dirty yellowish-white. Antennæ black, third segment thrice second, and reaching some way below eye-margin. Palpi black. *Thorax*: dark slate-grey. Chætotaxy: propleura hairy; presentellar acrostichals present; posterior dorso-centrals 5, the anterior



Fig. 133.—*Sarcophaga khasiensis* Senior-White: ♂ genitalia.
(From Senior-White.)

pairs weak. *Abdomen*: second segment without marginals. Genital segment 2 black. *Wings*: 1 bare. Costal bristle present. Segment iii of costa longer than v. *Legs*: mid-femur with comb and basal fringe, mid-tibia bare. Hind femur without lower hind macrochætal row, but with fringe, hind tibia double fringed. ♂ *genitalia* shown in fig. 133.

Length 9–12 mm.

Bionomics.—Unknown.

Distribution.—INDIA: Khasi Hills and Kashmir.

195. **Sarcophaga futilis** Senior-White. (Fig. 134.)

Sarcophaga futilis Sen.-Wh., Rec. Ind. Mus. xxvi, p. 246, pl. xiii, fig. 21, 1924.

Type-locality: Habarana, N.C.P., Ceylon. *Type* in the British Museum.

♂. —*Head*: frontal width half that of an eye. No lateral verticals. Frontals not diverging. Facials strong. Genals sparse, dirty white. One row postocular black cilia. Frontal stripe black, parafrontalia together not as wide, these and face pale yellowish. Antennae black, second segment reddish-brown, third at times brownish, four times as long as second,



Fig. 134.—*Sarcophaga futilis* Senior-White ♂ genitalia. (From Senior-White.)

but rarely reaching lower eye-margin. Palpi yellow, occasionally nearly black. *Thorax*: ground-colour yellowish-grey. Chaetotaxy: propleura bare; presutellar acrostichals only; posterior dorso-centrals 5. *Abdomen*: second segment with strong marginals. Genital segment 1 with marginals. Genital segment 2 black. *Wings*: 1 bare. Costal bristle weak. Segment iii of costa equal to v. *Legs*: mid-femur with comb and weak fringe. Mid-tibia bare. Hind femur with lower hind macrochaetal row, and fringe in larger specimens. Hind tibia with fringe on inside only. ♂ *genitalia* shown in fig. 134.

Length 9-11 mm.

♀.—Frontal width equal to that of an eye.

Bionomics.—Nothing is known.

Distribution.—INDIA: United Provinces, Dehra Dun, Allahabad; Central Provinces, Nagpur; Bihar, Pusa, Chapra; Chota Nagpur, Dumraon, Purulia; Orissa, Barkuda Island; Bengal, Calcutta, Siliguri; Assam, Gauhati; BURMA, Minbu; CEYLON, C. Prov., Kandy, N.C. Prov., Harbarane.

196. **Sarcophaga martellata** Senior-White. (Fig. 135.)

Sarcophaga martellata Sen.-Wh., Rec. Ind. Mus. xxvi, p. 247, pl. xiii, fig. 22, 1924.
Type-locality: Ceylon, N. Prov. *Type* in the Colombo Museum.

♂.—*Head*: frontal width two-thirds that of an eye. Lateral verticals present, weak. Frontals diverging. Facials very

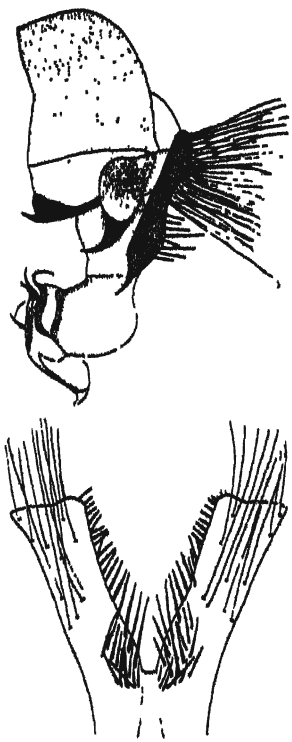


Fig. 135.—*Sarcophaga martellata* Senior-White: ♂ genitalia. (From Senior-White.)

Genals white. One row postocular cilia. Frontal stripe black, parafrontalia together about as broad, these and face silvery with dark reflections. Antennæ yellow-red, third

segment more than twice second. Palpi yellow. *Thorax*: yellowish-grey. Chætotaxy: propleura bare; prescutellar acrostichals only; posterior dorso-centrals 5. *Abdomen*: second segment bare or with very weak marginals. Genital segment 2 black. *Wings*: I bare. Costal bristle strong. Segment iii of costa equal to v. *Legs*: mid-femur with fringe and very short comb. Mid-tibia bare. Hind femur with fringe and lower hind macrochætal row. Hind tibia fringed on inside only. ♂ *genitalia* shown in fig. 135.

Length 10-11 mm.

♀.—Frons as broad as an eye. Frontals less strongly diverging. The three first posterior dorso-centrals very weak.

Bionomics.—Has been bred from a dead rabbit and in human excrement. The ♂ has been seen feeding at "Nim" fruits.

Distribution.—INDIA: Central Provinces, Jonk River; Patna State, Titilagarh; Chota Nagpur, Dumraon; Bengal, Calcutta; Madras Presidency, Parvatipuram, Coimbatore, Calicut, Kallar, Madras City; CEYLON, C. Prov., Matale, N. Prov., Niroddumunai.

197. **Sarcophaga martellatoides** Baranoff. (Fig. 136.)

Sarcophaga martellatoides Baran., Konowia, (2) x, pp. 114, 115, fig. 5, 1931.

Type-locality: Ceylon. *Type* in the Berlin Museum.

♂.—*Head*: the author states that the only difference from

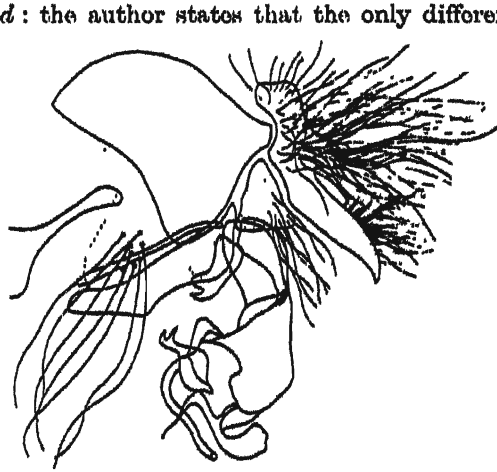


Fig. 136. *Sarcophaga martellatoides* Baranoff: ♂ genitalia. (From Baranoff.)

martellata is in the ♂ *genitalia* (*vide* fig. 136). He gives no external description whatever. Propleura bare.

Bionomics.—Unknown.

Distribution.—Only known from CEYLON.

198. **Sarcophaga hui** Ho. (Fig. 137.)

Sarcophaga hui Ho, Bull. Fan Inst. Biol. vi, p. 207, fig. 1, 1936. *Type-locality*: Hainan Island, Nanting. *Type* in Peiping, Fan Inst.; *paratype* in the British Museum.

♂.—*Head*: trons two-thirds of an eye-width. No lateral verticals. Frontals only slightly diverging. Frontal stripe dark red or black, the parafrontalia together wider than it. Parafrontalia and parafacialia silvery, sometimes slightly tinged yellow, hairs few and minute. Antennæ black, third



Fig. 137.—*Sarcophaga hui* Ho: ♂ genitalia. (From Ho.)

segment twice length of second. Palpi black.. Genal hairs black anteriorly and yellow posteriorly. Only one distinct row of postocular cilia. *Thorax*: pale yellowish-grey, stripes not conspicuous. Chætotaxy: proplcura bare; prescutellar acrostichals only; posterior dorso-centrals 4 to 5, first two or three pairs often very weak. *Abdomen*: first and second visible segments each with one lateral marginal. Genital segment 1 and genital segment 2 grey-black pollinose. *Wings*: vein I bare. Costal spine small. Section iii of costa a little longer than section v. *Legs*: mid-femur with comb of bristle-

like spines on apical half and a basal fringe. Mid-tibia without fringe. Hind femora with rather short fringe. Hind tibia weakly fringed posteriorly. ♂ *genitalia* shown in fig. 137.

Length 7·5–11 mm.

Bionomics.—Nothing is known.

Distribution.—Hainan Island.

199. **Sarcophaga similis** Meade. (Fig. 138.)

Sarcophaga similis Meade, Ent. Mo. Mag. xii, p. 261, fig. 4, 1876.
Type-locality: Britain. *Type* lost or never designated. Pandellé's acceptance of this species is generally followed; *neotype* in Paris Museum.
Sarcophaga appendiculata Kram., Zeit. Hym. Dipt. v, p. 332, fig. v, 1905.
Type-locality: Germany. *Type* in the Copenhagen Museum.

♂.—*Head*: frontal width equal to half an eye. Face whitish. Antennæ not reaching below lower eye-margin, third segment twice as long as second. *Thorax*: chætotaxy:

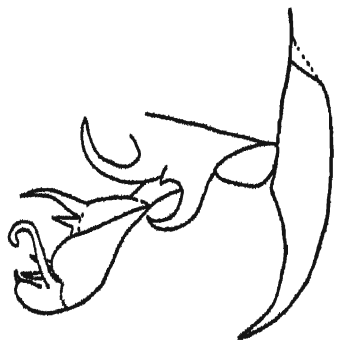


Fig. 138. *Sarcophaga similis* Meade: ♂ genitalia. (From Böttcher.)

propleura bare. Acrostichals only present as prescutellars; four posterior dorso-centrals, the two anterior very weak. *Abdomen*: second visible segment bare. *Wings*: normal. *Legs*: mid-femora on outer third postero-ventrally with a wide-spaced row of bristles, no typical comb. Mid-tibiæ usually long-haired on outer half. Hind tibiæ thickly haired on both sides. ♂ *genitalia* shown in fig. 138.

Length 7–12 mm.

Bionomics.—Nothing is known.

Distribution.—Europe, mainly in south-central region; Hainan Island.

200. **Sarcophaga hainanensis** Ho. (Fig. 139.)

Sarcophaga hainanensis Ho, Bull. Fan Inst. Biol. vi, p. 210, fig. 2, 1936.

Type-locality: Hainan Island, Namting. *Type* in Peiping, Fan Inst.; *paratype* in the British Museum.

♂.—*Head*: frons half an eye-width. Lateral verticals not differentiated. Frontals diverging. Frontal stripe broad, the parafrontals together about as wide. Parafrontalia and parafacialia silvery with darkish shimmer. Parafacial hairs weak, in a row near eye-margin. Antennæ black, third segment twice as long as second. Palpi black. Third row of postocular cilia indefinite. *Thorax*: darkish grey. Chætotaxy: propleura bare; acrostichals only present as presutellars; posterior dorso-centrals 4. *Abdomen*: first visible segment with one lateral. A weak median on second, as well as laterals. Genital segment 1 black, grey pollinose, no marginals. Genital segment 2 shining black. *Wings*: vein 1 bare. Costal spine distinct. Section iii of costa equal to section v. Vein III haired on basal two-thirds way to cross-vein. *Legs*: no fringes on mid- or hind femora and tibiæ. Mid-femoral comb of bristle-like hairs. ♂ *genitalia* shown in fig. 139.

Length 6–10 mm.

Bionomics.—Adults found sitting on pebbles of hill-streams.

Distribution.—Hainan Island.

201. **Sarcophaga brevicornis** Ho. (Fig. 140.)

Sarcophaga brevicornis Ho, Bull. Fan Inst. Biol. v, p. 23, fig. 3, 1934.

Type-locality: China, Peiping. *Type* in Peiping, Fan Inst. Biol.

♂.—*Head*: frons a little more than half an eye-width. Lateral verticals not differentiated. Frontals diverging. Facials minute. Two and sometimes three well-defined rows of postocular cilia. Frontal stripe narrow, the parafrontalia together rather wider. These are silvery with a slight yellow tinge. Antennæ black, third segment not quite twice length of second. Palpi black. *Thorax*: yellowish to slaty-grey. Chætotaxy: propleura bare, prescutellar acrostichals strong; posterior dorso-centrals 5, first always very weak, often not differentiated. *Abdomen*: second visible segment with one lateral marginal, fourth with a continuous row of marginals. Genital segment 1 brownish, grey pollinose. Genital segment 2 shining black. *Wings*: vein 1 bare. Costal spine present. Section iii of costa longer than section v. Vein III bristly from half to two-thirds way to cross-vein. *Legs*: mid-femur with typical fringe and comb. Mid-tibiæ bare. Hind femora typically fringed. Hind tibiæ with single posterior fringe only. ♂ *genitalia* shown in fig. 140.

Length 6–13 mm.



Fig. 139.—*Sarcophaga hainanensis* Ho : ♂ genitalia.
(From Ho.)

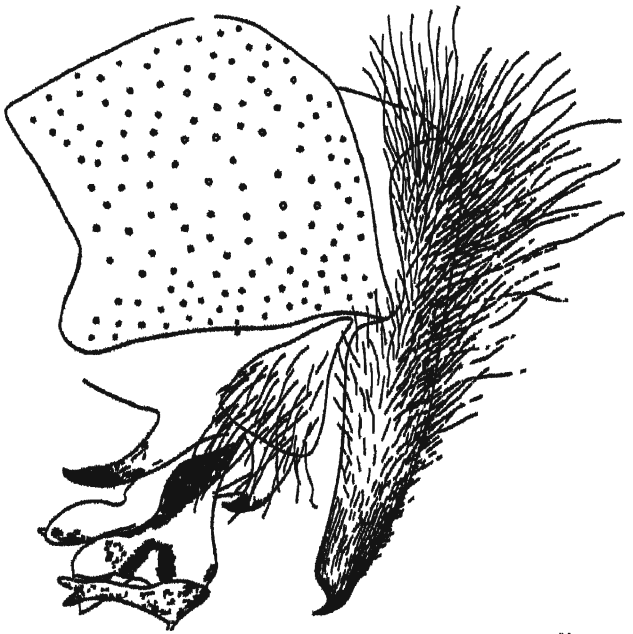


Fig. 140.—*Sarcophaga brevicornis* Ho : ♂ genitalia.
(From Ho.)

Bionomics.—Nothing is known.

Distribution.—China, Peiping; Hainan Island; Federated Malay States, Kuala Lumpur.

202. **Sarcophaga kempi** Senior-White. (Fig. 141.)

Sarcophaga kempi Sen.-Wh., Rec. Ind. Mus. xxvi, p. 247, pl. xv, fig. 29, 1924.
Type-locality: Matale, Ceylon. *Type* in the British Museum.
Sarcophaga kempioides Baran., Konowia, (2) x, pp. 114, 115, fig. 6, 1931.
Type-locality: Ceylon. *Type* in the Berlin Museum.

♂.—*Head*: frontal width half that of an eye. No lateral verticals. Frontals nearly straight. Facials strong. Genals black anteriorly, whitish posteriorly. Three rows post-

Fig. 141



Fig. 142.



Fig. 141.—*Sarcophaga kempi* Senior-White: ♂ genitalia. (From Senior-White.)
Fig. 142.—*Sarcophaga tsushima* Senior-White: ♂ genitalia. (From Senior-White.)

ocular cilia. Frontal stripe black, parafrontalia together about as wide, these and face whitish, the former with black reflections. Antennæ black, third segment grey pollinose, very strongly contrasted with the black second joint and about two and a half times as long. Palpi black. *Thorax*: dark grey. Chætotaxy: propleura bare; prescutellar acrostichals only; posterior dorso-centrals 5. *Abdomen*: second segment with hind marginals. Genital segment 1 grey pollinose, no marginals. Genital segment 2 black. *Wings*: 1 bare. Costal bristle present. Segment iii of costa equal to v. *Legs*: mid-femur with comb and basal fringe. Mid-tibia bare. Hind femur with lower hind macrochætal row and fringe. Hind tibia double fringed. ♂ *genitalia* shown in fig. 141. Viewed in other directions than profile it is seen that the long apical curved rods of the ædæagus are crossed, tongs-like, at half their length.

Length 6–12 mm.

♀. Frontal width three-fifths an eye-width.

Bionomics. Has been bred from dead *Achatina fulica* and a dead Sphingid larva. Its breeding is favoured by dry weather conditions. The ♂ is attracted to *Aristolochia ridicula*.

Distribution.—INDIA: Bihar, Pusa; Bengal, Calcutta; BURMA, Moulmein; CEYLON, C. Prov., Peradeniya and Matale; China.

203. **Sarcophaga tsushimæ** Senior-White. (Fig. 142.)

Sarcophaga tsushimæ Sen.-Wh., Rec. Ind. Mus. xxvi, p. 248, pl. xvi, fig. 33, 1924.
Typo-locality: Iki Island. *Type* in the Vienna Museum.

♂. *Head*: frons barely equal to half an eye. No lateral verticals. Frontals diverging. Facials weak. Genals black and bristly. Three rows postocular cilia. Frontal stripe black, parafrontalia together rather wider, dark greyish; face golden. Antennæ black, third segment two and a half times second. Palpi black. *Thorax*: chætotaxy: propleura bare; prescutellar acrostichals only, posterior dorso-centrals ? 5. *Abdomen*: second segment bare. Genital segments brown, the first without marginals. *Wings*: 1 bare. Costal bristle strong. Segment iii of costa longer than v. *Legs*: mid-femur without true comb and with basal fringe. Mid-tibia bare. Hind femur with lower hind macrochætal row and fringe. Hind tibia double fringed. ♂ *genitalia* shown in fig. 142.

Length 9 mm.

Bionomics.—Unknown.

Distribution.—The unique type is from Iki Island, Straits of Tsushima. This may be a purely Palæarctic species.

204 *a*. **Sarcophaga dux** Thomson. (Fig. 143.)

Sarcophaga dux Thoms., Dipt. Exped. Eugen. Resc, p. 540, 1868.
Type-locality : Hawaii. *Type* in the Stockholm Museum.
Sarcophaga tuberosa Pand., Rev. Ent. Fr. xv, p. 192, 1896.
Type-locality : southern France, Tarvre. *Type* in the Paris Museum.
Sarcophaga dux luzonensis Parker, Bull. Brooklyn Ent. Soc. xiv, p. 43, 1919.
Type-locality : Philippine Islands, Mt. Makoling. *Type* in Parker's collection.
Sarcophaga ceylonensis Parker, Ann. Mag. Nat. Hist. (9) xi, p. 125, fig. 1, 1923.
Type-locality : ? Ceylon, Peradeniya. *Type* in Parker's collection.
Sarcophaga misera auct. (*nec* Wlk.).

♂.—*Head* : frontal width two-thirds that of an eye. No lateral verticals. Frontals diverging. Facials weak. Genals

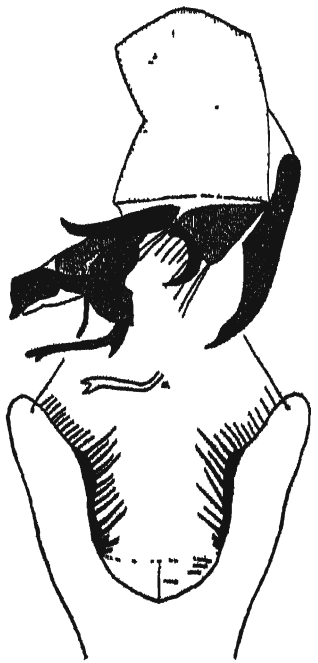


Fig. 143.—*Sarcophaga dux* Thomson : ♂ genitalia.
a. *Sarcophaga dux* Thomson var. *harpax* Pandellé : tip of the lateral apophysis of the sedeagus.
(From Senior-White.)

weak, generally black anteriorly and white posteriorly. Three rows postocular cilia. Frontal stripe black, parafrontalia together rather wider, those and face silvery with a tinge of gold in it. Antennæ black, third segment twice second. Palpi black, very exceptionally yellow. *Thorax* : ashy-grey.

Chaetotaxy: propleura bare; presutellar acrostichals only; posterior dorso-centrals 5, the anterior three weak. *Abdomen*: second segment bare. Genital segment 1 without marginals, grey-yellow pollinose. Genital segment 2 red, rarely black. *Wings*: I bare. Costal bristle present. Segment iii of costa longer than v. *Legs*: mid-femur with comb and basal fringe. Mid-tibia bare. Hind femur with lower hind macrochaetal row and weak fringe. Hind tibia with double fringe, the outer weak. ♂ *genitalia* shown in fig. 143.

Length 7–12 mm.

♀.—Frontal width equal to that of an eye.

Bionomics. Has been bred from a great variety of materials, but not from human excrement, save for a single Samoan record by Buxton. The records include: cucumber, rotten *Cajanus indicus*, oyster, *Achatina fulica*, *Indoplanorbis exustus*, dead beetle, dead *Acherontia* sp., decaying toad, dead snake, decomposing eggs of *Cornus*, dead squirrel, rotten meat, meat treated with vanillin, with borneol, with HCl plus papain. It is recorded as parasitic on locust and as causing human and bovine tissue myiasis. Human excrement appears to have some attraction for the adults.

Distribution.—Europe generally; Mesopotamia; INDIA: from Kashmir to East Bengal (Dacca), and the Nilgiri Hills; CEYLON; Java; Bali; Philippine Islands; Formosa; Hainan. In the Australian region it is recorded from North Queensland, Guam, and Hawaii. In the Nearctic region from Canada, Manitoba, and the United States. In the Ethiopian region it occurs in the Seychelles Islands.

We have examined the ♂ *genitalia* of a specimen identified by Hardy as *misera* Wlk., and can see no difference between these and *dux* Thoms. The type of *misera* is a female; thus its identity with the male selected as neotype by Johnson and Tiegs can never be certain. It is considered advisable to drop Walker's name and use Thomson's, which rests on examination of the genitalia of this type by Aldrich.

204 *b*. Sarcophaga dux Thomson var. **harpax** Pandellé. (Fig. 143, *a*.)

Sarcophaga harpax Pand., Rev. Ent. Fr. xv, p. 189, 1896.
Type-locality: Russia. *Type* in the Paris Museum.
Sarcophaga subtuberosa Parker, Proc. U.S. Nat. Mus. liv, p. 89, fig. 1, 1917.
Type-locality: Guam. *Type* in the United States National Museum.

♂.—Differs from the type-form by having the facial bristles strong and the genal bristles all black, though sparse. Genital segment 1 grey pollinose. Genital segment 2 black. ♂ *genitalia* shown in fig. 143, *a*. The only valid difference from the type-form lies here, in the different shape of the tip of the lateral apophysis of the aedeagus.

Bionomics.—Like the type-species, appears to be attracted to almost any decaying substance. It is specifically recorded as bred from a gastropod. The ♂ is attracted to *Aristolochia ridicula*.

Distribution. - In the Palæarctic region occurs in Europe generally, and in Japan. In the Ethiopian it is recorded from South-West Africa, Damaraland. The actual Oriental region records are sparse :—INDIA : Bihar, Chota Nagpur ; Bengal ; Orissa ; Madras ; CEYLON ; Singapore ; the Philippine Islands ; Formosa. In the Australian region from Guam, Fiji, Samoa, and Hawaii. In the Nearctic region from the United States.



Fig. 144.—*Sarcophaga dux* Thomson var. *scopariiformis* Senior-White : ♂ genitalia. (From Senior-White.)

201 *c*. **Sarcophaga dux** Thomson var. **scoparilformis** Senior-White. (Fig. 144.)

Sarcophaga dux Thomson var. *scoparilformis* Sen.-Wh., Spol. Zeyl. xiv, p. 82, fig. 1, 1927.
Type-locality: Ceylon, Matale. *Type* in the British Museum.
Sarcophaga dimaia Ség., Encycl. Ent. Ser. B. 2, vii, 24, 1933.
Type-locality: China, Kauling. *Type* in the Paris Museum.

♂. *-Head*: differs from the type-form by having a sixth, very weak, posterior dorso-central. Genital segment 1 very dark grey, and genital segment 2 shining black. The hind tibia is unfringed. ♂ *genitalia* shown in fig. 144. The only valid difference from the type-form is the different shape of the præputium of the aedeagus.

Bionomics.—Unknown.

Distribution.—CEYLON, C. Prov., Matale; China; Chekiang. Kauling; Hainan Island.

There are at least seventeen forms of *dux* described and figured from various parts of the world by various authors, occurring everywhere except in the Neotropical region. Breeding and cross-breeding experiments and biometrical studies on a considerable scale can alone settle their status. The fact that so many closely related forms can exist, often together in the same area, suggests that in reality they have racial biological differences as definite but as obscure as those on which depend the parallel case of the varieties of *Anopheles maculipennis* Meig., and which are only now being unravelled.

205. **Sarcophaga ruficornis** (Fabricius). (Fig. 145.)

Musca ruficornis Fab., Ent. Syst. iv, pp. 314–16, 1794.
Type-locality: E. India. *Type* lost.

♂. *—Head*: frons equal to two-thirds an eye-width. Lateral verticals wanting. Frontals strongly diverging. Facials weak. Genals white. One row postocular cilia. Frontal stripe black, parafrontalia together as wide, the latter yellowish above, and silvery, as in the face, below. Antennæ and palpi orange-yellow, the former occasionally darkened. Third segment of antennæ twice second. *Thorax*: ashy-grey. Chætotaxy: propleura bare; acrostichals only present as one small prescutellar pair; posterior dorso-centrals 5, the front four very weak. *Abdomen*: the spots pattern reduced, smaller than usual. Second segment bare. Genital segment 1 red, the posterior dorsal edge darkened, marginals none or very weak. Genital segment 2 red. *Wings*: 1 bare. No costal bristle. Segment iii of costa nearly twice as long as v. *Legs*: mid-femur with comb only, a few long basal hairs,

but no fringe. Mid-tibiæ bare. Hind femur with lower hind macrochætal row, and weak fringe in larger specimens. Hind tibia almost bare. ♂ *genitalia* shown in fig. 145.

Length 6–12 mm.

♀.—Frontal width equal to that of an eye. No acrostichals and only one posterior dorso-central, the prescutellar. Tip of apparent fourth segment reddish.



Fig. 145.—*Sarcophaga ruficornis* (Fabricius): ♂ genitalia. (From Senior-White.)

Bionomics.—Has been bred in dead grasshoppers, snakes, rabbits, squirrels, and rats; also experimentally in dead *Achatina fulica*. From beef, and in tissue myiasis in a dog.

Distribution.—Widely distributed in INDIA, recorded from North-West Frontier Province, Abbotabad, to Madras, Tinnevelly district; CEYLON; Malacca; the Philippine Islands; Formosa. In the Ethiopian region recorded from North-East Africa, the Chagos Archipelago, and Socotra Island.

206. **Sarcophaga iwuensis** Ho. (Fig. 146.)

Sarcophaga iwuensis Ho, Bull. Fan Inst. Biol. v, p. 35, fig. 1, 1934. Type-locality: China, Chekiang Province, Iwu Hsian. *Type* in Peiping, Fan Inst.

♀. *-Head*: frons five-sixths of an eye-width. Lateral verticals not differentiated. Frontals moderately diverging. Facials weak. Three rows black postocular cilia. Frontal stripe narrow. Parafrontalia, which are together broader than the frontal stripe, and parafacialia silvery with strong yellow tinge. Antennæ black, third segment 2·2 times length of second. Palpi black. *Thorax*: yellowish-grey. Chætotaxy: propleura bare; acrostichals 0 : 1; posterior dorso-centrals 5, the three

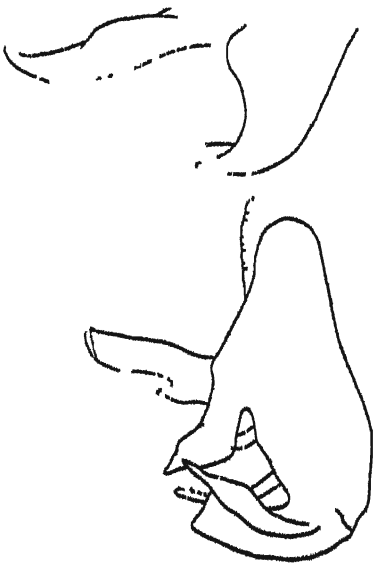


Fig. 146.—*Sarcophaga iwuensis* Ho: ♂ genitalia. (From Ho.)

anterior very weak. *Abdomen*: second visible segment with one weak median and one lateral marginal. Fourth with a continuous row of marginals. Genital segment 1 dark shining brownish anteriorly, grey pollinose posteriorly, no marginals. Genital segment 2 shining black. *Wings*: vein I bare. A strong costal bristle. Vein III bristly for more than half the distance from basal node to cross-vein. *Legs*: mid-femur with short fringe and a comb. Hind femur and mid- and hind tibiæ all bare. ♂ *genitalia* shown in fig. 146.

Length 7·5-11·5 mm.

Bionomics.—Nothing is known.

Distribution.—China, Chekiang Province; Hainan Island.

207. **Sarcophaga fuscicauda** Bottcher. (Fig. 147.)

Sarcophaga fuscicauda Bott., Ent. Mitteil. i, p. 168, fig. 5, 1912.
Type-locality: Formosa. *Type* in the Berlin Museum.
Sarcophaga hutsoni Parker, Ann. Mag. Nat. Hist (9) xi, p. 127, fig. 4, 1923.
Type-locality: Ceylon. *Type* in Parker's collection.

♂.—*Head*: frontal width half that of an eye. No lateral verticals. Frontals straight. Facials weak. Genals short, black and bristly anteriorly, long, white, and soft posteriorly. Two distinct and one less regular row of postocular cilia. Frontal stripe black, parafrontalia together about as broad, these and face silvery with dark reflections. Antennæ black, third segment two and a half times as long as second. Palpi black. *Thorax*: dark slaty blue-grey. Chætotaxy: propleura sparsely hairy; a prescutellar pair of acrostichals only;

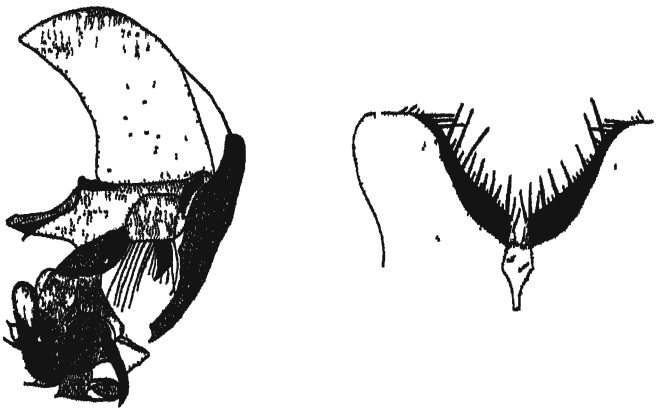


Fig. 147.—*Sarcophaga fuscicauda* Böttcher: ♂ genitalia.
(From Senior-White.)

posterior dorso-centrals 5, the first three pairs weak. *Abdomen*: second segment with or without marginals. Genital segment 1 without marginals, grey pollinose. Genital segment 2 brown, occasionally blackish or reddish. *Wings*: I bare. Costal bristle weak. Segment iii of costa longer than v. *Legs*: mid-femur with very wide-spaced comb, no true fringe. Mid-tibia bare. Hind femur with lower hind macrochætal row and weak fringe. Hind tibia with only traces of inner fringe apically. ♂ *genitalia* shown in fig. 147. Occasional specimens have small spines, best seen in three-quarter view from behind, developed on superior claspers.

Length 10–12 mm.

Bionomics.—Bred from decaying unopened cocoanut leaflets, dead *Achatina fulica*, *Lepidiota pinguis*, rabbit, and meat.

Parasitic on a Lumbricid worm. Recorded as causing human tissue myiasis. Both sexes of this species are attracted to *Aristolochia*.

Distribution. Recorded in INDIA from United Provinces, Mussoorie; Bombay to Bengal, Darjeeling District, and Dacca; North-east Assam and Sadiya. It occurs generally in South India, and is common in CEYLON; BURMA, Rangoon; Singapore; Java; Riouw Archipelago; Philippine Islands; Formosa, Tsushima Island. The specific identity of Queensland specimens is doubtful. Specimens with superior claspers spinulose or bare have been taken at the same time in the same locality.

208. **Sarcophaga karnyi** Hardy. (Fig. 148)

Sarcophaga karnyi Hardy, Proc. Linn. Soc. N.S.W. lii, (4) p. 454, fig. 7, 1927.
Type-locality: Java, Buitenzorg. *Type* in Buitenzorg Museum ?.

♀. ♂ *genitalia* shown in fig. 148. The only valid differences from *fuscicauda* are to be found in the ♂ *genitalia* in the absence of the "hood" projecting backwards from the apical

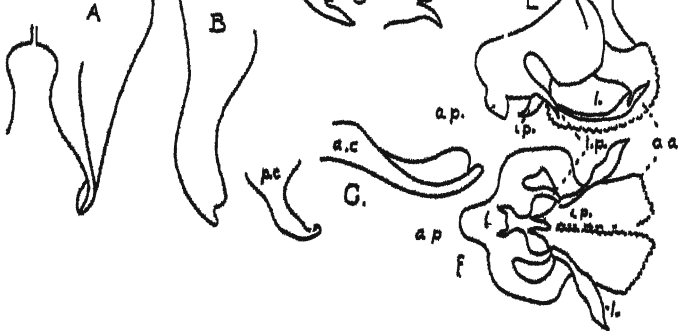


Fig. 148. *Sarcophaga karnyi* Hardy: ♂ genitalia. (From Hardy.)

Explanation of the lettering.

A forceps or apical part of them, seen posteriorly; B = the same, lateral view; C = claspers; D = another aspect of one or both claspers; E = second segment of penis, seen laterally; F = the same, ventral view; G = the same or its apex, seen posteriorly; H the same, seen anteriorly; J = apex of the lobes, seen from other aspects. *a.a.* = anterior appendage; *a.c.* = anterior clasper; *a.p.* apical process; *fl.* = filaments; *i.p.* = interior process; *k.* knob; *l.* = lobe; *l.p.* lateral process; *p.c.* = posterior clasper.

segment of the aedeagus that occurs in *fuscicauda*, and the anterior claspers furcate instead of simple, as in the latter.

Length. 10–12 mm.

♀. —Second row of postocular cilia weak or absent.

Bionomics. - Bred from *Xylotrupes* and *Gryllotalpa*, presumably after death and not as a parasite.

Distribution.—Burma, Mergui; Andaman Islands; Java; Borneo, Sarawak; Hawaii.

209. **Sarcophaga bainbriggei** Senior-White. (Fig. 149.)

Sarcophaga bainbriggei Sen.-Wh., Spol. Zeyl. xiii, p. 212 (nom. nov.), 1925.

Sarcophaga fletcheri Sen.-Wh., Rec. Ind. Mus. xxvi, p. 254, pl. xiv, fig. 26, 1924 (nom. preoc.).

Type-locality: Bihar, Pusa. *Type* in coll. Imperial Dept. Agric., India.

♂.—*Head*: frontal width two-fifths that of an eye. No lateral verticals. Frontals not diverging. Facials weak.



Fig. 149.—*Sarcophaga bainbriggei* Senior-White: ♂ genitalia. (From Senior-White.)

Genals white and weak. One row of postocular cilia, the other occipital hairs white, soft and long. Frontal stripe black, parafrontalia together as wide, these and face silvery. Antennæ black, third segment twice the second. Palpi generally black, sometimes yellow. *Thorax*: pale ashy-grey. Propleura bare. Presutellar acrostichals only. Posterior dorso-centrals 5, the three anterior very weak. *Abdomen*: second segment with strong marginals. Genital segment 2 black. *Wings*: 1 bare. Costal bristle present. Segment iii of costa longer than v. *Legs*: mid-femur with comb-like rows of bristles, but hardly a true comb, basal fringe very weak. Mid-tibia bare. Hind femur with lower hind macrochætal row and weak fringe. Hind tibia hardly fringed.

♂ *genitalia* shown in fig. 149. The development of the giant macrochæta on the apex of the accessory forceps on the right side is not always so pronounced as in the specimen figured. It may be no longer than the one on the opposite lobe.

Length 7–9 mm.

Bionomics. Has been bred from human excrement.

Distribution. INDIA: Bihar, Pusa; Bengal, Calcutta; Orissa, Balugaon; Madras, Coimbatore.

210. **Sarcophaga ballardi** Senior-White. (Fig. 150.)

Sarcophaga ballardi Sen.-Wh., Rec. Ind. Mus. xxvi, p. 254, pl. xi, fig. 16, 1924.

Type-locality: Coimbatore. *Type* in Madras Agric. Department collection.

♂.—*Head*: frontal width two-thirds that of an eye. No lateral verticals. Frontals weakly diverging. Facials weak. Genals white. One row of postocular cilia. Frontal stripe dark grey, its margins not well defined, parafrontalia together not as wide, these and face silvery with a pale golden tinge. Antennæ orange-yellow, third segment thrice second. Palpi concolorous. *Thorax*: ground-colour whitish-grey. Propleura bare. Acrostichals absent. Posterior dorso-centrals 6, the anterior four weak. *Abdomen*: second segment bare. Genital segment 2 red. *Wings*: 1 bare. Costal bristle present. Segment iii of costa nearly twice v. *Legs*: mid-femur with very strong comb and weak fringe. Mid-tibia bare. Hind femur without lower hind macrochætal row, but with fringe. Hind tibia strongly double fringed. ♂ *genitalia* shown in fig. 150.

Length 11–12 mm.

Bionomics.—Unknown.

Distribution.—Only known from the type-locality Madras, Coimbatore.

211. **Sarcophaga hæmorrhoidalis** (Fallen). (Fig. 151.)

Musca hæmorrhoidalis Fall., Vet.-Akad. Handl. p. 237, 1816.
Type-locality: Sweden. *Type* at Stockholm.
Sarcophaga georgina Wd., Auss. Zweifl. Ins. ii, p. 357, 1830.
Type-locality: Savannah, Ga. *Type* in Vienna Museum?.

♂.—*Head*: frontal width equal to an eye. Lateral verticals present but weak. Frontals diverging. Facials weak. Genals

Fig. 150.



Fig. 151

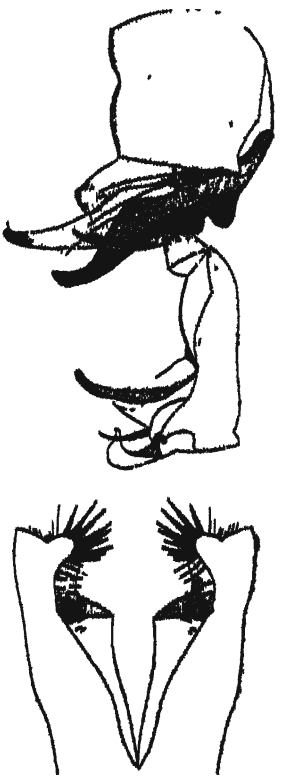


Fig. 150.—*Sarcophaga ballardi* Senior-White: ♂ genitalia.
(From Senior-White.)
Fig. 151.—*Sarcophaga hæmorrhoidalis* (Fallén): ♂ genitalia.
(From Senior-White.)

white. Two rows postocular cilia. Frontal stripe black, parafrontalia together not as wide, these and face fuscous-white. Antennæ black, third segment thrice second. Palpi black. *Thorax*: yellowish-grey. Propleura bare. Acrostichals quite absent. Posterior dorso-centrals 6, the anterior

four very weak. *Abdomen*: second segment without marginals. Genital segment 1 grey pollinose, with strong marginals. Genital segment 2 red. *Wings*: 1 bare. No costal bristle. Segments iii and v of costa equal. *Legs*: mid-femur with comb but hardly any basal fringe. Mid-tibia with traces of an apical fringe. Hind femur with very strong lower hind macrochaetal row, but no separate fringe. Hind tibia double fringed. ♂ *genitalia* shown in fig. 151.

Length 10–14 mm.

Bionomics. Is recorded as attracted to human excrement in N. America, Montana, and as being parasitized by *Nasonia brevicornis* in S. Africa.

Distribution. The entire Palaearctic region from Europe, through Palestine, Iraq, and Persia to Seistan. It also reaches China. In the Oriental region it is confined to the Himalayas from Kulu to Darjeeling, only reaching the Plains at Siliguri at the foot of the Darjeeling Terai. The Nicobars record is suspect *. It occurs in South Africa and the Seychelles and Rodriguez in the Ethiopian region. It is widely distributed in the Nearctic region, and reaches the Hawaiian Islands.

Genus 35. **SARCOPHILA** Rondani.

Sarcophila Rond., Dipt. Ital. Prodr. i, p. 86, 1856. Genotype, *Musca latifrons* Fall.

Leucomyia Brauer & von Bergenstamm, Denk. Nat. K. Akad. Wien, lvii, p. 368, 1891. Genotype *Musca cinerea* Fab., as *S. alba* Schiner.

Head: eyes well separated in both sexes, rather small. Frons produced anteriorly. Lateral verticals present in both sexes. Ocellars very strong, proclinate. Frontals parallel, exterior fronto-orbitals absent in ♂, three in ♀, the upper reclinate, the two lower proclinate. Facials absent, vibrissal ridges bare. Arista pubescent. *Legs*: no ♂ sexual ornamentation.

Only one species is found in the Oriental region, and the generic characters above are drawn up from it.

212. **Sarcophila cinerea** (Fabricius). (Fig. 152.)

Musca cinerea Fab., Ent. Syst. iv, p. 331, 1794.
Type-locality: E. India. *Type* lost.
Sarcophila alba Schiner, Reise 'Novara,' Dipt. p. 315, 1868.
Type-locality: Ceylon. *Type* in the Vienna Museum.

♂♀.—*Head*: frons very broad, equal to one and a half times an eye in both sexes, so produced anteriorly that viewed

* Miller, Bull. Ent. Res. xxiii, p. 474, 1932, on accuracy of the 'Novara' records.

laterally the distance from front margin of eye to root of antennæ is equal to half an eye breadth in this view. Not more than six frontals. Cheek only with soft white hairs. Only one row black postocular cilia, occiput otherwise almost bare, greyish. No frontal stripe, but a series of vertical black striæ on lower half of frons in its place. Frons and face silvery-white. Antennæ grey pollinose, tip of second segment brownish-yellow, third joint about twice as long as second. Arista brown, first joint incrassate, second more yellowish, pubescent only on basal half. Palpi yellow, not apically clavate. *Thorax*: silvery ashy-grey with indefinite darker stripes. Acrostichals none, or only a very weak presuturral pair. Dorso-centrals 2:3. Scutellum concolorous with mesonotum, at most faintly yellowish round the margin, with two marginal and a weak preapical pair of bristles. No apicals

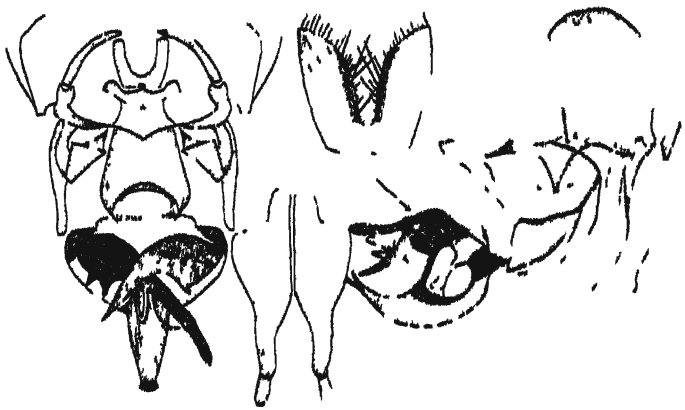


Fig. 152.- *Sarcophila cinerea* (Fabricius) ♂ genitalia

in either sex. Exceptionally a weak middle sternopleural is developed. *Abdomen*: rather more cinereous-grey than thorax. Apparent first segment with indefinite median dark stripe, second and third with oblique dark stripes, posteriorly diverging, leaving a pale median area on second, but fused together on third. Apparent fourth with straight dark median stripe. Genital segments both grey pollinose, without stronger hind marginals on first. *Wings*: clear, veins pale yellow. Costal bristle strong. I bare, III with four or five bristles above and two or three below. Segment iii of costa much shorter than v. *Legs*: dark blackish-grey.

Length 5–7 mm.

Bionomics.—Entirely confined to sea-shore. It is recorded as being preyed upon by *Cicindela biramosa* on Barberyn Island, Ceylon.

Distribution. INDIA: Orissa, Puri; Madras, Vizagapatam; Travancore, Varkalay. CEYLON: Colombo and Trincomali; Siam, Patani Cape.

Genus 36. **AGRIA** Robineau-Desvoidy.

Agria Myodaires, p. 376, 1830. Genotype, *Musca affinis* Fall.
Pseudosarcophaga Kramer, Ent. Wochen. no. 49, p. 201, 1908. Genotype, *S. affinis* Fall.

Head: ♂ frons narrowed, without orbitals; in ♀ rather wide, the parafrontalia with numerous rather long hairs, continuous with those of parafacialia. Frontals of varying number, extending a little beyond root of antenna. Vibrissæ near oral margin. Eyes bare. Arista biplumose on basal half only. *Wing*: IV sharply angled at bend, ending before apex of wing. No costal bristle.

♂ *hypopygium* large, a hump on genital segment I before its middle, forming apex of abdomen in profile.

213. **Agria hutsoni** Senior-White.

Agria hutsoni Sen.-Wh., Rec. Ind. Mus. xxvi, p. 258.
Type-locality: Matale, Ceylon. *Type* in the British Museum.

♀. *Head*: lateral verticals and ocellar strong, the latter procumbent. Frons three-fifths an eye-width, its margins absolutely parallel from vertex to base of antennæ. Fronto-orbitals 3, the uppermost, situated opposite the lowest ocellar, placed more inwardly than the two lower pairs. Inner frontals only seven, widely separated, with the three lowest close together below the level of base of antennæ, and outwardly directed. Frontal stripe dark brown, slightly tinged orange below, ending above ocellar triangle, but separating the latter from the yellow cinereous parafrontalia, from which the former is concolorous, by a pair of narrow diverging brown lines continued from its upper angles. The parafrontalia together rather wider than the frontal stripe. Face more silvery-cinereous, without carina, the facials strong and long, parallel to eye-margins. Vibrissal ridges bear only two short bristles above vibrissæ, the latter crossed apically, and situate the sagittal width of the third antennal joint above the epistomal margin. Peristomal bristles about ten in number, strong, reaching back of head. Genæ grey-cinereous, black-bristled, their greatest height equal to length of third antennal joint. Occiput grey, with two rows of black cilia. Antennæ brownish, thickly grey pollinose, second segment chætose above, third barely twice as long as second. Arista with first joint slightly thickened, as long as second antennal, with six or seven rays above and

two below, the latter apically, the rays wider than the sagittal width of the third antennal segment. Second joint of arista with three rays above and one or two below, situate basally contiguous to those on first joint, the remainder of second joint bare. Palpi yellow-grey with black chætæ, apically slightly clavate. Proboscis black. *Thorax*: brown, thickly covered throughout with yellowish-ashy pollen. Scapulars strong. Acrostichals 4 : 5, all but the posterior two pairs very closely approximated, somewhat irregularly placed. Dorso-centrals 2 : 3, a much weaker fourth posterior just behind suture; humerals 3; posthumerals 2, presuturals 1; alars 2 : 2 : 1; propleurals 2, long, upcurved; posthumerals or notopleurals 2; mesopleurals 5, along posterior margin, and some weaker, bristly hairs in anterior upper angle and along upper margin; sternopleurals 1 : 1, both long; hypopleurals with about 7 in straight row; scutellars 2 marginal, a subapical on disc at about two-thirds its length, no apical. *Abdomen*: grey, with ashy pollen. Apparent first segment black basally, two black spots latero-posteriorly; second segment with median black stripe, not reaching hind margin, and lateral posterior black patches; third segment similar, but median stripe reduced to a few dark spots; fourth segment unicolorous grey. The black markings are fixed in position, not changing with light incidence, but their individual margins are not sharp, fading there to brown. The median and lateral marginals arise from small round black spots. Each of first three segments with lateral discals and marginals, second in addition with a pair of median marginals, third with strong median and two pairs submedian marginals, fourth with four strong bristles, two above and two below the upper angle of the genital cleft. Sternites outstandingly bristled, especially an apical pair of chætæ on apparent first segment. *Wings*: clear, veins yellow. No costal bristle. Segment iii of costa little less than v. I bare, III bristly above halfway to cross-vein, below on node only. Anterior cross-vein oblique, inwardly directed posteriorly, just beyond middle of discal cell and below tip of I. IV bent at right angles, but beyond gradually sloping outwards. First posterior cell closed in margin well before apex. Posterior cross-vein bent outwardly anteriorly at half length, its posterior half parallel to basal half of last section of IV, the cross-vein nearer bend of IV than anterior cross-vein. Squamæ pale yellowish-white. *Legs*: coxæ grey pollinose, concolorous with thorax; remainder yellow. Front coxa with long anterior macrochætal row. Front femur with long bristles above and below. Mid-femur with one long bristle below premedianly. Mid-tibia with an anterior, posterior, and inferior submesal bristle. Hind-femur with upper anterior

row, and a median and two subapical inferior. Hind tibia with fine upper anterior bristles, the outer longest, and two upper posterior at one-third and two-thirds length respectively.

Length 5 mm.

Bionomics. Unknown.

Distribution. Only known from the unique type from CEYLON, C. Prov., Matale District.

Genus 37. **WOHLFARTIA** Brauer & von Bergenstamm.

Wohlfartia B. & von B., Denk. Nat. K. Akad. Wien, lvi, p. 55, 1889. Genotype, *Sarcophila magnifica* Schin.

Head: frons and epistome produced, giving the head a rather square outline in profile. Front wide in both sexes, more so in ♀. Arista pubescent; bucca high. Parafacialia with a few small hairs not in rows. Ocellar and lateral verticals present in both sexes. Back of head with only black hairs. *Thorax*: acrostichals generally 1 : 2 in ♂, 4 : 1 in ♀. Dorso-centrals 3 1 : 4; humerals 3; posthumerals or notopleurals 2; sternopleurals 2 : 1; post-alars 2; supra-alars 2. *Abdomen*: with the markings fixed irrespective of light incidence. *Wing*: III bristly. Segment iii of costa longer than v and vi together.

214. **Wohlfartia nuba** (Wiedemann).

Tachina nuba Wd., Auss. Zweifl. Ins. ii, p. 296, 1830 (*Tachina*). Type-locality: "Nubia." *Type* in the Vienna Museum.
Disjunctio nuba Becker, etc., Cat. Pal. Dipt. iii, p. 494.

Head: frons grey-yellow, with the narrowly developed parafrontalia clear yellowish-silvery. Face brownish, but with strong yellowish-white shimmer. Antennæ, second segment brownish-red, third twice as long as second, blackish, distinctly grey pollinose. *Thorax*: dorsum slightly yellowish. Pleura blackish, with grey-white pollen. *Abdomen*: ash-grey, with deep black spots on each segment, placed along the posterior margins, on the apparent second the median spot extended anteriorly as a stripe to first segment. Spots fixed, not changing with light incidence. *Wings*: clear, veins brown. "Cross-vein high above the apex." Squamæ white. *Legs*: black, femora grey-dusted.

Length 8 mm.

Bionomics.—Unknown.

Distribution.—Wiedemann records it from "Nubia." There are two specimens from INDIA, Karachi, in the British Museum.

APPENDIX.

The following are, as far as the authors are aware, the only species of CALLIPHORIDÆ described from the Oriental region during the years 1937, 1938 and 1939 :

1. **Paradichosia pygialis** Vill.

   Paradichosia pygialis Vill., Bull. Mus. R. d'H. N. Belg. xiii, no. 34, p. 15, 1937.
   Typo-locality : Washan, Szechuen. *Type* in Villeneuve's collection ?.

2. **Chætoptiliopsis burmanica** Baran.

   See p. 82.

3. **Sarcophaga serrata** Ho.

   Sarcophaga serrata Ho, Ann. Trop. Med. Paras. xxxii, p. 120, 1938.
   Type-locality : Java. *Type* in the Buitenzorg Museum.

   See p. 212.

4. **Sarcophaga auricauda** Ho.

   Sarcophaga auricauda Ho, Ann. Trop. Med. Paras. xxxii, p. 123, 1938.
   Type-locality : Java. *Type* in the Buitenzorg Museum.

   See p. 212.

5. **Sarcophaga walshi** Ho.

   Sarcophaga walshi Ho, Ann. Trop. Med. Paras. xxxii, p. 125, 1938.
   Type-locality : Java. *Type* in the Buitenzorg Museum.

   See p. 212.

6. **Sarcophaga senior-whitei** Ho (nom. nov.).

   See p. 223.

INDEX TO GENERA AND SPECIES.

[Synonyms are printed in italics.]

abdominalis *R. D.*, 66.
abdominalis *Mall.*, 59.
abdominalis *Fab.*, 168.
Acharantulus Bezzi, 135.
aenea *Fab.*, 172.
affinis, *Full.*, 279.
affinis Macq., 49
Agria *R. D.*, 270.
alba Selim., 277.
albiceps *Mg.*, 242.
albiceps *Wd.*, 113.
albiceps auct., nec Wd., 141.
albipilosa Sen. Wh., 42.
aldrichi, sp. n., 81.
Aldrichella Rohd., 35.
Aldrichina Tnsd., 32.
Alkangi Vill., 187.
Alkangiella *Vill.*, 176.
amica R. D., 55.
ampullacea *Vill.*, 50.
analis Macq., 66.
andrewsi, sp. n., 57.
Anemagra Wlk., 83.
annulatoi *Sen. Wh.*, 238.
antarctica Selim., 40.
antilope *Hott.*, 235.
antilopoides Hardy, 235.
aplendis, *Wd.*, 205.
appendiculata Kram., 261.
arcuata Macq., 143.
argentiloneta *Sen. Wh.*, 125.
Argyrocarina Mg., 46.
argyriocephala Macq., 55.
asiatica *Sen.-Wh.*, 126.
aspinata *Sen.-Wh.*, 226.
atripalpis *Mall.*, 41.
aucta Wlk., 33.
aucta auct., nec Wlk., 38.
aurata *Wlk.*, 282.
auriomaia *Ho*, 212, 282.
aurifrons Dols., 231.
australis Wlk., 197.
australiensis *R.-D.*, 32.
azurea Dol., 52.

bainbriggei *Sen.-Wh.*, 274.
ballardi *Sen.-Wh.*, 275.
ballardi Patt., 42.
banksi *Sen.-Wh.*, 232.
baranoffi, nom. nov., 228.
barbata *Thoms.*, 222.
barbata Big., 141.
barbari Tnsd., 54.
basalis *Wlk.*, 223.
basalis Macq., 54.
basiseta *Baran.*, 237.
bata Wlk., 138.
Beccarimyia Rond., 204.
beesoni *Sen.-Wh.*, 248.
bengalensis R.-D., 199.
Bengalia *R.-D.*, 83.
bezziana *Vill.*, 140.
bezzii *Sen.-Wh.*, 99.
bibula Wd., 143.
bicolor *Mall.*, 128.
bicolor *Wlk.*, 173.
bicoloripes *Mall.*, 126.
bipartita *Mall.*, 203.
biplumosa *Sen.-Wh.*, 176.
bivittata Big., 199.
bivittata *Wlk.*, 187.
Blaesoptila Lw., 208.
Boopontia *Udr.*, 78.
Borborochinia *Tnsd.*, 187.
Bottcheria Parker, 208.
brevicornis *Ho*, 262.
brunnibarbis R.-D., 39.
Bufalucilia Tnsd., 46.
burmanica *Baran.*, 82.

caerulia de G., 39.
caeruleocincta Big., 159.
caeruleolimbata Big., 42.
caesar auct., nec L., 49.
caesar *L.*, 47.

Casuarieps Rohd., 16.
Cainsa *Swe.*, 69.
calicifera *Bott.*, 216.
Calliphora *R.-D.*, 32.
Callitroga Brauer, 135.
callopis *Lw.*, 183.
calviceps Bezzi, 52.
capensis B. & B., 40.
carinata Mall., 122.
carnaria de G., 39.
carnaria *L.*, 208.
carnaria Scop., 39.
carnivora F., 39.
Catapicephala *Macq.*, 102.
caudagalli *Bött.*, 217.
Cephysa R.-D., 115.
ceylonensis Parker, 266.
Chortophilopsis *Baran.*, 82.
chalybea B. & B., 158.
chloris Hal., 54.
Chloroidea *Tnsd.*, 170.
Chlororhinia *Tnsd.*, 206.
Chlororhynchomyia Tnsd., 179.
chrysoides *Wlk.*, 161.
Chrysomyia *R.-D.*, 135.
cincta Big., 192.
cinerea *Fab.*, 277.
cinerea R.-D., 191.
clausa Tnsd., 179.
cærulana Sen.-Wh., nec Tnsd., 165.
cærulana *Tnsd.*, 168.
cærulia *Mg.*, 111.
cognata Mg., 111.
collecta Wlk., 180.
combrea Patt., nec Wlk., 144, 145.
combrea Wlk., 138.
Compsomyia Rond., 32, 135.
concava *Mall.*, 94.
conflagrans Wlk., 159.
confusa *Mall.*, 175.
consobrina Macq., 49.
corbiari Ség., 141.
Cosmina *R.-D.*, 171.
costata *Mall.*, 68.
cragyi Patt., 53.
crinita *Parker*, 254.
crinitaesis *Vill.*, 63.
crocsipalpis Jaenn., 40.
cuprea Wlk., 180.
cupreoviridis *Mall.*, 154.
cuprina Big., 173.
cuprina *Wd.*, 55.
cyanea Stein, 202.
cyanea-cincta Big., 138.
cyanea-marginata Macq., 52.
cyanea-marginata Mall., 42.
Cyaneosomyia Ség., 135.
cyathisana Pand., 242.

Dasyhaeala Rohd., 16.
dasyophthalma *Vill.*, 103.
defixa *Wlk.*, 145.
delectans *Wlk.*, 151, 159.
Dexopollenia Tnsd., 115.
dilutens Wlk., 159.
discolor *Fab.*, 192.
Disjunctio *Paud.*, 281.
ditissima *Wlk.*, 156.
dives Big., 138.
divisa *Wlk.*, 180.
doleschalli, *J. de T.*, 231.
dotata *Wlk.*, 155.
dubia *Mall.*, 60.
dubiosa Vill., 72.
duracuelli R.-D., 138.
dux Esch., 138.
dux *Thoms.*, 266.

elara Wlk., 143.
electa *Vill.*, 168.
elegans R.-D., 55.
Elephantolaemus Aust., 78.
emarginata Mall., 101.
eminelania *Rond.*, 65.
emoda Wlk., 143.
equestris Mg., 48.
erythrocephala Macq., nec Mg., 40.
erythrocephala *Mg.*, 33.
escheri *Bezzi*, 97.
Eucalliphora Tnsd., 32.
Eucosmina Mall., 176.
Euidiella Tnsd., 190.
euidielloides *Sen.-Wh.*, 190.
exempta *Wlk.*, 206.

falculata Pand., 222.
fasciata Mg., 191.
fasciventris *Mall.*, 77.
fasillacea Wlk., 91.
felix Wlk., 143.
formandles *Macq.*, 41.
ferruginea Dol., 66.
flava *Aldr.*, 130.
flava *Vill.*, 177.
flava Vill., 181.
flavibasis *Mall.*, 60.
flavibasis *Sen.-Wh.*, 182.
flaviceps Macq., 138.
flavicornis Mall., 53.
flavifrons Tnsd., 171.
flaviaervis Sen.-Wh., 223.
flavipalpis Sen.-Wh., 240.
flavipennis Kram., nec Macq., 50.
flavipennis Macq., nec Kram., 54, 204.
fletcheri Sen.-Wh., 274.

floreata Vill., 199
formosa *Vill.*, 168.
formosana Baran. nec Sen. Wh., 228.
formosana *Sen. Wh.*, 250.
fortis Wlk., 20.
fortunata Wlk., 42.
Francelia Shn., 16
fraterna Macq., 19.
fraquatti Taylor, 241.
fuerna Wlk., 55.
fulescens Big., 66.
fulvibarbis R. D., 30.
fulvicaspis *r. d. Hulp.* 34.
fulvicornis Big., 172.
fulvipes Big., 204.
fulviventris Rond., 29.
fulvohumera, sp. n., 195.
fumosata *Moll.*, 48.
fumipennis *Wlk.*, 29.
fuscicauda *Bott.*, 272.
fuscolurta *Moll.*, 206
futilis *Sen. Wh.*, 257.

quaqua Wd., 276.
qiraulti Tnsd., 54.
Glaucosarcophaga Tnsd., 208.
glossina Rond., 204.
grahami *Aldr.*, 35.
grahami Rohd., 35.
gratiosa R.-D., 138.
gravelyi *Sen.-Wh.*, 224.
gracca *Moll.*, 113.
griselta Vill., 199.
gryllocetona *Lac.*, 208.
Gymnadichaeta Vill., 58.

haematodes *Mg.*, 225.
haemorrhoidalis *Fall.*, 276.
hamatacnis *Ho*, 262.
harpax *Pand.*, 267.
hastativentris *Sen. Wh.*, 86.
hazara *Sen.-Wh.*, 124.
helicis *Tnsd.*, 208.
Helicobia Coq., 208.
Hemilpyrellia *Tnsd.*, 41.
henryi *Sen.-Wh.*, 233.
himella Wlk., 143.
hirtipes *Wd.*, 243.
hirtiventris *Moll.*, 120.
hobbyi, sp. n., 88.
Homaleria Big., 83.
hui *Ho*, 260.
humeralis *Moll.*, 169.
hutsoni Parker, 272.
hutsoni *Sen.-Wh.*, 279.
Hypopygiopsis *Tnsd.*, 28.

Idia Mg., 190.
Idiella B. & B., 190.
Idiellopsis Tnsd., 190
idmais Sög., 269.
illustris *Mg.*, 48.
incerta Moll., 68.
inconclusa *Wlk.*, 123.
indica Sen.-Wh., 172.
indica *Sare.*, 70.
indica *Tnsd.*, 185.
indicus *Aust.*, 79.
inducta Wlk., 52.
inermis Moll., 99.
inflata Wlk., 31.
infumata *Big.*, 103.
ingens *Wlk.*, 104.
inscribens Wlk., 52.
insidiosa R.-D., 33.
intonsus *Aldr.*, 78.
Inomyia Wlk., 151.
iwasensis *Ho*, 271.

jejuna *Fab.*, 88.
josephi *Bott.*, 217.
jucunda *Kirby*, 43.

kankanensis *Baran.*, 237.
karnyi *Hardy*, 273.
kbetneri *Baran.*, 220.
kempi *Sen.-Wh.*, 264.
kempioides Baran., 264.
khasiensis *Sen.-Wh.* (Pol.), 119.
khasiensis *Sen.-Wh.* (Sare.), 255.
knabi *Parker*, 240.
kocki *Moll.*, 112.
krameri *Bott.*, 247.
krameri Sög., 50.

labiata *R. D.*, 85.
laggra Wlk., 54.
Lauromyia B. & B., 277.
lateralis *Macq.*, 91.
latifrons *Fall.*, 277.
latifrons *Moll.*, 186.
latisterna *Parker*, 208.
latro de Meij., 101.
lepida R.-D., 48.
ligurriens *Wd.*, 42.
lilma *Wlk.*, 32.
Limpogaster Aldr., 115.
littoralis R.-D., 33.
loewi End., 40.
longicornis Bott., nec Macq., 250.
Lucilia *R.-D.*, 46.
Lucilioides Moll., 47.
lunata *Fab.*, 191.

luteigaster *de Meij.*, 197.
lutcola *Vill.*, 131.
luzonensis Parker, 266.

maculata Rond., 191.
magnifica *Schin.*, 281.
malayana *Mall.*, 36.
malayensis *Tnsd.*, 152.
Malayomyza *Mall.*, 169.
mallochi, sp. n., 204.
mandarina *Wd.*, 199.
marginata Aust., 137.
marginalis *Wd.*, 137.
marginifera Wlk., 52.
marshalli *Baran.*, 108.
martellata *Sen.-Wh.*, 258.
martellatoides *Baran.*, 259.
martin-loakei *Sen.-Wh.*, 95.
mogacephala *Fab.*, 138.
melanifera Big., 141.
melanocera R.-D., 85.
melanostoma *Wd.*, 202.
melanura *Mg.*, 221.
Melinda *R.-D.*, 111.
Metallea *v. d. Wulp*, 179.
metallica Macq., 192.
metallica v. d. Wulp, 31.
Metalliopsis *Tnsd.*, 179.
metilia Wlk., 52.
micans Big., 155.
Microcalliphora Tnsd., 135.
micropogon Big., 141.
misera auct., nec Wlk., 266
mongolica *Sty.*, 120.
monsdulitæ, sp. n., 131.
monspeliaca R.-D., 33.
Mufetia R.-D., 32.
munda Wd., 157.
muralis Wlk., 49.
musca R.-D., 33.
muscina Rond., 192.
Myia Rond., 32.

nana R.-D., 33.
nebulosa Big., 52, 53.
nebulosa Sen.-Wh., nec Tnsd., 163.
nebulosa *Tnsd.*, 155.
Neomalinda Mall., 111.
nepalana Sen.-Wh., nec Tnsd., 162.
nepalana *Tnsd.*, 168.
nepenthicola *Schm. & Vill.*, 133.
nesiotis *Schin.*, 46.
nigra *Mall.*, 77.
nigricans *Vill.*, 63.
nigricauda Big., 199.
nigriceps Patt., 144.
nigricornis Sen.-Wh., 55.
nigripennis Hough, 137.
nigripes *Aub.*, 147.
nigripes Sen.-Wh., 192.
nigritibia Mall., 196.
nigrocærulea Mall., 175.
nigrofasciata Macq., 143.
nigrofasciata Wlk., 160.
nigrofemorata Sen. Wh., 181
nigro nitens *Sen.-Wh.*, 74.
nila *Sen.-Wh.*, 200.
Nitellia R.-D., 115.
nitescens Wlk., 52.
nosocomorium Dol., 52.
notata *v. d. Wulp*, 180.
nuba *Wd.*, 281.
nubiana Big., 143.

obesa Big., 52.
obscuripennis Big., 91.
obscura Esch., 39.
Ochromyia B. & B. (nec Macq.), 65.
Ochromyia Macq., 83.
Ocrisia Tnsd., 115.
ostracea *Sty.*, 161.
omega *J. & T.*, 208.
orchidea *Bött.*, 244.
orientalis Macq., 141.
orientalis *Mall.* (Id.), 190.
orientalis *Mall.* (Vort.), 75.
orientalis *Parker*, 251.
orientalis Tnsd., 42.
orientaloides *Sen.-Wh.*, 251.
Orizia R.-D., 115.
ostindica *Sen.-Wh.*, 235.

pachyoma Big., 53.
papulina Big., 44.
pallens R.-D., 85.
pallescens Shm., 55.
pallicoxa Big., 180.
pallifrons Big., 55.
papuensis *Macq.*, 52.
Paracampsomyia Hough, 135.
Paradichosia *Sen.-Wh.*, 58.
paradoxa *Vill.*, 37.
Paralucilia B. & B., 136.
Parmacrophaga J. & T., 208.
parvula Mg., 48.
pattoni *Aub.*, 38.
pattoni *Sen.-Wh.*, 248.
pattoni, sp. n., 105.
pauciseta Kram., 242.
pavonina Schin., 141.
persica Sen.-Wh., 222.
pertinens Wlk., 160.
pes-hellcis *Sen.-Wh.*, 218.
pfeifferi Big., 138.

Phanicia R.-D., 46.
phaonis *Sg.*, 116.
phellia Wlk., 41.
phenice Sóg., 160.
philippinensis Mall., 156.
phormicopterus *Bott.*, 215.
Phumonesia Vill., 46.
Phumosa *R.-D.*, 65.
pictifacies Big., 159.
piliscutata *Sen.-Wh.*, 109.
pilitibia Mall., 196.
pilosa *Tnsd.*, 121.
pinangiana Big., 173.
pinguis *Wlk.*, 144.
pleuro fovcolata Vill., 200.
Plinthomyia Rond., 65.
plumata Schin., 168.
Pollenia *R.-D.*, 115.
Polleniopsis Tnsd., 115.
pollinosa *Tnsd.*, 183.
porphyrina *Wlk.*, 53.
prasina *Big.*, 151.
prolata *Wlk.*, 171.
promittens *Wlk.*, 68.
prosbalbina *Baran.*, 239.
Pseudo Calliphora Mall., 32.
pseudocerulana, sp. n., 165.
pseudohuelia *Mall.*, 158.
pseudomelanosa, sp. n., 163.
pseudonepalana, sp. n., 162.
Pseudosarcophaga Kram., 279.
Psilostoma Sure., 135.
puberscens Tnsd., 187.
pulchella *Vill.*, 180.
pulchra *Wd.*, 44.
punctulata *Wd.*, 171.
purpurea Tnsd. (Emid.), 202.
purpurea Tnsd. (Luc.), 49.
pusana *Sen.-Wh.*, 233.
pusilla *Vill.*, 64.
putoria Batt., 141.
Pycnosoma B. & B., 135.
Pycnosomopsis Tnsd., 135.

quadrinotata *Big.* (Ochr.), 90.
quadrinotata *Big.* (Stom.), 194.

Ravinia R.-D., 208.
recurva *Mall.*, 92.
reflectans Wlk., 157.
regalis R.-D., 137.
remuria Wlk., 138.
Rhinia *R.-D.*, 204.
Rhynchomyia *R.-D.*, 183.
Rhynchomyiopsis *Tnsd.*, 184.
robusta *Mall.*, 30.
Roubaudiella Seg., 46.
rubiginosa Big., 157.
rufis *Fab.*, 117.
rufiventris *Fab.*, 270.
rufiventris Macq., 44.
rufiventris *Vill.*, 106.
rufilacies *Macq.*, 141.
rufipes *Fab.*, 183.
rufipes Wd., 213.
rufithorax *Mall.*, 178.

saffranea Big., 138.
Sarcophaga *Mg.*, 208.
sarcophagoides *Mall.*, 110.
Sarcophila *Rond.*, 277.
sarcotes *Seg.*, 185.
sagi Jaen., 54.
scoparilformis *Sen.-Wh.*, 269.
scutellata Macq., 33.
scutellata *Sen.-Wh.*, 61.
semifulva Mall., 37.
Senior White Ho, 223.
sera *Rohd.*, 220.
serenissima, Wlk., 55.
sericata *Mg.*, 54.
serrata *Ho.*, 212, 282.
Seteromyia Rond., 171.
setipyga Vill., 179.
setosa *Tnsd.*, 179.
siamensis *Sen.-Wh.*, 93.
similis *Meade*, 261.
similis Tnsd., 197.
simplex *Wlk.*, 202.
simulatrix Pand., 40.
sinensis *Aub.*, 51.
sinica *Rohd.*, 253.
sivah *Big.*, 168.
solaris Wlk., 42.
Somomyia Rond., 32, 46, 135.
spitzbergensis R.-D., 33.
splendens *Macq.*, 106.
splendens Tnsd., 20.
sternalis *Mall.*, 200.
Stomatorrhina Kertesz, 190.
Stomorhina *Rond.*, 190.
striata Schin., nec Mg., 221.
Strongylomura *Big.*, 151.
subtuberosa Parker, 207.
sumatrana *Mall.*, 114.
Sumatria *Mall.*, 186.
surcouf, *Sen.-Wh.*, 101.
Synamphonevra Big., 171.
Synamphoneuropsis Tnsd., 171.

tagaliana *Big.*, 45.
Tainanina *Vill.*, 108.
talonota *Sen.-Wh.*, 246.

tegulata Wd., 51.
temperata Wlk., 55.
Termitolemnus *Bauan.*, 107.
termitophila Sen.-Wh., 197.
tessellata Big., 137.
testacea R.-D. (Bong.), 88.
testacea *R.-D.* (Rhm.), 204.
testacea *Sen.-Wh.*, 72.
testacea *Tnsd.* (Dxpl.), 129.
testacea Tnsd. (Poll.), 119.
testaceifacies Macq., 143.
Thelychasta B. & B., 151.
Thorneites *B. & B.*, 168.
tibialis *Vill.*, 167.
tifata Wlk., 52.
torosa Wd., 88.
townsendi, nom. nov., 119.
toxopei *Sen.-Wh.*, 122.
Trichometallea Tnsd., 179.
Tricyaleopais Vill., 32.
tripartita Big., 204.
tristylata *Bött.*, 254.
tsushimæ *Sen.-Wh.*, 265.
tuberosa Pand., 266.

unicolor *Macq.*, 201.
unicolor Tnsd., 202.

valangæ *Ald.*, 227.
varia Wlk., 168.
varicolor *Fab.*, 101.
vernicolor *Big.*, 168.
Verticia *Mall.*, 75
veterana Vill., 201.
vicariana Schm., 40.
vicina R.-D., 33.
villeneuvi *Patt.*, 147.
violacea *Macq.*, 31.
violacea *Seg.*, 70.
viridana Sen.-Wh., nec Tnsd., 167.
viridana *Tnsd.*, 163, 168.
viridaurea *Wd.*, 157.
viridis Tnsd., 172, 206.
Viridinsula Shn., 47.
vittigera *Mall.* (Alk.), 177.
vittigera Mall. (Euc.), 152.
vomitoria auct., nec L., 33.
vomitoria *L.*, 39.

wulayari *Sen.-Wh.*, 230.
wulshi *Ho.* 212, 282.
Wilhelmina *Schn. & Vill.*, 132.
Wohlfartia *B. & B.*, 281.

xanthogaster *Wd.*, 197.
xanthopyga *Sen.*-Wh., 97.

yerburyi, sp. n., 166.

zeylanica, sp. n., 164.

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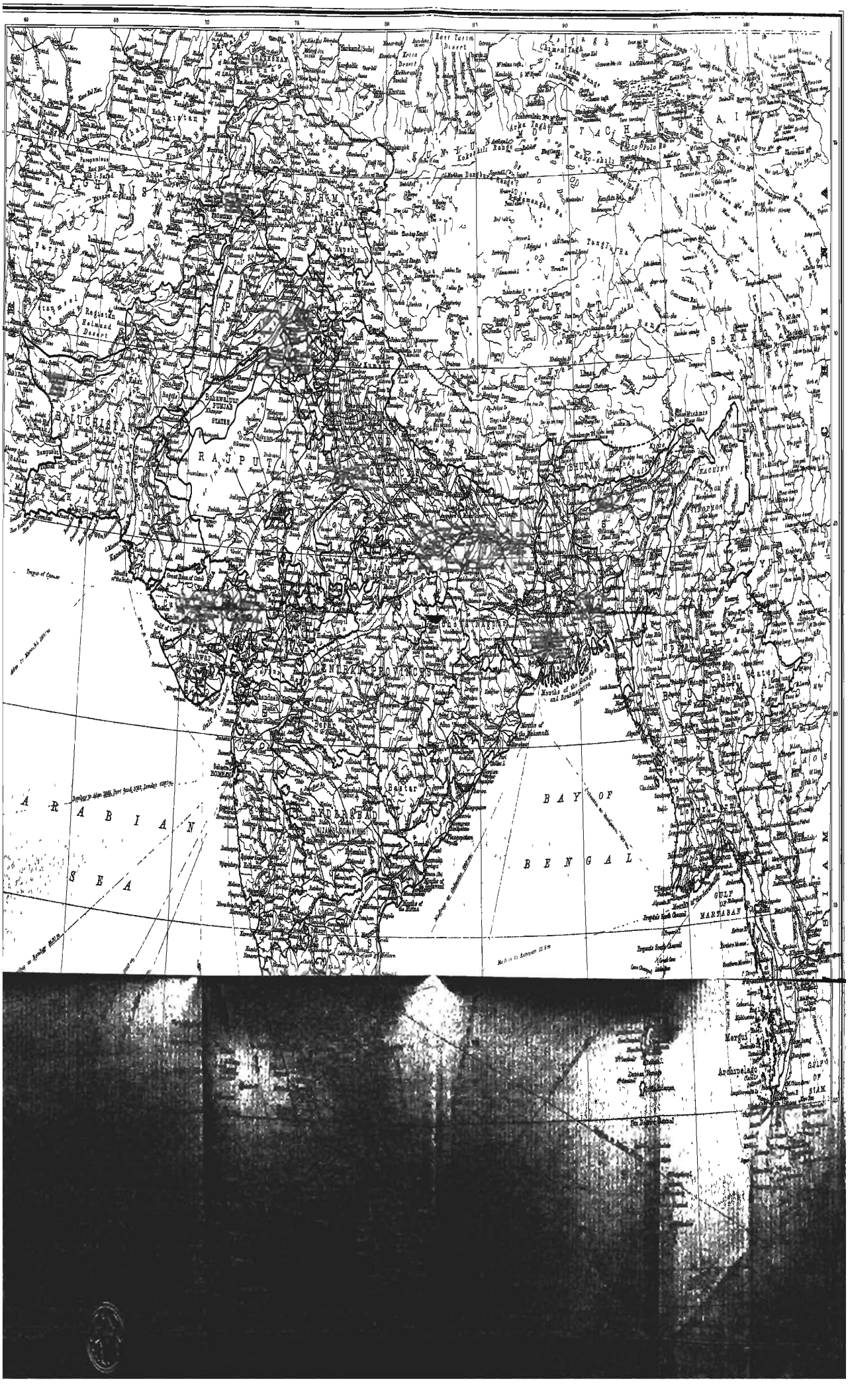
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