

INSECTS OF SAMOA

AND OTHER SAMOAN TERRESTRIAL ARTHROPODA

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*Department of Entomology
Keeper's Study.
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BRITISH MUSEUM (NATURAL HISTORY)

INSECTS OF SAMOA
AND OTHER SAMOAN TERRESTRIAL
ARTHROPODA

PART VI. DIPTERA

FASC. 3. Pp. 109-175

STRATIOMYIIDAE, TABANIDAE AND ASILIDAE
By GERTRUDE RICARDO

A NOTE ON THE LARVAE OF FOUR SPECIES OF STRATIOMYIIDAE
By P. A. BUXTON, M.A.

DOLICHOPODIDAE
By C. G. LAMB, M.A., Sc.D.

SARCOPHAGIDAE
By P. A. BUXTON, M.A.

MUSCIDAE
By J. R. MALLOCH

WITH TWENTY-FIVE TEXT-FIGURES



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INSECTS OF SAMOA

AND OTHER SAMOAN TERRESTRIAL ARTHROPODA

Although a monograph, or series of papers, dealing comprehensively with the land arthropod fauna of any group of islands in the South Pacific may be expected to yield valuable results, in connection with distribution, modification due to isolation, and other problems, no such work is at present in existence. In order in some measure to remedy this deficiency, and in view of benefits directly accruing to the National Collections, the Trustees of the British Museum have undertaken the publication of an account of the Insects and other Terrestrial Arthropoda collected in the Samoan Islands, in 1924-1925, by Messrs. P. A. Buxton and G. H. E. Hopkins, during the Expedition of the London School of Hygiene and Tropical Medicine to the South Pacific. Advantage has been taken of the opportunity thus afforded, to make the studies as complete as possible by including in them all Samoan material of the groups concerned in both the British Museum (Natural History) and (by courtesy of the authorities of that institution) the Bishop Museum, Honolulu.

It is not intended that contributors to the text shall be confined to the Museum Staff or to any one nation, but, so far as possible, the assistance of the leading authorities on all groups to be dealt with has been obtained.

The work is divided into eight "Parts" (see p. 3 of wrapper), which are subdivided into "Fascicles." Each of the latter, which appear as ready in any order, consists of one or more contributions. On the completion of the work it is intended to issue a general survey, summarising the whole and drawing from it such conclusions as may be warranted.

A list of Fascicles already issued will be found on the back of this wrapper.

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INSECTS OF SAMOA

PART VI. FASC. 3

STRATIOMYIIDAE, TABANIDAE, AND ASILIDAE

BY GERTRUDE RICARDO

(With 6 Text-figures.)

STRATIOMYIIDAE.

PACHYGASTRINAE.

1. *Eufijia tibialis* Bezzi.

Diptera Brachycera and Athericera of the Fiji Islands, p. 13, fig. 3, 1928.

THIS species was described by the late Prof. Bezzi from a solitary ♂ specimen taken in the Fiji Islands (Loloti).

The present series of ♂♂ agrees in all respects with the type, except that the slight black colouring of the legs is not present in the Samoan specimens, the legs being wholly yellow.

Length 2-4 mm.

Savaii: Safune, 4 ♂, 12.v.1924 (Bryan). Upolu: Malolotelei, 1 ♂, 19.vii.1925 (Wilder). Tutuila: Leone Road, 1 ♂, 7.ix.1923; Amauli, 1 ♂, 6.xi.1923 (Swezey and Wilder).

CLITELLARINAE.

2. *Hermetia illucens* Linn.

The specimens of this well-known American species in the present collection are all ♀♀.

Upolu: Apia, various dates, iii., v., vi., vii.1924, and 13.ix.1923 (Swezey and Wilder). "Samoa," iii.-viii.1921 (O'Connor). Bred from dead crabs.

The larva is figured on p. 123.

3. *Hermetia samoensis*, sp. n.

♂. Nearly allied to *Hermetia illucens* L., but distinguishable by its much smaller size and by the shape of the pale transparent yellow spots on the second abdominal segment. Eyes bare, as in *H. illucens*.

Head: face and forehead black, with same yellow centre on face below antennae and white pubescent spots on forehead as in *H. illucens*; hairs on face yellowish-white. Antennae as in *H. illucens*, basal part of second joint linear.

Thorax: somewhat shining, bluish-black, with beginnings of three dull yellowish pubescent stripes; at sides, hairs are blackish anteriorly; posteriorly, and on pleurae, dull yellowish.

Abdomen: rather slender; large pale yellow or transparent yellow spots on second segment taking up its whole length and invariably reaching posterior margin of segment,* leaving only a narrow black central line; anteriorly upper edges sloping, outer edges extending upwards, black border on sides a little broader than narrow central line; greyish pubescent bands present only on third and fourth segments, widest at sides and seldom continuous. Genitalia small, apparently similar to those of *H. illucens*.

Legs: similar to those of *H. illucens*; front tibiae usually entirely dark, sometimes faintly pale at base and clothed throughout with pale coloured pubescence.

Wings: brownish, varying in intensity of colour, but always paler on posterior border.

♀. Agreeing with ♂; basal part of second joint of antennae dilated.

Length, ♂♀, 9–11.5 mm.

Hermetia samoensis may perhaps be nothing more than a local form of *H. illucens*,† since I can find no really very distinct differences, though possibly the second antennal joint in the ♂ is more linear. Moreover, besides its very much smaller size, *H. samoensis* is less robust.

Upolu: Apia, type ♂, and numerous other ♂♂ and ♀♀, from rotting pumpkins and chicken dung, iv.1925; Vailima, 1 ♀, vi.1924.

* In some of the specimens of *H. illucens* in the British Museum these yellow spots also attain the posterior margin; Williston (*Trans. Amer. Ent. Soc.*, Vol. xv, p. 246, 1888) notes that in none of his North and South American ♀♀ of *H. illucens* do the yellow spots reach the hind border of the second segment as they do in the ♂.

† The larva, however, is different, see p. 123.

3A. Genus et sp. indet.

Near *Ampsalis* Walker, of which, according to the late Mr. E. Brunetti, *Tracana* Walker is an absolute synonym.

A ♂ and ♀, the latter much damaged. ♂. Antennae long, second joint twice as long as first, third joint long and complex.

Thorax and scutellum blackish.

Abdomen reddish-brown.

Legs entirely yellow.

Wings shaded yellow on fore borders, as far as apices of basal cells and first vein from the discal cell.

Length 4 mm.

Upolu: Tuaeфу, Sliding Rock, 1 ♂, 16.ix.1923 (Swezey and Wilder).

Savaii: Safune, rain forest, 2,000–4,000 feet, 1 ♀, 9.v.1924 (Bryan).

CHRYSOCHLORINAE.

4. *Chromatopoda annulipes* Walker (Text-figs. 1 and 2).

Sargus annulipes Walker, *List Dipt. Ins. in coll. Brit. Mus.*, Pt. III, p. 515, 1849.

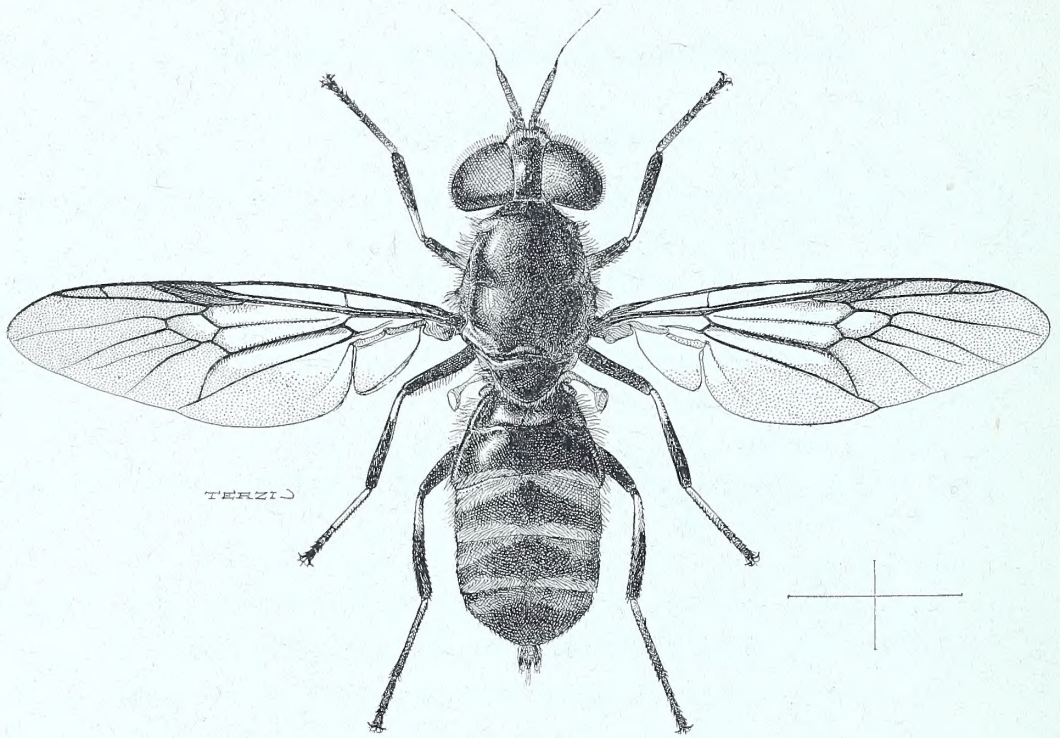
Chrysochlora frontalis Thomson, *Eugenies Resa*, Dipt., p. 459, 1869.

The late Professor Bezzi (*op. cit.*, p. 33) records this species from Fiji, and states that *Chrysochlora frontalis* Thomson is the male of Walker's species, and that *Chrysochlora bicolor* Macquart is merely a variety of the latter. Bezzi gives a synoptic table for the distinction of the three forms, and says that the genus is characteristic of the Pacific Islands. The British Museum possesses a ♂ of the present species from Tahiti, Society Is., 13.iii.1925 (*Miss L. E. Cheesman*).

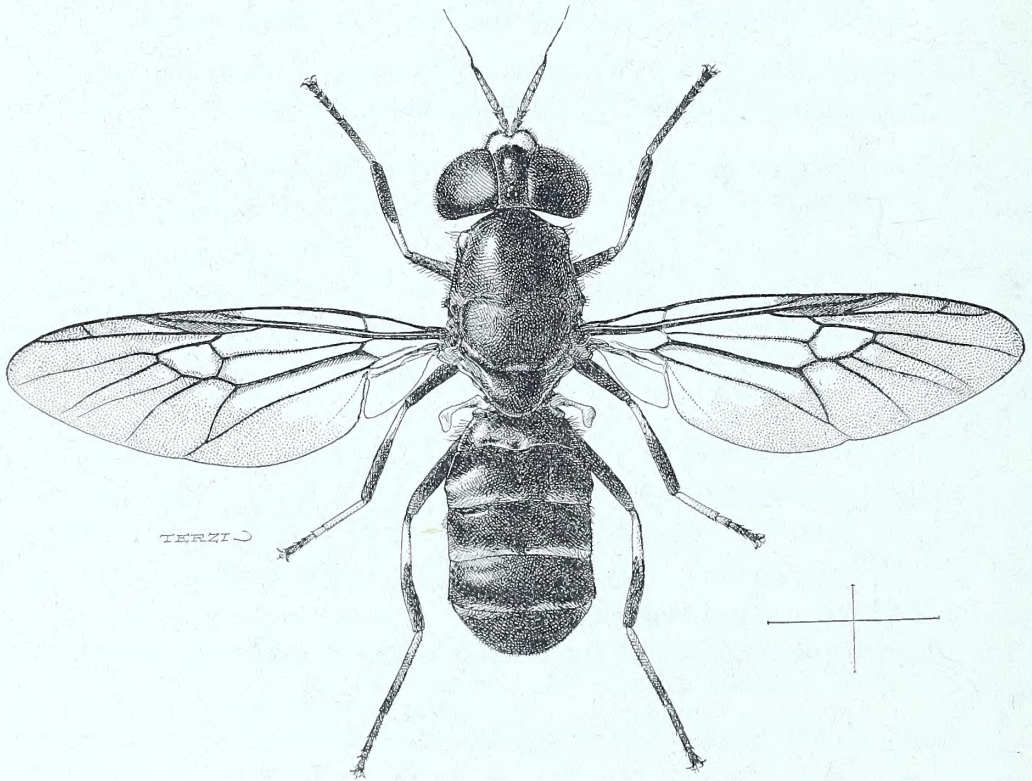
Some of the specimens in the series from Samoa vary in the colouring of the legs, which are almost entirely black in four ♂♂ and two ♀♀; these individuals also have the face dull yellowish-brown instead of metallic green. They all come from Safune, the ♂♂ from the rain forest, 2,000–4,000 feet, and one ♀ from the lowlands (up to 1,000 feet).

A ♂ and ♀ pinned together, presumably taken *in coitû*, are typical of the species.

Length: ♂, 9.5–12 mm.; ♀, 8–12 mm.



TEXT-FIG. 1.—*Chromatopoda annulipes* Walker. ♂.



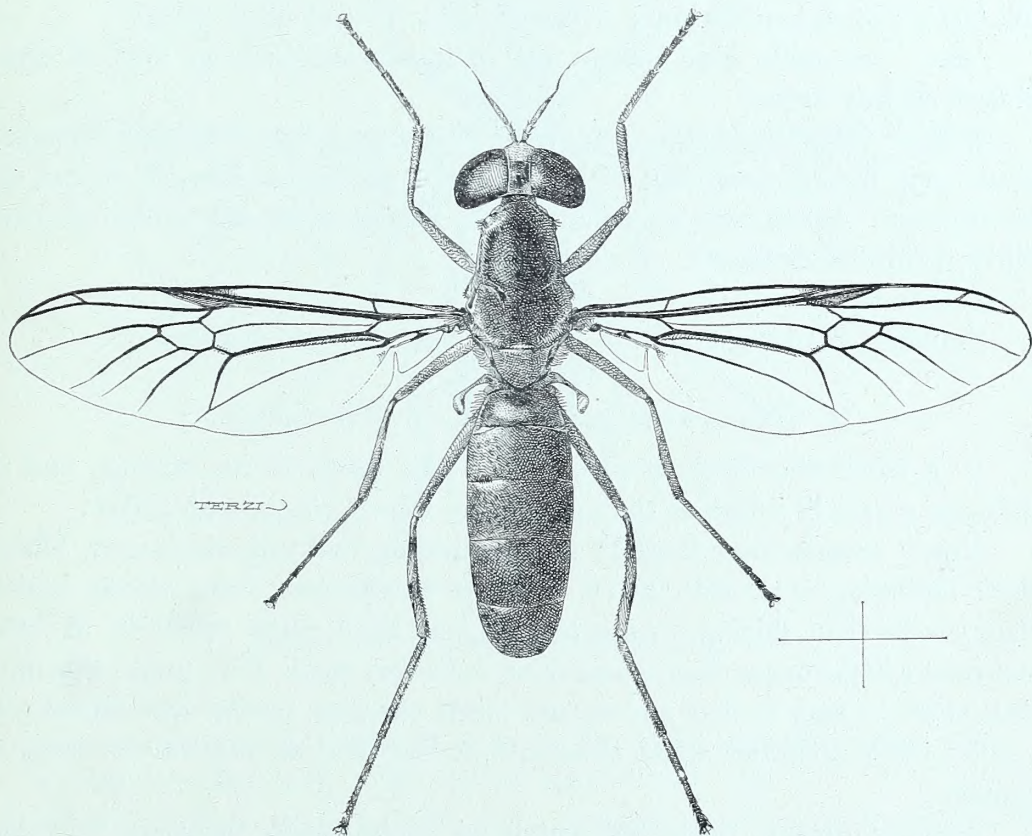
TEXT-FIG. 2.—*Chromatopoda annulipes* Walker. ♀.

Savaii : Safune, rain forest, 5 ♂, 2, 3.v.1924 (Bryan) ; Safune, 2 ♀ (Bryan).
 Upolu : Apia, 6 ♂, varying dates, v.1924, 6 ♀, varying dates, v., vi.1923, vi.1924
 (Armstrong). Tutuila : Pago Pago, 1 ♂, 12.vi.1924, 1 ♀, 18.iv.1924 (Bryan).
 Manua : Ofu : 1 ♀, 27.ii.1926 (Judd) ; and Tau, 1 ♂, 20.ii.1926 (same collector).

5. *Chrysochlora luteipes*, sp. n. (Text-fig. 3).

♀. Dorsum of thorax greenish ; abdomen mahogany-brown ; legs almost wholly yellow.

Head : broader than thorax ; face, front and proboscis yellow, large protruding tubercle taking up most of face almost transparent pale yellow ; a



TEXT-FIG. 3.—*Chrysochlora luteipes*, sp. n. ♀.

very few pale hairs at base of antennae and also above oral opening ; front only slightly narrower at vertex. Ocelli situated on a large dusky spot, having an

irregular anterior margin and extending to borders of eyes and above them. Antennae long, first two joints small, reddish-yellow, third joint twice as long as first two joints combined, brownish and slightly pubescent, with long slender arista, thickened at its base and exceeding main portion of antenna in length.

Thorax: slightly punctate on dorsum, greenish-black, shining; shoulders and anterior border, sides and posterior corners yellowish-brown, shining; pubescence very scanty, thickest below suture, consisting of very short yellow hairs; pleurae yellowish (rather brighter than colour of forehead), mesopleurae paler; metapleurae yellow, with white hairs; scutellum mahogany-brown, posterior border yellowish.

Abdomen: mahogany brown, with black indistinct median line and some dull black blotches on dorsum; venter similar, without black stripe.

Legs: yellowish, hind femora rather transparent-looking, dark at tips; all tarsi slightly darker.

Wings: large, longer than abdomen, with stout brown veins and a stigma; second vein forked, discal cell with three veins proceeding from it, second one the shortest; fourth vein proceeding from second basal cell bordering discal cell for a third of its length. *Halteres* yellow.

Length 14 mm.

Tutuila: Pago Pago, type ♀, 30.ix.1923 (Swezey and Wilder).

6. *Chrysochlora insularis*, sp. n. (Text-fig. 4).

♀. A small blue-black species, with a long arista to its antenna, and its abdomen narrowly yellow at the sides. Legs brown, ringed with yellow.

Head: broader than thorax; face protruding, dull yellowish-brown, bluish-black bordering eyes, with traces of white tomentum; front wholly bluish-black, somewhat shining. Antennae brown, third joint yellowish at base, first joint a little longer than second joint, both very small, third joint being more than twice as long as first and second joints together, conical and tapering to a point, with a slender arista thickened at base and as long as remainder of antenna.

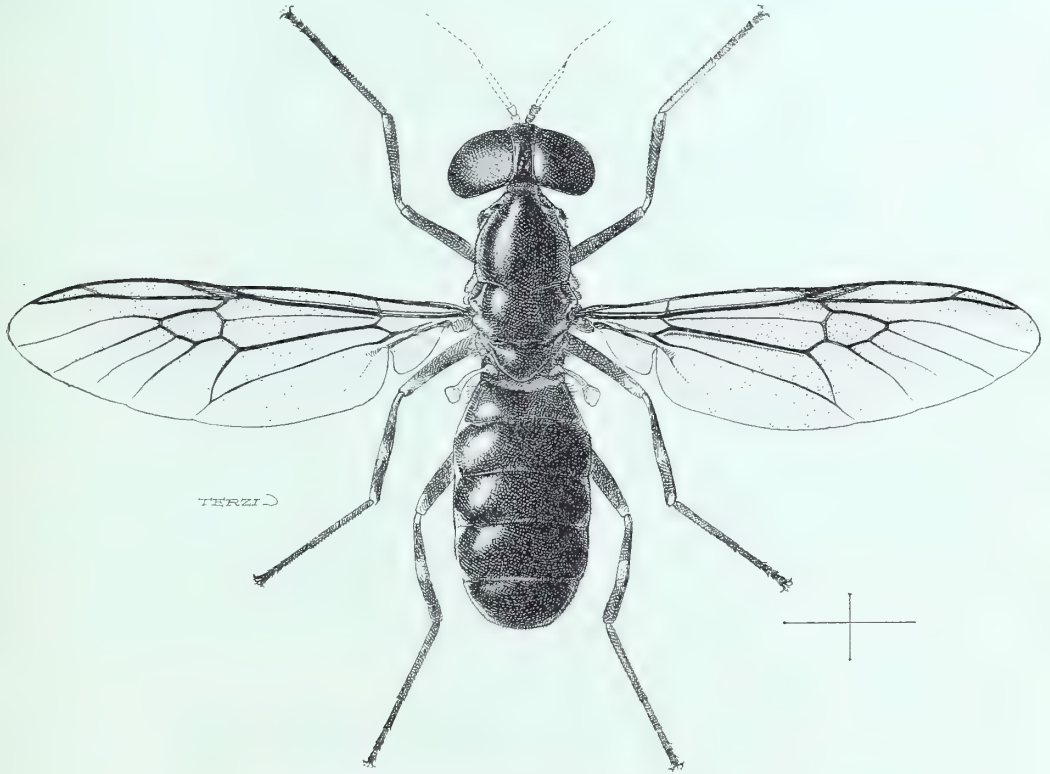
Thorax: dorsum (including scutellum) bluish-black, shoulders yellowish-brown, nearly devoid of pubescence; pleurae black, mesopleurae dull honey-yellow.

Abdomen: same colour as thorax; narrow yellow borders at sides of segments widest on second, third and fourth segments; dorsum almost bare,

a little pale pubescence visible on last segment ; venter black, with large, median, dull yellow triangles, their wide bases reaching sides.*

Legs : brown, coxae and basal halves of hind femora yellowish, hind tibiae with yellowish ring in middle.

Wings : clear, with stout brown veins and large brown stigma ; venation as in *C. luteipes* ; fourth vein proceeding from second basal cell borders discal cell for half its length.



TEXT-FIG. 4.—*Chrysochlora insularis*, sp. n. ♀.

Length 7–8 mm.

Upolu : Malololelei, 2,000 feet, type ♀, 26.v.1924, paratype ♀, 4.v.1924.

Larvae in rotten bark. The larva is figured on p. 123.

The only other species of this genus recorded as occurring in the Pacific are the yellowish *Chrysochlora lineata* de Meijere, *Nova Guinea, Zool.*, ix. 3, p. 318, 1913 (New Guinea) ; and *Chrysochlora fasciata* Thomson, *Eugen. Resa*,

* In the paratype these spots are smaller.

Diptera, p. 460, 1869 (Galapagos Is.), which is described as having a short arista, while the colouring of the abdomen is different.

GEOSARGINAE.

7. *Microchrysa maxima* Bezzi.

Op. cit., p. 33, 1928.

A series of males and females, which agree in every respect with Bezzi's species, the types of which were bred from "banana refuse" in Fiji. Prof. Bezzi characterises the species as the largest yet known in this genus, measuring 8–10 mm. in length.

The female from Tonga in this series has a green, metallic, shining abdomen. The larva is figured on p. 123.

Upolu : Apia, 10 ♂, 7 ♀, bred from rotten pumpkin, ii. and xi.1925. Savaii : rain forest, 2,000–4,000 feet, 1 ♀, 1924 (Bryan). Tonga : Haapai, 1 ♀, 13.ii.1925.

This species has a very strong general resemblance to *Sargus hovas* Bigot, *Ann. Soc. Ent. France*, (3), vii, p. 133, 1859, for which Kertész (*Trans. Linn. Soc., Lond.*, xv, p. 99, 1912) founded the genus *Cephalochrysa*. The two species are almost identical in size, but *M. maxima* differs in having no pale posterior border to the scutellum, while the white band on the front is split up into spots. Kertész regarded his genus as being distinct from *Microchrysa* owing to larger size, identity of colouring in the two sexes, the dark colour of the veins of the wings, and the fact that the white band on the front reaches the eye on each side. Since all these characters are present in *M. maxima* Bezzi, it would appear that Kertész's genus should be sunk in *Microchrysa*.

The above remarks are based on a series of *Microchrysa* (*Sargus*) *hovas* from the Seychelles Is. (Mahé), in the British Museum. According to Bigot, the type of the species was taken in Madagascar.

TABANIDAE.

TABANINAE.

8. *Tabanus samoensis* Ferguson.

Bull. Ent. Research, xvii, 3, p. 315, fig. 1, March, 1927.

Tabanus samoensis is the only species of the present family known to occur in the Samoan Islands. The type and two paratypes, all females, are in the

British Museum, which also possesses an hitherto unnamed female specimen, taken in Samoa in 1920 by Dr. F. W. O'Connor.

T. samoensis is described as a "medium-sized dark-brown species, related to *T. torresi*, Ferg. and Hill;" the latter is a Papuan species, which occurs also within Australian territorial limits.

According to a field-note by Buxton, in *T. samoensis* the "eye colour in life is a uniform dark green." I would add that the general colour of the body appears to me more blackish brown than "dark brown (almost chocolate)," as described by Ferguson.

Upolu: Malololelei, 2,000 feet, type ♀ and 1 paratype ♀, 18.iv.1924; Malololelei, 2,000 feet, a second paratype, ♀, 4.v.1924. Samoa, 1 ♀, 1920 (F. W. O'Connor). Tutuila: Pago Pago, 1 paratype (Bryan).

In the introduction to his description, the late Dr. Ferguson remarked that Tabanidae from Fiji and the New Hebrides were not available for comparison.

This species is not closely allied to any of those mentioned or described in Bezzi's work, and the shape of the palpi, which are not "long, slender, of about same breadth throughout," distinguishes it from all the species given in his table, pp. 34, 35.

Tabanus expulsus Walker was originally taken in the New Hebrides, but the type is not now to be found in the British Museum. According to the description, this species cannot be identical with *T. samoensis*.

ASILIDAE.

LEPTOGASTRINAE.

9. (?) *Leptogaster javanensis* de Meijere.

Tijdschr. voor Ent., Deel 56, Supplement, p. 39, Pl. 2, fig. 14, 1914.

Two specimens in poor condition may possibly belong to this species, which was described from a solitary male, from Java. The individuals before me agree with de Meijere's description in having the same shining black thorax, and the same shading at the tip of the wing; but they differ in having the hind tibiae only darker at the apices, without black stripes, while the small transverse vein is situated on the middle of the discal cell, instead of at the end of the basal fourth of the cell.

Savaii: Salailua, rain forest, 2,000–4,000 feet, 1 ♂, 17.v.1924 (Bryan).
Upolu: Malololelei, 2,000 feet, 1 ♂ (♀?), xii.1925.

No species of Asilidae has hitherto been recorded as occurring in Samoa, and Bezzi (*op. cit.*, p. 41) describes only one new Fijian species of *Leptogaster*.

LAPHRIINAE.

10. *Maira aenea* Fabr.

This well-known species has been recorded as occurring as far east as Dutch New Guinea, and the British Museum possesses specimens from the New Hebrides and N.-E. Queensland; Macquart records it from New Ireland and the Solomon Islands.

Specimens before me agree with de Meijere's statement concerning examples from New Guinea, in having in the moustache four black bristles, with a lower yellow pair. The ♂ from Apia has exclusively yellow bristles, and the hairs on the legs are yellow. The ♂♂ vary in length from 10 to 16 mm., and the ♀♀ from 10 to 12 mm.

Tutuila: 1 ♂, 760–900 feet (Kellers); Leone, 2 ♂, 11.viii.1925, and 18.ix.1923 (Swezey and Wilder); Pago Pago, 3 ♂, 1 ♀, 12.ii.1924, 2 ♂, 1 ♀, 2.iv., 16.viii., and 23.ix.1924 (Bryan); Afono, 1 ♀, 25.ix.1923. Manua: Amauli, 1 ♀, 5.ix.1923 (Swezey and Wilder). Savaii: Safune, 1 ♀, 15.v.1924 (Bryan). Upolu: Apia, 1 ♂, 4.xi.1924, 1 ♀, 30.viii.1924 (Armstrong).

11. *Maira varians*, sp. n.

♂♀. A bluish, metallic, shining species with no pale markings on the thorax; the moustache is composed of black bristles and finer long pale yellow hairs; the black bristles, which number six on each side, distinguish the present species from *Maira aenea* Fabr., and *Maira hispidella* v. d. Wulp. Judging from the description that this species was nearly allied to, if not identical with, *Maira hispidella* var. *nigropilosa* de Meijere, of Dutch New Guinea, I sent a couple of specimens to the author for comparison. This Prof. de Meijere was good enough to undertake; he also kindly forwarded to me a male specimen of his var. *nigropilosa*, which I have presented to the British Museum. As Prof. de Meijere points out, there are small differences in the Samoan species which preclude it from being regarded as identical with his subspecies; and, since it does not agree with the description of any known species occurring in the

Australian or Oriental Region. I reluctantly treat it as a new species of this difficult genus.

Maira varians differs from de Meijere's subspecies in the shape of the genitalia, which are not so stout; the basal cells of the wings are also darker, with brown streaks at each side bordering the veins, the streak bordering the third longitudinal vein being the most apparent; in var. *nigropilosa* only the extreme apex of wing is darkened, with side streaks hardly appearing. The male has either no tomentose spots on the abdomen or, if present, they are very small. The species is less robust in appearance than the New Guinea species.

♂. *Head*: face brownish-black, with some dull brown tomentum and bright golden yellow or yellowish hairs below antennae and at sides; moustache composed of many hairs and bristles, about six long black bristles on each side, two lower ones shorter and weaker, long and short yellow hairs intermixed with bristles. Palpi black-haired. Beard dirty white. Antennae blackish; first joint quite twice as long as second, both with short black bristles; third joint large, narrow at base. Front black, with some reddish-yellow tomentum and hairs at sides, and two long, black, ocellar bristles. Occiput with soft black hairs. Collar black, with black hairs.

Thorax: shining metallic green or blue, shoulders covered with hoary coloured tomentum; a small, short stripe on central line of anterior half of dorsum, not reaching anterior border; pubescence on dorsum consisting of scanty black hairs on central line, thicker and longer at sides, with three rather weak supra-alar bristles and two post-alar bristles. Pleurae covered with hoary tomentum, and with a few whitish hairs; pteropleurae with a bunch of long, fine, black hairs. Scutellum of same colour as main portion of dorsum, with long black bristly hairs on its posterior border.

Abdomen: of same colour as thorax, with short black pubescence; traces of white tomentose spots on posterior angles of segments rarely present; * sides of abdomen with rather weak, indistinct bristles, two on first segment and one or two on following three segments, and with fine, chiefly black, rather numerous hairs; venter similarly clothed. Genitalia of same colour as remainder of abdomen, black haired, lower pincers much less swollen at base than those of var. *nigropilosa*, being of much the same stoutness on basal two thirds.

* Among the material before me, only one ♂ shows these spots, and even here they are very small and indistinct; in the specimen of *M. hispidella* var. *nigropilosa* received from Prof. de Meijere there are distinct spots on the second, third, and fourth segments.

Legs : of same colour as body, with fine soft black hairs ; front femora and front coxae clothed with white hairs below, and partly so above ; * pubescence thickest on tibiae, front and middle pairs with long black hairs on their outer sides, and with black bristles.

Wings : dark brown, paler at base and on lower fore border.

♀. Agreeing generally with ♂ ; hoary spots on abdomen present, but very small ; bristles on sides of abdominal segments stouter ; legs not so thickly pubescent.

Length : type ♂, 12 mm. ; other ♂♂, 12–16.5 mm. ; type ♀, 15 mm. ; other ♀♀, 9.5–12 mm.

Tutuila : Pago Pago, type ♂ and ♀, 14.xii.1925. Upolu : 1 ♂, 2 ♀, 15.ix.1923, 2 ♂, 14.xii.1925 (Swezey and Wilder) ; Vailima, 1 ♀, 8.vi.1924 ; Malololelei, 2,000 feet, 2 ♂, 18.iv., 21.vi.1924 (Armstrong). Savaii : Safune, lowlands up to 1,000 feet, 2 ♀, 1, 13.v.1924 (Bryan).

ATOMOSIINAE.

11A. (?) *Atonia* (Williston *nec* Gistel) sp.

A small damaged specimen, without wings and approximately 8 mm. in length, which certainly belongs to the above-mentioned subfamily, appears to be closely related to Williston's genus *Atonia*, the recorded species of which occur in Mexico and San Domingo, and on the western coast of South America.

Upolu : Malololelei, 1 ♂, 8.vii.1925 (Wilder).

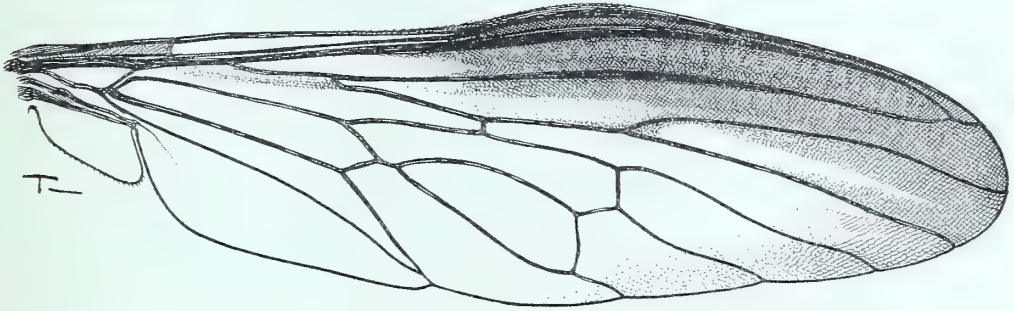
OMMATIINAE.

12. *Ommatinus varitibiatus*, sp. n. (Text-figs. 5 and 6).

♂♀. The available specimens are somewhat denuded, so that the pubescence on the thorax cannot be described. They bear a strong resemblance to *Ommatinus curvimargo* Bezzi (*op. cit.*, p. 48, fig. 15, 1928), of Fiji, but they are without the strong bristles on the hind femora, and the outward curve of the costal margin of the male wing is not so sharp and short. The anterior transverse vein in the female is far beyond the middle of the discal cell ; in the male it is at the middle

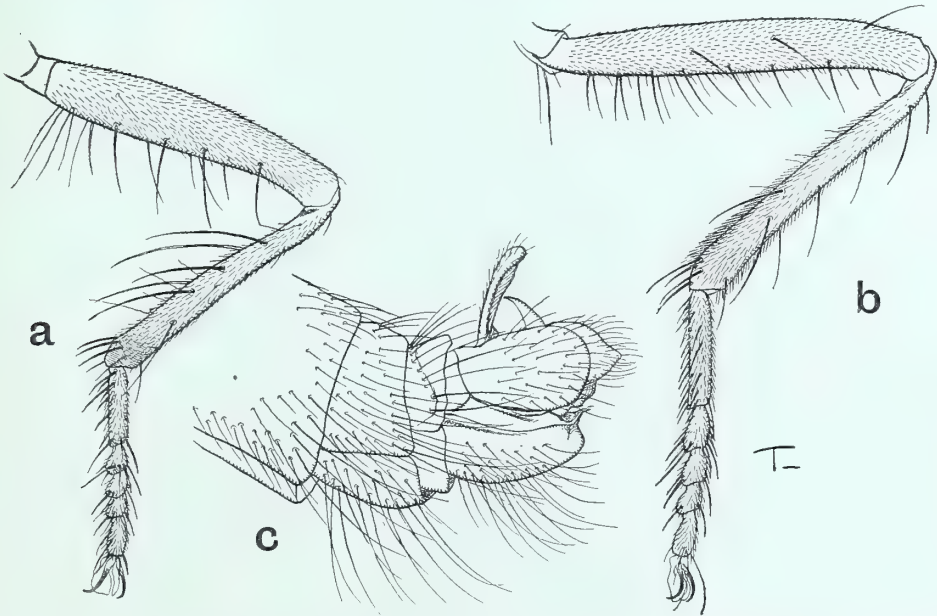
* No white hairs are visible on the legs of *Maira hispidella* v. d. Wulp var. *nigropilosa* de Meijere.

in the Fijian species it is before the middle. The moustache is more yellow and the very strong spines above the mouth are yellow, not black; the moustache in the male is wholly yellow, in the female the upper long bristles are dark.



TEXT-FIG. 5.—*Ommatinus varitibiatus*, sp. n. Wing of ♂.

The femora have yellow, rather weak bristles below and one or two above; the middle pair have several very strong black ones on the upper side. The



TEXT-FIG. 6.—*Ommatinus varitibiatus*, sp. n. a, Middle leg of ♀; b, hind leg of ♀; c, ♂ genitalia.

tibiae all bear black bristles, which, as in *O. curvimargo*, are especially long and strong in the case of the front pair; the tarsi are more reddish-brown than black.

Length : type ♂, 19 mm. ; type ♀, 18.5 mm.

Savaii : Safune, rain forest, 2,000-4,000 feet, type ♂ and type ♀, 3.v.1924 (Bryan).

LIST OF TEXT-FIGURES.

- Text-fig. 1. *Chromatopoda annulipes* Walker. ♂.
 " 2. " " " " ♀.
 " 3. *Chrysochlora luteipes*, sp. n. ♀.
 " 4. " *insularis*, sp. n. ♀.
 " 5. *Ommatinus varitibiatus*, sp. n., wing of ♂.
 " 6. " " " sp. n. *a*, middle leg of ♀; *b*, hind leg of ♀; *c*, ♂ genitalia.

A NOTE ON THE LARVAE OF FOUR SPECIES OF
STRATIOMYIIDAE

BY P A. BUXTON, M.A., London School of Hygiene and Tropical Medicine

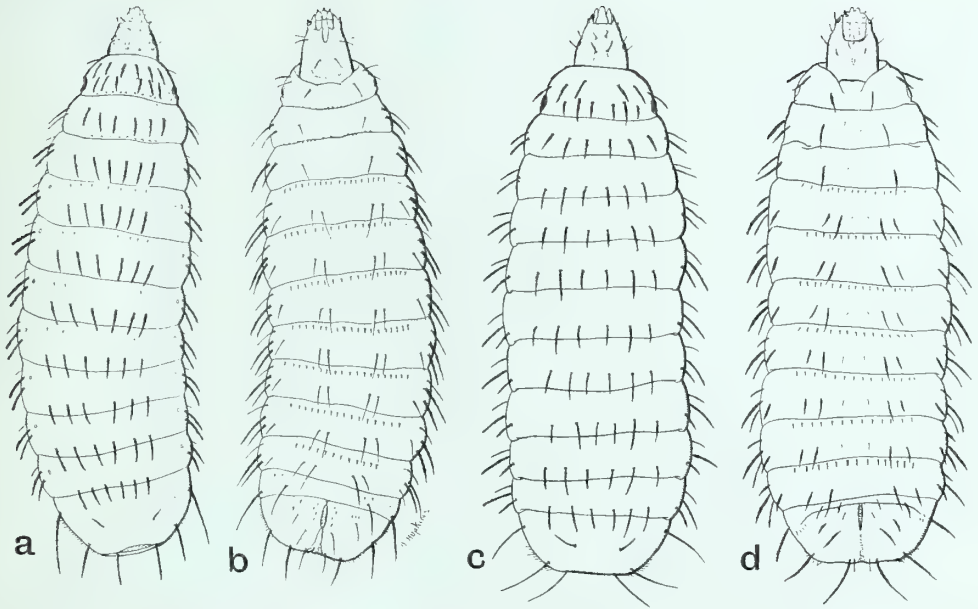
(With 2 Text-figures.)

SPECIMENS of the larvae of four species (*Hermetia illucens* Linn., *H. samoensis*, sp. n., *Chrysochlora insularis*, sp. n., and *Microchrysa maxima* Bezzi) were collected. It was evident that these larvae are important scavengers, especially as they are large, and in some cases numerous; they devour the remains of plants and animals after *Musca*, *Chrysomyia*, *Sarcophaga*, etc., have ceased to be attracted to them. In other words, in Samoa and other countries, Stratiomyid larvae compete with mites and larvae of beetles, rather than with larvae of most other Diptera. The actual decayed materials from which the species were bred are mentioned in the text of Miss Ricardo's paper.

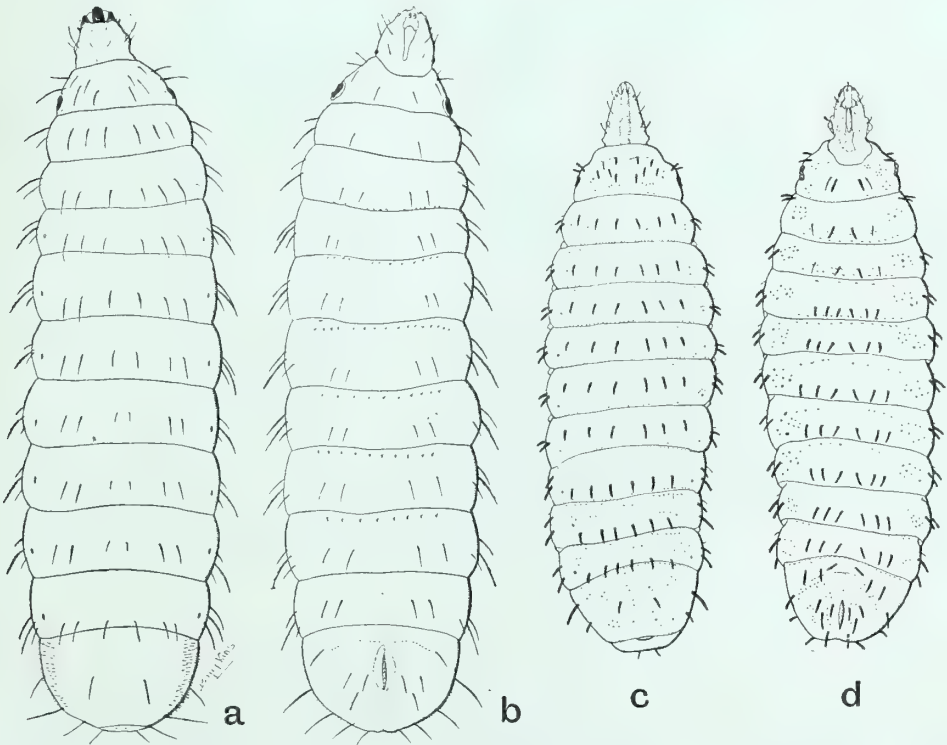
The external characters of the larvae are sufficiently shown in the figures, which require no annotation. The small hairs, which clothe the dorsum of all segments, have been omitted. They occur in all the four species, but are coarser on *C. insularis* than on the other larvae.

LIST OF TEXT-FIGURES.

- Text-fig. 1. *Hermetia illucens* Linn., *a*, dorsal, *b*, ventral aspect; *Hermetia samoensis*, sp. n., *c*, dorsal, *d*, ventral aspect.
 ,, 2. *Chrysochlora insularis*, sp. n., *a*, dorsal, *b*, ventral aspect; *Microchrysa maxima* Bezzi, *c*, dorsal, *d*, ventral aspect.



TEXT-FIG. 1.—*Hermetia illucens* Linn., *a*, dorsal, *b*, ventral aspect; *Hermetia samoensis*, sp. n., *c*, dorsal, *d*, ventral aspect.



TEXT-FIG. 2.—*Chrysochlora insularis*, sp. n., *a*, dorsal, *b*, ventral aspect; *Microchrysa maxima* Bezzi, *c*, dorsal, *d*, ventral aspect.

DOLICHOPODIDAE

BY C. G. LAMB, M.A., Sc. D., Engineering Laboratory, Cambridge.

(With 13 Text-figures.)

THE perusal of such a monograph as Becker's *Dolichopodidae der Indo-Australischen Region* will show that practically nothing is known as to the distribution of these insects in the smaller archipelagos of the Pacific. Sporadic small collections have been made from time to time, but the records are rather of collectors' visits than of insect habitats. Moreover, the insects are liable to be distributed in soil imported with plants; thus Grimshaw described *Chrysosoma pallidicorne* from specimens from Hawaii, and the species was also collected in the Seychelles. In addition, it has also been recorded from Formosa, a locality which has been more assiduously investigated than almost any other in the Tropics. There can be little doubt that its natural home is somewhere in Tropical Asia, and that the Islands received it as an immigrant.

The present collection is small, and almost the only species of the family that can be named with a fair degree of certainty belong to the same subfamily, the Chrysosomatinae. The few specimens of the other genera represented (such as *Sympycnus* and *Chrysotus*) are unluckily in too damaged a condition to warrant any conclusions as to affinities. The Chrysosomatinae include a species (or possibly subspecies) near to the Pacific *C. patellifer* Thoms., and there is a small group which may well be endemic. But on the whole few conclusions can be drawn as to the distributional relationships of the group. Furthermore, there are no clear indications of seasonal or zonal distribution.

MEDETERINAE.

1. *Medeterus grisescens* Meigen.

A single ♂ specimen of this widespread species.

Upolu : Malololelei, 2,000 feet, xii.1925. India, Ceylon, Seychelles.

DIAPHORINAE.

There are a few imperfect specimens of two species of the genus *Chrysotus*, which occur in all the Samoan islands. In addition, there are single male specimens of two interesting forms of the subfamily. One is very like *Chrysotus*, but the arista is absolutely dorsal, and the third joint is shortly triangular. This species is most closely allied to *Melanostolus*, but is not a member of that genus. The other is an insect with the facies of a dark *Diaphorus*, but the arista is quite apical, and the eyes are widely separate above and below.

It is unfortunate that these two interesting forms are represented only by single specimens; they are referred to in the hope that the attention of collectors may be drawn to this group.

CAMPSICNEMINAE.

Sympycnus, Loew.

The collection before me includes two males and five females from all the main islands. Unless specimens are in the most perfect condition, especially as regards their tarsal joints, it is impossible to determine even the section of the genus to which they belong. Unfortunately none of the present specimens are in sufficiently good order for any attempt at naming them to be possible.

CHRYSOSOMATINAE.

Chrysosoma, Guér.

The vast majority of the Dolichopodidae brought back by Messrs. Buxton and Hopkins belong to this genus, as defined by Becker. In Samoa, as elsewhere in the tropics, *Chrysosoma* appears to be the dominant genus. Becker's monograph in *Capita Zoologica, Deel I, Aftlevering 4* ('s Gravenhage: Martinus Nijhoff, 1922) has been taken as the basis for determination. Unfortunately the genus as now limited is merely a convenient category for the reception of species; with increased knowledge of the forms, however, reasonable subdivisions will doubtless be possible.

2. *Chrysosoma ferrifer*, sp. n. (Text-fig. 1).

There is a considerable number of both sexes of a species which must be very close to Thomson's *C. patellifer*. Bezzi (*Diptera Brachycera and Athericera of the Fiji Islands*, p. 66, 1928) points out that this Pacific species evidently

varies from one locality to another, and it is possible that we have here no more than a very dark subspecies. It is better, however, to give a fairly detailed description in order to facilitate future discriminatory work. Owing to its very dark colour it superficially resembles Wiedemann's *C. leucopogon*, and since the latter is a widespread and familiar species, reference to it will be made in the description. The females have enormous tibial spines below, and have also two superior bristles on the first tarsal joint of the front legs, which is a definite *leucopogon* character. The male has a hypopygium very like that of *C. patellifer*, shaggy femora, long bristles on the front femur and tibia, and the remarkable "brand" on the hind tibia. It differs in colour, and in having (like *C. patellifer*) spatulate ends to the arista. Care must, however, be taken in the use of the latter character. In some of the present specimens the spatulate tips have been broken off in the process of setting. Hence the definite absence or presence of such expansions cannot be predicated with certainty when species are described from single specimens. As stated above, the present species has its nearest ally in *C. patellifer* Thomson, but is completely different in colour, and slightly so in chaetotaxy. The wings are devoid of fringes, and the spatulate palette of the arista is entire and unslit.

♂. *Head*: like that of *C. leucopogon*, blue-green with face and epistoma much dusted with silver, palpi similarly metallic, and tongue black. Antennae black, with similar long upper and lower second joint bristles; third joint conical with upper margin about twice basal length; arista would reach to end of scutellum if bent back, and has a terminal palette black at base, white and unslit at tip. Post-ocular fringe very dense and pure white.

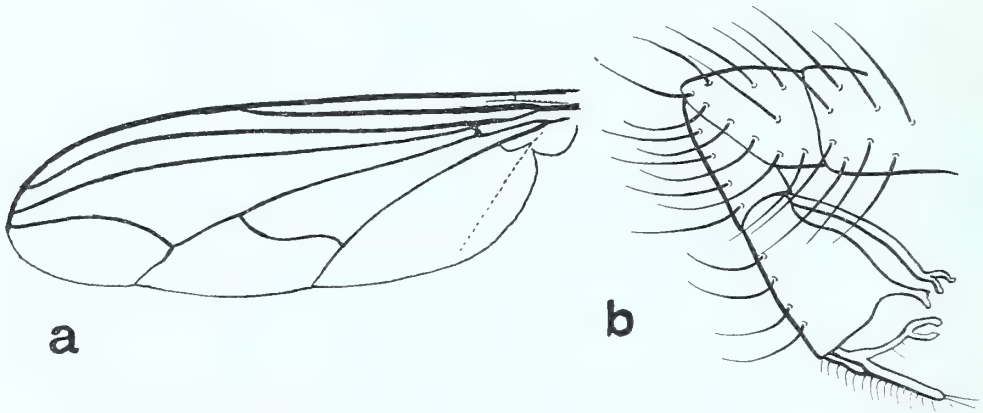
Thorax: dorsum unicolorous, somewhat shining bright green, slightly brassy between d.c. rows; acrostichals 5, lengthening backwards; d.c. consisting of the prescutellars and one in front, followed by five tiny hairs, as in *C. leucopogon*; pleura somewhat shining green above, grey below; as so often the case, dorsum as seen in inspecting pleura, and thus in oblique light, distinctly blue; scutellum concolorous with dorsum, with two long bristles.

Wings (Text-fig. 1, *a*): exactly like those of *C. leucopogon*, glassy and fringeless. *Squamal fringes* long, white and silky. *Halteres* black.

Legs: darkened orange, except for black coxae, trochanters, femora, hind tibiae and very dark hind tarsi. The front femora spindle-shaped; tibia and first tarsal of same length, coxa about two-thirds that length, silvery haired with three smallish end bristles; femur white haired below, with four long

white bristles; tibia with four long superior bristles, tarsi practically unarmed. Mid legs: coxa white haired at base, femur with longish inferior white hairs, tibia with a superior basal bristle, regular clothing bristles, and very small crown, tarsus practically unarmed. Hind legs: femur white haired below, tibia with long brand at base and tiny crown, clothing bristles well aligned, and curved, a single superior bristle at two-thirds length; tarsus unarmed.

Abdomen: dullish green with blackish margins to segments: marginal bristles long, discal ones fairly long; basal segment with a central, V-shaped depression and large bristly side swellings, as in *C. leucopogon*; venter with long white hairs, upper surface of hypopygium similarly clothed. Hypopygium (text-fig. 1, *b*) entirely shining black.



TEXT-FIG. 1.—*Chrysosoma ferrifer*, sp. n.: (a), wing; (b), hypopygium.

♀. Similar to ♂ but with relatively stouter bristles; first front tarsal joint with the two bristles characteristic of the *leucopogon* group. *Legs* devoid of white fringes; mid tibia with longish crown, three equally spaced large anterior bristles and three inferior, middle ones of each row forming a pair; some variation in tibial colour, from orange to a considerable degree of suffusion. Venation differing from that of ♂ in same way as in *C. patellifer*. The wing figured is that of the ♂: in ♀ first vein much shorter, joining costa just about level with beginning of undulated cross vein, instead of about level with end of latter, as in ♂.

Length: 5.5 mm.; wing, 6.5 mm.; antenna, 32 mm.

Localities.—Upolu: Apia, type ♂, 31.v.1924, 1 ♀, 1.vii.1924; Malololelei, 2,000 feet, 1 ♀, vi.1924; Afiamalu, 7.xi.1925 (Witon); Tuaeufu, 16.ix.1923

(Swezey and Wilder). Tutuila : Pago Pago, 1 ♀, 14.xii.1925 ; Tutuila, 800 feet, 1 ♂, iv.1918 (Kellers). Manua : Tau, 1 ♀, 20.ii.1925 (Judd). Savaii : Salailua, 2 ♀, 22.v.1924 ; Safune, 1 ♀, 3.v.1924 (Bryan). Tonga : Nukualofa, 1 ♂, 1 ♀, 15-22.ii.1925 (Hopkins).

3. *Chrysosoma complicatum* Becker.

Becker, *l.c.*, p. 159.

A single ♂ specimen.

Upolu : Aleipata, v, vi.1924.

The typical series of this species was taken by Steinbach in the Marshall Is. (Jaluit).

4. *Chrysosoma parvicucullatum*, sp. n. (Text-figs. 2 and 3a).

This is a fine species, but unfortunately the only available material consists of two males, one of which is somewhat immature.

♂. *Head* : vertex, together with triangle between depressed central area and eyes, purplish green, dusted in parts ; face and epistoma with bright silvery



TEXT-FIG. 2.—*Chrysosoma parvicucullatum*, sp. n. : wing.

dust, except just at base of antennae ; tongue and palpi greyish orange. Occiput silvery grey ; orbital fringe delicate and silvery, as are the hairy jowls ; beard wanting. Antennae black, third joint with a coating of ochreous dust ; upper and lower bristles on second joint very long, third joint a regular flattened cone, about as long as other two joints together ; arista black, but similar to third joint basally, about twice as long as thoracic axis.

Thorax : dorsum entirely shining green, with purplish reflexions ; three pairs of long acrostichals ; the last two pairs of d.c. (including prescutellars), followed by two or three fine hairs ; scutellum concolorous with thoracic dorsum,

metanotum duller green-grey; pleurae entirely greyish silvery; above and in front of wing-base is a conspicuous black velvety oblong spot.

Wings (Text-fig. 2): glassy, with brown veins. *Fringes of squamae* black. *Halteres* long-stalked, entirely pale orange.

Legs: yellow, middle coxae grey, hind femora with swollen tip, forming a black ring; front coxae almost white, all tibiae with glints of silver in certain illuminations; the hind trochanters with a conspicuous spur beneath; middle tibia shaped like a flattened spindle, hind tibia also curiously flattened as far as swollen basal ring mentioned above. Clothing bristles very small and inconspicuous, legs being nearly bare except as follows: front coxa with three black bristles towards tip; middle tibia with small anterior bristle near base; hind tibia with superior and inferior rows of about nine small bristles, and a tiny crown: clothing bristles of hind tarsi better developed than remainder, especially on first joint.

Abdomen: each segment with proximal half purplish black, distal half bright green; basal segment with deep triangular pit extending all along its base, leaving sides as lateral swellings; latter bright green, pit somewhat dull silvery grey; lateral swellings bearing as usual long marginal bristles; remaining segments likewise well provided with marginal bristles, and with abundant small discal bristles; colour pattern extending round venter. Hypopygium (Text-fig. 3, *a*) shining black, hairs on appendages pale.*

Length: $5\frac{1}{2}$ mm.; wing, 6 mm.; antenna, 3 mm.

Upolu: Malololelei, 2,000 feet, type ♂, xii.1925. Savaii: Salailua, 1 ♂, 23.v.1924 (Bryan).

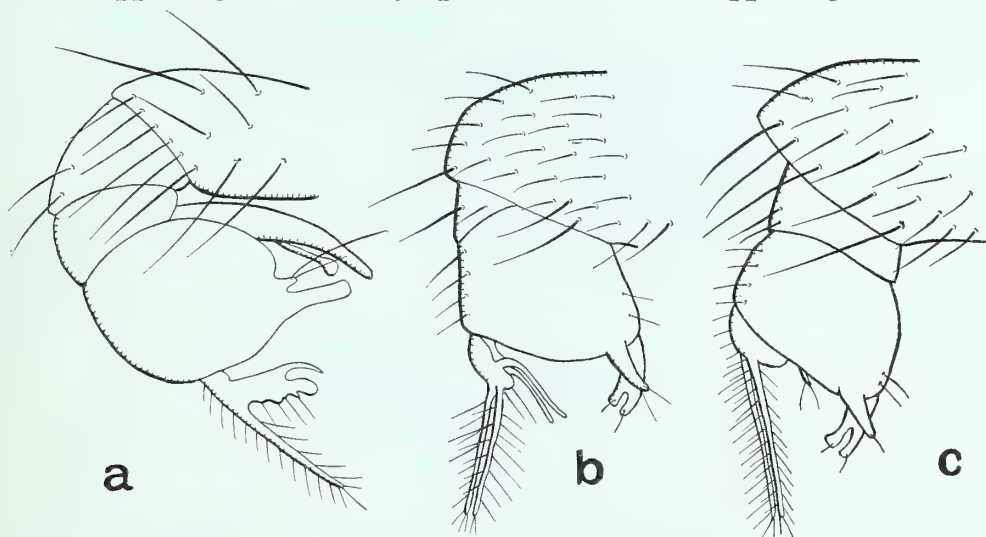
The next three species constitute a group of closely allied forms, in which the wings have a more or less extensive black band. In two of the species the wings resemble those of *C. pulcherrimum*, having a broad black main area and conspicuously white tips.

It is remarkable that all three species are represented solely by males, with the possible exception of one damaged female, which can only doubtfully be referred to this group. On the other hand, the present collection includes a long

* The outline figure was made from a cleared preparation: it does not show all the hairs, or the line of demarcation between the main body and the outer flap-like appendages. Usually these latter form a hood within which the inner appendages and the penis can be hidden. This species has a very shallow hood owing to the flaps being reduced in length axially: hence the specific name.

series of females to which no male can be assigned. These females differ completely from the males in venation and in other respects, so that at present it is impossible to correlate the two series. In the case of some species of *Dolichopus* females are rarely captured, but it is extraordinary that the same peculiarity should apply to all these three species.

The latter are very similar in character, and their hypopygia (see Text-figs. 3 and 5) are also much alike. The differences lie in the shape and hairiness of the outer appendages. In many specimens the inner appendages are hidden



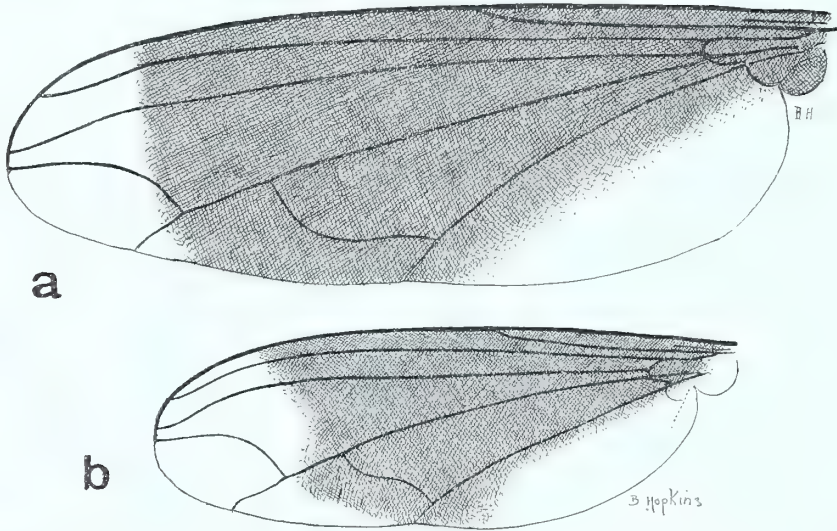
TEXT-FIG. 3.—*Chrysosoma parvicucullatum*, sp. n. (a), and *C. decorum*, sp. n. (b and c): hypopygia extended and partly closed.

by the hood, so that care is required in determination. As a rule a glimpse of them can be obtained by viewing the hypopygium from beneath.

It would appear that these three species form an endemic group, since no near relations can be traced in published literature. It is noteworthy that, in wing-marking and venation, the following species (*C. decorum*) is almost identical with the remarkable species *C. pulcherrimum* Beck., of Ceylon. The form of the hypopygium also recalls that seen in the species in question, though the long-haired appendages of the latter are represented by greatly reduced structures, and the conspicuous, bright yellow, inner spikes of *C. decorum* are not identifiable with any similar appendages in *C. pulcherrimum*. The colour of the legs is also much darker, but the general facies is that of an under-sized *C. pulcherrimum*.

5. *Chrysosoma decorum*, sp. n. (Text-figs. 3, *b* and *c*, and 4, *a*).

♂. *Head*: entirely shining green, very slightly dusted near eyes on extreme top; vertex excavate as usual, with a pair of vertical bristles and a few hairs; face also shining green, brassy in centre, but somewhat dusted when seen in profile; epistoma and lower part of face with slight silvery dust; tongue and palpi black: postocular fringe white, longest below, but beard absent. Antennae entirely black; bristles on second joint very small; third joint conical, its



TEXT-FIG. 4.—*Chrysosoma decorum*, sp. n. (*a*), and *C. innatum*, sp. n. (*b*): wings.

axial length about $1\frac{1}{2}$ times depth of second joint; arista slightly swollen at base, and if bent back capable of reaching to about end of scutellum.

Thorax: dorsum entirely shining green, the three d.c. pairs (including pre-scutellars) followed by a few fine hairs; three pairs of acrostichals as long as d.c.; scutellum as dorsum; pleurae darker shiny green, not dusted.

Wings (Text-fig. 4, *a*): marked just as in *C. pulcherrimum*, surface all blackened except for white apex and basal areas, centres of cells also slightly less darkened; alula completely dark. *Squamae* with black fringes. *Halteres* very dark.

Legs: all coxae and femora black; front and middle tibiae yellow, dusky at tips; hind femora almost black; all tarsi simple and nearly black. Front coxae with one or two lower anterior black bristles and a few scattered white hairs; front femora slightly spindle-shaped, with four small inferior bristles;

front tibiae and tarsi devoid of bristles. Middle femora spindle-shaped; middle tibiae with an inferior bristle at about two-fifths of their length, and a superior one fairly near base. Hind legs bare, except for superior and inferior rows of quite small bristles on tibiae.

Abdomen: basal segment almost simple, but with usual side bristle tufts; colour of abdomen reddish brassy, this tint, however, evident only on distal part of segments, remainder being moderately dull black, rather variable in extent. Marginal bristles present; fringe on hypopygium conspicuous. Hypopygium (Text-fig. 3, *b* and *c*) entirely black except inner thorn-like appendages (frequently hidden by hood and therefore readily overlooked), which are clear yellow.

Length: 5 mm.; wing, 5 mm.; antenna, 2 mm.

Savaii: Safune, rain forest 2,000 feet, many ♂♂, v.1924 (Bryan). Salailua, 2 ♂♂, 17-20.v.1924 (Bryan). Upolu: Leulumoega, 2 ♂♂, 14.ix.1923 (Swezey and Wilder); Malololelei, type ♂, 19.ix.1925 (Wilder), 1 ♂, 25.v.1924; Apia, 1 ♂, 31.v.1924.

Manono Is., 1 ♂, 10.v.1924.

6. *Chrysosoma consimile*, sp. n.

Perhaps merely a depauperated form of *C. decorum*, to which it is in any case exceedingly closely allied. The hypopygium is very like that of *C. decorum*, the general shape being almost the same, though it is somewhat slighter in build. The main points of difference lie in the smaller size, much paler legs, and the more diffuse and fainter blackening of the wings.

♂. *Head*: Vertex and face shining bluish green, epistoma slightly silvery, post-orbitals as *C. decorum*: tongue and palpi black. Antenna with brownish third joint and simple black arista.

Thorax: uniformly bright blue-green, pleurae slightly duller; bristles as in *C. decorum*.

Wings: similar to those of following species (*cf.* Text-fig. 4, *b*); cross-bands brownish and rather faint. *Halteres* bright yellow.

Legs: yellowish, except middle and hind coxae, which are greyish green; tip of hind femur dark above, hind tarsi dusky. Bristles: front coxa with terminal bristle and another a little above it; middle tibia with single superior bristle at base, and, like middle tarsus, with rows of rather long clothing bristles; hind tibia with upper and lower rows of five or six small bristles.

Abdomen: blue-green on distal portion of each segment, blackened elsewhere; dark portion increasing from base to tip, terminal segments more brassy.

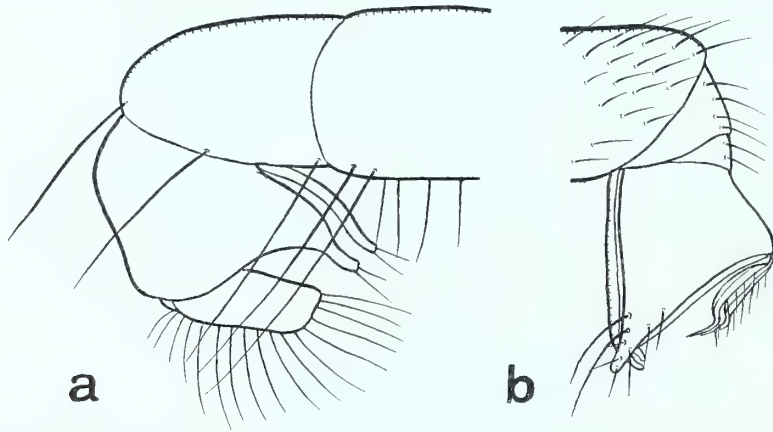
Hypopygium black.

Length: 4.5 mm.; wing, 4.5 mm.; antenna, 2 mm.

Manua: Tau, 2 ♂♂, 20.ii.1926 (Judd), 1 ♂, 17.ix.1923 (Swezey and Wilder).

Tutuila: Leone Road, 2 ♂♂, 19.ii.1924 (Bryan), 2 ♂♂, 7.ix.1923 (Swezey and Wilder); Pago Pago, 1 ♂, 4.ix.1923 (Swezey and Wilder), 1 ♂, 14.xii.1925.

Upolu: Apia, type ♂, 22.v.1924.



TEXT-FIG. 5.—*Chrysosoma innatum*, sp. n. (a), and *C. viduum*, sp. n. (b): hypopygia.

7. *Chrysosoma innatum*, sp. n. (Text-figs. 4, b and 5, a).

This species, though structurally very close to *C. decorum*, is quite distinct in colour and general facies; there is also a considerable difference in the hypopygial appendages.

Head: vertex and frons entirely shiny bluish green, face grass-green; epistoma silver dusted, palpi dark orange. Antennae with black first and second joints, third joint suffused with brownish, shortly conical; arista pale; orbital bristles pale, and a slight whitish beard.

Thorax: dorsum entirely shining green, bluer on base and on rounded scutellum; d.c. as in *C. consimile*: pleurae duller green, slightly dusted.

Wings (Text-fig. 4, b): as in *C. consimile*. Alula not darkened. *Halteres* yellow. *Squamal fringes* pale.

Legs entirely yellow, except for middle and hind coxae, which are somewhat brassy, a small dark spot exactly on tip of hind femur, and somewhat

suffused tarsi. Bristles: two black terminal bristles on front coxa, and tiny rows of four upper and lower on hind tibia.

Abdomen: shallow excavation on first segment brownish, remainder of surface shining green, with proximal edges of segments blackened; marginal bristles normal, those on last segment exceedingly long and spreading, axially sinuate; two long bristles similar to these on penultimate segment. Outer hypopygial appendages (Text-fig. 5, *a*) shorter than in *C. consimile*, flattened-cylindrical in section and covered with bristles (not merely fringed along margin as shown in figure).

Length: 4.5 mm.; wing, 4.25 mm.; antenna, 2 mm.

Savaii: Safune, rain forest, 2,000–4,000 feet. 1 ♂, 5.ix.1924 (Bryan).
Upolu: Malololelei, 3 ♂♂, vii.1925 (Wilder), 3 ♂♂ (including type), 20.vi.1924.

8. *Chrysosoma viduum*, sp. n. (Text-fig. 5, *b*).

Closely resembling the three species belonging to the preceding group, but with different antennae and hypopygial structure. This species is likewise represented in the present collection by the male sex alone.

Head: vertex, frons, face and epistoma bright green with bluish reflections, but slightly shagreened surface; points of insertion of antennae a little dusted; tongue and palpi brownish black; post-ocular fringe silvery white. Antennae entirely velvety black, with moderate-sized upper and lower bristles on second joint; the third joint not conical; arista with basal joints swollen.

Thorax: dorsum and scutellum coloured like head; d.c. as in previous group (three and following hairs), four acrostichal pairs as long as d.cs., last pair well up to prothorax; all thoracic bristles exceptionally stout; pleurae like dorsum.

Wings like Text-fig. 4, *a*, with same colour bands as in *C. decorum*. *Halteres* nearly black.

Legs: entirely black-brown to black, including all coxae. Bristles: front coxae with three or four stout terminal bristles in vertical line, front tibiae with small superior about one-fifth down; middle tibiae like front pair, but with neighbouring small bristle; hind tibiae with usual upper and lower rows of about six bristles.

Abdomen: first segment slightly arched; all segments basally black and distally aeneous green; marginal bristles stout, those on last segment forming

a conspicuous crown. Hypopygium (Text-fig. 5, *b*) black; styles of last group replaced by a falcate appendage.

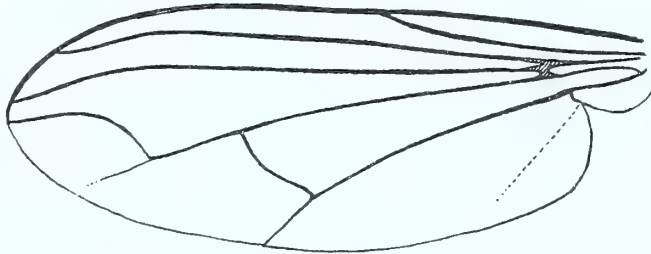
Length: 4 mm.; wing, 4.25 mm.; antenna, 2 mm.

Upolu: Malololelei, 1 ♂, 21.vi.1924 (Armstrong), 2 ♂♂, vi.1924, type ♂, vii.1924.

Chrysosoma, sp. ? (Text-fig. 6).

The collection includes a fair number of ♀♀ to which no ♂ can be assigned. Though it is just possible that these belong to one of the four preceding species, they differ very greatly from any of them, as will be seen from the following description and figures.

Head: slightly excavate, vertex shining blue-green down to antennae; face golden green, suffused with dust; epistoma grey dusted, palpi and tongue



TEXT-FIG. 6.—*Chrysosoma*, sp.: wing of ♀.

black, post-ocular fringe pale, more profuse and longer below. Antennae black, with conical third joint.

Thorax: dorsum and scutellum shining green, with four d.c. and four acrostichal pairs.

Wings as shown in Text-fig. 6, glassy, with black veins. *Halteres* orange.

Legs entirely yellow, except middle and hind coxae, a brown spot at tip of hind femur and dusky tarsi; tarsal joints rather stout. Bristles: front coxae with three bristles in a vertical row; middle tibiae with large anterior bristle at one-fourth of their length from base, a large upper one midway and a small crown; hind tibiae with superior row of about four bristles.

Abdomen entirely shining brassy green, but base of first segment and space between first and second segments appear as a dusky orange band.

Length: 3.5 mm.; wings, 3.5 mm.

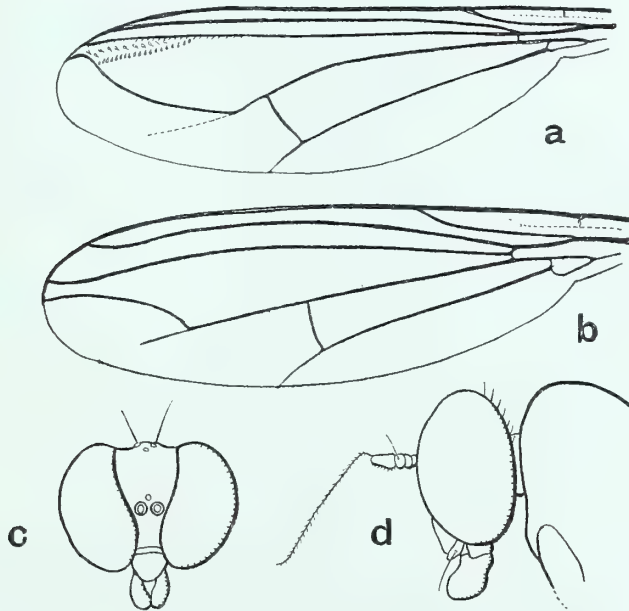
Upolu: Malololelei, 8 ♀♀, 21.iv.1925, 20.vi.1924, xii.1925, vii.1924 (Buxton

and Hopkins); 4 ♀♀, vii.1925 (Wilder); Apia, 1 ♀, 31.v.1924. Savaii: 1,000 feet, 2 ♀♀, 21.xi.1925 (Buxton and Hopkins). Tutuila: Leone Road, 1 ♀, 9.ii.1924 (Bryan); Pago Pago, 1 ♀, 9.ix.1923 (Wilder).

Helixocerus, gen. n.

The collection contains two males and a female (in fair condition) of an interesting new form, which belongs to the Chrysosomatinae, but exhibits striking sexual dimorphism in the wing venation. In addition, dorsocentral and acrostichal bristles are absent, the arista is pubescent and bent sharply at right angles at its second joint, and the male genitalia are of exceptional length, as in some species of *Mesorhaga*.

Genotype: the following species.



TEXT-FIG. 7.—*Helixocerus mendosum*, gen. n., sp. n.: (a) wing of ♂; (b) wing of ♀; (c) head from in front; (d) head from left side.

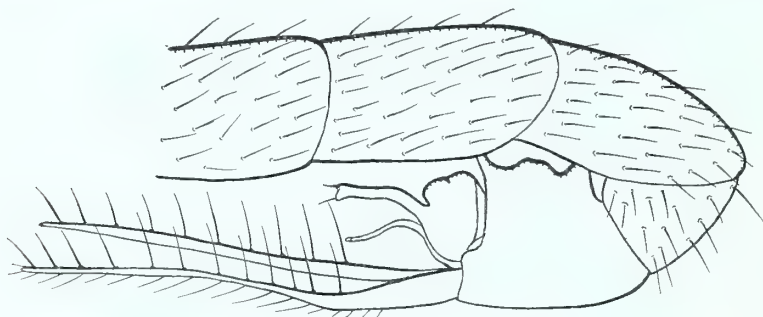
9. *Helixocerus mendosum*, sp. n. (Text-figs. 7 and 8).

♂. *Head* (Text-fig. 7, *c* and *d*): scarcely excavate, with small ocellar prominence; no bristles except ocellar; face entirely shining aeneous, narrowing uniformly from ocelli to epistoma; epistoma (except base), tongue and palpi orange. Post-ocular fringe represented by a few tiny bristles on upper part; lower portion of occiput quite bare. Antenna as shown in Text-fig. 7, *d*; first

and second joints orange, latter with small upper bristle; third joint conical, about as long as first and second together, black with silvery dust; arista terminal, stout, black and somewhat pubescent, sharply bent at flagellar junction.

Thorax: mostly shining green (yellow behind head), becoming brighter towards scutellum, which is brilliant blue-green; surface quite bare (with no signs of bristle insertions, which would be visible had actual bristles been removed) except for a pair of prescutellar bristles, and usual terminal scutellar pair; pleurae entirely orange.

Wings: as shown in Text-fig. 7, *a*; glassy, with brown veins; upward curve of fourth vein entirely different from normal: remarkable rows of small



TEXT-FIG. 8.—*Helixocerus mendosum*, gen. n., sp. n.: hypopygium.

spines below last third of lower border of third vein; costa exceptionally strongly spined (spines not shown in figure). *Halteres* orange.

Legs entirely orange, without bristles except a single stout black bristle at distal extremity of front coxa.

Abdomen: dorsum shining green, like thorax; viewed from above appearing constricted at segments three, four, and five, where it is laterally flattened; marginal bristles present; venter shining orange except last two segments, which are shining dark brown. Hypopygium (Text-fig. 8) very large and complex in form, extending at least as far as middle of venter.

♀. Similar to ♂ in colour, etc., but face wider and more nearly parallel sided (one specimen has a single small d.c. bristle).

Venation (Text-fig. 7, *b*) normal, no rows of spines below end of third vein. Length: 3.25 mm.; wings, 2.25 mm.; antenna 1 mm.

Upolu: Malololelei, 1 ♀, 26.iv.1924 (Bryan). Tutuila: Leone Road, type ♂, 9.ix.1923; Pago Pago, 1 ♂, 7.ix.1923 (Swezey and Wilder).

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extended and partly closed.
,, 4. *Chrysosoma decorum*, sp. n. (a), and *C. innatum*, sp. n. (b) : wings.
,, 5. *Chrysosoma innatum*, sp. n. (a), and *C. viduum*, sp. n. (b) : hypopygia.
,, 6. *Chrysosoma*, sp. : wing of ♀.
,, 7. *Helixocerus mendosum*, gen. n., sp. n. : (a) wing of ♂ ; (b) wing of ♀ ; (c) head from
in front ; (d), head from left side.
,, 8. *Helixocerus mendosum*, gen. n., sp. n. : hypopygium.

SARCOPHAGIDAE.

By P. A. BUXTON, M.A., London School of Hygiene and Tropical Medicine.

(With 9 Text-figures.)

ALL the adult material of this family collected by the Bishop Museum, and by Mr. Hopkins and myself was submitted to Dr. J. M. Aldrich of Washington, who identified all the species previously known, but, as the late Prof. M. Bezzi's work on the Diptera of Fiji was then in the press, refrained from describing new species. The entire collection, with Aldrich's identifications and remarks, was then forwarded to Bezzi, who, in 1927, described two new Samoan species, and published a key to all the Sarcophagid flies known to occur in the South Pacific.

It had been arranged that Prof. Bezzi would contribute an article to the present work, and since his lamented death it has fallen to me to do so. In matters of systematics and synonymy I have followed his paper, and have made use of all the early stages and field notes collected by Mr. Hopkins and myself. In view of the large number of species of *Sarcophaga* in existence, and the fact that the early stages of so many are unknown, I have illustrated all those points in which the Samoan larvae are found to differ from one another. In describing the posterior extremity of larvae or pupae I refer to the three dorsal papillae as *d*, *e*, and *f*, and the three ventral as *a*, *b*, and *c*; *f* and *a* are the median ones. This is consistent with the usage of Sinton.

Of the adults, we brought home long bred series of *Sarcophaga dux*, *S. fuscicauda*, and *S. peltata*, that is to say all the widely distributed species except *S. orchidea* and *S. froggatti*. The first three species were obtained in large numbers by exposing small carcasses, and specimens of faeces in Apia. On the other hand the more interesting native species were rare, or elusive; *S. rhynchura*, only known from specimens from Savaii, was never bred, and could not have passed unrecognised owing to its characteristically infuscated wings; *S. cirrhura*, which is less distinctive, was bred once only (a single specimen), and netted in

two remote places, but not in Apia. It seems, therefore, that the native forms are being replaced by the obtrusive introduced species. Neither of the native species is confined to the hills.

One is inclined to assume that all the widely distributed species (*Sarcophaga dux*, *S. froggatti*, *S. fuscicauda*, *S. orchidea*, *S. peltata*) have recently been introduced by European shipping. This may well be the case but is by no means certain, for all these species, except the last, have an Oriental distribution, and it is possible that some of them were brought from S.-E. Asia by immigrant Polynesians, and in this way distributed through the Pacific.

The adults may be separated from one another by Bezzi's key, which, in so far as it relates to Samoa, is here reproduced:—

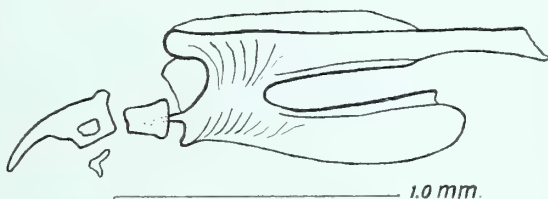
1. (2) Fourth abdominal segment in both sexes reddish and clothed with golden dust; occiput black; frontal stripe in both sexes more narrow than one of the parafrontalia; parafrontalia and parafacialia with golden dust, but the face quite black; parafacialia almost bare, with only a few hairs below near the eyes; propleura and prosternum bare or nearly so; metapleura with a few hairs; anterior dorso-centrals well developed; one pair of strong prescutellar acrostichals; three sternopleurals; third abdominal segment without bristles at hind border *peltata* Aldrich.
2. (1) Fourth abdominal segment quite black and without golden dust; frontal stripe as broad as, or broader than, one of parafrontalia; face always grey or whitish
3. (6) Only two sternopleurals, at least in male; prosternum and propleura densely pilose; parafrontalia and parafacialia of male conspicuously golden-dusted.
4. (5) Wings strongly infuscated; parafacialia quite destitute of bristles or hairs; no distinct prescutellar acrostichals; superior claspers of male genitalia with a strong preapical angle; penis without long appendages *rhynchura* Bezzi.
5. (4) Wings quite hyaline; a row of parafacial bristly hairs; one pair of weak prescutellar acrostichals; superior claspers greatly attenuated; penis with long cirriform appendages *cirrura* Bezzi.
6. (3) Three sternopleurals; prosternum and propleura bare or nearly so; parafrontalia and parafacialia grey or whitish, never conspicuously golden.
7. (8) Palpi distinctly reddish or quite yellowish; postocular cilia in but one row; parafacialia with many rows of hairs; two strong post-sutural dorso-centrals and one acrostichal; metapleura bare *orchidea* Böttcher
8. (7) Palpi quite black.
9. (12) Postocular cilia in but one row; ocellars strong; hind tibiae fringed; superior claspers regularly acute.

10. (11) Superior claspers gradually attenuated to the end *dux* Thomson.
 11. (10) Superior claspers with a thin spiniform process at end *froggatti* Taylor.
 12. (9) Postocular cilia in 2-3 rows; ocellars thin; hind tibiae quite bare; superior claspers with a small point at end *fuscicauda* Böttcher.

1. *Sarcophaga dux* Thomson (Text-figs. 1; 2 A; 3 A; 4 A; 5; 6 A).

In a letter to me, Aldrich says: "This is the species which Johnston and Tiegs identified as *miseria* Walker; but Walker's type is a female and I certainly could not identify it myself if I were to see it. . . . It is possible that a varietal name will apply to these specimens."

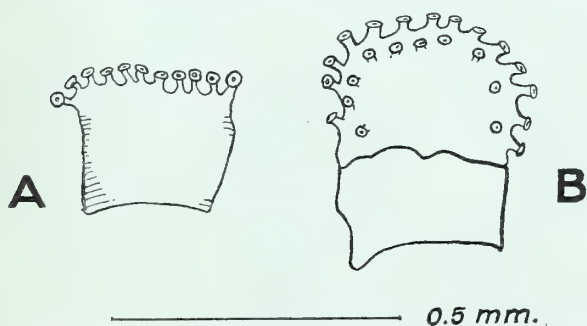
This species was commonly bred in Apia from carrion, and once from human faeces. Specimens were also collected at Falelatai, Upolu, and Pago Pago, Tutuila.



TEXT-FIG. 1.—*Sarcophaga dux* Thomson: mouth-parts of third stage larva, separated by dissection.

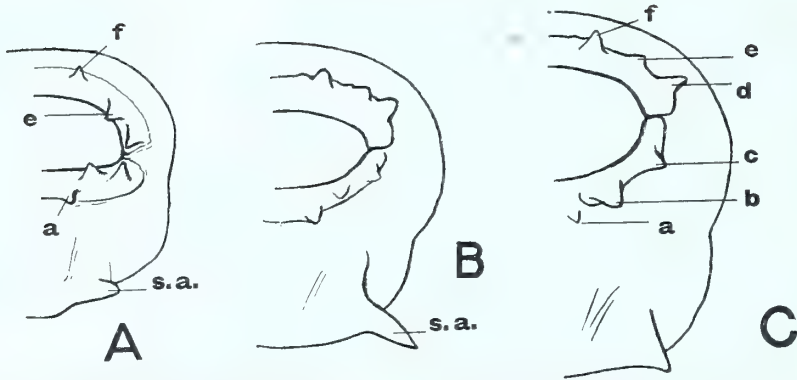
The species is known to occur in Fiji and many parts of the Oriental Region.

The following notes on the third stage larva are based upon a single specimen, from a batch which produced adults of this species only. The mouth-parts are shown in Text-fig. 1, and call for no remark. The anterior spiracles (Text-fig. 2 A) have eleven openings, arranged in one row. The posterior end of the larva is shown in Text-figs. 3 A and 6 A. In this species papillae *f*, *e* and *a* are small, *d*, *b* and *c*, longer and pointed. The supra-anal papilla (*s.a.*) is blunt. If one may rely on a single specimen, the posterior spiracular cavity is shallower than in the other species, and the lower margin is nearly straight. The posterior spiracles (Text-fig. 4 A) are provided with broad slits, which are crossed by a relatively small number of bars.

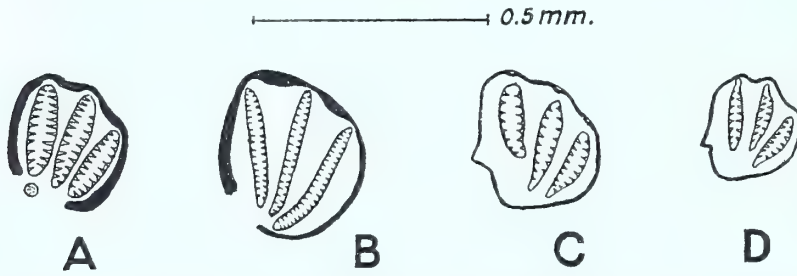


TEXT-FIG. 2.—*Sarcophaga dux* Thomson (A), and *S. fuscicauda* Böttcher (B): anterior spiracle of third stage larva.

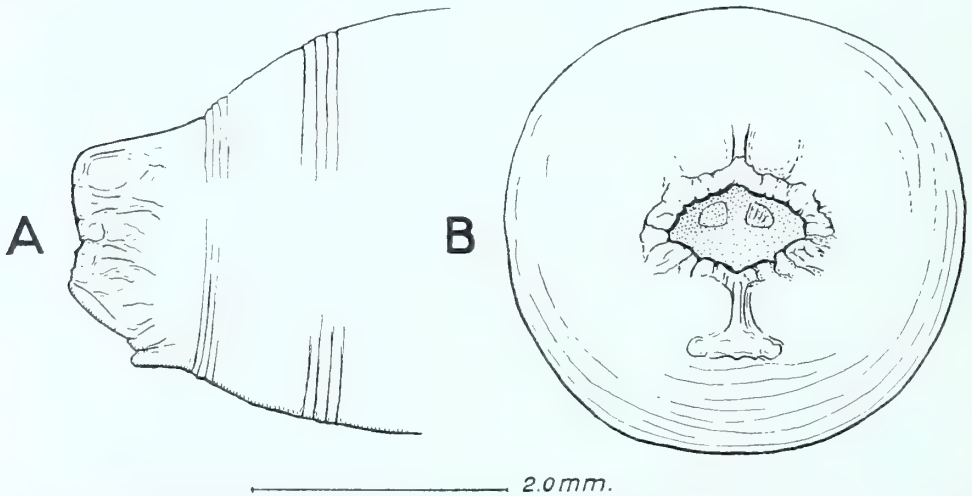
The puparium is described from several dozen empty cases, from which identified adults had been bred. It is dark red-brown, robust and heavily



TEXT-FIG. 3.—*Sarcophaga dux* Thomson (A), *S. fuscicauda* Böttcher (B), and *S. peltata* Aldrich (C): right side of posterior extremity of third stage larva; *d*, *e*, and *f*, superior papillae, *a*, *b*, and *c* inferior papillae; *s.a.*, supra-anal papilla.



TEXT-FIG. 4.—*Sarcophaga dux* Thomson (A), and *S. fuscicauda* Böttcher (B): posterior spiracle of larva. *Sarcophaga dux* Thomson (C), and *S. peltata* Aldrich (D): posterior spiracle of puparium.



TEXT-FIG. 5.—*Sarcophaga dux* Thomson: posterior extremity of puparium, A from side, B from end.

chitinized, with all intersegmental lines clearly defined by transverse surface markings, but the intersegmental areas not depressed, so that the outline is smooth in profile (Text-fig. 5, A and B). Size 10 to 11 mm., by 4.0 mm. Posterior spiracular cavity deep, wider than high, with rugose margin, but the larval papillae hardly to be distinguished; margin deeply notched at the side, and prolonged dorsally to form a ridge, which lies between two smooth rounded areas, and ventrally to form a distinct keel; rounded supra-anal papillae at each end of a transverse ridge (Text-fig. 5, A and B). Posterior spiracle as shown in Text-fig. 4 C.

Greene, using material collected in Honolulu, has already figured and to some extent described the puparium of this species.

2. *Sarcophaga froggatti* Taylor.

Sarcophaga knabi Parker.

This species, which is widely distributed in the Oriental Region and in Australia, was probably rare in Apia, and was bred once only, from horse manure. It was also taken at Safune, Savaii, below 1,000 feet, 1.v.1924 (Bryan). Hopkins took it on carrion, at Nukualofa and Vavau, Tonga, ii. and iii.1925.

The early stages were not collected.

3. *Sarcophaga orchidea* Böttcher.

There are only two Samoan records, Apia, vii.1925 (Wilder), and Pago Pago, iv.1924 (Bryan). The specimens referred to are females, and we never bred this species; I was therefore inclined to question the records, but Bezzi assured me that both sexes are readily distinguished by the reddish palpi, and by the fact that the parafacialia bear many rows of fine short hairs.

I took this species in a number of the islands of the New Hebrides, and it is known to occur in New Guinea, the Philippines and other parts of the Oriental Region.

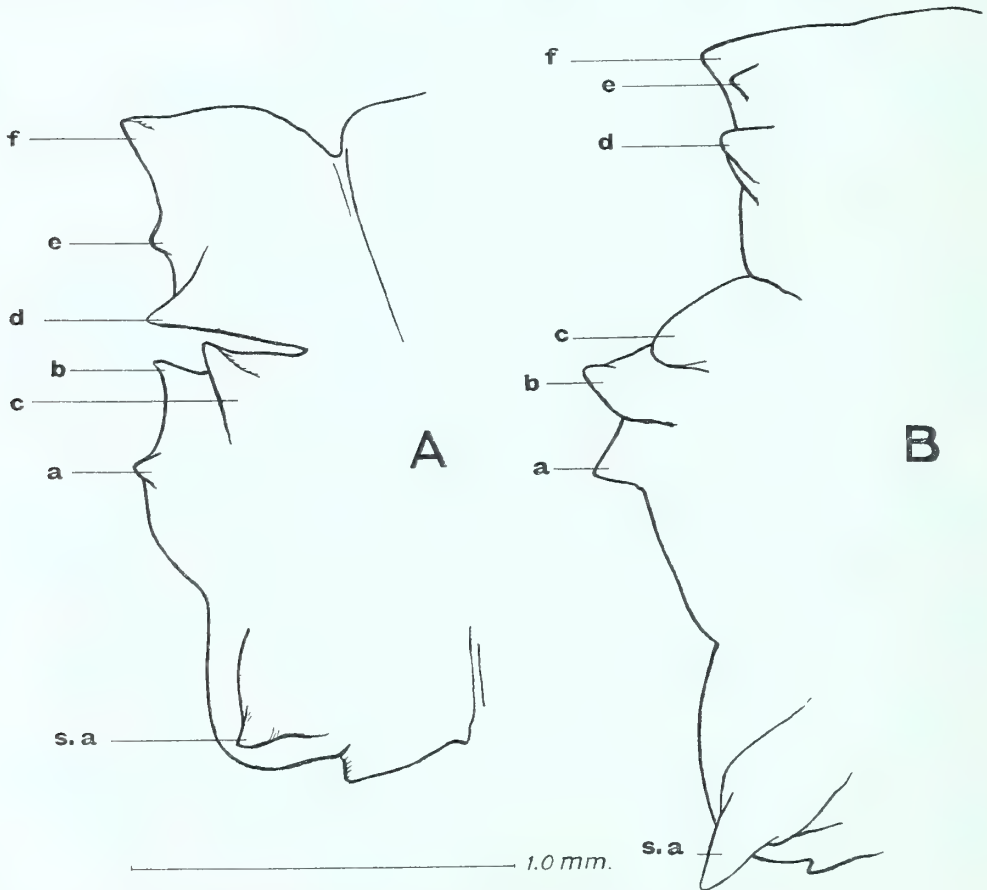
We did not collect the early stages of this insect.

4. *Sarcophaga fuscicauda* Böttcher (Text-figs. 2 B, 3 B, 4 B, 6 B).

In a letter, Aldrich writes that “*S. fuscicauda* appears to be the same species as that which Johnston and Tiegs identified as *irrequieta* Walker, and afterwards as *peregrina* R.-D. Walker’s type specimen is a female and can hardly be identified; I doubt very much the identification with *peregrina*, as there are no types in existence and the description is almost meaningless.”

During 1924 and 1925 we bred large numbers of this species in Apia, from a dead rat, bat, fish, crab and snail; also from human faeces, and single individuals from rotten pumpkin and passion fruit. Swezey and Wilder took it at Malololelei, at 2,000 feet, vii.1923; it has also been taken at Lauili, Tutuila, iii.1926 (Judd).

S. fuscicauda, first described from material from Formosa, is also known to occur in Hawaii, Fiji, the Philippine Is., Japan, Singapore, Burma, and India.



TEXT-FIG. 6.—*Sarcophaga dux* Thomson (A), and *S. fuscicauda* Böttcher (B): profile of posterior extremity of third stage larva. Lettering as in Text-fig. 3.

The third stage larva is known from a single specimen. The mouth-parts are not distinguishable from those of *S. dux*. The anterior spiracle has about twenty-four openings, arranged in two irregular arcuate rows (Text-fig. 2 B). The posterior extremity is characteristic; all the six papillae (a to f) are small,

rounded, and closely resemble one another; the supra-anal papilla is long and acuminate (Text-figs. 3 B and 6 B). The posterior spiracular cavity is wide. The posterior spiracles have long narrow slits with numerous bars (Text-fig. 4 B).

No *puparia* of this species were preserved by us in Samoa. The puparium is thus described by Greene from specimens collected in Honolulu: "Large, dull, dark red. Posterior cavity deep, diameter large, located centrally on the longitudinal axis; tubercles on outer edge of cavity indistinct. Each spiracular plate is reddish-black with three yellow, narrow slits, the third slit much shorter than the other two: first slit deeply curved on lower half toward the lower end of the middle slit; middle slits about parallel; spiracular plates separated by a space slightly less than the width of one plate. Anal opening some distance from the edge of the cavity; each side of the anal opening is a conical tubercle, these tubercles are widely separated. Posterior end of puparium shows two segments slightly more pronounced than the others. Anterior spiracles close to anterior end of puparium; each spiracle has twenty-seven small yellow lobes, five of these are below the edge and on the outside surface of the spiracle; basal part of the spiracle reddish-brown.

Length, 9 mm.; diameter, 3.5 mm."

The puparium is also figured by Greene.

5. *Sarcophaga* (*Oxysarcodexia*) *peltata* Aldrich (Text-figs. 3 C, 4 D, 7, 8).

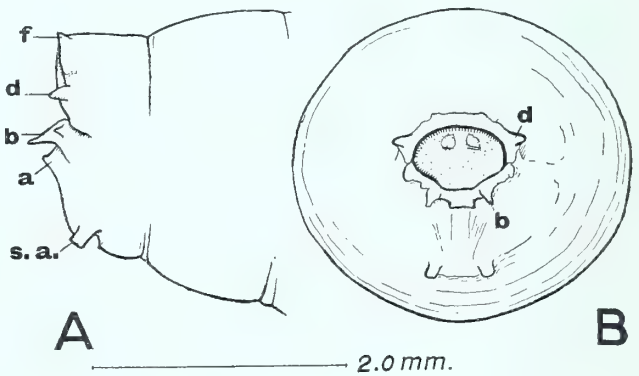
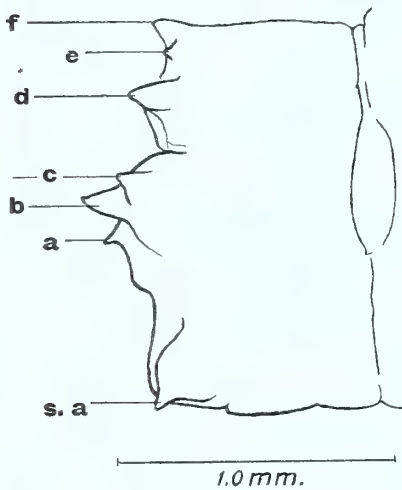
Sarcophaga taitensis Schiner (?).

Aldrich's *S. peltata*, which was described from specimens from Porto Rico and Florida, is also known to occur in Central America. Aldrich says definitely, by letter, that the Samoan species and his *S. peltata* are identical, and he thinks that they may be Schiner's *S. taitensis*, which has many years' priority. Bezzi is inclined to separate the Central American *S. peltata*, of which he says that the face is "broadly greyish in middle," from the species which occurs in Samoa, of which the face is wholly black; but even if it is established that the species are different, the status of *S. taitensis* is uncertain pending the study of toponymical material.

This species, whatever its correct name, is easily distinguished from the others which occur in Samoa, by the fourth abdominal segment being yellow and covered with golden pollen. In Apia it was common, and frequently bred from human faeces; it was also bred from horse and cow droppings, and once from a dead guinea-pig. On Upolu it occurred as high as Malololelei, at about 2,000 feet; it was also collected in Tutuila and Savaii.

Bezzi remarks that the difference between the adults of this species and the others are perhaps sufficient to justify its being placed in the separate genus *Oxysarcodexia*. It is interesting, therefore, to find that the larva is also distinctive, though at present our knowledge of early stages of *Sarcophaga* is hardly sufficient to allow this evidence to be weighed.

In the third stage *larva* the mouth parts cannot be distinguished from those of *S. dux*. The anterior spiracles (as shown by the examination of one larva and many puparia) have ten to fourteen openings, arranged in a single regular row. At the posterior end of the larva the papillae *f*, *d*, and *b* are long ;



TEXT-FIG. 7.—*Sarcophaga peltata* Aldrich : profile of posterior extremity of third stage larva. Lettering as in Text-fig. 3.

TEXT-FIG. 8.—*Sarcophaga peltata* Aldrich : puparium —A from side, B from end. Lettering as in Text-fig. 3.

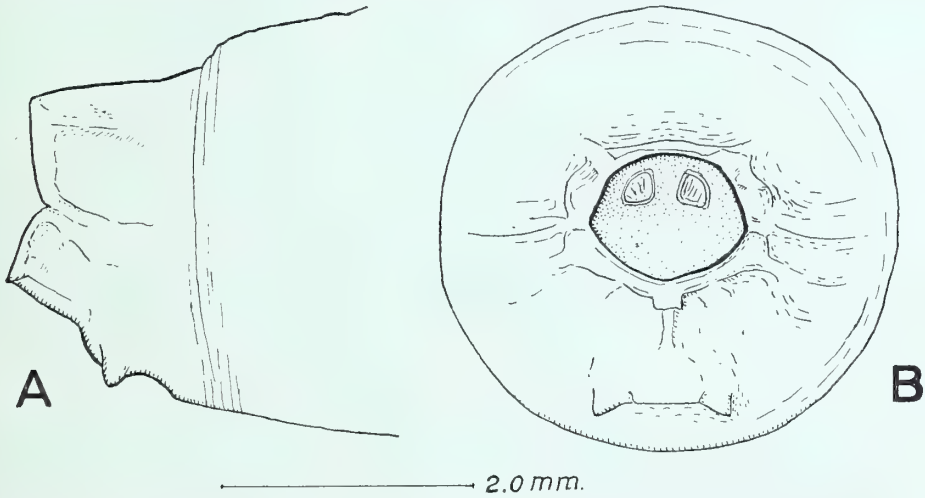
e, *a*, and *c* are small ; the supra-anal papilla is blunt (Text-fig. 3 C and 7). The posterior cavity is round and deep. The posterior spiracles closely resemble those of *S. fuscicauda*, but, so far as can be judged from a single example, the rim is less heavily chitinized.

The *puparium*, as shown by two complete examples and a number of empty cases, is fragile, lightly chitinized and dull brown, with the whole surface finely and irregularly granular, so that the intersegmental lines can only be distinguished with difficulty. Size 7.0 mm. by 3.0 mm. The posterior spiracular cavity is wide and regularly rounded, with margins not rugose but prolonged into definite pointed papillae, which, when viewed from the side, are very characteristic. These papillae correspond with those of the larva, and the longest

is *b*; the puparium of this insect differs in this respect from the puparia of *S. dux* and *S. cirrhura*, in which the larval papillae cannot be identified. In the present species there is no dorsal ridge; the ventral keel is ill-defined, and the supra-anal papillae are blunt (Text-fig. 8, A and B). The posterior spiracles are distinguished at once from those of *S. dux* by the upward prolongation of the slits (Text-fig. 4 D).

6. *Sarcophaga cirrhura* Bezzi (Text-fig. 9).

This species is closely related to *S. rhynchura*, with which it forms a small, peculiar group, apparently endemic to Samoa and characterized by the possession



TEXT-FIG. 9.—*Sarcophaga cirrhura* Bezzi: posterior extremity of puparium, A from side, B from end.

of only two sternopleural bristles, and by the densely pilose prosternum and propleura. The type male was bred at Apia from a dead rat, viii.1925; other males were collected at Siumu, Upolu, ii.1923 (Armstrong), and Safune, Savaii, between sea-level and 1,000 feet, v.1924 (Bryan). The female is unknown, and perhaps unrecognisable.

The *larva* is likewise unknown. The *puparium* described is that of the male type. It resembles that of *Sarcophaga dux* in the surface sculpturing, and in being large, robust, and dark in colour. Size 11.0 mm. by 4.0 mm. (Anterior spiracles missing in specimen examined.) The posterior spiracular cavity differs from that of *Sarcophaga dux* in being more nearly circular, with margins less rugose, and more sharply defined; dorsal ridge absent (Text-fig. 9);

ventral keel definite; a transverse ridge above anus, ending in pointed papillae. In profile the posterior extremity is rectangular, above and below (Text-fig. 9, A and B). The posterior spiracles resemble those of *S. dux*, except that they are proportionately wider (since only one puparium is available for study, this apparent difference may be due to distortion in mounting). The mouth-parts are indistinguishable from those of *Sarcophaga dux*.

7. *Sarcophaga rhynchura* Bezzi.

Easily recognisable in the male sex by the infuscated wings; the species is only known from material from Savaii, where specimens were taken at Salailua and Safune,* between sea-level and 1,000 feet, v.1924 (Bryan).

The early stages are unknown.

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- „ 9. *Sarcophaga cirrhura* Bezzi: posterior extremity of puparium, A from side, B from end.

* Not "Lafune" as given in Bezzi's original description (*Ann and Mag. Nat. Hist.*, (9) Vol. 19, p. 306, 1927).

MUSCIDAE.

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IN keeping with general practice in recent literature, this family is treated in the following pages as including the Anthomyiidae of the older authors.

Bezzi (*Diptera Brachycera and Athericera of the Fiji Islands*, pp. 167-185, 1928) records fifteen genera, twenty-one species, and one variety, of the family as represented in Fiji. In the Samoan material before me I find representatives of eleven genera, twenty-five species, two of which cannot be determined, and two varieties. Of those recorded by Bezzi as found in Fiji, but not included in the present material, *Ophyra* Robineau-Desvoidy occurs in Samoa, making thus twelve genera and twenty-six species. Of the others, *Gastrophilus* Leach is an introduced genus, and like *Passeromyia* Villeneuve and Rodhain, and *Orthellia* Robineau-Desvoidy, may yet be found in Samoa; the two species referred by Bezzi to *Coenosia* do not belong there.

The family Muscidae includes some species that are of considerable economic importance to man. The larvae of many of them live in flesh and preserved meats, and sometimes gain entrance to the stomach or intestinal tract in human beings, causing myiasis, while the adults of others, particularly of the common house-fly, are held responsible for the conveyance of the germs of certain diseases. Many of the species are of course perfectly innocuous, and some are to some extent beneficial; but in order to arrive at a true estimate of their importance, it would be essential to determine their status in all stages and in all their relations to other organisms in their natural environment, an undertaking of considerable magnitude even in this limited faunal region.

Under each genus I have made a comparison with the Fijian species recorded by Bezzi in the work mentioned above, and in the case of one or two genera I have described species which, though extralimital, may yet be found to occur in Samoa.

One feature which is common to this collection, and to that from Fiji reported on by Bezzi, is the lack of any species belonging to the subfamily Anthomyiinae,

even the almost cosmopolitan *Hylemyia cilicrura* Rondani being absent. It is a fact, however, that this subfamily is much rarer in the Australasian region than in any other, and possibly there are no endemic species in either Samoa or Fiji. The habits of the representatives of the genera of Anthomyiinae, where the latter occur, are so varied that the absence of these species from any region would indicate that some factor other than mere habits is responsible.

It will be noted that, of the new species in this family described by Bezzi from material from Fiji, only one is mentioned in the present paper as occurring in Samoa; this species, *Limnophora mesolissa*, is probably very widely distributed in the islands of this region, in fact I have seen females from New Guinea which I am certain belong to it. Of the genera mentioned below as having representatives in Samoa, only one, *Pectiniseta* Stein, is not known to occur in Fiji, but it is entirely probable that this genus is represented there, and also in Samoa, by the genotype, since that species is rather widely distributed in the region.

Although I have not actually seen specimens of them, as I have stated above, the two species referred by Bezzi to *Coenosia* do not belong to that genus; judging from the descriptions, they possibly are referable to *Lispocephala* Pokorny, a genus which is cosmopolitan, very well represented in the Orient, and contains a large number of species, some groups of which are probably entitled to subgeneric segregation. By far the largest number of species in any one faunal section occurs in the Hawaiian Islands, whence I have seen specimens of thirty-four species, which constitute possibly 75 per cent. of the indigenous Muscid fauna of the islands. It would appear strange, if there is as close an affinity between the Samoan and Hawaiian fauna in certain other groups as is indicated, that this genus, which is so strongly represented in Hawaii, should be absent from Samoa. I can only believe that the material now in my hands represents but a portion of the species which occur in Samoa, and it is entirely probable that, when a complete collection has been made, the genus will be found to be represented there, though no doubt far less numerous in species and individuals than in Hawaii.

The absence of *Fannia canicularis* Linn. from the Samoan and Fijian collections is worth noting, as is also that of *Muscina stabulans* Fabr.; it would be of interest to make a special attempt to discover if the former at least is not present, or, if really absent, to note if and when it appears.

LISPINAE.

Of the three genera included in this subfamily, only one is represented in the Samoan material.

Lispa Latreille.

Bezzi records only *Lispa assimilis* Wiedemann as occurring in Fiji. I have before me examples of three species from Samoa, two of them evidently undescribed, and specimens of one undescribed species from the New Hebrides, the description of which is included herein.

I have seen a specimen of *L. tentaculata* De Geer, from Viti Levu, Fiji, in the Hamburg Museum.

1. *Lispa assimilis* Wiedemann.

This is one of the most widely distributed of oriental species. Stein has recorded it as found in Australia, but I have seen no specimens from that continent.

Apia: vi.-vii.1913 (Doane).

Specimens submitted by Professor R. W. Doane, of Leland-Stanford University.

2. *Lispa isolata*, sp. n.

♂♀. *Head* black; frons deep black, slightly shining, triangle slightly dusted with yellowish; orbits densely dusted with yellow from middle forward, face densely dusted with golden yellow, cheeks dusted with greyish yellow, merging into grey of occiput; a large brown mark on each side of occiput, and one in centre connecting with dark vertex; antennae black, apex of second segment pale; palpi orange-yellow; *frons* in middle about one-third of width of head, narrowed slightly at vertex and in front; all verticals long, ocellars as long as inner verticals; post-verticals very small, parallel; parafacials haired; arista plumose; third antennal segment extending almost to mouth; palpi hardly dilated, club-shaped. *Thorax* black, with dense grey dust; dorsum with five broad, shining, black-brown vittae, broader than intervening grey spaces, median vitta extending to apex of scutellum; pleura with blackish vitta along upper margin; posterior pair of presutural and two posterior pairs of post-sutural dorsocentrals strong, anterior pair of presutural and two anterior pairs of postsuturals very short and fine; sternopleurals 3. *Abdomen* narrow ovate,

coloured like thorax ; each tergite from first to fourth with a pair of large, subquadrate, shining, black-brown spots, which are more or less extensively fused anteriorly, in ♀ usually leaving only a small, grey, wedge-shaped, pale mark on posterior margin and extending over almost all visible dorsal surface ; lateral margins of some of apical tergites with an additional dark spot ; fifth and sixth tergites dusted with yellowish-grey, sixth blackish on sides ; superior pair of hypopygial forceps fused, forming a broad convex plate, which is narrowed slightly to apex and has a small, rounded emargination in tip ; lateral processes rounded in lateral view. *Legs* black, tibiae reddish-yellow ; front *tibia* without median posterior bristle ; middle femur normal in structure ; middle tibia with median posterior bristle ; hind femur with about three widely spaced anteroventral bristles in ♂, none in ♀, and one or two bristles near middle of posteroventral surface ; hind tibia with one anterodorsal and one anteroventral bristle. *Wings* brownish hyaline ; inner cross vein close to middle of discal cell ; veins three and four subparallel at tips. *Squamae* and *halteres* yellow.

Length, 6-6.5 mm.

Upolu : Vailima, type, allotype, and thirty-seven paratypes, 26.iii.1925 ; Malololelei, one paratype, 26.iv.1924. Tutuila : Pago Pago, one paratype, 14.xii.1925.

The last mentioned specimen has the thoracic vittae almost fused, a character which is less evident in the other examples.

3. *Lispa albifacies*, sp. n.

♂. *Head* fuscous ; frons, face, and cheeks densely dusted with white, almost silvery, dust on frons appearing to vary according to angle from which it is viewed ; antennae fuscous, second segment dusted with whitish at apex ; palpi fuscous, with dense whitish dust on dilated portions ; *frons* at vertex about one-third of width of head, slightly narrowed in front ; ocellars longer than postverticals, all four verticals present and well developed, each orbit with four or five bristles and some long hairs ; triangle extending almost to anterior margin ; antennae long, third segment about twice as long as second and reaching almost to mouth margin ; parafacials bare ; arista long haired above and below ; palpi dilated, spoon-like ; cheek about as high as width of third antennal segment. *Thorax* and *abdomen* fuscous, densely dusted with grey. (Type specimen greasy, so that it is impossible to make certain of markings, but thoracic dorsum apparently without vittae, while abdomen shows indications of dark

dorsal spots.) Thorax (damaged in case of type) apparently with 2+3 pairs of long dorsocentrals, and with surface hairs rather long and evenly distributed; sternopleurals 1+1. Abdomen narrowly ovate; bristles on apex of fourth visible tergite and on middle of fifth long and strong, those on middle of fourth shorter; superior hypopygial forceps gradually tapered to apices, slightly curved upward towards venter, with tips glossy dark brown and simple. *Legs* fuscous, tips of femora narrowly pale, bases of tibiae yellowish, rather broadly so in case of front pair; front femur with posteroventral bristles hair-like, long at base, becoming short towards tip; front tibia without a median posterior bristle, its tip with three long bristles; middle femur attenuated apically, without exceptional armature; middle tibia with one posterior median bristle; hind femur with one bristle near middle on anteroventral surface, and two bristles on basal half of posteroventral surface; hind tibia with hairs a little longer than usual, and one anterodorsal and one anteroventral bristle beyond middle; hind tarsus with fine outstanding hairs on one side, basal segment with a hirsute lobe on posterior side, causing it to be much wider than remaining segments, lobe projecting forward at tip, but not extending beyond end of main portion of segment. *Wings* greyish hyaline; inner cross vein a little beyond middle of discal cell; veins three and four parallel at tips. *Squamae* white. *Halteres* fuscous.

Length, 4.5 mm.

Upolu: Siumu, type, 24.xi.1923 (Armstrong).

This species belongs to the same group as *L. metatarsata* Stein and *L. cana* Walker, but the longer antennae, long-haired arista, and the bristling of the legs, distinguish it from either of those species.

3A. *Lispa fuscipalpis*, sp. n.

♂. Similar in general coloration to *L. isolata*, but palpi fuscous, face pale sulphur-yellow dusted, cheeks white dusted, thoracic vittae not so sharply defined as usual in *L. isolata*, and a dark mark, large and rather ill-defined, behind anterior thoracic spiracle, instead of a dark upper marginal vitta.

Differing structurally from *L. isolata* in having palpi slightly, but noticeably, dilated at apices, and only the two pairs of postsutural dorsocentrals strong, remainder being indistinguishable.

Length, 5.5 mm.

New Hebrides: Tanna, type, xi.1925 (Buxton).

The above description is published here because it appears desirable to indicate species of possible occurrence in Samoa.

The foregoing species may be separated as follows :

- | | |
|---|-----------------------------|
| 1. First posterior cell quite noticeably narrowed at apex, owing to slight forward curvature of tip of fourth vein ; front tibia with median posterior bristle ; hind tibia with median posterodorsal bristle | <i>assimilis</i> Wiedemann. |
| — First posterior cell not narrowed at apex, apical section of fourth vein straight, or almost so ; front tibia without median posterior bristle ; hind tibia without median posterodorsal bristle | 2. |
| 2. Hind tarsus of ♂ with basal segment exceptionally widened ; parafacials bare | <i>albifacies</i> , sp. n. |
| — Hind tarsus of ♂ normal, basal segment not wider than usual ; parafacials with fine hairs on their entire extent | 3. |
| 3. Posterior pair of presutural dorsocentral bristles strong ; palpi orange-yellow | <i>isolata</i> , sp. n. |
| — No well-developed presutural dorsocentrals ; palpi fuscous | <i>fuscipalpis</i> , sp. n. |

FANNIINAE.

The Samoan material before me includes representatives of but a single genus of this subfamily.

Fannia Robineau-Desvoidy.

This genus is most abundantly represented in the Palearctic and Nearctic regions, though there are also many species in South and Central America. Three species, including the cosmopolitan *F. canicularis* Linn., are known to exist in Australia. Bezzi described as new a species occurring in the Fiji Islands, but he had only females, and I very much doubt the possibility of identifying a species of the *pusio* group, to which his *F. glabella* evidently belongs, in this sex. I find it practically impossible to separate the females of the three North American species of this group, and I believe that until males of *F. glabella* Bezzi are taken it must remain a doubtful species.

Representatives of only one species of *Fannia* are included in the Samoan material.

4. *Fannia pusio* Wiedemann.

This may be *F. glabella* Bezzi. It is the only small, all-black species of the group in which the abdomen of the male has three black spots on each tergite that has the hind tibia long haired ventrally. In this and the closely related species there are microscopic hairs on the parafacials, a character not met with

elsewhere in the genus, or in fact in the family, except in Lispinae and certain Australasian species related to *Melanocheilia* Rondani.

This and allied species have been found in North America, in the larval stages, feeding upon dead shell-fish, and the larvae and puparia from which adults have been reared were found in insect breeding-cages, and in birds'-nests.

In America, *F. pusio* occurs in the Southern States and subtropical portions. I have seen no examples from the Indo-Australian region other than those now before me.

Upolu : Apia, 1 ♂, 2 ♀, 23.v.1925 ; 2 ♀, same locality, reared from rotten fish, iii.1925. Savaii : Safune, 1 ♂, 12.v.1924 (Bryan).

COENOSIINAE.

This subfamily is difficult to distinguish from the Phaoniinae, the only character that appears to be of consequence for this purpose consisting in the presence of but one backwardly directed bristle on the upper portion of the frontal orbits in Coenosiinae and of two such bristles in Phaoniinae. If this be accepted as the criterion, *Atherigona* Meigen must be assigned to the Coenosiinae, but it is not very appropriately placed therein, most species of Coenosiinae being predacious in the adult stage, while *Atherigona* adults are not so. In the present paper I include two genera in the subfamily. As already mentioned, I suspect that the two Fijian species described by Bezzi under *Coenosia* actually belong to another genus.

Orchisia Rondani.

5. *Orchisia costata* Meigen.

This is a widely distributed species, occurring in Southern Europe, Africa, Asia, and throughout the Pacific region to Australia. It has been recorded by Bezzi as found in Fiji.

Readily recognised by the costal margin of the wings being infuscated, and their hind margins and apices white ; one of the few genera in which the scutellum has but two strong marginal bristles.

Savaii : Matavanu crater, 10 specimens, 13.v.1924 (Bryan).

Atherigona Rondani.

With the exception of one very widely distributed species, this genus is strictly confined to the Old World. The species (*A. excisa* Thomson) that occurs

in America infests decaying fruits, and has been introduced by commerce from the tropics of the Eastern Hemisphere.

Under *Atherigona*, Bezzi records as found in Fiji three species, including two described by him as new, and one variety.

In addition to the three species in question, I have seen specimens of *A. laeta* Wiedemann from Fiji.

There are examples of four species in the material before me, but of these one is represented by a female only, and is unidentifiable. Those species and *A. laeta* are included in the key given below.

KEY TO THE SPECIES.

1. Wings with a dark cloud at apex	<i>hendersoni</i> Malloch.
— Wings entirely hyaline at apex	2.
2. Males	3.
— Females	6.
3. Front femur with a quite distinct concavity on upper side near tip, beyond which dorsal surface is furnished with dense decumbent hairs	4.
— Front femur without a concavity or dense decumbent apical hairs on upper side	5.
4. Palpi fuscous	<i>excisa</i> (Thomson).
— Palpi testaceous	<i>excisa</i> var.
5. Upper portions of frontal orbits glossy black	<i>laeta</i> Wiedemann.
— Entire frontal orbits densely dusted with pale grey, not shining	<i>samoænsis</i> , sp. n.
6. Upper portions of frontal orbits shining black, without grey dust	<i>laeta</i> Wiedemann.
— Entire frontal orbits densely dusted with pale grey, not shining	7.
7. Palpi yellow	<i>samoænsis</i> , sp. n.
— Palpi black or fuscous	8.
8. Humeri yellow	<i>excisa</i> (Thomson).
— Humeri black	sp. ?

6. *Atherigona hendersoni* Malloch.

I have compared the Samoan female specimen with the type series of this species from Henderson Island, and can detect no structural distinction between them.

Upolu : Apia, 23.v.1924.

7. *Atherigona excisa* (Thomson).

The larvae of this species, which is evidently very common in the islands, feed in decaying fruits and vegetation, and at times in decaying animal matter.

Most of the specimens before me are from Upolu, particularly from Apia, but there are examples from Tutuila (Pago Pago). Possibly the species will be found in all the islands where suitable habitats occur.

8. *Atherigona samoaënsis*, sp. n.

♂♀. *Head* testaceous, occiput fuscous, densely dusted throughout with yellowish-grey, frontal orbits not shining, uniformly grey, interfrontalia black-brown, paler in front; first two antennal segments reddish, third segment fuscous; arista fuscous; palpi yellow. *Thorax* fuscous, densely dusted with yellowish grey, humeral angles slightly testaceous, disc of mesonotum with three faint dark vittae, each lateral vitta linear; scutellum hardly yellow at apex in ♂, noticeably so in ♀. *Abdomen* in ♂ testaceous, infuscated above and densely dusted with grey, first visible tergite with a pair of pale brown spots, second and third tergites each with a pair of large lateral fuscous spots and a fuscous central line; chitinous prominence on sixth tergite of ♂ with two widely divergent cylindrical processes at apex, not contiguous at base, with slightly upcurved tips, and about twice as long as thick; abdomen in ♀ with spots on second and third tergites fused. *Legs* testaceous, front femora and tibiae fuscous except at base, front tarsi fuscous, apical segment slightly paler, in both sexes without abnormal hairs; front femur in ♂ normal, and with one or two preapical postero-ventral bristles. *Wings*: inner cross vein a little proximad of middle of discal cell; fourth vein very slightly curved forward apically.

Length, 3-3.5 mm.

Savaii: Safune, lower forest, 1,000-2,000 feet, type ♂ and allotype, 3.v.1924 (Bryan).

In my recently published key to the Sumatran species, *A. samoaënsis* will work out as *A. bituberculata* Malloch, but it is distinguishable from the latter by its entirely yellow palpi, and by the larger, more widely separated, and slightly upcurved processes of the sixth abdominal tergite in the ♂.

Atherigona, sp. ?

A ♀ specimen in the collection before me differs from the ♀ of *A. samoaënsis* in having the antennae entirely black, and the abdomen much darker, with the dorsal spots larger.

Length, 3.5 mm.

Savaii: Safune, lower forest, 1,000-2,000 feet, 5.v.1924 (Bryan).

PHAONIINAE.

Pygophora Schiner.

This genus occurs in Africa, the Orient, throughout the islands of the Pacific and Indian Oceans, and in Australia. Bezzi described one species from material from Fiji. There are specimens of two new species in the Samoan material, and a ♀ of another which I cannot identify specifically.

Originally the genus was distinguished from other genera in the family by the presence of a short, stout, apical process on the ventral side of the hind tibia, but this is strictly a male character, and moreover it does not occur in the males of most of the species that are referable to the genus. The essential generic characters are found in the arrangement of the orbital bristles in both sexes, as pointed out by me in a previous paper dealing with the genus. The distinctions between this and other genera will be clearly stated in a forthcoming paper on the genera of Muscidae of the world, which is now practically ready for the press.

9. *Pygophora buxtoni*, sp. n.

This species is very much like the Fijian *P. ctenophora* Bezzi, with a specimen of which, from Nadi, Fiji, I have compared it. The male, however, lacks the transverse stripe of dense, microscopic, black hairs on each side of the fourth abdominal tergite. In the males of both species there are two parallel series of short, fine bristles near the apex of the middle femur on the posteroventral surface.

♂. *Head* normal, frons widened anteriorly, ocellars short and fine; antennae extending almost to mouth; head fuscous, occiput densely dusted with grey, frons with orbits and frontal triangle dusted with golden yellow, central stripe rufous; face and cheeks yellow, densely dusted with yellow; antennae and palpi lemon yellow; arista yellow. *Thorax* normal, fuscous, densely dusted with grey, with three more or less pronounced dark dorsal vittae. *Abdomen* testaceous yellow, third to fifth tergites dark above, densely dusted with grey, third and fourth each with three, fourth with two dark spots; fourth and fifth visible tergites not compressed, former without apical keel and bristles, and with only sparse decumbent setulae on sides, its distal margin with some rather dense and moderately long bristles low down on sides; ventral lobes rounded and bare, glossy yellow. *Legs* yellow: posterior median bristle on front tibia long and curled; middle coxae with fasciculate spine not very stout; middle femur with a few long posteroventral and anteroventral bristles, posteroventral

surface with two short series of fine bristles near apex ; middle tibia with a long, fine bristle near base and another in middle on posterior side ; hind femur with about four very short, stubby bristles on posterior surface near base, two long posteroventral bristles near middle, and a few bristles along anteroventral surface, long at base and becoming very short apically ; hind tibia with three anterodorsal and about six posterodorsal bristles, apical two on anterodorsal and bristle near middle on posterodorsal surface very long. *Wings* greyish, with a faint dark cloud on apical half, more evident costally ; inner cross vein near middle of discal cell. *Squamae* whitish. *Halteres* yellow.

♀. Differing from ♂ in usual respects, but with entirely yellow *legs*, and may be distinguished from its allies by having basal bristle on posterior side of middle tibia much nearer base than usual in *Pygophora* ; middle tibia with no median anterodorsal bristle.

Length, 6.5–7 mm.

Tutuila : Pago Pago, type ♂, allotype, and one paratype ♂, 19.iv.1924 (Bryan) ; Tutuila, two paratype ♀, 23, 25.ix.1923 (Swezey and Wilder) ; Tutuila, one paratype ♀, 18.iv. (Kellers).

Named in honour of Mr. P. A. Buxton.

Pygophora, sp.

A ♀, which it is impossible to identify specifically, has the legs much darker than those of *P. buxtoni*, the femora being entirely black, and the tarsi brown. In default of a ♂, I do not care to give a name to this species.

Length, 6 mm.

Savaii : Safune, 2.v.1924, rain forest, 2,000–4,000 feet (Bryan).

10. *Pygophora hopkinsi*, sp. n.

This very striking little species belongs to the group in which the males have long lanceolate bristles on the sides of some of the apical abdominal tergites. The two species to which it is most closely related are *P. lepidofera* Stein, and *P. minuta* Malloch. From both of these it is readily distinguishable by the presence of a large dark spot at the tip of the costa of the wings, the others having the wings entirely hyaline. In *P. minuta*, which is found in Australia, the third antennal segment is largely brown, while in *P. lepidofera*, an Oriental species, and in *P. hopkinsi* the entire antennae are bright yellow ; *P. minuta* also has lanceolate bristles on the third abdominal tergite, while in the other two species there are only normal bristles on that tergite. It will be extremely difficult to separate the females, since the above are exclusively male characters.

In *P. hopkinsi* and *P. lepidofera*, the middle coxae of the male each have a long, strong, backwardly directed spur, but I am unable to say if such occurs in *P. minuta*, as I made no mention of it in my description, and the type specimen is not now available to me.

♂. *Head* normal, frons widened in front, antennae extending almost to mouth; head fuscous, occiput densely dusted with grey, frons brownish on upper portion of central stripe, densely dusted with yellow except on vertex and ocellar region, which are dusted with grey; face and cheeks yellow, densely dusted with yellow; antennae and palpi bright yellow; arista yellow at base, dark at tip. *Thorax* normal, fuscous, densely dusted with grey, and without dark dorsal vittae. *Abdomen* testaceous yellow, darkened on dorsum apically, with three dark spots on third, three others on fourth, and two much smaller spots on fifth visible tergite; fourth visible tergite distally compressed above, keel-like, with some long apical central bristles, sides, and those of fifth tergite also, with many narrowly lanceolate bristles, slightly upcurved at tips and equally long on both tergites; processes of fifth sternite with a broad, rounded, downwardly directed plate. *Legs* entirely testaceous yellow; tibial bristles normal, not very long; posteroventral bristles on front femur long and fine; middle coxae each with a long, strong, backwardly directed spine; middle femur without apical posteroventral comb. *Wings* clear, with a large dark-brown mark on costal half extending from near middle of marginal cell to apex of wing and over third vein, diffuse on margins; inner cross vein close to middle of discal cell; tips of veins three and four subparallel; outer cross vein straight. *Squamae* whitish. *Halteres* yellow.

♀. Differing from ♂ in having almost entirely black *femora*, middle coxae without a spine, and abdominal tergites black with yellow hind margins, and three black spots on each.

Length, 3.5–4.5 mm.

Tutuila: Pago Pago, type ♂ and allotype, 14.xii.1925; Leone Road, two paratype ♀, 19.ii.1924; Pago Pago, one paratype ♀, 18.iv.1924 (Bryan). Upolu: Malololelei, 2,000 feet, two paratypes, 8, 19.vii.1925 (Wilder), one paratype ♀, xii. 1925. Savaii: Safune, two paratype ♂, one paratype ♀, 12, 13.v.1924 (Bryan).

A single ♀ from Manua (Tau) is closely similar to *P. hopkinsi*, but may not belong to that species.

Named in honour of Mr. G. H. E. Hopkins.

Pectiniseta Stein.

This genus as originally described presents an unique sexual dimorphism, the arista of the male being fringed with long hairs above and bare below, while that of the female has long hairs both above and below. In other respects the genotype is closely similar to *Lispocephala* Pokorný.

In the Samoan material before me there are two specimens of a species which agree in most particulars with *Pectiniseta*, but the arista of the female has long hairs above and is bare below. I am certain that both sexes are represented in the collection, but the abdomen of what is evidently the male is missing. The species is distinct from the genotype, *P. prominens* Stein, which is the only species so far referred to the genus. I consider *Coenosia pectinata* Stein to be a prior name for the genotype (New Guinea), and I have seen specimens of the genotype from Formosa, and Moorea in the Society Islands.

11. *Pectiniseta fulvithorax*, sp. n.

♀. Testaceous yellow, shining. *Frons* at vertex a little less than one-third width of head, widened anteriorly; inner verticals long, outer pair short; post-verticals shorter than ocellars; each orbit with three strong bristles, two upper bristles curved backward, lower one curved inward; antennae extending almost to mouth margin; arista plumose above, bare below; palpi slender. *Frons* dusted with yellow on triangle and orbits, interfrontalia fuscous; occiput fuscous, densely dusted with brown-grey; first two antennal segments fuscous, third segment yellow; arista fuscous; palpi yellow. *Thorax* with five dark vittae, central one broad and continued over disc of scutellum, submedian pair linear, on lines of dorsocentrals, sublateral pair very faint; 1+3 dorsocentrals, three sternopleurals; acrostichal hairs in two series anteriorly, prescutellar acrostichals not distinct; scutellum with four subequal bristles; pleura unspotted. *Abdomen* with weak bristles; a faint dark central mark on first tergite, and five black spots on each of next three tergites, central one elongate, submedian pair and sublaterals transverse, former more or less fused with central spot, sublaterals rather fainter. *Legs* yellow, slender; front femur with three or four fine posteroventral bristles; front tibia without a median posterior bristle, and with three apical bristles; middle tibia with one median posterior bristle, and about six unequal apical bristles; hind femur with one long postero-

ventral bristle near middle, and one short and one long preapical anteroventral bristle; hind tibia with one short anteroventral, two long anterodorsal, and two short posterodorsal bristles, tip like that of middle tibia. *Wings* hyaline, inner cross vein close to middle of discal cell. Lower *squama* less than twice as large as upper.

♂. Differing from ♀ in *thorax* being without dorsal vittae, and in *wings* being distinctly clouded at tip, from end of first vein onwards, cloud becoming faint posteriorly.

Length, 4.5 mm.

Savaii: Safune, 2,000–4,000 feet, rain forest, type ♀, 23.v.1924; allotype ♂ (defective), same locality, 8.v.1924 (Bryan).

Limnophora Robineau-Desvoidy.

The name of this genus is used here in its restricted sense, all the species included having the prosternum and the base of the third vein setulose.

Bezzi records only one Fijian species. Specimens of this and of four other species, one of which was met with in the Tonga group, are before me. In other regions the flies are found on the banks of streams and near bodies of water, and the larvae of at least some of the species are aquatic. A note on the habits of one Samoan species will be found on p. 166, footnote.

I present below a key for the separation of the Samoan species.

KEY TO THE SPECIES.

1. Thorax with three pairs of postsutural dorsocentral bristles, posterior pair longest; frons of ♂ opaque deep velvety black, about one-fourth as wide as head, that of ♀ a little wider; longest hairs on arista about as long as its basal diameter; wings evenly and rather noticeably infumed in ♂, less so in ♀; abdomen without dorsal spots in either sex, entirely black; thorax not vittate *immaculiventris*, sp. n.
- Thorax with four pairs of postsutural dorsocentral bristles, two anterior pairs much shorter than two posterior pairs; at least abdomen with distinct grey dusting and black marks on dorsum 2.
2. Thorax entirely black, without any indication of grey dusting; frons of ♂ not wider than third antennal segment; small species, not more than 4 mm. in length *atrithorax*, sp. n.
- Thorax in both sexes with very distinct whitish-grey dusting 3.
3. Frons of ♂ about one-third as wide as head, in both sexes with a long shining black triangle; longest hairs on arista fully half as long as width of third antennal segment; black presutural mark invariably connected somewhat broadly with postsutural one centrally; small species, rarely 4 mm. in length *mesolissa* Bezzi.

- Frons of ♂ not one-sixth as wide as head, that of ♀ much wider, with triangle not distinctly shining; longest hairs on arista not nearly half as long as width of third antennal segment; black presutural mark on thorax, if present, always separated from postsutural one by a sutural fascia of grey dust; larger species, always at least 5 mm. in length 4.
4. No well-defined presutural black mark on thoracic dorsum, area usually so occupied not very much darker than remainder of presutural region; less than basal half of scutellum black; abdomen not yellow on sides in either sex *subobsoleta*, sp. n.
- A well-defined deep black presutural mark on thoracic dorsum; more than basal half of scutellum black; base of abdomen in ♂ yellowish on sides *flavolateralis*, sp. n.

12. *Limnophora mesolissa* Bezzi.

As already indicated in the introduction to the present paper, this species is very probably widely distributed in the Pacific, as I have seen examples of it from New Guinea, and Bezzi described it from material from Fiji. *L. mesolissa* was distinguished by Bezzi from *L. plumiseta* Stein by its shining black frontal triangle. In this particular character the two species are practically identical, but the series of males of *L. plumiseta* from Sumatra and Formosa, which I have seen, present a character that appears readily to distinguish the species in this sex. This consists of a number of long bristly hairs at the base of the front femur on the posteroventral surface; these hairs are at first long, but gradually decrease in length on the basal third, their tips being bent forward, and thence to near the tip of the femur they are succeeded by very much shorter hairs, with a few longer and stronger hairs at the tip. In the male of *L. mesolissa* the front femur has a regular series of rather short, fine, posteroventral bristles throughout its entire length. In the males of both species the fifth abdominal sternite is elongate, and has a patch of short, dense, stiff, black hairs on each side of its distal third.

Length, 3-4 mm.

Upolu: Malololelei, 2,000 feet, xii.1925; iv.1924 (Bryan); vii. (Wilder); Tuafefu, 16.ix.1923 (Swezey and Wilder); Apia, vi.-vii.1913 (Doane); xii.1922 (Armstrong). Tutuila: Pago Pago, xii.1925. Savaii: Safune, v.1924 (Bryan). Manua: Tau, ii.1926 (Judd).

From the above records, I have no doubt that this species occurs throughout the year and in all, or nearly all, of the islands of the group where suitable breeding places are to be found. There are thirty-six specimens before me, but only six of these are males—a rather small proportion.

13. *Limnophora immaculiventris*, sp. n.

A slender species, which belongs to the group in which the frons of the male is about as wide as that of the female, and deep black. Some of the most closely related forms occur in Australia and the Oriental Region.

♂♀. Black, slightly shining. *Frons* black, slightly projecting, almost velvety, viewed from certain angles appearing covered with brownish dust; face and cheeks slightly dusted with white; frons of ♂ about one-fourth as wide as head at vertex, nearly twice as long as wide, that of ♀ shorter and wider; orbits in both sexes narrow, with short fine bristles, of which only upper one on each side is backwardly directed; inner verticals long, outer pair very short; ocellars well developed; longest hairs on arista about equal to its greatest diameter; antennae extending almost to mouth, third segment fully 2·5 as long as second; parafacials linear, below cheek about half as high as width of third antennal segment. *Thorax*, seen from behind, with slight greyish dusting on humeri; pleurae dusted with whitish grey; 2+3 pairs of dorsocentrals, presutural acrostichal hairs biseriate, prescutellar acrostichals not developed, 1+2 sternopleurals. *Abdomen* without any indication of dorsal spots, incurved lateral portions of tergites dusted with pale grey; abdomen of ♂ cylindrical, of ♀ broader, and pointed at apex, apical and discal bristles on fourth tergite in former quite long. *Legs* black, front coxae dusted with whitish grey; legs slender, front tibia without a median posterior bristle; middle tibia with two posterior bristles; hind femur with a short preapical anteroventral bristle; hind tibia with one anterodorsal and one anteroventral bristle near middle. *Wings* slightly and evenly infuscated; fourth vein almost imperceptibly curved forward at tip; outer cross vein curved; inner cross vein at from two-fifths to one-third from apex of discal cell. *Squamae* fuscous. Knobs of *halteres* yellow.

Length, 3·5–4 mm.

Upolu: Vailima, type ♂ and one paratype ♂, 26.iii.1925; Malololelei, 2,000 feet, allotype, xii.1925.*

Although, owing to the width of the frons, this species would appear to be allied to *L. mesolissa* Bezzi, it is not so closely related to it as is the following species (*L. atrithorax*). The head of the allotype has been broken off, and is mounted on the card with the specimen.

* On both occasions the flies were skating on the surface of mountain streams, on which they stood flapping their wings. They were generally found on the down-stream side of a large boulder, skimming about with Gerridae. They were extremely difficult to catch.—P. A. BUXTON.

14. *Limnophora atrithorax*, sp. n.

♂♀. Black, distinctly shining. *Head* black, frons, parafacials, and cheeks thinly clothed with pale dust, interfrontalia of ♀ brown, with triangle shining; eyes bare; frons of ♂ not as wide as third antennal segment, orbits setulose on almost their entire length, more strongly so in front, upper two fine hairs bent forward, vertical bristles short and weak; frons of ♀ about one-fourth as wide as head, upper two orbitals bent backward, triangle narrow, extending almost to anterior margin, all vertical bristles distinct; longest hairs on arista about as long as half width of third antennal segment; latter about twice as long as second segment; parafacials linear below; vibrissal angle not produced; cheek about as high as width of third antennal segment. *Thorax* wholly shining black, when seen from behind with very faint dusting and without vittae; 2+4 pairs of dorsocentrals, anterior two pairs behind suture strong, but not so long as posterior pairs, presutural acrostichal hairs in 2—3 series, prescutellar acrostichals not developed. *Abdomen* of ♂ densely dusted with yellowish grey, disc of first tergite largely black, that of second with a pair of large triangular black marks, third tergite with a pair of much smaller marks, fourth evidently unmarked; abdomen of ♂ ovate, with numerous bristly hairs; abdomen of ♀ much less evidently overspread with dust, appearing totally black except when seen from behind, when the spots, though much larger than in ♂, are faintly distinguishable. *Legs* black, normal; front tibia without a median posterior bristle; middle tibia with one median posterior bristle; hind femur with 3—4 preapical anteroventral bristles; hind tibia with one anterodorsal and one anteroventral bristle. *Wings* greyish hyaline; fourth vein quite distinctly curved forward at tip; outer cross vein almost straight; inner cross vein at less than one-third from apex of discal cell. *Squamae* grey. Knobs of *halteres* yellow.

Length, 3.5 mm.

Savaii: Safune, Matavanu crater, type ♂, allotype, and one paratype ♂, 13.v.1924 (Bryan).

The specimens are not in very good condition, having been crushed in some manner before mounting.

15. *Limnophora flavolateralis*, sp. n.

This species superficially resembles certain species of *Heliographa* Malloch, particularly *H. insignis* Stein and *H. fasciata* Stein, of New Guinea, but it may

readily be distinguished from them by the lack of setulae on the distal portion of the upper surface of the first wing vein.

♂♀. *Head* black, with dense whitish-grey dusting; interfrontalia of ♀ black, triangle slightly shining; antennae and palpi black; eyes bare; frons of ♂ almost twice as wide as third antennal segment, orbits much narrower than interfrontalia, and setulose on their entire length, ocellars short and fine, but slightly longer than verticals; frons of ♀ at vertex hardly more than one-fifth as wide as head, widening anteriorly, orbits entirely clothed with bristles, two upper bristles on each backwardly directed, ocellars stronger than in ♂, all four verticals well developed, triangle narrow, extending to, or almost to, anterior margin; parafacials in ♂ narrower than, in ♀ about equal to, width of third antennal segment; vibrissal angle produced a little more than frons; cheek almost twice as high as width of third antennal segment; longest hairs on arista distinctly longer than basal diameter of latter. *Thorax* black, with a conspicuous band of white dust in front of suture, descending over hind margin of mesopleura and centre of sternopleura, and a similar but broader transverse fascia on hind margin of mesonotum; apical third of scutellum densely clothed with white dust; 2+4 pairs of dorsocentrals, four irregular series of presutural acrostichal hairs, prescutellar pair of acrostichals well developed, and sternopleurals 1+1. *Abdomen* coloured like thorax, sides in ♂ appearing yellowish basally; covering of dust in both sexes very dense and yellowish grey; dorsal area of first tergite brownish black except hind margin on each side; second tergite with usual pair of angular spots brownish black, very large, extending entirely across dorsal area, fused in centre, and leaving only a narrow stripe on each side of anterior margin; third tergite with similar, but slightly smaller marks, which are more distinctly separated in centre; fourth tergite with dorsal surface quite faintly darkened in centre; ♂ with dorsal aspect shining brownish black, except a narrow, wedge-shaped fleck of grey dust on each side of anterior margin of each tergite. Abdomen of ♂ cylindrical, tapered to apex, visible tergites two to four each with well-developed apical bristles, three and four each with a discal series, third tergite in ♀ without a discal series. *Legs* black; front tibia without a median posterior bristle; middle femur without ventral bristles; middle tibia with two posterior bristles; hind femur with 3-4 preapical anteroventral bristles; hind tibia with one anterodorsal and one anteroventral bristle. *Wings* greyish hyaline; fourth vein slightly curved forward at tip; inner cross vein about one-third from apex of discal cell. *Halteres* yellow.

Length, 5–7 mm.

Upolu : Siumu, type ♂, allotype, and paratype ♂ and ♀, 26.ii.1923 (Armstrong) ; Apia, one paratype, 20.x.1923 (Armstrong) ; Vailima, one paratype, 9.vi.1924 ; Lalomanu, xi.1924. Savaii : Safune, two paratypes, 11.v.1924, one paratype, 1,000–2,000 feet, 4.v.1924 (Bryan) ; Lealatele, one paratype, xi.1925. Tutuila : Afono trail, one paratype, 25.ix.1923 (Swezey and Wilder).

15A. *Limnophora subobsoleta*, sp. n.

♂♀. Similar in general coloration and habitus to *L. flavolateralis*, but differing in having presutural area of *thorax* but slightly infuscated anteriorly, pleurae dusted with grey except for a rather inconspicuous dark mark below wing base, basal half or less of scutellum black, brownish black marks on dorsum of *abdomen* much smaller, especially in ♀, and distinctly divided in centre by a stripe of grey dust, and a conspicuous central dark mark on fourth tergite in both sexes.

Structurally the two species are very similar, but in *L. subobsoleta* frontal orbits in ♂ are broader than interfrontalia, acrostichal hairs in front of suture are stronger, and there is a lower posterior sternopleural bristle ; hairs on arista are a little shorter, and there are four or more well-developed bristles on basal half of posteroventral surface of middle femur in ♂, which are much shorter, but still evident, in ♀.

Length, 5.5–7 mm.

Type, male, and allotype, Tonga Islands : Tongatabu, Houma, type ♂ and allotype, 19.ii.1925 (Hopkins).

No specimens of this species have been received from Samoa.

Ophyra Robineau-Desvoidy.

This genus includes two species, which are very widely distributed throughout the Orient and are also found in Australia. Of the two, both are known to occur in Samoa, one only in Fiji.

16. *Ophyra nigra* Wiedemann.

Recorded as having been reared at Apia, from larvae in a dead cat (Buxton and Hopkins).

This species is distinguished from *O. chalcogaster* Wiedemann by its entirely

black front tarsi, the other having a white ventral mark at the base of most of the segments of the latter.

There is just a possibility that *O. aenescens* Wiedemann, an American species which has extended its range to Hawaii, may also be found in Samoa. It may be known readily from any other species of the genus by its rufous yellow palpi, all the others having the palpi black or fuscous.

17. *Ophyra chalcogaster* Wiedemann.

O. chalcogaster is represented by a solitary female amongst the material of the Hamburg State Zoological Museum now in my hands. The locality label is simply "Samoa," with the addition of "Mus. Godeffroy, No. 13267."

Dichaetomyia Malloch.

This genus occurs in the tropical and subtropical portions of the Eastern Hemisphere, extending throughout Africa except the extreme north, across southern Asia, and southward to Australia. There are very many species, but practically nothing is known of the immature stages.

Bezzi records two species as found in Fiji, under the names *D. rufa* Stein, var. *personata* Bezzi, and *D. prodigiosa* Bezzi. Whether the identification of *D. rufa* is correct or not is a problem that can only be determined by a comparison of types. Many of the yellow species in this genus are almost identical in colour and chaetotaxy, and can only be distinguished from each other by minute characters usually not mentioned by their original describers. Judging from Bezzi's description, some specimens before me from Samoa are separable from var. *personata* only by colour, though some of the forms represented are distinguishable from each other by structural characters not mentioned in the description of that variety. Bezzi's other species, *D. prodigiosa*, is identical with *D. elegans* Malloch, described some months prior to the publication of Bezzi's work, from a female taken in the Fiji Islands. I have since seen a series of four specimens, two of them males, likewise collected in Fiji.

The material before me appears to include examples of two species, one of them represented by the typical form and two varieties, one or both of which may ultimately prove to be valid species. These may be distinguished as shown in the key presented below.

KEY TO THE SPECIES.

1. Wing without evident costal cloud; hind femur of ♂ without evident posteroventral bristles centrally; abdomen not blackened at tip *rufa* (Stein).
 — Wing with quite evident brown costal cloud, most conspicuous in costal and marginal cells; hind femur of ♂ with some outstanding bristles on central third or more of posteroventral surface; abdomen more or less broadly blackened at tip *fumicosta*, sp. n., 2.
2. Some black hairs on sides of, and invading ventral surface of, scutellum; facets of upper anterior portion of eyes almost as large as anterior ocellus *fumicosta*, var. *hirta* nov.
- No hairs on lower portion of sides, nor on ventral surface, of scutellum; facets of upper anterior portion of eyes not very much enlarged 3.
3. All fine hairs on mesopleura, except a few surrounding stigmalta bristle, black *fumicosta* typ. form.
- All fine hairs on mesopleura, including also some of setulose hairs on hind margin, yellow *fumicosta* var. *savaii* nov.

18. *Dichaetomyia rufa* (Stein) ?

I have had some difficulty in arriving at a conclusion as to the identity of this species, and only a very careful scrutiny of the type specimen, which should be in the Hungarian National Museum, will definitely decide the matter. Stein in his original description, written when he was still a comparative beginner in work on exotic forms, compared *D. rufa* with *Aricia pallida* Fallen, a rather unhappy selection since the latter belongs to *Phaonia* Robineau-Desvoidy, and is not at all closely related, the resemblance being one of colour only, and by no means striking. This course on Stein's part undoubtedly misled Bezzi, and caused him to state that his variety *personata* differs from *D. rufa* in having the frontal stripe deep black, even in the male. It is true that *A. pallida* has the frons testaceous yellow, but every one of the species of *Dichaetomyia* related to *D. rufa* known to me has the frons black. The colour of the palpi in the original description of *D. rufa* is given as yellowish, generally somewhat tinged with brown at the base, which would practically correspond with Bezzi's description, though he states that the palpi are black, sometimes with the extreme tips in the male whitish. I have found considerable variation in the colour of the palpi in certain members of this genus, and in the series before me, comprising this and the next species, the tendency to darkening of the palpi is most evident in specimens that are slightly greasy. I am of the opinion therefore that Bezzi had examples before him which agree in colour characters with Stein's original

description of *D. rufa*, and that those specimens belong to the species listed herein under that name with a query.

The situation with reference to the identity of *D. rufa* is not improved by Stein himself, as in his 1918 paper (*Ann. Mus. Nat. Hungar.*, vol. 16, p. 185) he distinguished *D. decipiens*, a new species, from *D. rufa* by the colour of the tibiae, the former having these tinged with brown, while in *D. rufa* they are stated to be yellow. This statement contradicts the original description, which explicitly mentions that the tibiae are tinged with brown, and it appears entirely probable to me that Stein based his key upon examples other than the type, and that he misidentified the species. The specimens provisionally accepted here as belonging to *D. rufa* work out as *D. decipiens* in the key given by Stein; but they are without posteroventral bristles on the hind femur, a character which is of some importance in the genus, and therefore possibly they should not be assigned to that species. Bezzi does not mention this last character in his description, so that I cannot determine whether, if they do not belong to *D. rufa*, one might accept *D. personata* as distinct and providing the proper name for this species.

Upolu: Apia, 1 ♂, 3.iii.1924. A second ♂, labelled "Samoa" and taken by Professor R. W. Doane, may also be from Apia.

19. *Dichaetomyia fumicosta*, sp. n.

♂♀. This species agrees with *D. rufa* Stein in general habitus and colour, but the tip of the abdomen is rather broadly blackened, and the costal margin of the wings is quite distinctly suffused with dark brown, most conspicuously so in the costal and marginal cells. In all other characters the species are very similar, but in *D. fumicosta* there are always some rather long bristles on the central third or more of the posteroventral surface of the hind femur in the ♂. I can distinguish a lightly marked central vitta of white dust on the anterior part of the thoracic dorsum, which fills more than half of the space between the dorsocentral bristles. The other characters are as given in the key.

Length, 7-8 mm.

Upolu: Apia, type ♂, allotype, and one fragmentary paratype, vi.-vii.1913 (Doane); Apia, Mt. Vaea, 1,200 feet, paratypes, 20.ii.1925; Malololelei, 2,000 feet, one paratype, 28.vi.1925; Vailima, 12.xii.1925; Tuaeifu, one paratype, 16.ix.1923 (Swezey and Wilder); Vaea, 1,000 feet, 23.iv.1924 (Bryan). Savaii: Salailua, one paratype, 13.v.1924 (Bryan); Safune, lower forest,

1,000–2,000 feet, one paratype, 5.v.1924 (Bryan). Tutuila : Fagasa, one paratype (Swezey and Wilder).

Dichaetomyia fumicosta, var. *hirta*, var. n.

♂. Similar to type form, but differing in having some stiff black hairs on lower portions of sides of, and invading ventral surface of, scutellum.—This is a character met with in the group which contains *D. quadrata* Wiedemann and some other species, but it is not so well developed in the present variety as in those. The costal cloud will readily distinguish this form from any of the *quadrata* group. The characters given in the key will suffice for the distinction of this variety from the others.

Length, 7 mm.

Upolu : Malololelei, 2,000 feet, type ♂, xii.1925.

Dichaetomyia fumicosta, var. *savaii*, var. n.

♂♀. In addition to the characters for the distinction of this variety mentioned in the key, it may be added that the two specimens before me are somewhat larger, and have the abdomen more extensively blackened than in the others. The third antennal segment also appears to be comparatively longer, and the discal bristles on the fourth visible abdominal tergite are stronger.

Possibly a good species rather than a variety; an examination of the male hypopygia in a series of examples should prove whether it is so or not.

Length, 8 mm.

Type, ♂, and allotype, Savaii : Safune, type ♂ and allotype ♂, at an altitude of 2,000–4,000 feet, 3, 23.v.1924 (Bryan).

The fact that a larva is projecting from the tip of the abdomen, in the case of the female of this last variety, evidently indicates that the species is viviparous. I should not be surprised to learn that the members of the genus *Dichaetomyia* are scavengers, depositing live larvae in sewage, stagnant pools, or ditches.

MUSCINAE.

The subfamily Muscinae is distinguished by the lower squama being normally wide, with the inner basal angle produced and lying close against the basal lateral angle of the scutellum, and the apex broadly rounded or subtransverse ;

if the lower squama is narrow the pteropleura is setulose, and the fourth wing vein is distinctly bent forward at the tip, with the bend beginning at or before the middle of its terminal section, or else the middle tibia has a strong bristle almost on the ventral surface near the middle.

Synthesiomyia Brauer and von Bergenstamm.

This genus is monotypic, the only species being very widely distributed in tropical and subtropical regions of both hemispheres.

20. *Synthesiomyia nudiseta* van der Wulp.

A series of specimens from Upolu (Apia), some of them reared from carrion. Recorded by Bezzi as occurring in Fiji.

Musca Linnaeus.

I have recently restricted this genus to those species generally placed in *Musca*, which have erect hairs on the centre of the propleura.

21. *Musca domestica* Linnaeus.

A generally distributed and common species. I do not accept *M. vicina* Macquart as distinct from *M. domestica* Linnaeus, the only difference between the two forms being found in the comparative widths of the frons in the two sexes. In the male of *M. vicina* the frons is normally much narrower than in that of typical *M. domestica*, but I have found so much variation in this character that I am forced to disregard it, accepting the specimens as all belonging to one species.

The species is widely distributed throughout the Samoan group, and is the only one recorded by Bezzi as found in Fiji.

22. *Byomya sorbens* Wiedemann.

The above name is the one applicable to this species, according to the recent investigations of Professor Patton. The species is very similar to, if not identical with, the one accepted as *B. vetutissima* Walker, which occurs in Australia.

STOMOXYDINAE.

This subfamily is represented in Samoa by but one genus, which occurs also in the Fiji Islands; in the material before me there are examples of only a

single species, while two species are recorded by Bezzi as having been found in Fiji. There are no specimens of *S. limbata* Austen from Samoa, and this species is evidently rare in Fiji, as only one male is recorded.

23. *Stomoxys calcitrans* Geoffroy.

Dr. Buxton and Mr. Hopkins have recorded this species as occurring only in Apia, where it was not at all common. I have examined some of the specimens, which are typical.



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INSECTS OF SAMOA AND OTHER SAMOAN TERRESTRIAL ARTHROPODA

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