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Revision of the Oriental Bloodsucking Muscidæ (<i>Stomoxinae</i> , <i>Philaematomyia</i> , Aust., and <i>Pristirhynchomyia</i> , gen. nov.). <i>E. Brunetti</i> ..	59

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IV. REVISION OF THE ORIENTAL BLOOD-SUCKING MUSCIDÆ (*STOMOXINÆ*, *PHILÆMATOMYIA*, Aust., AND *PRISTIRHYNCHOMYIA*, GEN. NOV.).

By E. BRUNETTI.

In the present paper, sixteen species are regarded as probably distinct, belonging to the group *Stomoxinæ*. I have also established a new genus *Pristirhynchomyia*, with one species, allied to Mr. Austen's recently created genus *Philæatomyia*.

These latter two genera certainly belong to the group of genera immediately approximate to *Musca*, whatever this group may be called. The arrangement of genera in Muscidæ in the 3rd volume of the Palæarctic Catalogue contains several associations with which I can hardly concur; especially the placing of the genus *Musca* itself in Anthomyidæ, and the abolition of Oestridæ as a family.

Two genera not yet found in the Orient are included amongst these descriptions, that they may be recognised should they occur here.

One (*Hæmatobosca*, Bezzi) is European, and may occur in the Himalayas or in North-West India; the other (*Stygeromyia*, Aust.) is African, and might easily be imported through the agency of cattle traffic.

That the species are generally closely related to each other is easily realised by the number of synonyms even amongst the few European species. *Stomoxys calcitrans*, L., has been described seventeen or eighteen times, *Hæmatobia stimulans*, Mg., possessing six synonyms and *Lyperosia irritans*, L., a comparatively uncommon species, two.

I have little doubt of the specific distinctness of all the forms described in this paper, with the exception of the genus *Stomoxys*, of which a considerable amount of further study seems imperative.

At times it has even occurred to me that all the so-called species from the East could almost be comprised under three typical forms, which may be termed *calcitrans*, L., *indica*, Picard, and a species with a distinctively formed fore tarsus in the ♂ (the only sex known)—*pulla*, Aust.

For this reason I cannot feel satisfied with the table of species in *Stomoxys*, and in this genus the present article must be regarded as more preparatory than conclusive.

It may be noted here that some confusion may possibly arise, and erroneous deductions arrived at by a misunderstanding, as to whether the width of the frons is measured across the vertex or across the middle.

Mr. Austen, in his paper dealing with these genera measures along the vertex, but I have always adopted the second course, taking its average width, ignoring the widening at the vertex and towards the frontal triangle; or in other words I have regarded its width as the distance between two perpendicular lines drawn so as to touch the greatest length of eye margins.

My thanks are due to Prof. Bezzi for some valuable notes on *Lyperosia* and *Hæmatobosca* and especially to Mr. E. E. Austen for information, respecting *Lyperosia minuta* and *L. exigua*, enabling me to avoid describing both species again as new. The former I knew only from four specimens (African) in indifferent condition; the latter from the description only, in which, be it noted, no mention is made of the conspicuous long hairs on the hind tarsi in the ♂. As my descriptions of both species have been drawn up from a good series of both sexes of each species, I allow them to remain as redescriptions of *minuta* and *exigua*; the original descriptions of these two species not always being accessible.

In connection with studies on this group, the following papers may be consulted:—

1. E. E. Austen. A monograph of the Tsetse flies (*Glossina*). London, British Museum (1903).
2. K. Grünberg. "Über blutsaugende Musciden," Zoologischer Anzeiger, xxx, 78 (1906).
3. M. Bezzi. "Die Gattungen der blutsaugenden Musciden," Zeits. Hymen. v. Dipt., 1907, p. 413.
4. M. Bezzi. "Mosche ematofaghe," Rend. Istit. lomb. di sci. e lett., 1907, p. 433.
5. E. E. Austen. "New genera and species of blood-sucking Muscidæ from the Ethiopian and Oriental Regions, in the British Museum," Ann. Mag. Nat. Hist. (8), iii, 285 (1909).
6. E. E. Austen. Illustrations of African blood-sucking flies, other than mosquitoes and tsetse flies. London, British Museum (1909).

Table of genera in **STOMOXINÆ**.

- A Arista plumose above and below.
1. 1st and 3rd longitudinal veins at base bare.
Apical part of 4th vein quite straight.
1st posterior cell rather narrowly open.
Body generally more slender (*Lyperosia*-like).
Palpi comparatively less spatulate.
Arista with comparatively fewer hairs below *Hæmatobosca*,¹
Bezzi.

¹ Not yet recorded from the Orient, but occurs in Italy.

2. 1st and 3rd longitudinal veins at base bare.
Apical part of 4th vein not straight, but less curved than in *Hæmatobia*.
1st posterior cell broadly open.
Body generally stouter (*Stomoxys*-like).
Palpi comparatively more spatulate at tips.
Arista with comparatively more hairs below, *Bdellolarynx*, Aust.
3. 1st and 3rd longitudinal veins with a few minute bristles at their bases.
Apical part of 4th vein much curved (as in *Stomoxys*).
1st posterior cell broadly open.
Body generally stouter (*Stomoxys*-like).
Palpi comparatively less spatulate at tips.
Arista with comparatively less hairs below, *Hæmatobia*, Rob. Desv.
- AA Arista plumose above only.
- B Palpi much shorter than proboscis.
(3rd longitudinal vein bristly at base) *Stomoxys*, Geoff.
- BB Palpi always approximately as long as proboscis.
- C Apical part of 4th vein quite straight.
3rd longitudinal vein with minute bristles at base.
1st posterior cell rather narrowly open.
Proboscis not tapering; palpi clavate at tips.
Body chiefly *Stomoxys*-like.
Sternopleural bristles black, *Stygeromyia*,¹ Aust.
- CC Apical part of 4th vein with distinct curve, as in *Stomoxys* and *Hæmatobia*.
3rd longitudinal vein at base bare.
1st posterior cell rather broadly open.
Proboscis gently tapering from base to tip; palpi not clavate at tips.
Sternopleural bristles distinctly yellow, *Lyperosia*, Rond.

HÆMATOBOSCA, Bezzi, 1907.

Zeits. Hym. Dipt., 414.

This genus may be characterised thus: Body more slender than in *Hæmatobia*; palpi as long as proboscis; arista with some hairs below; 3rd longitudinal vein bare at base; 4th, as a whole, considerably curved (in comparison with that of *Lyperosia*); 1st posterior cell rather narrowly open.

I add a description of this genus to my paper, although it is not yet known from the East, because it may easily occur in the northern part of India.

¹ Not yet recorded from the Orient, but occurs in Arabia.

The typical (and only) species is *atripalpis*, Bezzi, Bull. So. Ent. Ital., xxvii, 60 (1895) (*Hæmatobia*), described from Italy.

Austen's recently erected genus *Bdellolarynx* is very closely allied.

BDELLOLARYNX, Austen, 1909.

Ann. Mag. Nat. Hist. (8), iii, 290.

“ Small, stoutly built, thick-set flies, closely allied to *Hæmatobia*, R. D., but distinguishable as follows:—No sexual colour-dimorphism (unless it be in wings); front, facial angles, and anterior margin of buccal cavity less prominent; jowls descending considerably behind, instead of nearly horizontal, but basi-occipital region much less protuberant; bristles below facial angles small and fine, instead of relatively coarse; in ♂ front wider with upper inner margins of eyes more nearly parallel, less approximate in middle of front; arista feathered above with considerably longer hairs, and below with about six fairly long hairs; 1st and 3rd longitudinal veins entirely bare, without bristles at base.” The chætotaxy is as follows: Humeral bristles 2; post-humeral 1; notopleural 2; præsutural 1; supra-alar 1; intra-alar 1; post-alar 2; dorso-central 5 (2 in front of and 3 behind suture, may be difficult to distinguish, especially in ♀); inner dorso-central 1 (sometimes 2 in ♂); scutellar 4 (1 præbasal, 1 basal, 1 discal, situated close to lateral margin, 1 apical); mesopleural about 10 or 12; sternopleural 1: 1.

“ *Bdellolarynx* is distinguished from *Hæmatobosca*, Bezzi, by the palpi being much more spatulate at the tips, by the arista having a greater number of hairs below, and, in the wing, by the shape of the 1st posterior cell and the course of the terminal portion of the 4th longitudinal vein (in *Hæmatobosca* the latter details are the same as in *Stygeromyia*, Aust.). Typical species, *B. sanguinolentus*, sp. nov.”

Bdellolarynx sanguinolentus, Aust., 1909.

Loc. cit., 290.

♂ ♀ India, Ceylon, Assam. Long. ♂ $4\frac{3}{4}$ -5 mm.; ♀ $3\frac{1}{2}$ - $4\frac{1}{4}$ mm.

“ Mouse-grey or slate-grey, clothed with short black hair, bristles also black; palpi buff; dorsum of thorax with a pair of extremely narrow, widely separated, parallel, longitudinal ad-median blackish stripes, a somewhat triangular blackish mark extending backwards from inner end of each humeral callus, and an elongate blackish streak in a line with latter mark behind transverse suture (two outer marks less distinct in ♀); dorsum of abdomen with a narrow, interrupted, longitudinal, median, clove-brown stripe, and, on 2nd and 3rd segments, paired transverse, roughly triangular, clove-brown blotches, the pair on 2nd segment especially large. Wings hyaline or tinged with tawny olive in ♂, hyaline in ♀; femora greyish clove-brown, extreme tips ochraceous_

buff, one or more pairs sometimes more or less brownish except at base, tarsi dark brown."

Types in the British Museum; ♂ captured by me at Calcutta, 8-ii-09; ♀ from Mussoorie, ix-06 [*Howlett*]. Other specimens in the British Museum from Allahabad, 6-x-05 [*Howlett*]; Sylhet, 13-iv-05 [*Hall*]; and Henaratgova and Haldumulla (both Ceylon), 7-ii and 14-vi-92 respectively [*Yerbury*]. In the Indian Museum are 3 ♂♂ from Tharbani, Nepal, 27-ii-08; and from the base of the Dawna Hills, Lower Burma, 2-iii-08 [*Annandale*]; 3 ♂♂ from Bandra (Bombay Presidency) "hovering in slaughter house," 28-xi-09 [*Hodgart*]; and one ♀ from Maddathorai (base of Western Ghats, Travancore, 17-xi-08 [*Annandale*]). I have a ♂ in my own collection taken by me in Calcutta, 18-ii-05. Both Dr. Annandale and the Museum Collector Mr. Hodgart have noticed the apparent habit in the males of this species of hovering, an unusual practice of the members of this subfamily, although I have occasionally noticed it in *Stomoxys calcitrans*.

N.B.—Although the specimen forming the type of this genus was taken by me I was unaware of its generic difference from *Stomoxys* at the time of capture.

HÆMATOBIA, Rob. Desv., 1830.

Essai sur les Myod., 388.

Original description.—"Palpi elongati, ultra epistoma porrecti, interdum apice dilatati; apud quasdam species, tarsi postici externè serrati."

This genus was first split off from *Stomoxys* by Robineau Desvoidy for those species in which the palpi are as long as the proboscis, in contradistinction to *calcitrans* with its very short slender palpi. The author added that the palpi are sometimes a little dilated at the tip, and that in some species the hind tarsi ("tarses posterieurs") were serrated. He only included four species, all from France. Of these, two (*ferox* and *geniculata*) are synonymous with *stimulans*, Mg., and another (*serrata*) is synonymous with *irritans*, L., a species for which Rondani erected the genus *Lyperosia*. The remaining species, *tibialis*, still stands good as distinct and remains in *Hæmatobia*.

From the more restricted point of view, the characters of *Hæmatobia* are: (1) the presence of minute but distinct (though easily broken off) bristles at the base of both the 1st and 3rd longitudinal veins, this being the only genus in which these bristles appear on the 1st longitudinal vein; (2) the arista being plumose below as well as above; (3) the palpi, which are practically as long as the proboscis; (4) the well-curved apical part of the 4th longitudinal vein (as in *Stomoxys*, to which genus the present species bear considerable resemblance in size and shape); (5) the broadly open 1st posterior cell. Lesser characters may be gleaned from my table of genera.

Table of Oriental species.

Legs all black, except base of tibiæ	
pale	<i>sanguisugens</i> , Aust., ♂
Posterior femora wholly pale	.. <i>rufipes</i> , sp. nov., ♀

***Hæmatobia sanguisugens*, Aust., 1909.**

Ann. Mag. Nat. Hist. (8), iii, 288.

♂ Himalayas. Long. 5½-6 mm.

“Olivaceous-grey, or brownish grey, with clove-brown markings; dorsum of thorax with 2 pairs of clove-brown longitudinal stripes (outer stripes broader and widely interrupted at transverse suture), and a less sharply defined median stripe; dorsum of abdomen with a clove-brown median longitudinal stripe, extending from front margin of 2nd to beyond middle of 4th segment, narrowly interrupted before hind margins of 2nd and 3rd segments, a pair of transversely elongate dusky blotches on 1st segment, a pair of large clove-brown spots on 2nd segment and a pair of similar but smaller spots on 3rd segment; wings slightly infuscated, light sepia coloured; legs clove-brown, bases of tibiæ ochraceous-buff.”

The types of this species are in the British Museum taken at Kasauli, Punjab (W Himalayas), “on cows” [*Lt.-Col. F. Wyville Thomson*]. “The flies sucked the animals, and their abdomens became distended with blood. I have never noticed them biting man.” Mr. Austen compares his species to the European *H. stimulans* of Meigen, distinguishing it by “its usually somewhat smaller size (average length of 6 ♂♂, 5.75 mm.), by the median dark dorsal stripe on the abdomen being practically continuous throughout its extent instead of widely interrupted before reaching the hind margins of the 2nd and 3rd segments, by the 4th abdominal segment in the ♂ being always without a pair of dorsal spots, and by the 1st longitudinal vein being either entirely bare or having at most one or two minute bristles, instead of a row of bristles conspicuous under a strong lens when viewed at a low angle from the direction of the hind margin of the wing.”

N.B.—One ♂ in the Indian Museum, taken 10-viii-09 by Mr. Paiva at Darjiling (7,000 ft.), agrees almost perfectly with Mr. Austen’s description. Incidentally, I may note that, previous to reading of his species, I had marked this specimen as a variety of *stimulans*. Mr. Austen however mentions six specimens that show consistency in the markings. The lesser size I do not value as a specific character as I have noticed that Oriental specimens of very common European species appear to be generally undersized. The intrinsic value of the minute spines on the bases of the 1st and 3rd longitudinal veins, when present, is also, to my thinking, much less than some writers have considered it.

H. stimulans may quite possibly occur in Northern India; this species, if found, should be recognisable by the differences from *sanguisugens* given above.

***Hæmatobia rufipes*, mihi, sp. nov.**

♀. Himalayas, Nepal. Long. 4-5 mm.

Head. Frons one-third width of head, yellowish grey, with a broad dull bare stripe. Ocellar triangle with two pairs of small bristles above and a pair of strong ones below.

Fronto-orbital bristles 9, the upper 4 placed rather out of the straight line, slightly irregularly, the lower 5 normal and well curved inwards.

Face whitish grey, with the usual bristles about the mouth. Antennæ blackish, arista with 7 long hairs above, and 5 below. Palpi reddish yellow, with black bristles, which are more numerous at the tip. Proboscis wholly shining black, slightly longer than palpi. Back of head grey, occipital orbit normally fringed with bristles.

Thorax. Dorsum yellowish brown, with a broad median grey stripe from anterior margin to beyond the middle; this stripe edged with a dark brown but not sharply-defined line. Towards the margin of the dorsum the colour is much browner. Humeri grey. The median grey stripe appears blackish, if viewed from behind. The whole of the sides of the thorax uniformly blackish grey, with minute sparse black pubescence. Scutellum brownish yellow, with minute pubescence, two strong spiny bristles towards each side. The two apical bristles are broken off, but appear to be strong. *Chaetotaxy.* Humeral bristles 3 (one or more sometimes weaker); post-humeral 1; præsutural 1; noto-pleural 2; supra-alar 2; intra-alar 1; post-alar 1; meso-pleural 10, the uppermost placed just below the hindermost noto-pleural; sterno-pleural 1: 1. The dorso-central bristles not very conspicuous, apparently 1 before, 3 or 4 behind suture and a hindermost very strong one.

Abdomen. Yellowish grey; a narrow median black stripe; each segment mainly occupied by a pair of large blackish spots of irregular shape. Whole dorsum covered with soft hairs. Belly grey.

Legs. Reddish yellow. Fore femora (except extreme tips), tips of hind femora, and the tarsi, blackish. Fore femora with rows of long stiff hairs on outer and lower sides; middle femora with 2 curved hairs above, at tip; hind femora with a few longish hairs above at tip, one below. Middle tibiæ with 2 or 3 bristles at tip, hind tibiæ with one bristle behind, at tip. Legs minutely pubescent.

Wings clear, outer cross-vein nearly straight Tegulæ yellowish; halteres yellow.

Described from 2 ♀♀ in the Indian Museum. Darjiling (6,000 ft.), 29-ix-08 [*Brunetti*, type]; and Noalpur Nepal, 23-ii-08.

STOMOXYS, Geoff., 1764.

Hist. Des. Ins., ii, 538.

See also Sch. F. Aust. (Dipt.), i, 577 (1862).

The genus *Stomoxys*, Geoff., as understood by the older authors, and as described by Schiner, included both *stimulans*, Mg. (now referred to *Hæmatobia*), and *irritans*, L. (now placed in *Lyperosia*). Both these latter species were primarily split off from *Stomoxys*, under the name *Hæmatobia*, Rob. Desv., on the strength of the palpi being as long as the proboscis.

Some discussion has arisen as to whether the name *Stomoxys*, Geoff., or *Siphona*, Mg., should stand for the present genus. Two recent authorities,—Speiser (Zeits. f. wiss. Insek., i, 461) and Bezzi, both in his "Mosche ematofaghe" (Rend. Istit. lomb. (2), xl, 17) and in the 3rd volume of the new Palæarctic Catalogue,—have replaced *Stomoxys* by *Siphona*, Mg.

I am glad to see that Mr. Austen (Ann. Mag. Nat. Hist. (7), xix, 445) has deprecated the change, giving full and satisfactory reasons for supporting the continuance of the name *Stomoxys* for the present genus.

The following generic description is founded on that of Schiner, with the elimination of such characters as only apply to the more recently established genera, and the addition of other distinctive characters which appear to be, in the restricted sense of the genus, generically consistent.

STOMOXYS, Geoff.

(Redescription.)

Medium-sized, grey flies, one species (*calcitrans*) being one of the common "house flies."

Head semi-circular, somewhat flattened in front; epistome nearly straight, nearly bare; buccal cavity hardly prominent, with a row of strong spines each side; cheeks rather narrow, descending only a little below the eyes.

Front in ♂ narrow, in ♀ about one-third the width of the head, the exact dimensions in both sexes varying in different species, and (within narrow limits) sometimes in the same species. In both sexes a row of about 7 fronto-orbital bristles, which in the ♀ are augmented by smaller ones on the upper part of the frons placed nearer to the eyes. Eyes bare.

Antennæ recumbent, moderate in size, 1st joint very small, 2nd distinct, with a few short bristles, 3rd about three times the length of the 2nd. Arista plumose on upper side only, with about 8 to 10 long, well separated hairs of (after the first one or two) gradually decreasing length nearly to the tip, these hairs being very slightly curved, but seldom bisinuate. Proboscis horizontal, very prominent, of hard chitinous material, considerably thicker on basal part, narrowing gradually to tip; labella very small. Palpi

cylindrical, narrow, small, much shorter than proboscis, often inconspicuous through lying flat against the epistome.

Thorax a little longer than broad, of the average Muscid type, with macrochætæ,¹ and minute bristly hairs.

Abdomen ovato-conical, moderately arched, generally marked with infuscated spots, a dorsal stripe, or transverse darker bands. Legs of moderate size and length, minutely pubescent, with a few stronger bristles; inner side of middle tibiæ bare. Wings of the typical Muscid venation, resembling that of *Cyrtoneura stabulans*, F. (also a "common house fly"), except that the 4th longitudinal vein is bent upwards in a sharper curve after passing the inner transverse vein, thus leaving the 1st posterior cell rather broadly open; 3rd longitudinal vein with some distinct but minute bristles at its base.

The metamorphoses occur in decaying vegetable matter, horse-dung and similar substances. Both sexes in the adult suck blood, including, occasionally, that of man, but they are especially irritating to horses and cattle. The genus is probably world-wide, or at least wherever civilised man is found.

Table of Oriental species of STOMOXYS.

- | | | |
|----|--|--------------------------------------|
| A | Fore tarsus normal. | |
| B | Abdominal segments without bands, but with two distinct (often ill-defined) spots on at least the 2nd and 3rd segments. Tibiæ pale at base only. | |
| C | Frons in ♂ $\frac{1}{4}$ width of head; in ♀ $\frac{1}{3}$. | |
| D | Thorax with 4 well-defined (but variable) stripes, never divided. Width of frons $\frac{1}{4}$ in ♂ $\frac{1}{3}$ in ♀ | <i>calcitrans</i> , L., ♂ ♀ |
| DD | Thorax with 4 oblong large spots, each more or less divided. Width of frons (presumably) neither $\frac{1}{4}$ nor $\frac{1}{3}$ as sex is given as doubtful | <i>plurinotata</i> , Big. |
| CC | Frons in ♂ $\frac{1}{5}$ (♀ unknown). Tibiæ with basal half pale, middle pair apparently wholly so | <i>oblongopunctata</i> , sp. nov., ♂ |

¹ The chætotaxy of *S. calcitrans* is fully described under the heading of that species rather than under that of *Stomoxys*, as I do not wish to suggest that that particular arrangement of bristles is necessarily generic, not being acquainted with the chætotaxy of species from other parts of the world, that is to say of species which must obviously remain in this genus. The chætotaxy of at any rate all the species I have seen is uniform.

- CCC Frons in ♂ $\frac{1}{7}$ to $\frac{1}{8}$ (? ♀ unknown).
- E Frons shining white; abdominal marks as in *calcitrans* (? Oriental) *sitiens*, Rond., ♂.
- EE Frons quite dark; 2nd, 3rd, and 4th abdominal segments each with two black marks in the shape of elongated triangles *triangularis*, sp. nov., ♂.
- BB Abdominal segments with a distinct black band on, at least, hind margins.
- F Frons comparatively wide, $\frac{1}{6}$ to rather wider than $\frac{1}{4}$.
- G Frons $\frac{1}{6}$; tibiæ pale at base only; transverse dark band at base of 2nd and 3rd segments as well as on hind margins *bengalensis*, Picard, ♂ ♀.
- GG Frons rather wider than $\frac{1}{4}$; anterior tibiæ and tarsi pale; no band at bases of segments; 2nd segment wholly clove-brown or nearly so (♀ unknown) *pusilla*, Aust., ♂
- FF Frons narrow, $\frac{1}{7}$ to $\frac{1}{8}$; tibiæ wholly pale brown ¹ *indica*, Picard, ♂ ♀.
- AA Fore tarsus in ♂ with 1st joint fringed on inside with a row of hairs of equal length (♀ unknown) *pulla*, Aust., ♂

N.B.—The above table of species is by no means satisfactory to me as sufficiently distinguishing them, but in the present uncertain knowledge as to the limits of each, it is the best that I can offer.

***Stomoxys calcitrans*, L., 1761.**

Fauna Suec., Ed. ii, 467 (*Conops*).

N.B.—For the numerous descriptions of this species under the specific name *calcitrans*, see the recent Catalogue of Palæarctic Diptera, vol. iii, p. 611.

A list of the various synonyms of *calcitrans* is appended.

pungens, DeGeer, 1776, Ins., vi, 78 (*Musca id.*).
tessellata, F., 1794, Ent. Sys., iv, 395.
id., 1805. Syst. Antl., 281.

¹ As noted under the description of this species, I cannot specifically distinguish *limbata*, Austen, from *indica*, Picard.

<i>aculeata</i> ,	Rob. Desv., 1830, Myod.,	386.
<i>dira</i> ,	<i>id.</i> ,	<i>id.</i> , 387.
<i>infesta</i> ,	<i>id.</i> ,	<i>id.</i> , 387.
<i>inimica</i> ,	<i>id.</i> ,	<i>id.</i> , 387.
<i>pungens</i> ,	<i>id.</i> ,	<i>id.</i> , 386.
<i>sugillatrix</i> ,	<i>id.</i> ,	<i>id.</i> , 386.
<i>aurifacies</i> ,	<i>id.</i> , 1863, Hist. Nat. d. Dipt., ii,	607, ♀
<i>chrysocephala</i> ,	<i>id.</i> ,	<i>id.</i> , 604.
<i>claripennis</i> ,	<i>id.</i> ,	<i>id.</i> , 604, ♂
<i>cunctans</i> ,	<i>id.</i> ,	<i>id.</i> , 607, ♀
<i>flavescens</i> ,	<i>id.</i> ,	<i>id.</i> , 605, ♂
<i>minuta</i> ,	<i>id.</i> ,	<i>id.</i> , 606, ♀
<i>præcox</i> ,	<i>id.</i> ,	<i>id.</i> , 608, ♂
<i>rubrifrons</i> ,	<i>id.</i> ,	<i>id.</i> , 606, ♂
<i>vulnerans</i> ,	<i>id.</i> ,	<i>id.</i> , 605, ♀
<i>aculeata</i> ,	Mcq., 1835, Suites à Buff., ii,	242.
<i>pungens</i> ,	<i>id.</i> ,	<i>id.</i> , 242.
<i>pungens</i> ,	Mg., 1838, Sys. Besch., iv,	170.
? <i>libatrix</i> ,	Rob. Desv., 1830, Myod.,	387.

(Redescription.)

Head. ♂ Frons one-fourth width of head; grey, yellowish grey or slightly bluish grey. A very wide frontal stripe appearing from above almost velvet-black, thus leaving only very narrow eye-margins. Generally, this black stripe has a greyish V-shaped piece cut out of its upper end, which lighter space encloses the ocellar triangle, which latter is small, and touches the absolute vertex; and bears, just above the lower ocellus, two pairs of bristles (the lower pair the larger). There are also 4 other pairs close together (all 6 pairs forming one double row) on the upper part of the triangle, the uppermost pair being on the extreme vertex. Seen from below, the black frontal stripe is invisible, the whole frons and face appearing white, or yellowish white. Fronto-orbital bristles, about 15, the upper part of the row not always placed uniformly. Two pairs of vertical bristles as usual. Eyes black, absolutely bare. Antennæ blackish, 3rd joint more or less yellowish grey, 2nd joint with several small bristles and 1 or 2 long ones; arista with 8-9 bristles and minute pubescence on basal half above; thickened at base, where it is often yellowish. Face white or yellowish white, covered with close, microscopic tomentum. Mouth opening similar, with the usual strong bristles on each side. Palpi small, reddish yellow, with a few short black bristles. Proboscis shining black, quite bare, tapering from base to tip. Back of head generally more or less bluish grey, with very short pubescence.

In the ♀ the fronto-orbital bristles are less strong and less regular, generally rather less in number, and on the upper part of the frons there is a short extra row each side, placed nearer the eye margin, sometimes also with additional irregularly placed small bristles. In all other respects the ♀ head is similar to that of the ♂

Thorax. Ground colour varying from yellowish grey to whitish grey. Seen from in front, a dorsal pair of moderately narrow, well separated stripes, which are normally mummy-brown, but vary sometimes to the extent of being nearly blackish. These stripes extend from the anterior margin nearly to the posterior one. On the outer side of each stripe is a similar stripe, distinctly interrupted at the suture, in front of which it becomes sometimes of a thickened cigar shape, placed diagonally, pointing to the humerus, sometimes it retains its direct direction forwards as a continuation of the portion behind the suture. It often also takes the form of an irregularly shaped spot. At the posterior ends of these dorsal stripes are two irregular black patches, immediately in front of the scutellum. Towards the side of the dorsum, just above the wing, is a concolorous brown streak, sometimes distinct enough to form a short third stripe.

Viewed from behind, the dorsal space between the two median lines appears much lighter, varying from light grey to even quite whitish. Scutellum concolorous with thoracic dorsum, generally with an irregular mummy-brown triangle at base. *Chaetotaxy.* Humeral bristles 3, post-humeral 1 (weak), præsutural 1, notopleural 2, dorso-central with only the hindermost in each row really strong; a distinctly less strong one in front of it, whilst the remainder are barely larger than the small bristles dispersed generally over the whole dorsum, but there is usually a single moderately strong one just in front of the suture. Two moderate sized inner dorso-central bristles. Of the side bristles, there are 4 placed above the wing more or less in the shape of a diamond, all of which I should be disposed to term supra-alar, or possibly 3 supra-alar and 1 postalar.

The mesopleura bears a hinder row of about 12, diminishing in size from above downwards except that the strongest ones are generally the 2nd and 3rd, or the 3rd and 4th. Some long stiff hairs on front part of mesopleura. Sternopleura with a strong bristle on upper hind corner, a strong one on lower hind corner, in company with some shorter comparatively strong ones, but which are much longer than the very small bristles covering the whole sternopleura and, to a greater or less extent, the whole of the side of the thorax.

Scutellum with a strong basal bristle each side, near margin, with a less strong præbasal one in front, and the usual apical pair which are very strong. Occasionally a pair of bristles corresponding to dorsal macrochætæ stand out a little stronger than the microchætæ covering dorsum of thorax and scutellum, but in most specimens they are by no means obvious.

Abdomen. Normally (and generally) yellowish grey; sometimes much more yellowish, at least on the dorsum; sometimes approaching slate-grey, either wholly or towards the sides of the segments; seen from behind at a low angle, sometimes quite whitish. The markings, although following a general plan, are very variable. In what may be regarded as the typical form, there are on both the 2nd and 3rd segments, a basal mark in the shape of a moderately wide short dorsal stripe, which reaches to about the middle of the

segment, where it is sometimes cut off sharply and squarely, sometimes drawn out to a distinct point, sometimes fading away indistinctly. There is a pair of more or less circular spots of moderate size placed on the posterior margins, each midway between the middle line and the side border. On the 4th segment is a single, more or less triangular basal mark, sometimes small, or indistinct, or occasionally absent. All these marks are vandyke-brown in colour, occasionally approaching clove-brown. These principal markings can be seen most distinctly from above, or a little in front, often appearing blurred or almost invisible if viewed from behind. What I should call the secondary markings, are irregular, almost *Sarcophaga*-like reflections, often invisible when viewed from certain directions; of a pale greenish grey colour. They take the form of an irregular elongated spot each side, often connected by the colour extending along the posterior margin of the segment; and a pair of comparatively large, more or less circular spots on the 4th segment, these latter spots being present in the majority of examples.

The whole abdomen is shortly pubescent with short soft black hairs, which are little thicker on the shoulders, and a little longer and stronger on the posterior margins, and over the dorsum of the 4th segment.

When it comes to describe varieties, the difficulties as to the limits of the species are very apparent. Practically I regard as probable varieties of this species, all forms which partake of the above pattern or any reasonable variation of it, this variation being considered to be of very wide limits.

The short dorsal stripes on segments 2 and 3 occasionally form an unbroken stripe, extending to the base of the 4th segment. In one form they are very short, and the usual circular spots become quite elongated and narrow; whilst in another variety there is a pair of additional similar brown nearly circular spots in front of the main pair, and placed on the base of segments 2 and 3. There is often a pair of very narrow spots on the 1st segment, sometimes united into a transverse narrow line. In some examples the ordinary brown circular spots on segments 2 and 3 are united by the colour extending narrowly along the posterior margin; sometimes bordering the basal margin of these two segments also. In another variety, well marked in its more pronounced form, the dorsal stripe is expanded on both base and posterior margin, on which latter it is often considerably widened and joined to the two spots, thus somewhat approaching *bengalensis*, Picard.

It must be remembered that the extreme base of each segment is shining black; but that this is only visible when the segments are abnormally drawn out, and that in a normal state, the black colour is covered by the posterior margin of the preceding segment.

Belly generally concolorous, with short, somewhat sparse black pubescence, without conspicuous markings.

Legs. Blackish, minutely pubescent; femora, and sometimes tibiae also, more or less with greyish reflections. Fore femora

with a row of bristles above from middle to tip, diminishing in size, a row on outer side on basal half, replaced towards the tip by moderately soft, rather long hairs; a row of about 16 to 18 comparatively strong bristles on under side, extending the whole length of the femur, and equal in size. Middle femora with some bristles, lying rather flat, on front side; two contiguous, moderately strong, slightly curved bristles above, near tip, and a row of bristly hairs on under side. Hind pair with a row of bristles on front side, a single curved bristle below near tip. Knees tawny, the colour extending sometimes over the whole basal half of some of the tibiæ; tips of tibiæ with 2 or 3 short spines. Tarsi blackish, under side with a little gold-yellow pubescence, which is sometimes lightly present on inner side of anterior tibiæ. Pulvilli dirty white.

Wings. Practically clear, but in the ♂ sometimes slightly tinged with brown on basal and front parts; 1st posterior cell widely open, the 4th vein forming a well rounded loop at the bend upwards; apical portion gently curved. Outer cross-vein normally with one gentle inward curve, variable, at times nearly straight, or nearly bisinuate. Tegulæ yellowish white.

Described from a long series of specimens of both sexes in the Indian Museum collection and my own, and also from European specimens. It is practically one of the world-wide species that occurs wherever civilised man is found, and in at least the East it is apparently present all the year round in every locality. Actual dates would therefore be of little significance. It is in the Indian Museum collection from Gangtok (Sikkim), Sylhet, Kurseong (Darjiling), Mussoorie, Simla, Calcutta, Port Canning, Puri, Berhampur, Bhogaon, Travancore State (S. India), Rajmahal (all India); Colombo, Rangoon, Kawkareik (Lower Burma), Mandalay, and from on board ship, at light, off Tuticorin. Personally I have met with it in many parts of the Punjab, Mussoorie, at Rangoon, Singapore, Penang, and other places further East, and have it from Java, Ceylon and the Philippines.

N.B.—The above lengthy description has appeared advisable from the variability of this very common species. Further variations and combinations of the differences (mostly in the abdominal markings) above stated, occur in individual examples, and as the species has already been described under no less than 17 different names, I hesitate to regard as distinct any form which appears to fall within its possible range of variation; especially as I have seen no distinct "variety," "race," "form," or "subspecies" peculiar to any special locality and illustrated by any number of consistently marked specimens.

"Stomoxys libatrix," Rob. Des., 1830.

Ess. Myod., 387.

The author's very short description runs as follows:—

"Very near *inimica*, R. D. (*l.c.*, p. 387, from North America) sides of the face a little more yellowish; abdominal segments

especially the 4th, bear a small transverse line at their bases; the emarginations are blacker; tegulæ brownish; wings a little clearer."

N.B.—Prof. Bezzi ("Mosche ematofaghe, Rend. Istit. lomb., 1907) says that, although admitted as distinct in Van der Wulp's catalogue, it is probably only another synonym of *calcitrans*, L., an opinion in which I cannot but concur, and, therefore, failing evidence to the contrary, I propose to sink the name as synonymous with *calcitrans*.

***Stomoxys plurinotata*, Big., 1887.**

Bull. Zool. Soc. Fr., xii, 593.

"Long. $5\frac{1}{2}$ mm. Antennis nigris; facie et fronte albescentibus, vitta frontali, bifida, nigra; palpis fulvis; thorace albido cinerascete, maculis quatuor latis, elongatis, fuscis, duplicatis, pleuris cinereis; calyptris albis, halteribus pallide flavidis; scutello cinerascete; abdomine cinereo, segmentis 1-3 superne univittatis, 2° et 3°, utrinque, in medio, punctis duobus fuscis, rotundatis, notatis, cum vitta mediana aliquoties junctis; pedibus nigris, tibiis parum fulvo tinctis; alis hyalinis. Ceylan 3 specimens."

I append a translation of Bigot's more extended French description:—

Antennæ black, tip of 2nd segment pale; vertex greyish, frons and face dirty white, frontal stripe wide, bifid above; palpi pale, proboscis black. Thorax grey, with 4 large oblong elongated spots, nearly contiguous, blackish, each divided by a not very distinct greyish line. Scutellum greyish; sides of thorax grey; sometimes the spots mentioned appear as 4 longitudinal stripes interrupted at the suture. Tegulæ white, halteres yellowish white. Abdomen grey, with a dorsal black band on segments 1 to 3, sometimes terminating at the base of the 3rd; the 2nd and 3rd having each two roundish blackish spots, which are often united to the median stripe; sometimes the 1st and 2nd segments have 2 large irregular blackish spots: also the sides of the abdomen are generally marked with elongated spots of irregular shape and of the same shade; legs black, base of tibiæ reddish, wing clear: sex?

N.B.—No one seems to have met with this species since its original description, yet I include it as distinct, although it may quite possibly be another variation of *calcitrans*. The type is in Bigot's collection: he does not mention the width of the frons, but from his doubt as to the sex of his species I am inclined to regard it as probably distinct from *calcitrans*, of which presumably he would be quite conversant with the respective width of the frons in each sex.

***Stomoxys oblongopunctata*, mihi, sp. nov.**

Assam. Long. 6 mm.

Differs from *calcitrans* by the wholly reddish yellow antennæ and arista, and the pair of elongo-triangulate brown spots on the 2nd and 3rd abdominal segments, placed on the hind margin:

their bases on the sides of the segments, and their apices meeting the moderately broad concolorous dorsal stripe, which does not reach the posterior border of the 2nd segment. The extreme bases of these two segments are very narrowly brown, the 4th segment has a very indistinct trace of the commonly present blackish grey spots. Thoracic dorsum lightly yellowish grey, that of the abdomen slightly bluish grey. Basal half of tibiæ pale, in certain lights the whole of the middle pair appears pale. Frons $\frac{1}{8}$ width of head; with face, whitish grey. Anterior ends of outer pair of thoracic stripes rather deeply black, enlarged into a spot of considerable size just above the shoulders.

N.B.—This specimen is evidently quite distinct from *calcitrans*, yet I can compare it for purposes of description with no other. It was sent to Mr. Austen, who returned it, marked, “? *brunnipes* Grunb. or sp. nov. closely allied.” It appears to me, however, that it can hardly be *brunnipes*, Grünb. (an African species, but which, of course, may quite easily occur in the Orient as well), as that species is said by its author to have a frons only $\frac{1}{8}$ the width of the head, whereas in the present example the frons measures $\frac{1}{6}$.

From Grünberg's description I should expect a considerably larger proportion of the tibiæ and tarsi to be brown than is the case in this specimen. I therefore venture to describe it as new.

In the Indian Museum, from Sylhet, Assam, taken by Lt.-Col. Hall, 31-1-05.

For purposes of comparison, in the event of my being in error as to its specific difference from *brunnipes*, I append a translation of both sexes of Grünberg's species.

Originally described from German East Africa, only the ♂ was mentioned, but immediately following this description was that of a supposed different species, *sellata*, this being now accepted as the ♀ of *brunnipes*.

***Stomoxys brunnipes*, Grünb., 1906.**

Zool. Anzeig., xxx, ♂, 89; ♀ (*S. sellata*, Grünb.), 90.

(Description of ♂ : translation.)

Black, with brownish yellow, partly greyer dusted.

Frons in ♂ one-eighth width of head, with narrow velvet-black stripe; sides of frons, and the cheeks, shining yellow grey dusted. Antennæ black, with brownish yellow arista. Palpi brownish yellow.

Thorax yellowish grey dusted, grey on shoulders and between the black stripes on fore border. The black stripes converge in front of the suture, but they are sometimes separated behind it, by the presence of narrow intermediate spaces.

Abdomen brownish yellow dusted, the segments with broad blackish band on posterior borders. When viewed from behind, a black dorsal line can be distinctly seen, which is expanded on the fore borders of the segments.

Coxæ, trochanters and femora black, extreme femora tips, tibiæ and tarsi brown; wings with a little blackish tinge; tegulæ also; halteres yellow.

Long. 6-7 mm. Only the ♂ The Camaroons, German East Africa.

(Description of ♀ : translation.)

Frons in ♀ not quite one-third width of head, with broad, deep velvet-black stripe, and broad (one-half of the width of the middle stripe), whitish grey, slightly glistening side borders. Under side of head also whitish grey, slightly glistening, 1st and 2nd joints of antennæ black, 3rd dark brown, grey dusted, arista and palpi pale brown.

Thorax above grey, with broad black stripes on each side, nearly confluent and nearly reaching the scutellum.

Thorax black above, with a broad grey middle stripe: shoulders lightly slate-grey; pleuræ a little less grey; scutellum black, with greyish brown shimmer, distinctly dusted at the tip.

Abdomen black, rather shining, dark brown dusted on upper side and shimmering grey at the sides. Viewed from behind, elongated brown side spots become visible on the 2nd and 3rd segments, reaching from the fore border to the middle of each segment; last segment dark greyish brown dusted, unmarked.

Coxæ, trochanters and femora black; extreme tips of latter, also the tibiæ and tarsi, brown. Wings nearly clear, with slight brownish tinge, tegulæ white; halteres yellowish white. Long. 7½ mm. Camaroons, German East Africa. Only the ♀

Stomoxys sitiens, Rond., 1873.

Ann. Mus. Civ. Stor. Genova, iv, 288, ♀

This species, of which apparently the ♀ is still unknown, has not been definitely recorded from the East, but specimens in the Indian Museum collection, sent to Mr. Austen for examination being returned as possibly *sitiens*, causes me to include a description of the species in this paper and to add some comments. Rondani's original description is as follows:—

“Long. 5 mm., ♂ *Similis calcitranti* europeæ, sed minor, et distincta praesertim: Facie et orbitis albissimis, non sub-luteis, et oculis in fronte sat proximis, orbitis mediocribus vitta nigra angusta sejunctis, et sic oculorum distantia triplo circiter minor latitudine singuli oculi, non ut in mare *calcitrantis* frons lata fusca, et parum angustior singulo oculo. Praeterea in *sitiante*, abdominis grisei segmenta tria basi paulo canescentia praesertim ad latera; caetera ut in sp. europeæ. Keren (Abyssinia).”

(Translation.)

Near *S. calcitrans* of Europe, but smaller, and differing as follows: Face and eye margins extremely white, not yellowish,

and the eyes in front considerably approximate, the moderately wide eye margins separated by a narrow black stripe, and thus the distance between the eyes less by about a third than the breadth of a single eye, not as in the ♂ of *calcitrans*, frons broad, fuscous, and hardly narrower than a single eye. Moreover, in *sitiens* the pubescence of the three basal grey abdominal segments is greyer, especially towards the sides; the rest as in *calcitrans*.

The four specimens in the Indian Museum collection tentatively regarded by Mr. Austen as possibly *sitiens* were collected by me at Calcutta, 18-ii-05, Penang, 8-viii-06, and Rangoon, 23-xii-04 to 3-i-05, but they are all, unfortunately, in poor condition, and exact identification is, perhaps, impossible. Other specimens in my own collection taken by me in the same localities are in no better state of preservation.

Now, Bezzi states ("Mosche ematofaghe," Rend. Istit. lomb., 1907, p. 14) that he has seen a considerable number of specimens of *sitiens* from Eritrea and notes that the principal difference from *calcitrans* is its narrower frons; adding that he believes Rondani was in error in stating the frons to be splendid shining white, as he finds it has an even greater tendency to yellow than in *calcitrans*.

Secondly, he, in his table of species, divides *brunnipes*, Grünb., from *sitiens*, Rond., by the former having "at least the four anterior tibiæ all pale on the outside," whilst of *sitiens* he says "tibiæ at the base narrowly pale," *calcitrans* also, be it noted, falling in the same subdivision in his table. The four Museum specimens being all ♀♀ the test of the width of the frons does not apply. The frons is certainly more whitish than in average *calcitrans*, but not more so than in occasional specimens of it. The specimens are in too bad condition for accurate description, but it may be noted that the abdominal spots are more elongate than in normal *calcitrans*; a dorsal stripe is present on the 2nd segment, extending over part of the 3rd; all the tibiæ are dull reddish brown (much brighter in one example); the 2nd joint of the antennæ is more or less reddish.

A second specimen in the Indian Museum from Calcutta, 14-iv-08, agrees with *sitiens* with the exception of all the tibiæ being reddish brown, the middle pair lighter still, almost yellowish. The frons is glistening shining white, one-seventh in width, and the abdominal spots similar to *calcitrans*. Rondani mentions that the pubescence of the abdomen is grey toward the sides, but in the present specimen it is uniformly black.

It is possible it may be an Oriental form of the African species, but personally I have found that the wholly brownish tibiæ, when present as a character, are always consistently so.

Likewise, in *calcitrans* and those species which have only the base of the tibiæ pale, the colour rarely, if ever, extends over more than the middle of the limb.

That *sitiens* is a good species, distinct from *calcitrans* by the narrow frons, with the shining white frons as a secondary character, seems clear, but I doubt if any specimen of it has come before me.

***Stomoxys triangularis*, mihi, sp. nov.**

♂. South India. Long. $4\frac{1}{2}$ mm.

Head. Frons $\frac{1}{8}$, dark grey; face and antennæ blackish grey; proboscis rather long; palpi pale.

Thorax. Rather deep yellowish grey. The four deep black stripes narrow and separate on anterior margin, but united soon afterwards into two broad stripes, which are continued thus to posterior margin of dorsum. A black lateral stripe in front of wing. Sides of thorax greyish anteriorly, blackish grey behind. Scutellum very dark grey. Chætotaxy apparently normal.

Abdomen blackish grey. 1st segment with posterior border somewhat darkened, 2nd with a small triangular basal spot and two large triangular spots occupying nearly all the segment, their bases almost meeting in middle of segment, their apices directed towards the posterior corners, 3rd segment with two similar irregularly triangular spots placed more obliquely; 4th segment with two sub-triangular spots, their apices pointing hindwards. Belly black.

Legs black; knees and tibiæ narrowly at base reddish yellow.

Wings and tegulæ pale brown, slightly deeper on anterior half.

Described from 2 ♂♂ in the Indian Museum collection taken by Dr. Annandale in the Travancore State, South India (Maddathorai, 17-xi-08, type, and Pallode, 16-xi-08).

N.B.—An obviously distinct and quite dark species, compared with all others I know from the East. The abdominal markings are distinct (when viewed from the side) in one of the specimens, but the abdomen of the other is best described as blackish grey with irregular blackish patches, though it is certainly of the same species.

***Stomoxys indica*, Picard, 1908.**

Bull. Soc. Ent. Fr. 20.

? *S. limbata*, Aust.

A translation of Picard's description is appended:—

Long. $4\frac{1}{2}$ -5 mm. ♂ Interocular space very straight, equal to one-eighth the width of the head. Frons and face with more golden pubescence than in the ♀. Lines on thorax darker. Wings, tegulæ and halteres strongly smoky. Legs testaceous, more brownish than in ♀.

♀ Interocular space equals one-third width of head. Frons and face with silvery grey pubescence. Antennæ black, 3rd joint white dusted; arista testaceous, black at tip. Palpi testaceous, not reaching margin of epistome. Thorax grey 'ternate' with two moderately wide rather dark brown stripes on each side of middle, the outer pair interrupted at the suture. Scutellum wholly grey; wings clear; veins light brown; tegulæ transparent; halteres white. Legs testaceous; coxæ black, femora brownish, anterior ones lighter on inner side, darker on outer side. Abdomen

grey, slightly bluer than rest of body; the first 3 segments furnished with a straight black dorsal line and a wide black band on posterior margins, that on the 2nd segment covering a larger space than the grey part.

N.B.—Previous to reading Mr. Austen's description of his new species *limbata*, or seeing specimens of it determined by him, I had identified a number of examples of both sexes in both the Indian Museum and my own collection, as certainly *indica*, Picard. On the Museum receiving back from Mr. Austen 2 ♂♂ and 1 ♀ sent to that dipterologist some time previously, I found that he had referred them to his *limbata*.

Apart from minor details, the only serious discrepancy in the descriptions of the two species appears to be in the width of the frons (which, however, I regard as one of the most valuable characters); this being quoted by Picard as one-eighth the width of the head in the ♂ and by Austen as one-fourth to one-fifth. Now, although the width at the vertex is undoubtedly wider, the width across the frons about midway between the vertex and the base of the antennæ is between $\frac{1}{7}$ and $\frac{1}{8}$ in the 2 ♂♂ of the Museum collection, determined by Mr. Austen as paratypes of his *limbata*; and $\frac{1}{3}$ in the ♀. All the ♂♂ I have seen have the frons from $\frac{1}{7}$ to $\frac{1}{8}$ in width (and, incidentally, "slightly constricted in the middle," as Austen says of *limbata*, although Picard mentions the frons of his species as being "very straight").

I therefore feel constrained to regard all these specimens examined by me as Picard's *indica*, and Mr. Austen's *limbata* as a probable synonym of it. A noteworthy feature of similarity is that both authors mention the extra width of the marginal black band on the 2nd segment, and a final coincidence is that both authors describe their species from the same three localities, India, Ceylon and Assam.

S. indica occurs in the Indian Museum collection from Calcutta, 18-vi-08 [*Annandale*]; Rajmahal, Bengal, 7-vii-09 [*Annandale*]; Bhogaon, N. Bengal, 3-x-09 [*Paiva*]; Allahabad, 15-viii-09 [*Lord*]; Maddathorai, Travancore State, 16-xi-08 [*Annandale*]; Victoria Gardens, Colombo, 26-iv-08 [*Paiva*]; Rangoon, 24—26-ii-08 [*Annandale*]; Singapore, 1-viii-06 [*Brunetti*]. In my collection I have it from Calcutta, 24-vii and 14-viii-04, and from Rangoon, 18-viii-06, taken by myself.

***Stomoxys limbata*, Aust., 1909.**

Ann. Mag. Nat. Hist. (8), iii, 292.

♂ ♀ India, Ceylon, Assam.

♂ "Smoke-grey: face and sides of front bright yellowish-silvery, front narrow; dorsum of thorax with usual clove-brown longitudinal stripes, admedian stripes narrow and wide apart; dorsum of abdomen with deep clove-brown or blackish transverse band on hind border of each of first three segments; wings with a

brownish tinge; femora dark clove-brown, their extreme tips and base of hind tibiæ ochraceous-buff, front and middle tibiæ and tarsi mummy-brown, hind tarsi and hind tibiæ except base sepia-coloured."

♀ "Apart from usual sexual differences, agreeing essentially with ♂, except that dark markings on dorsum of thorax and abdomen are paler (olive-brown instead of clove-brown or blackish), that the wings although brownish are less noticeably infuscated, that the squamæ are paler (whitish or yellowish white), and that the front and middle tibiæ are also brighter in hue." Type in British Museum from Sylhet, 11-ii-05 [*Lt.-Col. Hall*]; also a specimen from Peradeniya, Ceylon, 22-v-92 [*Yerbury*].

"*S. limbata* is closely allied to *S. nigra*, Mcq., but is distinguished by the front in the ♂ being somewhat narrower, with the frontal stripe slightly constricted in the middle, instead of having its sides parallel; and in the ♀ by the front and middle tibiæ being mainly ochraceous instead of for the most part clove-brown or blackish."

The length of this species is from a little under 5 mm. to 5½ mm.; width of head ♂ 1.6 to 2 mm., ♀ 1.8 to 2 mm.; width of front at vertex ♂, 0.4 mm., ♀ just over 0.5 mm.

N.B.—Specimens seen by Mr. Austen and identified by him as his *limbata* are in the Indian Museum collection from Port Canning, Lower Bengal, 21-vii-07 [*Annandale*]; Calcutta, 20-viii-07; and Sylhet, 31-i-05 [*Lt.-Col. Hall*]; Mr. Austen also refers to this species a ♀ from Peradeniya, Ceylon, 22-v-92 [*Lt.-Col. Yerbury*].

N.B.—As noted under *S. indica*, Pic., I am strongly inclined to regard *limbata* as synonymous with that species.

Stomoxys bengalensis, Pic.

(*Translation.*)

♂ Interocular space one-fifth width of head. Frons and face with whitish pubescence, lightly gilded. Antennæ black, arista testaceous, tip black; palpi pale yellow.

Thorax grey, with two parallel black stripes on each side of a very indistinct median line. Scutellum rather dark grey. Wings a little smoky, veins blackish brown; tegulæ and halteres dark brown. Legs black, base of tibiæ pale brown. Abdomen light slaty brown, with black dorsal line on first three segments; each segment with a narrow basal transverse band, and a wide one on posterior margin, especially that on the 2nd segment; 4th segment wholly grey (in fresh specimens), long. 7½ mm. ♀ unknown. Sent by Col. Raymond from Calcutta.

N.B.—*S. bengalensis* should, by the description, be a good species, and I had noted three ♂♂ in the Indian Museum collection (from Calcutta) as being probably this species. They were, however, returned after examination by Mr. Austen as *calcitrans*, and closer study both of them and subsequently acquired specimens lead me to suppose they fall within the range of the commoner species.

If so, however, the approximation to the description of *bengalensis* is considerable, as the abdominal spots are sometimes spread out, so as to form a sort of band on the posterior margin, and there are in some examples a narrow dark band at the base of at least the 2nd and 3rd segments.

***Stomoxys pusilla*, Aust., 1909.**

Ann. Mag. Nat. Hist. (8), iii, 293.

♂ India. Long. 4·2 to 4·5 mm.; width of front at vertex 0·4 mm.

“Dorsum of thorax mouse-grey or yellowish grey, with usual clove-brown longitudinal stripes; dorsum of abdomen olive-grey; first segment, except a small ill-defined area in centre (not reaching hind margin), second segment, either entirely or with exception of extreme front margin, and a median longitudinal stripe and fairly deep posterior transverse band on third segment, clove-brown; sides of front and sides of face, when viewed from above, light maize-yellow; wings brownish; femora clove-brown, front and middle tibiæ and tarsi and extreme tips of front and middle femora buff, hind tibiæ and tarsi light mummy-brown, base of tibiæ paler.”

Type in British Museum, Allahabad, x-05 [Howlett].

“*S. pusilla* differs from *S. limbata* in its smaller size, in the yellower colour of the sides of the front and face; in the dorsum of the second abdominal segment being entirely clove-brown or practically so, instead of having a clove-brown posterior transverse band and median longitudinal stripe, and in the pale tibiæ and tarsi of the front and middle legs.”

N.B.—This species and the next I have never seen. The present one must approximate very closely to *indica*, Pic.; *pulla* is, of course, well defined by its fore tarsus.

***Stomoxys pulla*, Aust., 1909.**

Ann. Mag. Nat. Hist. (8), iii, 294.

♂ India. Long. 4·2 to 4·4 mm.

“Very dark species; when viewed from above, body appearing almost uniformly clove-brown, extreme front margin of thorax mouse-grey, with commencement of usual clove-brown longitudinal stripes; when abdomen is viewed from behind, at a very low angle, terminal segment appears olive-grey, while second and third segments may appear more or less mouse-grey, with clove-brown transverse blotches, and perhaps a trace of a narrow median longitudinal stripe; front narrow, occupied for most part by frontal stripe, sides of front not noticeable except anteriorly; wings brownish; legs clove-brown, tibiæ ochraceous-buff at extreme base, first joint of front tarsus fringed on inside with a row of hairs of equal length, claws black.”

Type in British Museum, from Mussoorie, N. W. India, x-06 [Howlett].

“ This is a very distinct species, which, while resembling the foregoing (*pusilla*) in size, is at once distinguishable by the dusky coloration of the body and legs, by the sides of the front being scarcely visible except anteriorly, and by the remarkable row of hairs on the inside of the first joint of the front tarsus. Owing to the latter character *S. pulla* ♂ presents some slight approximation to the ♂ of the African *S. omega*, Neust., in which, however, the row of hairs on the inside of the front tarsus extends to the end of the second joint, while the hairs themselves are much longer and conspicuously curled.”

Stomoxys, sp.

A single ♂ in the Indian Museum, apparently immature, certainly belongs to a distinct species from all others given in this paper. It has a frons which narrows rapidly from the vertex (where it is about $\frac{1}{4}$ the width of the head) downwards, being only between $\frac{1}{8}$ and $\frac{1}{7}$ at a short distance above the antennæ, where it widens as usual. The outer side of the middle tibiæ are wholly moderately light brown, and the abdomen is apparently unmarked, but being in a somewhat crumpled state it is impossible to describe it more precisely. In other respects it resembles a slightly under-sized *calcitrans*. From Calcutta, 18-vii-07.

Stomoxys dacnusa, Speis., 1908.

Zool. Anz., xxxiii, 666.

“ Orichalceo griseo, vittis duabus brunneoviolaceis, pedibus luteis, coxis atque femoribus præter ultimam tertiam partem brunneo piceis, alis basi et nervatura validiora luteis squamis lutescentibus. Annam.”

♀ Long. corp. 5.5 mm. ; alarum 5.5 mm.

Further notes from his more lengthy description in German may be added as follows :—

Yellowish grey, with a brassy tinge. From the anterior border of the thoracic dorsum, a moderately broad brownish black, with a violet tinge, stripe towards each side.

Unfortunately the hinder part of the thorax, the pleuræ, chest, and first segments of the abdomen cannot be correctly described, owing to the blood which has exuded over them. Tip of scutellum and of abdomen uniformly grey. Legs pale brownish yellow ; only the coxæ, and basal two-thirds of the femora, blackish brown or nearly black.

Head blackish brown, only the base of the antennæ paler yellowish brown, the antennæ, with the arista, tawny brown.

Frons, almost exactly one-third width of head at vertex, widening in front. Chætotaxy normal. Palpi very little spindle-

shaped at tip, tawny. Fore femora with the brown colour nearly reaching the tip, under side with a row of longer bristles, in addition to the normal hairs. Middle femora above, towards the tips, with some small ones, hind femora with rather larger, distinct bristles, below with some preapical ones. Hind tibiæ with two bristles near the middle. Hind metatarsus with some stronger bristles below. Wing as in *calcitrans*; 1st longitudinal vein (subcosta) ends exactly above the small cross-vein; 2nd (radius) rather nearer the wing tip than in *calcitrans*.

N.B.—Being described from a single damaged specimen, the specific identity of this species must be admitted with caution; I therefore place it last of all.

Description of **STYGEROMYIA**, Aust., 1907 (non-Oriental).

Ann. Mag. Nat. Hist. (7), xix, 445.

“ In some respects intermediate between *Stomoxys*, Geoff., *Hæmatobia*, Rob. Desv., and *Lyperosia*, Rond. (*sensu* Bezzi). In general appearance and form of body similar to *Stomoxys*, but in shape of proboscis and palpi resembling *Hæmatobia*, though with arista feathered only on upper side, as in *Stomoxys* and *Lyperosia*. Head somewhat flattened from front to rear, with basi-occipital region only slightly swollen; proboscis short, stout and shining, of uniform thickness throughout, not tapering to the tip, chitinous, but terminated by a pair of small fleshy labella; palpi equal to proboscis in length, large, clavate towards the tips, curving upwards, and with stout bristles on the outer side at the distal extremity.

“ Bristles of thorax: Humeral 3; post-humeral 1; notopleural 2; præsutural 1; supra-alar 1; intra-alar 1; post-alar 2; dorso-central 6 (1 in front of and 5 behind the suture); inner dorso-central 1; scutellar 4 (1 præbasal, 1 basal, 1 discal, 1 apical); mesopleural 9 or 10, wider apart than in *Stomoxys* or *Hæmatobia*; sternopleural 1 (posterior, as in *Stomoxys*, instead of 1: 1, as in *Hæmatobia*).

“ *Wings* with 1st posterior cell narrowly open at the tip, the width of the opening being precisely that seen in the same cell in the wing of *Musca corvina*, Fab., and less than half of that exhibited by the 1st posterior cell in the case of *Stomoxys calcitrans*, L.: *apical portion of 4th vein* beyond the bend *perfectly straight*, not bent inwards at the extremity, as in *Stomoxys* and *Hæmatobia*. Typical species, *Stygeromyia maculosa*, sp. nov.”

N.B.—This is not an Oriental genus, being described from Africa, but since, owing to the traffic in cattle between one continent and another, it may easily be imported, I have thought it best to include at least the generic description to facilitate identification should it occur in the East.

LYPEROSIA, Rond., 1862.

Dipt. Hal. Prod., v, 230.

Loc. cit., i, 93 (nom. in tab.).

In splitting off this genus from *Hæmatobia*, R. Des., Rondani in a table of genera gave the following diagnosis of it: "Arista hairy only on upper side, the hairs wavy; 2nd longitudinal vein reaching the costal opposite the small cross-vein." In this genus Rondani placed two species, "*irritans*, L.," and "*serrata*, R. D.;" Prof. Bezzi very kindly supplied me with notes on this genus from Rondani's work, and informs me that that author was mistaken in his identification of *irritans*, L., having another species before him at the time, and for this species my correspondent proposes the name of *titillans* (Rend. Istit. lomb. (2), xl, 24).

Moreover, Rondani's "*serrata*, R. D." was the true *irritans*, L.

LYPEROSIA, Rond.*(Revised description.)*

Body more elongate than in *Stomoxys*; abdomen about twice as long as broad. Eyes bare, approximate in ♂, frons in ♀ about $\frac{1}{3}$ width of head. Antennæ according to Rondani inserted at the middle of the eyes, with the 3rd joint a little longer than the 2nd, but I should describe them as inserted very slightly lower on the face than in *Stomoxys*. Antennæ plumose on upper side only, the hairs undulating. Proboscis as in *Stomoxys*; palpi comparatively stout and broad, as long as proboscis, less bristly than in *Hæmatobia*. Apical part of 4th longitudinal vein curved rather less than in *Stomoxys* and *Hæmatobia*, the whole vein being considerably straighter, and without the definite "elbow" so usual in the higher *Muscinae*; 3rd longitudinal vein bare at base; 1st posterior cell comparatively broadly open; sternopleural bristles yellow.

Table of species.

Hind tarsi not dilated.

Abdomen without a dorsal stripe *minuta*, Bezzi, ♂ ♀

Abdomen with a dorsal stripe (sometimes indistinct).

Hair on body brown *exigua*, Meij., ♀Hair on body yellow *flavohirta*, sp. nov., ♀

Hind tarsi dilated.

Hair on body brown *exigua*, Meij., ♂Hair on body yellow *flavohirta*, sp. nov., ♂

Lyperosia minuta, Bezzi, 1892.

Ann. Mus. Civ. Genova (2), xiii, 192.

♂ ♀ India, Ceylon (originally described from Somaliland).

“*Cinerea, lutescenti-pilosa, pedibus luteis; antennarum articulo secundo rufescente; oculis etiam in mare a fronte latius cula sejunctis. Long. mm. ♂ 1·8—2·3, ♀ 3—3·8 Obbia.*”

(Redescription.)

Head. ♂ Eyes sub-contiguous; the frons for a short distance being extremely narrow, the actual width varying slightly in different specimens. Vertical triangle only moderately wider; the frons below its narrowest part, rapidly widening. Normal colour of frons dark grey or blackish grey in the middle and lighter grey along the edges of the eyes, which latter are without any distinct eye margin. For a considerable space above the base of the antennæ the frons is occasionally quite reddish or reddish brown. Lower part of the head, including oral cavity, yellowish grey, varying lighter or darker according to the individual. Ocellar triangle (isosceles) distinctly raised above the surface, concolorous, ocelli distinct. Antennæ grey, sometimes with a slight reddish brown tint, microscopically pubescent; 2nd joint sometimes much brighter, always with a short distinct bristle; 3rd joint more or less grey dusted. Arista black considerably thickened at the base, where it is normally black also. The arista bears normally at least 6 long equidistant, bisinuate hairs; with often an additional one placed just before the first, and also a very small one near the tip. There are invariably several very minute bristles at the base. Palpi elongate, black or very dark blackish brown, gradually thickened towards tip, with short stiff hairs; practically as long as the proboscis, which is dark brownish yellow, shining. Back of head moderately dark grey, with microscopic hairs.

Chætotaxy. Seven fronto-orbital bristles; mostly curved, and often pointing in different directions. Vertical triangle with 2 stronger longer bristles in front, crossing one another, and 2 smaller ones behind, which also cross each other, with 2 other similar ones practically on the vertical margin of the head, with 1 pair each side of these, of true vertical bristles.

♀ Frons at vertex, one-fourth width of head, widening only slightly, as at the level of the antennæ it is only one-third the entire width.

Fronto-orbital bristles normally arranged in two rows, an upper row of four, placed closer to the margins of the eyes, the bristles directed forwards or slightly to either side; and a lower row (these would be the lower fronto-orbital bristles of Osten Sacken), of either three or four, which is placed nearer the middle of the frons, and in which the bristles always curve inwards. The rows sometimes almost form one linear row, or occasionally overlap, and sometimes the upper row consists of three bristles only; in some individuals

the number of bristles on one side of the face is different to that on the other side, in fact this occurrence is not uncommon.

Thorax. Variable, within certain limits. Dorsum rather dark acuous grey, with a more or less distinct but nearly always obvious, broad light grey stripe beginning in the middle of the anterior border and fading away at or before the transverse suture. Humeral calli light grey; the transverse suture, and more or less of the scutellar dorsum, also. In other examples, the dorsum is best described as being yellowish grey, with two broad, well-separated, well-defined stripes from the anterior border nearly to the scutellum; with sometimes an additional narrow intermediate stripe behind the suture.

The sides of the thorax are lighter, ash-grey or yellowish grey. Metanotum dark blackish grey, practically bare.

Chaetotaxy. The principal bristles are nearly always uniform in perfect specimens, but are very easily broken off. They are often smaller than their normal size, and in that case sometimes are not conspicuously larger than the small bristly hairs with which the thorax is covered. All the bristles are brownish yellow and generally reclinate. Humeral bristles 2; post-humeral 1; præsutural 1; notopleural 2; supra-alar 1; intra-alar 1; post-alar 1. A pair of inner dorso-central bristles, and a row on each side of comparatively small but distinct dorso-central bristles, the hindermost being as usual the largest; whilst outside this row is a second row of microscopic ones which only extends from the transverse suture to the posterior border. The normal row of dorso-central bristles is continued to the anterior border. Along the median line of the thoracic dorsum are numerous microscopic bristly hairs, of which those in front of the suture are arranged more or less in four rows, while those behind it are more irregularly placed.

On the scutellum there are two basal bristles, placed near the edge, a post-median row of four, of which the inner ones are less strong; and two strong long apical ones. Over the whole of the thoracic dorsum and the scutellum are microscopic bristly hairs, which are more or less irregularly placed.

On each side of the thorax there is a row of 6 (occasionally 7, or even 8) on the hinder side of the mesopleura, and 3 very distinct sternopleural ones, placed 1:2. Smaller bristly hairs occur irregularly, being much more numerous in some specimens than in others.

Abdomen. Rather dark grey (in some examples much lighter); with short, brownish yellow hairs, curved backwards; and a row of long bristly curved hairs towards the posterior border of each segment. Belly dark grey, sometimes reddish (probably in the case of specimens captured soon after having sucked blood); the dorsal bristly hairs continued over the sides to a considerable extent.

Genital organs in the ♂ apparently consisting of a telescopic arrangement of three pieces, brown, with blackish marks and some hairs; the tip hairy. Ovipositor in the ♀ conically elongated, concolorous, protruded, pubescent.

Legs. Coxæ, rather bluish grey dusted, reddish yellow towards tips, with a row of 5 or 6 bristles. Femora rather brownish or blue-grey dusted, reddish yellow at base and tip; with rows of short bristly hairs. Fore femora generally curved, and with a row of comparatively long bristles on outer and inner sides, the latter row being the longer; the rest of the fore femora being clothed in rows of bristly hairs. Middle femora with rows of very short bristles, and some longer ones near the base on under side, and two on upper side near tip. Hind femora, sometimes somewhat curved, with rows of small bristles and a row of long comparatively weak ones on under side, and a strong one on outer side near tip.

All the bristles on the legs brownish yellow.

Tibiæ brownish yellow or yellowish, closely pubescent, with very short stiff hairs. Tarsi yellowish, blackish towards tips, microscopically pubescent. Pulvilli greyish white.

Wings. Practically clear, iridescent in certain lights; microscopic bristles along costa to beyond end of 2nd longitudinal vein; very soft hairs on remainder of wing border. Inner cross-vein exactly opposite end of 1st longitudinal and placed above centre of discal cell. Third and 4th veins converge normally towards tips. Halteres and tegulæ yellowish grey.

Described from about 12 specimens of each sex in the Indian Museum, mostly from the Victoria Gardens, Colombo, taken by Mr. Paiva, 26-iv-08. Other specimens are from Chittagong, 27-vii-08, 8-ix-08 [*Lt.-Col. Hall*]; Mandalay, 12-iii-08 [*Annandale*]; Sukna (500 ft.), 3-vii-08 [*Annandale*], where it was abundant on cattle; Calcutta, 6—31-viii-09.

N.B.—Dr. Annandale noticed that the fly rests with its wings folded together, as contrasted with *exigua*, which when at rest, extends its wings horizontally.

Lyperosia exigua, Meijere.

(*Translation.*)

Hæmatobia exigua, Meij., in P. Schat, "Verdere Mededeelingen over Surra," Mededeel. Proefstation Oost-Java, 3e. Ser., No. 44 (1903).

Hæmatobia exigua, Meij., Bijd. tot se Dierk. Natura Artis Magistra, xviii, p. 104 (1904).

Front in ♂ very narrow, with very narrow white eye margins, between which a narrow black line is present. Frontal triangle black. In the ♀ the white eye margins separated by a black frontal stripe of uniform width. Under side of head white. Antennæ brownish yellow, especially the somewhat thickened 2nd joint, which is thereby conspicuous; the 3rd joint darkened at tip. All the joints with whitish shimmer. Palpi as long as the proboscis, brownish yellow. Proboscis brownish yellow, darker above.

Thorax dark grey, whitish dusted, in front with two narrow blackish longitudinal stripes. The sides of the dorsum, viewed sideways, broadly brownish tinged. Sides of thorax, humeral calli,

transverse suture and a cross-band on the scutellum, whitish shimmered in certain lights.

Abdomen dark grey, with a blacker (ending at the tip of the 3rd segment) dorsal stripe, which is only wholly visible when viewed from certain directions. Sometimes it appears in the form of darker spots.

Legs brownish yellow, on the outer side more or less darkened; sometimes the hind pair, with the exception of the outer basal part of the femora and tibiae, quite dark; in the fore legs, with the femora, nearly to the tips; the middle third of the tibiae and the tarsi tips, sometimes darker.

Veins as in *irritans*, L., the small cross-vein straight, placed beyond the tip of the 1st longitudinal vein. Halteres and tegulae whitish.

Length of body 4 mm.; wing length 4 mm.

According to Herr Schat, this species, together with *Stomoxys calcitrans*, L., may be capable of transmitting disease.

(*Redescription.*)

Head. Frons in ♂, $\frac{1}{6}$ to $\frac{1}{6}$ width of head; in ♀ between $\frac{1}{4}$ and $\frac{1}{4}$. Ground colour almost wholly ash-grey, except the black frontal stripe, which is very narrow, yet quite distinct, in the ♂, and forms in the ♀ one-fourth of the width between the eyes at the level of the ocellar triangle, gradually widening to one-third at the level of the base of the antennae.

The frons has in the ♂ a row, normally of nine, distinct, well-developed brownish yellow or yellow bristles, arranged practically in a single row, mostly curved inwards towards those of the opposite row, especially the lower ones.

In the ♀ they are more irregularly placed, forming normally an upper frontal row of 3 or 4, situated rather nearer the eyes, and pointing outwards or forwards; and a lower row (the lower fronto-orbital bristles of Osten Sacken) of 4, 5 or 6, situated nearer to the frontal stripe, also placed rather closer together, and always curved inwards. These two rows, the upper and the lower one, are not always placed in the same relation to each other. Those in the upper row are more liable to be placed out of line, the lowermost bristle being often on a level with, or even below, the uppermost bristle of the lower row. All the bristles are always brownish yellow or yellow.

Antennae yellow, 3rd joint very slightly white dusted; arista often distinctly yellow at extreme base. Palpi yellow, with a few hairs. Proboscis dark brownish or brownish yellow. Bristles of cheeks yellowish, or whitish yellow; lower part of head with some pale hairs; back of head with numerous very short bristly hairs.

Thorax. Dorsum normally moderately dark grey; often with either a bluish, brownish or sub-aënous tinge; sometimes almost ash grey, especially in the median portion. There is generally a fairly distinct pair of narrow well-separated fuscous stripes, a

sub-triangular brownish spot towards each side in front of the suture, and a similar but larger and longer spot behind the suture each side. The macrochætæ of the thorax are practically the same as in *minuta*, but the very small bristles covering nearly the whole surface are relatively larger than in the previous species. The large bristles are brownish yellow, the smaller ones blackish. Sides of thorax ash-grey or with a bluish tinge, mesopleura with a row of long yellow bristles on hinder side, as in *minuta*, and smaller ones in front; sternopleura with numerous bristly hairs, and a row of curved yellow long hairs below humeral calli.

Scutellum concolorous with thorax, macrochætæ as in *minuta*, but the smaller bristly hairs more numerous and much stronger. Metanotum blackish grey, bare.

Abdomen. Rather dark grey, lighter at base, where a distinct blackish dorsal narrow stripe extends over the 1st segment to some portion of the 2nd. The whole surface of the abdomen is covered with short hairs, and there is a row of well-separated long curved ones towards the posterior border of each segment, and a fan-shaped bunch of yellow ones towards each side of the 1st segment; all the other hairs and bristles on the abdomen being distinctly brownish or brownish yellow. Belly concolorous, pubescent.

Legs. Mainly yellow, coxæ bluish ash-grey or yellowish grey, femora except base and tip often more or less lightly violet-grey tinted, sometimes almost wholly yellow. All the femora bear rows of rather long soft yellow hairs, the fore pair have a row of longer bristly hairs on upper side and a row of still longer ones on under side; middle pair with two stronger bristles on upper side, near tip; hind pair with three stronger ones below, near tip. Tibiæ, which are sometimes a little brownish, closely pubescent, with comparatively short bristly, yellow hairs, a long bristle in front at tip of fore pair, some short stiff bristles at tip of middle pair, and a long bristle on hinder side near tip of hind pair which are darker than the others. Tarsi mainly blackish, bristly, pubescent; metatarsus and bases and tips of the remaining joints more or less yellowish. Second and 3rd tarsal joints (in ♂) distinctly dilated at tip, each with 3 or 4 long curved hairs on under side, and generally all the joints with one straight hair and one longer curved one on the upper side at the tip. Pulvilli whitish, grey fringed claws black.

Wings. As in *minuta*.

Described from a good series of both sexes taken in the slaughter-house in Calcutta, 6—31-viii-09. Also from several of each sex from Travancore State, South India, captured by Dr. Annandale as follows: Nedumangad 14-xi-08; Quilon 10-xi-08; Maddathorai 17-xi-08; Pallode 15-xi-08, nearly all on cattle and buffaloes. Also from specimens from Sukna (500 ft.), 3-viii-08 [Annandale]; Chittagong (E. Bengal), 2-viii-08 and 3-ix-08 [Lt.-Col. Hall]. All the above specimens are in the Indian Museum collection. Two ♀ ♀ in the Pusa collection were taken at Bombay on cattle, 29-v and 16-x-05, and I have a considerable number of both sexes in my own collection from Calcutta and West Java.

N.B.—Dr. Annandale has noticed that this species when at rest, sits with its wings spread out horizontally.

***Lyperosia flavohirta*, mihi, sp. nov.**

♂ ♀ Lower Burma. Long. $2\frac{1}{2}$ –3 mm.

This species is very near *exigua*, the differences all being minor ones, yet I believe, by taking them in the aggregate, a specific separation for this form is warranted.

1. The lighter coloured parts of the head and thorax are more *whitish* than in *exigua*.

2. The small bristly hairs covering the thorax, scutellum and abdomen are distinctly more yellow than brownish yellow.

3. The dorsal stripe on the abdomen is generally continuous almost to the tip, and is more uniformly wide; whereas in *exigua* it often terminates on the posterior border of the 2nd segment, sometimes appearing on the 1st segment only, and often (when nearly complete in length) takes the form of elongated triangles, bases uppermost.

4. The legs are paler yellow and the whole body is paler.

Described from 6 ♂♂ and 2 ♀♀ taken by Dr. Annandale on cattle at Kawkareik, Lower Burma, 1-iii-08.

N.B.—Dr. Annandale noticed this species in great abundance on cattle in the interior of the Amherst District in Tenasserim, March 1909. He remarked that when at rest it stood higher on its legs than other Indian species of the genus, thus approximating to the appearance of a Dolichopodid.

***Lyperosia irritans*, L.**

As this palæartic species may quite possibly be found in Northern India, a brief description is appended, drawn up from the only two specimens before me, 2 ♂♂ in my own collection, from Roumania.

Dark yellowish grey, $3\frac{1}{2}$ to 4 mm. long with 4 not very well-defined thoracic blackish stripes, of which the middle pair attain the anterior margin. Abdomen with blackish dorsal stripe on 2nd segment. Palpi distinctly spatulate at tip, flattened, nearly as long as the shining black proboscis. Frontal space $\frac{1}{7}$ width of head, mainly occupied by whitish eye margins, but leaving a very narrow black stripe. Legs black, knees pale, hind femora with a single hair below, just beyond middle, and another at tip; hind tibiæ with some comparatively long hairs on inner sides. Wing clear, 1st posterior cell very narrowly open; outer cross-vein long, nearly straight.

PHILÆMATOMYIA, Aust., 1909.

Ann. Mag. Nat. Hist. (8), iii, 295.

“Greyish flies, not unlike *Musca domestica*, Linn., in general appearance, but distinguishable at once, owing to the remarkable

proboscis. Front in ♂ narrow, its width in centre being from one-eleventh to one-fifteenth of total width of head; width of front in ♀ at vertex, one-third of total width of head; proximal portion of proboscis (mentum) a strongly swollen chitinous bulb, distal portion soft and fleshy, folded back under distal end of bulb when not in use, but when in use extended, its terminal section consisting of a 'tubular extension' which is protruded from between the labella, and is surrounded at the distal extremity with a circlet of stout chitinous teeth; venation generally as in *Musca domestica*."

Mr. Austen proceeds to give a more detailed generic description and adds the following chætotaxy:—

"Thoracic bristles; humeral 3 (in ♂ sometimes 4); post-humeral 1; notopleural 2; præsutural 1; supra-alar 1; intra-alar 1; post-alar 3; dorso-central 4 or 5 (the large and conspicuous bristles alone included—2 or 3 in front of, 2 behind suture); inner dorso-central 1; scutellar 4 (1 præbasal, 1 basal, 1 discal, 1 apical); mesopleural, normally 6 (space between uppermost two greater than that between any other two); sternopleural 1: 2."

Philæmatomyia insignis, Austen, 1909.

Loc. cit. ante, 298.

♂ ♀ India, Ceylon, Sokotra, Cyprus, Senegal and Congo Free State.

Length of 17 ♂ ♂ 3—5·8 mm.; of 25 ♀ ♀ 4—6½ mm.

"Smoke-grey to isabelline-grey, or yellowish grey; dorsum of thorax with 4 dark longitudinal stripes, broader and clove-brown or blackish in ♂, narrower and dark grey or brownish in ♀; ♂ often with an additional broad median stripe, most distinct in front and behind; dorsum of abdomen with a transversely elongate dark blotch on 1st segment, not reaching hind margin, and a small clove-brown median triangle at base of 2nd and 3rd segments, in some specimens also with a similar but smaller and usually lighter mark at base of 4th segment; all hair and bristles on head, body and legs black; palpi ochraceous-buff; wings hyaline or with a slight ochraceous tinge, veins in proximal half buff or ochraceous-buff; legs black, femora greyish pollinose." Types of ♂ and ♀ from India in the British Museum. Mr. Austen records it from the East from Calcutta, 23-vii-07, "on draught bullocks, burrowing into the hair"; Mussoorie, ix-06; Allahabad, 11-x-05 [*Howlett*]; Bentota, Ceylon, 13-vi-91 [*Yerbury*]; Daukotuwa, Ceylon. The above data derived from specimens in the British Museum.

N.B.—This species (identified by its author in the case of some of the specimens examined) figures in the Indian Museum from Calcutta (where it is common also from May to September), 15-ii-08 [*Annandale*] and 5-iii-05 [*Brunetti*]; Chittagong, 14-vii-08 [*Lt.-Col. Hall*]; Mandalay, 13-iii-08; Kawkareik (North Tenasserim), 5-iii-08, on cattle; Rangoon, 25-ii-08; and Port Canning (30 miles south of Calcutta), 21-vii-07, and Quilon, S. India, 9-xi-08 [all

Annandale]; Puri, Bengal, 2-iii-08, Purneah, N. Bengal, 7-viii-07, Madhupur, Bengal, 15-x-09, and Victoria Gardens, Colombo, 26-iv-08 [all *Paiva*]; Cawnpore, xii-04 [*Brunetti*]; Allahabad, 12-viii-09 [*Lord*]; Purulia, Bengal, 13-x-09. I have it in my own collection from Rangoon (both sexes not uncommon), 23-xii-04 to 1-iii-05, and 18-viii-06; Calcutta, 24-vii-04 and 22-viii-04; Jubbulpore, India, 15-xi-07, and Telok-Ayer, N. Borneo, 29-vii-06, all the specimens taken by me.

PRISTIRHYNCHOMYIA, mihi, gen. nov.

With the exception of an important modification of the proboscis, identical with *Philæatomyia*, Aust., the general characters, the venation and chætotaxy agreeing exactly.

The two parts of the proboscis, however, are structurally reversed, the wide basal part being fleshy and flexible, the second part (of about equal length) being sub-cylindrical, black and distinctly chitinized, possibly retractile to the extent of its withdrawal partly or wholly within the fleshy basal portion. At the end of the chitinous portion is a soft fleshy tip, the terminal orifice being of the shape of a triangle with a rounded base (the edges being thickened somewhat by a rim bearing the teeth). At the apex of the triangle is a single black tooth, whilst arranged around the orifice above are three pairs of similar black teeth.

Under high microscopic power the apparent "rim" of the orifice is seen to be the base of each tooth extended considerably on each side, so that the "rim" is not continuous.

The new genus is intermediate between *Philæatomyia* and *Musca*, but the presence of the teeth suggests that it can hardly be other than a "biting fly."

Pristirhynchomyia lineata, mihi, sp. nov.

♀. Calcutta. Long. 4-5 mm.

Head. Yellowish grey, whitish grey when viewed from below. Frons at level of antennæ $\frac{1}{3}$ width of head, slightly narrower at vertex; with a broad dull black median stripe (widest in the middle). Vertical triangle blackish, distinctly raised, with 3 pairs (rarely 4) of bristles, the upper pair small, the lower pair strong and long. Normally 7 strong fronto-orbital bristles placed along the edge of the black centre stripe, above these are two very minute ones, with a powerful one above these, this latter one being level with the centre of the ocellar triangle. The upper strong bristle, and the 7 large fronto-orbital ones are always present.

Outside this row is an irregular row of very small but distinct bristles. Two minute vertical bristles, and a pair of strong ones on vertex near the upper corner of each eye. Antennæ blackish grey, 3rd joint lighter; 2nd joint with several short stout bristles and one much stronger one. Arista considerably thickened at base;

7 or 8 nearly straight long hairs on upper side and 4 or 5 on lower side, with some very minute additional ones on basal half (both above and below).

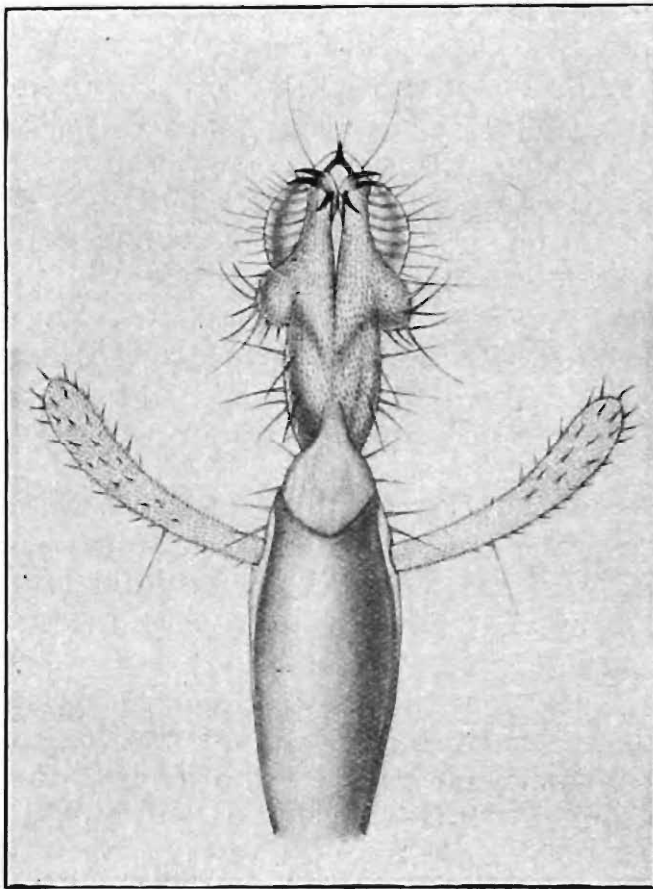


FIG. 1.—Proboscis of *Pristirhynchomyia lineata*; dorsal view of specimen mounted in canada balsam for microscopic examination.

Buccal opening blackish, with a row of strong spiny bristles each side, the uppermost one being the strongest; a number of very small bristly hairs on under side of epistome. Palpi blackish grey, cylindrical, narrowed towards base, with very short irregular bristles.

Proboscis consisting of a sub-conical thickened fleshy basal portion, followed by a subcylindrical, chitinous black portion (both portions about equal in length); at the

end of the latter a softer tip bearing 7 black teeth in accordance with the generic description.

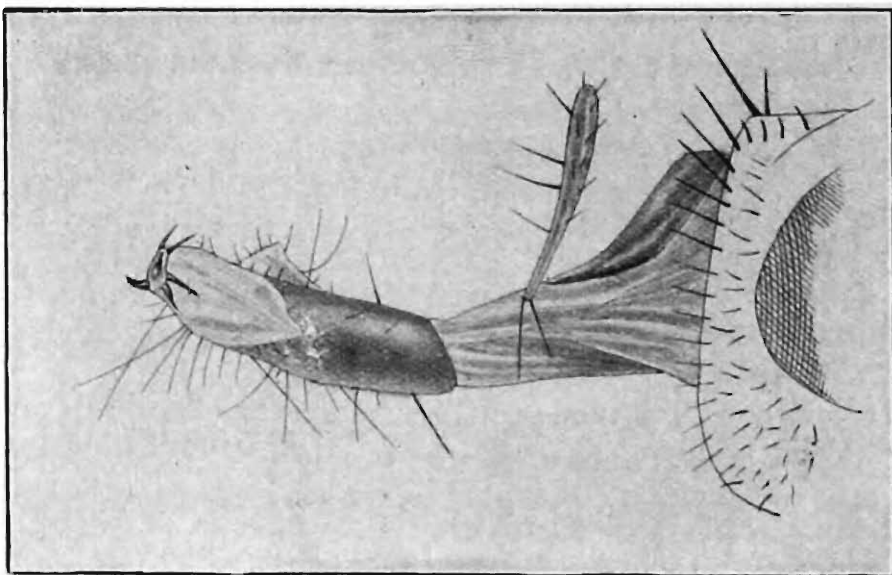


FIG. 2.—Proboscis of *Pristirhynchomyia lineata*; profile view of dried specimen.

Thorax. Varies from dark ash-grey (sometimes with a bluish tinge), to distinctly yellowish grey. Normally, the markings of the dorsum appear as four stripes, the inner pair barely interrupted at the suture but slightly widened behind it; the outer pair less regular, distinctly interrupted at the suture; in front of which the direction is changed, pointing to, and nearly reaching, the shoulders; and behind which, the stripes, seen from behind, appear widened near the bases of the wings; thence narrowing and disappearing before attaining the posterior border of the dorsum. Scutellum and sides of thorax concolorous.

Chætotaxy as in *Philæatomyia insignis*, Aust. The whole surface of the dorsum is covered with minute bristles. Of the dorso-central rows of bristles, the intermediate smaller ones are larger in size than in that species, but 5 or 6 macrochætæ are usually evident behind the suture and 2 (with a lesser, intermediate but by no means minute one) in front of it.

Abdomen. 1st segment blackish, remainder yellowish grey; 2nd and 3rd narrowly black at the base and on posterior border. A rather narrow dorsal black line extends over both segments; 4th segment with two small elongated blackish dorsal spots.

The whole abdomen with short stiff hairs; no macrochætæ, but a row of rather stronger bristly hair near posterior border of each segment; these being somewhat stronger and longer towards the sides and on the 4th segment. Belly concolorous, with short, stiff hairs. Ovipositor capable of complete withdrawal; when protruded, a conspicuous, yellowish grey, nearly bare, cylindrical organ with a strong, black, hard apical knob.

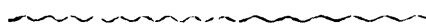
Legs. Black, with a little greyish reflection in certain lights; minutely spinose. Fore femora with several longitudinal rows of strong bristles on outer side, a stronger spiny row on under side; middle femora with 2 or 3 short, stiff bristles on hinder side near tip; hind femora with 2 or 3 similar bristles below, near tip.

Anterior tibiæ with 2 distinct spines at tip, shorter ones on hind pair; middle tibiæ with 3 or 4 bristles on hinder side; hind tibiæ with apparently an irregular row of similar bristles on outer side.

Wings. Pale grey, veins yellow on fore border and base, blackish elsewhere. Costa with a few short black bristles at base. Tegulæ yellowish grey, upper scale small, quadrangular. Halteres very small, yellow.

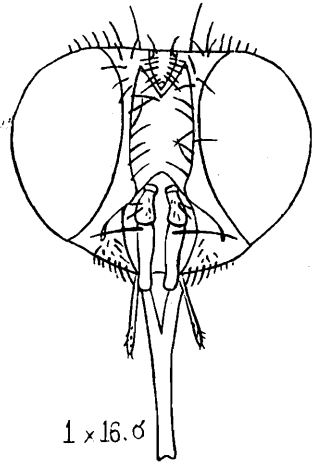
Described from a good series of ♀♀ in the Indian Museum taken in Calcutta in early December, 1907. I have seen no specimen that I can assume to be the ♂ of this species.

It may be remarked that Dr. Annandale has repeatedly observed this fly distended with blood, and actually sucking open sores on cattle. Though the proboscis itself is not sufficiently stiff to pierce the skin the toothed tip would easily enlarge a small hole, otherwise made.

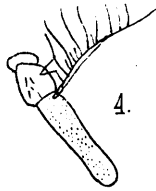


EXPLANATION OF PLATE VII.

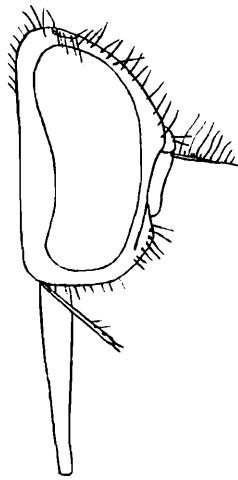
- 1.—*Stomoxys calcitrans*, L., head ♂, front view.
2.— *id.*, head ♂, profile.
3.— *id.*, head ♀, front view.
4.— *id.*, arista.
5.— *id.*, thoracic bristles, viewed from above.
6.— *id.*, *id.*, lateral view.
7.— *id.*, wing.
8—II.— *id.*, abdomen (8, typical).
12.—*S. indica*, Picard.
13.—*S. triangularis*, Brun., sp. nov.
14.—*S. oblongopunctata*, Brun., sp. nov.
15.—*Bdellolarynx sanguinolentus*, Aust., head ♂
16.— *id.*, head ♀
17.— *id.*, arista.
18.— *id.*, wing.
19.— *id.*, abdomen.



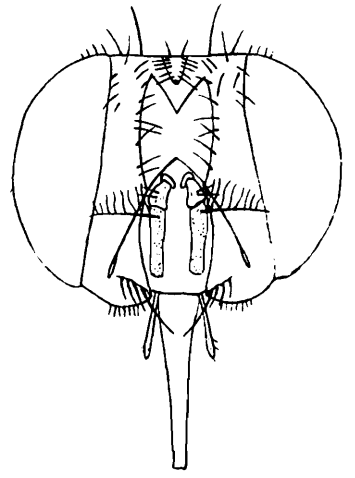
1 x 16. ♂



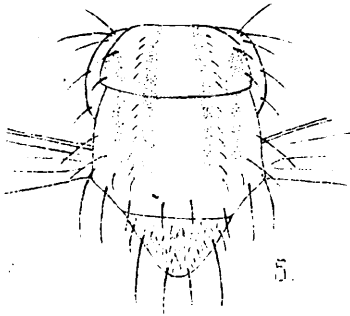
4.



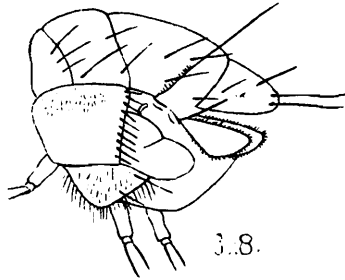
2 . 16. ♂



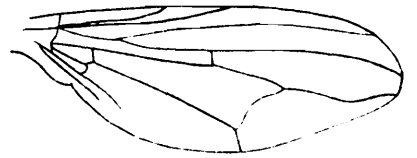
3 x 16. ♀



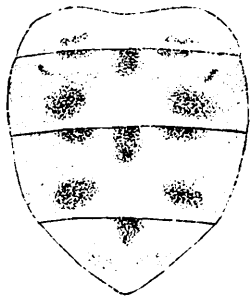
5.



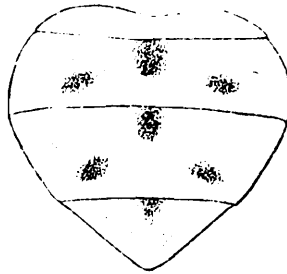
3.8.



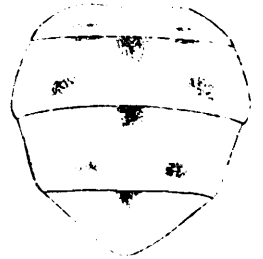
7 x 6 1/2.



8 x 8.



9 . 8.



10 . 8.



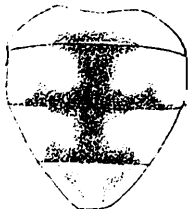
12 x 8.



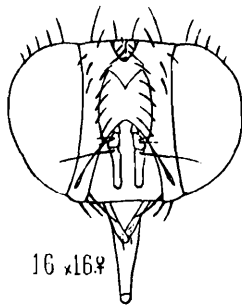
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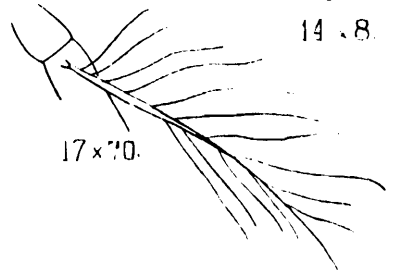
14 . 8.



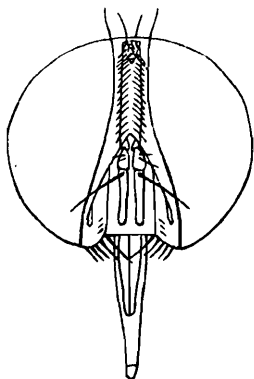
11 x 8.



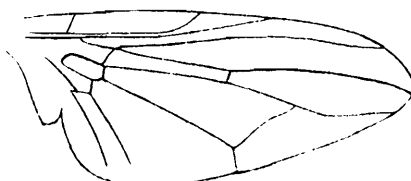
16 x 16 ♀



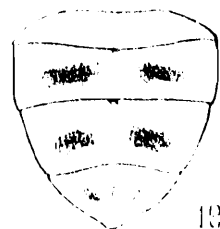
17 x 70.



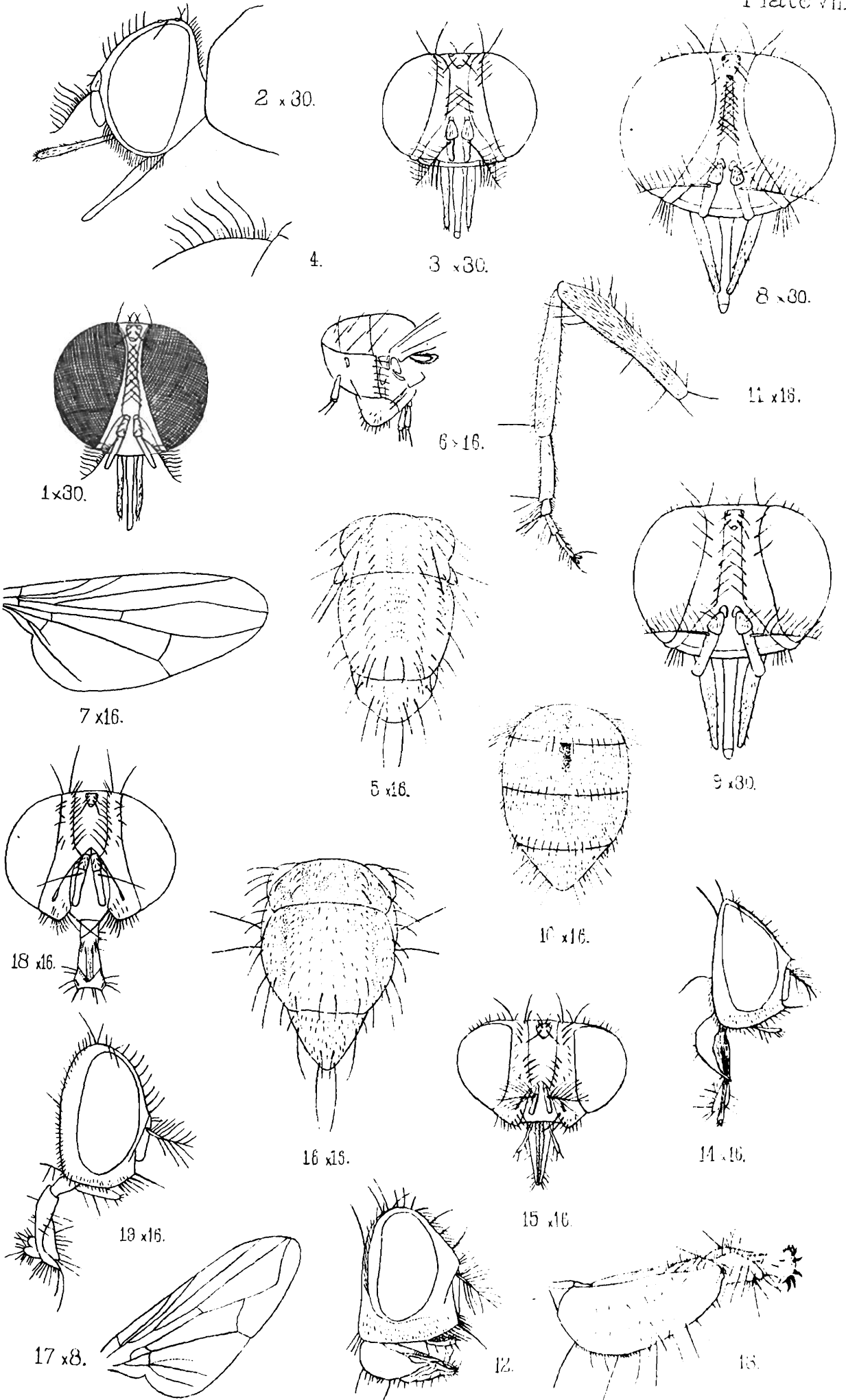
15 x 16. ♂



18 x 8.



19



Miscellaneous Zoological Publications.

	Rs. As.		Rs. As.
Account of the Deep-sea Brachyura collected by the R.I.M.S. "Investigator." By A. Alcock, M.B., C.M.Z.S. ..	6 0	Echinoderma of the Indian Museum: Littoral Holothurioidea collected by the R.I.M.S. "Investigator." By R. Koehler and C. Vaney ..	2 0
Account of the Deep-sea Madreporaria collected by the R.I.M.S. "Investigator." By A. Alcock, M.B., C.M.Z.S. ..	4 0	Echinoderma of the Indian Museum: Deep-sea Ophiuroidea collected by the R.I.M.S. "Investigator." By R. Koehler ..	10 0
Account of the Triaxou (Hexactinellid) sponges collected by the R.I.M.S. "Investigator." By F. E. Schulze, Ph.D., M.D. ..	16 0	Echinoderma of the Indian Museum: Shallow-water Ophiuroidea collected by the R.I.M.S. "Investigator." By R. Koehler ..	4 0
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Other Publications edited and sold by the Superintendent of the Indian Museum (also obtainable from Messrs. Friedlander & Sohn) issued by the Director of the Royal Indian Marine.

Illustrations of the Zoology of the R.I.M.S. "Investigator" 1892. Fishes, Plates I to VII. Crustacea, Plates I to V, 1894. Fishes, Plates VII to XIII. Crustacea, Plates VI to VIII. Echinoderma, Plates I to III, 1895. Echinoderma, Plates IV and V. Fishes, Plates XIV to XVI. Crustacea, Plates IX to XV, 1896. Crustacea, Plates XVI to XXVII, 1897. Fishes, Plate XVII. Crustacea, Plates XXVIII to XXXII. Mollusca, Plates I to VI, 1898. Fishes, Plates XVIII to XXIV. Crustacea, Plates XXXIII to XXXV. Mollusca, Plates VII and VIII, 1899. Fishes, Plates XXV and XXVI. Crustacea, Plates XXXVI to XLV, 1900. Fishes, Plates XXVII to XXXV. Crustacea, Plates XLVI to XLVIII. Index, Part I, 1901. Crustacea, Plates XLIX to LV. Mollusca, Plates IX to XIII, 1902. Crustacea, Plates LVI to LXVII. Crustacea, Plates LXXVIII to LXXXVI. Fishes, Plates XXXVI to XXXVIII, 1905. Crustacea (Malacostraca), Plates LXXVII to LXXXIX. Crustacea (Entomostraca), Plates I and II. Mollusca, Plates XIV to XVII, 1907. Fishes, Plates XXXIX to XLIII. Crustacea (Entomostraca), Plates III to V. Mollusca, Plates XIX and XX, 1908.—Re. 1 per plate. Mollusca, Plates XXI to XXIII, 1909.—As. 8 per plate.