

STUDIES ON MEDICALLY IMPORTANT FLIES IN THAILAND V.  
ON 32 SPECIES BELONGING TO THE SUBFAMILIES MUSCINAE  
AND STOMOXYINAE INCLUDING THE TAXONOMIC KEYS  
(DIPTERA: MUSCIDAE)\*<sup>1</sup>

BY

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ABSTRACT

Flies from different geographical parts of Thailand were collected to study their medical importance as well as making a zoogeographical study. After examination, 32 species of 10 genera, *Orthellia*, *Mitroplatia*, *Morellia*, *Pyrellia*, *Rypellia*, *Haematobia*, *Haematobosca*, *Stygeromyia*, *Haematostoma* and *Stomoxys*, belonging to Muscidae were identified and these are reported in this paper. Some of these are newly recorded ones from this country. This study is based on the specimens available in the authors' collection.

INTRODUCTION

Flies of the Order Diptera, which consisted of a large number of species, have a worldwide distribution and some of them are particularly dominant in the tropical parts of Asia. Several species have a great medical and veterinary importance throughout the temperate and tropical zones of the world and some species have been only thought to be the carriers of various bacteria of medical importance.

Because of their medical and veterinary importance, we made a plan to study each synanthropic species of flies in the families Muscidae, Calliphoridae and Sarcophagidae in Thailand in detail. In order to complete the taxonomic studies, some species which

are not medically important are also included. Because of the volume of pages required to report the results, all papers will be reported part by part as series and all papers are actually the first papers on the taxonomic studies on flies of medical importance in Thailand. We are reporting two subfamilies, Muscinae and Stomoxyinae, of Muscidae in this paper.

The species belonging to the genus *Musca*, including the taxonomic key, have already been reported (Tumrasvin and Shinonaga, 1977).

TERMINOLOGY

**Head** (Figs. 1 and 2): *a2* and *a3*, 2nd and 3rd antennal segments; *ar*, arista; *ce*, compound eye; *e*, epistoma; *f*, face; *fr*, facial

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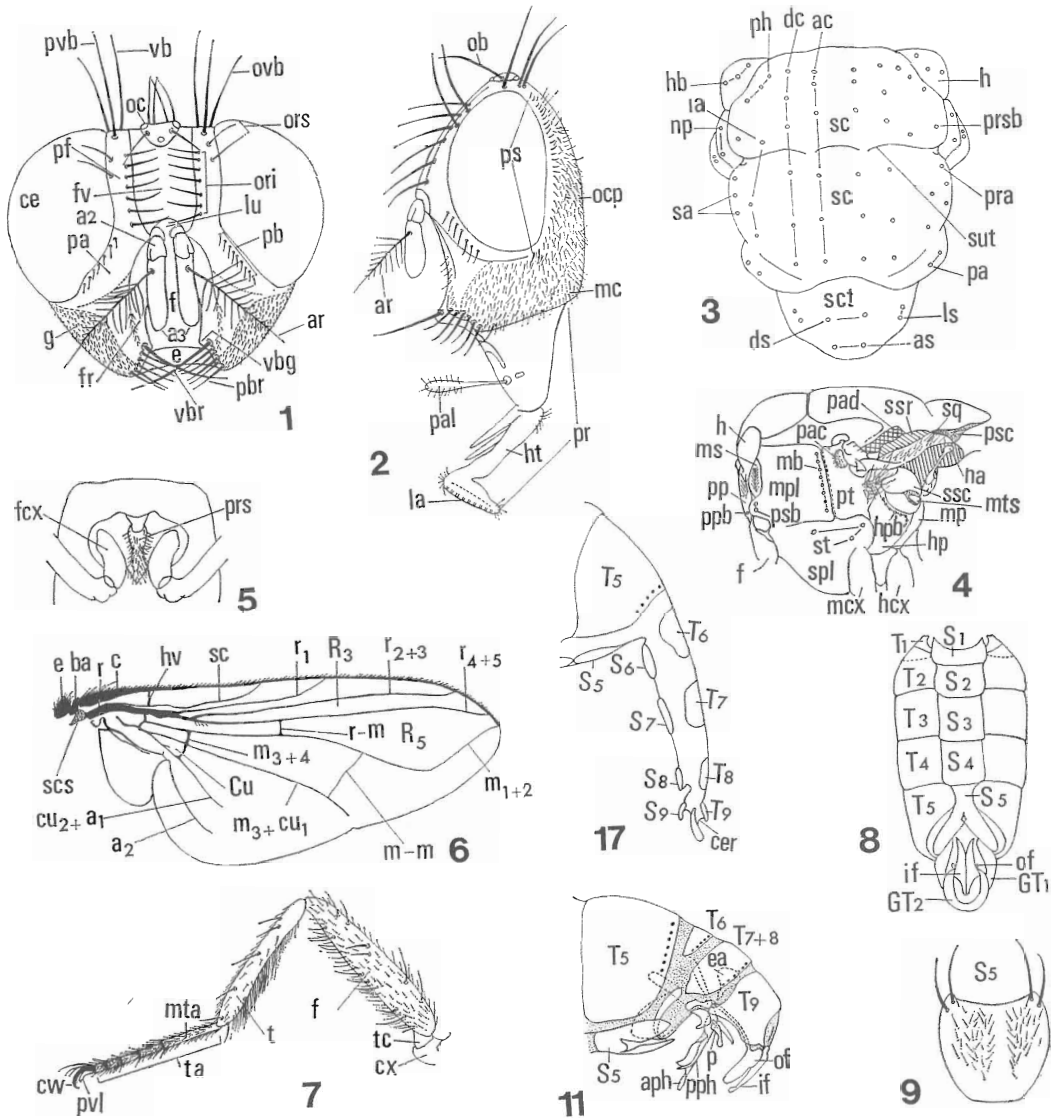


Plate 1

ridge; *fv*, frontal vitta; *g*, gena; *ht*, haustellum; *la*, labella; *lu*, lunula; *mc*, metacephalon; *ob*, ocellar bristle; *oc*, ocellus; *ocp*, occiput; *ori*, frontal bristles; *ors*, fronto-orbital bristles; *ovb*, outer vertical bristle; *pa*, parafacialia; *pal*, palpus; *pb*, parafacial bristles; *pbr*, peristomal bristles; *pf*, parafacial bristles; *pr*, proboscis; *ps*, postocular setae; *pvb*, prevertical bristle; *vb*, vertical bristle; *vbg*, vibrissal angle; *vbr*, vibrissa.

**Thorax** (Figs. 3–5): *ac*, acrostichal bristles; *as*, apicoscutellar bristles; *dc*, dorso-central bristles; *ds*, discoscutellar bristles; *fcx*, fore coxa; *h*, humerus; *ha*, halter; *hb*, humeral bristles; *hcx*, hind coxa; *hpb*, hypopleuron; *hpb*, hypopleural bristles; *ia*, intralar bristles; *ls*, lateroscutellar bristles; *mb*, mesopleural bristles; *mcx*, mid coxa; *mp*, metapleuron; *mpl*, mesopleuron; *ms*, mesothoracic spiracle; *mts*, metathoracic spiracle;

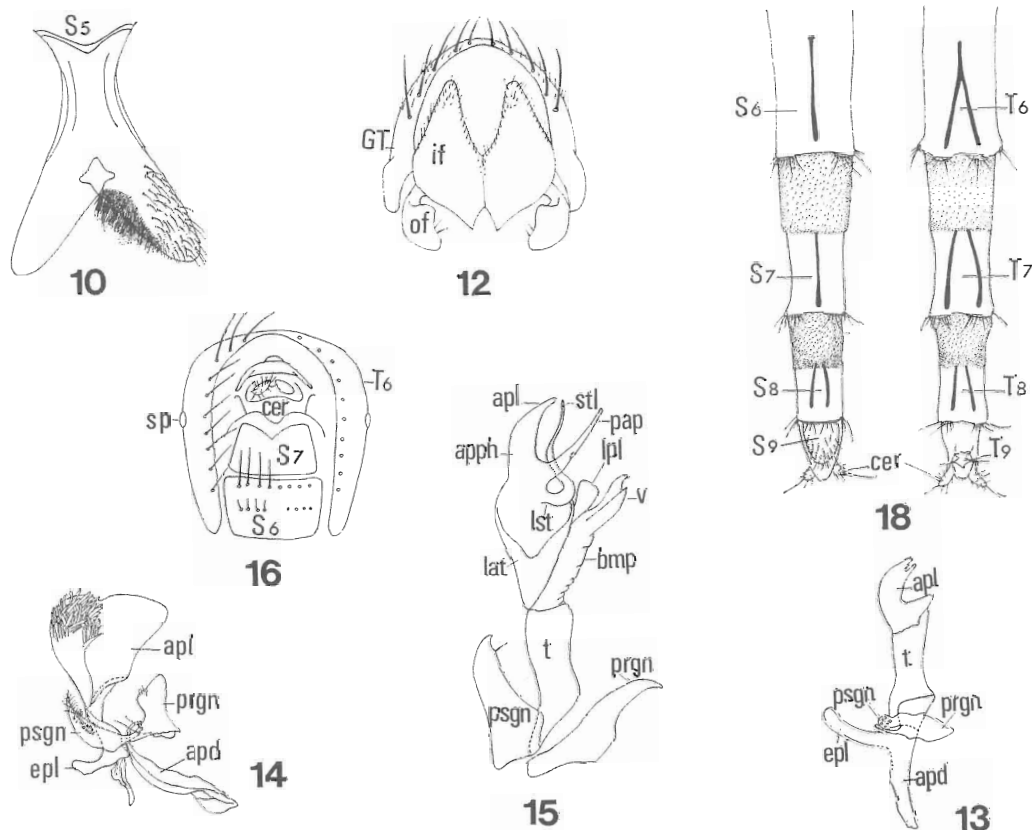


Plate 2

*np*, notopleural bristles; *pac*, pre-alar callus; *pa*, post-alar bristles; *pad*, post-alar declivity; *ph*, posthumeral bristles; *pp*, propleuron; *ppb*, propleural bristle; *pra*, pre-alar bristle; *prs*, prosternum; *prsb*, presutural bristle; *psb*, prostigmal bristles; *pt*, pteropleuron; *sa*, supra-alar bristles; *sc*, scutum; *sct*, scutellum; *sq*, squama; *ssc*, supraspiracular convexity; *ssr*, suprasquamal ridge; *st*, sternopleural bristles; *stp*, sternopleuron; *sut*, thoracic suture.

**Wing** (Fig. 6):  $a_2$ , 2nd anal vein (axillary vein); *ba*, basicosta; *c*, costa; *Cu*, cubital cell;  $cu_2+a_1$ , 2nd cubital and 1st anal vein; *e*, epaulet; *hw*, humeral cross-vein;  $m_{1+2}$ , 1st and 2nd medial vein;  $m_{3+4}$ , 3rd and 4th medial vein;  $m_3+cu_1$ , 3rd medial and 1st cubital vein; *m-m*, medial cross-vein;

*r*, radius;  $r_1$ , 1st radial vein;  $r_{2+3}$ , 2nd and 3rd radial vein;  $R_3$ , 3rd radial cell;  $r_{4+5}$ , 4th and 5th radial vein;  $R_5$ , 5th radial cell; *r-m*, radio-medial cross-vein; *sc*, subcosta; *scs*, subcostal sclerite (underside of wing).

**Leg** (Fig. 7): *cw*, claw; *cx*, coxa;  $f_{1-3}$ , fore, mid and hind femora; *mta*, metatarsus; *pol*, pullvillus; *ta*, tarsi; *tc*, trochanter;  $t_{1-3}$ , fore, mid and hind tibia.

**Abdomen** (Figs. 8-10): *GT* (1-2), 1st and 2nd genital tergites; *if*, inner forceps; *of*, outer forceps; *S* (1-5), 1st to 5th sternites; *T* (1-5), 1st to 5th tergites.

**Male terminalia** (Figs. 11-15): *apd*, apodeme; *aph*, acrophallus; *apl*, apical plate; *apph*, apical plate of paraphallus; *bmp*, basal membranous part; *ea*, ejaculatory apodeme; *epl*, epiphallus; *if*, inner forceps;

*GT*, genital tergite; *lat*, lateral arm; *lpl*, lateral plate; *lst*, lateral stylus; *of*, outer forceps; *p*, parameres; *pap*, process of apical plate; *pph*, paraphallus; *prgn*, pregonit (anterior paramere); *psgn*, postgonit (posterior paramere); *S* (5), 5th sternite; *stl*, stylus; *t*, theca; *T* (5-9), 5th to 9th tergites; *v*, ventralia.

**Female terminalia** (Figs. 16-18): *cer*, cercus; *S* (5-9), 5th to 9th sternites; *sp*, spiracle; *T* (5-9), 5th to 9th tergites.

KEY TO SUBFAMILIES

1. Pteropleuron hairy on upper embossed part;  $m_{1+2}$  strongly upcurved . . . 2  
 Pteropleuron usually bare on upper embossed part, except for *Dichaetomyia*, where the pteropleuron hairy but with metathoracic spiracles with some black hair on the lower margins . . . . . 3
2. Proboscis of licking type; usually 1+2 *st*; lower squama broad, inner margin lying close to the scutellum . . . . . Muscinae  
 Proboscis of blood-sucking type, strongly sclerotised; never more than 1+1 *st*; lower squama tongue-shaped, inner margin diverging from scutellum . . . . . Stomoxyinae
3. Hind tibia usually with anterodorsal or posterodorsal bristles (*ad* or *pd*) or both, but never with a strictly dorsal bristle (*d*) in exact alignment with the *d* pre-apical; axillary vein and anal vein only slightly convergent towards wing-margin . . . . . 4  
 Hind tibia with a strictly *d* bristle below the middle part in addition to, and exactly in alignment with, the *d* pre-apical; axillary vein strongly curved anteriorly . . . . . Fanniinae
4. Pteropleuron either entirely bare or with the hair mainly or only on em-

- bossed part, in this case the lower squama of *Musca*-type; palpi at most only gradually dilated towards apex, never spoon-shaped . . . . . 5  
 Pteropleuron with a patch of fine erect hair on lower part, just above the posterior *st* and with the upper embossed part quite bare; palpi strongly dilated at apex, somewhat spoon-shaped; frons broad in both sexes. . . . . Lispiniae
5. Usually with three *st*, the lower one closer to the posterior one, then forming shallow curve . . Phaoniinae  
 Three strong *st* always present, the lower one practically equidistant from the two upper ones, arranged in an inverted isosceles triangle . . . . . Coenosiniinae

SUBFAMILY MUSCINAE

All members of flies belonging to this subfamily have the upper embossed part of the pteropleuron setulose, normal and licking proboscis, the broad lower squamae and  $m_{1+2}$  bending anteriorly.

KEY TO GENERA

1. Thorax and abdomen black or yellow with dark vittae or tessellated patterns . . . . . 2  
 Thorax and abdomen metallic black, blackish-brown, green, blue or purple, without dense grayish pollen. . 3
2.  $m_{1+2}$  sharply bending anteriorly (Fig. 19) (except *M. lucens* where  $m_{1+2}$  rather broadly rounded); outline of arisal plumosity forming a convex curve up to tip; prostigmal bristle present, stem vein with one or several setulae on posterior side of dorsal surface . . . . . *Musca*  
 $m_{1+2}$  broadly rounded (Fig. 21); outline of arisal plumosity forming a

very sharp angle at tip; prostigmal bristle absent or indistinct; stem vein bare . . . . . *Morellia*

3. Prosternal sclerite strongly dilated anteriorly, broadly triangle, displacing the membranous part, its anterior margin contiguous with propleuron and hairy (Fig. 24); three strong pre-apicals on mid femur situated on a transverse ridge like a hook (Fig. 28)

. . . . . *Mitroplatia*  
Prosternal sclerite not or only slightly dilated anteriorly, might be hairy or bare; pre-apicals on mid femur normal . . . . . 4

4. Suprasquamal ridge hairy; prosternum hairy; with 1 *ia* . . . . . *Orthellia*

Suprasquamal ridge bare; prosternum bare; with 1 or 2 *ia* . . . . . 5

5. With 1 *ia* . . . . . *Pyrellia*

With 2 *ia* . . . . . *Rypellia*

GENUS *Morellia* Robineau-Desvoidy, 1830

*Morellia* R.-D., Mem. pres. div. Sav. Acad. Sci. Inst. Fr., 2: 405 (1830).

Eyes holoptic or somewhat slightly sub-contiguous in male, dichoptic in female and bare in both sexes; arista plumose; palpi fuscous to black; jowl black with grayish-brown dust; *sc* with 2 to 4 indistinctly broadened vittae on presutural area, between these vittae and at shoulder region conspicuously silver-dusted; thorax and abdomen usually black; *ac* 0-1+1-2; *dc* 2-3+3-5; *ia* 0+1; *hpb* 3 (except *M. biseta* and *M. nigrisquama* with 4); *ph* 1-2; *prsb* 1; *pra* usually 1; *sa* 2; *pa* 2; *np* 2; *as* 1; *ds* 2-3; *ls* 2; *st* 1+2; *psb* distinct or indistinct among the adjacent long setulose hairs; *prs* hairy or bare; upper part of *pp* bare; upper part of *pt* hairy; *hp* with several fine hair on upper part or near hind coxa; *ssr* bare; *ms* and *mts* dark brown to black; wings hyaline;  $r_1$  bare;  $r_{4+5}$  with some fine hairs on dorsal and ventral surfaces;  $m_{1+2}$  bend-

ing anteriorly; legs black; mid tibia without *av* bristle, usually with several *p* bristles; abdomen black.

The position and arrangement of bristles on legs seem to be specific characters in each species.

Two species, *M. nigrisquama* and *M. quadriremis*, were recorded from Thailand.

KEY TO SPECIES OF *Morellia*

1. Prosternum bare . . . . . *quadriremis*  
Prosternum hairy . . . . . 2
2. Lower squama brown. ♂: abdomen with a narrow black median vitta but without shifting spots . . . . . 3  
Lower squama light brown in ♂ and whitish in ♀: abdomen with a narrow black median vitta and with shifting spots or conspicuous pollinosity in both sexes . . . . . 4
3. ♂: hind tibia with 6 semi-erect *av* bristles on apical half (Fig. 27); the anterior half of *av* row on hind femur strong . . . . . *nigrisquama*  
♂: hind tibia with only 2 semi-erect *av* bristles near apex (Fig. 29); the apical one-fifth of *av* row on hind femur strong . . . *pseudonigrisquama*
4. Mid tibia with 1 *pv* near apical third: discal cell wholly or almost wholly haired; wing length less than 7 mm . . . . . *hortensia*  
Mid tibia with 2 strong *pv* bristles; discal cell always wholly haired; wing length more than 7 mm . . . . . *biseta*

1. *M. quadriremis* Emden, 1965

*M. quadriremis* Emden, Fauna of India, Diptera, 7(1): 105 (1965).

MALE. Body length 5.5 mm. *Head*: Eyes separated at vertex by a distance equal to 0.14 of head width; *fv* obsolete; upper two-thirds of *pf* dark brown and undusted; *pa*

dark brown and silver-dusted; antennae black and silver-gray-dusted, apical half of *ar* bare; *pal* fuscous. *Thorax*: With two black vittae not divided, though there is a slightly silver-dusted narrow vitta from suture to *ia*; *ac* 0+2, *dc* 3+3, *ds* 2, other bristles as in generic description of the genus; prosternal plate almost parallel-sided; *sct* with a silver-dusted vitta on each side. *Wings*: Membrane with large bare areas on basal part, discal cell bare except on a triangular apical patch (Fig. 21). *Legs*: *f*<sub>1</sub> with dense setulose hairs on ventral surface and with a row of strong *pv* (near ventral surface), on which apical six bristles conspicuously flattened (Fig. 25); *t*<sub>1</sub> with a row of *ad*; *f*<sub>2</sub> with 7 strong pre-apicals, which occupy area from anterior to posterior surfaces, and anterior 3 of which are situated on a transverse ridge and somewhat flattened (Fig. 26) and with *pv* on basal half; *t*<sub>2</sub> with a row of dense short and stout erect *ad* on basal fourth, which are short at base and increase in length to the point at basal fourth, and with 3 *p*, 3 very small *pd* and 1 strong *pv*; *f*<sub>3</sub> with a row of *av* and *ad* (3 apical *av* strongest) and with a row of long *pv* on basal half; *t*<sub>3</sub> with a row of rather short *ad*, 2 *av* and 1 strong *pd*. *Abdomen*: With rather large shifting spot on each side of moderately broad black median vitta and on lateral sides.

**FEMALE.** Body length 5.5 mm; eyes separated at vertex by a distance equal to 0.26 of head width; *fv* black; *pf* dark brown and slightly silver-dusted, and with 1 conspicuous proclinate and 2 short bristles on the upper part; apical six of *pv* bristles on *f*<sub>1</sub> slightly flattened; only 4 strong pre-apicals but not flattened; *t*<sub>2</sub> with a short *ad* at basal two-thirds and equal in length; color and other characters similar to those of the male.

*Specimens examined*: 1♂, 1♀, nr. Sai

Yok, 500 m, Kanchana Buri, 8X 1975, R. Kano.

*Distribution*: India, Sri Lanka, Thailand.

2. *M. nigrisquama* Malloch, 1928

*M. nigrisquama* Malloch, Ent. Mitt. 17: 329 (1928).

**MALE.** Body length 6.5 mm. *Head*: Eyes separated at vertex by a distance equal to 0.16 of head width; *fv* obsolete; *pf* black and slightly gray-dusted; *pa* with dense silver-gray dust; antennae black, 3rd segment dusted brownish-gray. *Thorax*: With each narrow thinly gray-dusted vitta along the *dc* and another gray-dusted vitta on each lateral side, which is distinct in posterior view; *ac* 0+1, *dc* 3+4, *hb* 4, *ds* 2, other bristles as in generic description of the genus; *sct* with a silver-dusted stripe on each side. *Wings*: Membrane wholly haired. *Legs*: *f*<sub>2</sub> simple at apex; *t*<sub>2</sub> with a complete row of small *ad*, 3 small *pd* and 4 *p*; *f*<sub>3</sub> with a complete row of *ad* and *av* and with a row of very short *pv* on basal half; *t*<sub>3</sub> with 6 strong *av* on apical half (Fig. 27), a complete row of short *ad*, dense half-erect hairs from middle to apical fourth of *pv* surface and with 1 strong *pd*. *Abdomen*: Slightly covered with brownish-gray dust, and with shifting spots on each side of narrowly undusted black median vitta and on lateral sides.

*Specimen examined*: 1♂, Doi Pui, 1,685 m, Chiang Mai, 16 IX 1975, W. Tumrasvin.

*Distribution*: Burma, Formosa, India, Malaysia, Nepal, Sumatra, Thailand.

*Remarks*: The male of this species is closely related to *M. pseudonigrisquama* but it differs conspicuously from the latter by having 6 long *av* and only 1 *pd* on *t*<sub>3</sub>. The female specimen is not available in our collection.

3. *M. biseta* Emden, 1965

*M. biseta* Emden, Fauna of India, Diptera, 7(1): 110 (1965).

**MALE.** Body length 9.0 to 10.5 mm. *Head:* Eyes separated at vertex by a distance equal to 0.14 of head width; *fv* obsolete; *pf* shining fuscous; *pa* dark brown to fuscous with dense silver-dusted; antennae black, 3rd segment dusted brownish-gray. *Thorax:* With densely silver-dusted vittae at center and laterally and with two undivided black vittae on *dc* line; *ac* 1+1-2, *dc* 3+4-5, *hb*, 4, *ph* 1-2, other bristles as in generic description of the genus; *sct* with large silver-dusted vitta on each lateral side. *Wings:* With dark brown veins and wholly haired,  $r_{4+5}$  of dorsal surface with some fine hair extending to *r-m*. *Legs:*  $f_2$  without *av*, with only 3 pre-apicals, 1 on *p* and 2 on *pd* surfaces;  $t_2$  with 2 strong *pv*, 1 at middle and another 1 on apical fourth, and 3-4 small *p*;  $f_3$  with *ad* and *av* row, which are strong on apical, 3 *pd* on apical fifth and the short *pv* on basal half;  $t_3$  with 1 strong *ad* beyond middle, 7 *av* on more than apical half, 2 *bd*, 1 at apical fourth and another 1 at about basal fifth. *Abdomen:* Dusted silver-gray with a black median vitta,  $T_3$  with a large shifting spot on each side, which extends from hind margin almost to base.  $T_1$  with a complete shifting vitta on each side,  $T_2$  with a shifting spot at base of lateral surface and another subtriangle one on each side at base of dorsal surface.

**FEMALE.** Body length 9.0 to 10.5 mm: eyes separated at vertex by a distance equal to 0.25-0.26 of head width; *fv* black; 4 conspicuous *ors*, the foremost one strong; without *pv* on  $t_3$ ; color and other characters similar to those of the male.

*Specimens examined:* 5♂♂, 4♀♀, nr. Sai Yok, 500 m, Kanchana Buri, 9, 11 IX 1975,

R. Kano and H. Kurahashi; 2♂♂, 1♀, Sai Yok, 500 m, Kanchana Buri, 9-13, 27-29 XII 1975, S. Shinonaga and W. Tumrasvin; 1♀, nr. Burma Bord. 1,200 m, Fang, 26 IX 1975, W. Tumrasvin; 3♀♀, Fang Exp. St. 500 m, Fang, 26 IX 1975, R. Kano; 2♂♂, 1♀, Khao Yai, 30 km. S. Pak Chong, 6 X, 25-26 XII 1975, R. Kano and S. Shinonaga.

*Distribution:* India, Sri Lanka, Thailand.

4. *M. hortensia* (Wiedemann, 1824)

*Musca hortensia* Wiedemann, Analec.

Ent.: 49 (1824).

*Morellia hortensia:* Stein, Tijdschr. Ent. 52: 209 (1909).

**MALE.** Body length 6.0 to 7.0 mm. *Head:* Eyes separated at vertex by a distance equal to 0.14 of head width; *fv* obsolete; *pf* fuscous and slightly silver-dusted; *pa* densely silver-dusted;  $a_3$  covered with brownish-gray dust, *ar* bare on apical one-third. *Thorax:* Densely silver-dusted on central vitta and laterally, with a large black vitta on each *dc* line and not divided; *ac* 1+2, *dc* 3+4-5, *ph* 1-2, *ds* 2-3, other bristles as in generic description of the genus; *sct* with large vitta of dense silver dust on each side. *Wings:* Membrane might be wholly haired or basal third of discal cell bare (Fig. 20). *Legs:*  $f_2$  with a short *av* row on basal half, a row of bristles on basal half, *pd* on apical one-fourth strongest;  $t_2$  with a strong *p*, a strong *pd* and *pv* between apical third and fourth;  $t_3$  with 3 strong *av* on apical one-third, a row of *ad* with one on apical one-fourth strongest and a strong *pd*. *Abdomen:* With 3 dark longitudinal vittae and silvery patches.

**FEMALE.** Body length 5.0 to 6.5 mm; eyes separated at vertex by a distance equal to 0.25-0.26 of head width; *fv* black; foremost proclinate *ors* strongest; color and other characters similar to those of the

male.

*Specimens examined*: 2♀♀, Kasetsart Univ., Bang Khen, 31 VIII 1975, R. Kano and H. Kurahashi; 1♂, nr. Sai Yok, 500 m, Kanchana Buri, 6 IX 1975, H. Kurahashi; 1♂, Khao Yai, 800 m, 60 km. S. Pak Chong, 3 X 1975, R. Kano; 1♀, Hill, C. 200 m Sa Kaeo, 3 IX 1975, H. Kurahashi; 1♂, 20 km. Sai Yok Water fall, Evergreen for., 6 IX 1975, W. Tumrasvin; 1♂, Ban Pong Din, 10 km. N.E. Doi Saket, 30 IX 1975, W. Tumrasvin.

*Distribution*: China, Formosa, India, Indonesia (Borneo, Sumatra and Java), Malaysia, Nepal, Philippines, Japan (Ryukyus), Sri Lanka, Thailand; Papuan subregion.

5. *M. pseudonigrisquama* Shinonaga et Tumrasvin, 1978

*M. pseudonigrisquama* Shinonaga et Tumrasvin, Jap. J. Sanit. Zool. 29: 351 (1978).

**MALE.** Body length 5.0 to 7.5 mm. *Head*: Eyes separated at vertex by a distance equal to 0.14–0.16 of head width; *fv* obsolete; *pf* black with slightly silvery dust in the lowest part; *pa* black with silver-gray-dusted; antennae black, *a*<sub>3</sub> with brownish dust; *pal* black. *Thorax*: Densely silver-dusted on central vitta of the anterior end of *sc* and lateral sides, becoming more thinly gray-dusted behind suture, the broad black median vitta not divided; *ac* 1+2, other bristles as in generic description of the genus; *sct* black. *Wings*: Hyaline; membrane wholly haired. *Legs*: Fuscous black, slightly silver-dusted, rather dense on fore *tc*; *t*<sub>3</sub> with 2–3 *av* at apical one-fifth, a row of *ad* (middle one longest) and 2 *pd*. *Abdomen*: *T*<sub>2</sub> wholly black; *T*<sub>3</sub> to *T*<sub>5</sub> black with a conspicuous median vitta on each segment, broadest on *T*<sub>3</sub>; the anterior end and lateral parts of *T*<sub>3</sub> and *T*<sub>4</sub> densely silver-dusted; *T*<sub>5</sub> wholly silver-dusted, except the narrow median vitta.

*Specimens examined*: 14♂♂, Khao Yai, 30 km. S. Pak Chong, 24–26, 25–26 XII 1975, S. Shinonaga; 1♂, nr. Sai Yok, 500m, Kanchana Buri, 8 IX 1975, H. Kurahashi.

*Distribution*: Thailand.

*Remarks*: This species is closely related to *M. nigrisquama* but it differs from the latter by having 2–3 *av* and 2 *pd* on *t*<sub>3</sub>.

GENUS *Mitroplatia* Enderlein

*Mitroplatia* Enderlein, Sber. Ges. naturf. Freunde Berl. 1935: 236 (1935).

The generic description of this genus is almost similar to that of the genus *Morellia* but it differs from *Morellia* by having a different color and shape of prosternal sclerite. The body of *Mitroplatia* is metallic in color and its prosternal sclerite strongly dilated anteriorly, broadly triangle, displacing the membranous part, its anterior margin contiguous with propleuron, but the body of *Morellia* is not metallic in color and the prosternal sclerite is not or only slightly dilated anteriorly, separated from propleuron by a conspicuous membrane, parallel-sided to ovate.

6. *Mitroplatia* sp.

**MALE.** Body length 6.0 mm. *Head*: Eyes separated at vertex by a distance equal to 0.14 of head width; *fv* obsolete; *pf* and *pa* metallic black; antennae dark brown, *a*<sub>3</sub> covered with brownish dust; *pal* dark brown and dilated in apical half. *Thorax*: Dark blue with purple reflections; small silvery spot and silver-white dust indicating a median vitta, anterior part of *sc* with some grayish-white dust at shoulder; *ac* 3+3, *dc* 2+5, *ia* 0+1, *prsb* 1, *hb* 4, *ph* 1, *np* 2, *pra* 1, *sa* 2, *pa* 3, *as* 1, *ds* 2, *ls* 2, *st* 1+2; upper part of *prs* with setulose hair; *mts* dark brown. *Wings*: Hyaline and wholly haired. *Legs*: Black and slightly silver-dusted; knee dark reddish-brown; *ta* reddish-brown; *f*<sub>2</sub> with 8 strong preapicals,



which extend from *a* to *p* surfaces and anterior 3 of which are like a hook and situated on a transverse ridge and with a row of *ad* on distal one-fourth; *t*<sub>3</sub> with a row of *av* on apical half. *Abdomen*: Same color as thorax; with conspicuously grayish-white-dusted on lateral sides; anterior margins of *T*<sub>3</sub> and *T*<sub>5</sub> with dark brown bands, without median vitta.

*Specimens examined*: 2♂♂, Khao Yai, 30 km. S. Pak Chong, 25–26 XII 1975, W. Tumrasvin.

*Remarks*: Only two male specimens, the same species, of *Mitroplatia* are available in our collection and these specimens do not fit the males of *M. albisquama* (Emden) and *M. viridaurea* (Emden) at all. Moreover, the rest of the species described by Emden were females. Therefore it is rather impossible to identify at this time what species these two males should be.

GENUS *Orthellia* Robineau-Desvoidy, 1863

*Orthellia* R.-D., Hist. nat. Dipt. env. Paris 2: 837 (1863).

Body metallic green, blue, black or purple; eyes in male usually holoptic, in female dichoptic; arista plumose; *ac* 0+1 (except in *claripennis* with 0+0), *dc* 0–2+1+7; *ia* 0+0–1; *prsb* 1; *hb* 3; *ph* 1; *np* 2; *sa* 2; *pa* 3; *as* 1; *ds* 1; *ls* 1; *st* 1+2; prostigmal bristle present; suprasquamal ridge hairy; prosternum hairy; pteropleuron hairy; hypopleuron usually with several hairs in the upper part; *r*<sub>1</sub> bare; *r*<sub>4+5</sub> with a row of black setulae on the dorsal and ventral surfaces; *m*<sub>2+2</sub> strongly bent forward, angularly or bow-shaped; subcostal sclerite setulose; mid tibia with a strong *pv*.

KEY TO SPECIES OF *Orthellia*

1. Presutural dorsocentral bristles 2 pairs ..... 2  
    Presutural dorsocentral bristles absent ..... 7
2. Discal cell wholly hairy; mid tibia

- without *ad* ..... 3
- Discal cell with a bare longitudinal strip close to *m*<sub>3</sub>+*cu*<sub>1</sub>; mid tibia with or without *ad* ..... 5
3. Tarsi and palpi pale orange; palpi rather slender and hardly dilated to apex; inner facets of male eyes markedly enlarged ..... *rufitarsis*  
    Tarsi and palpi dark brown ..... 4
4. Palpi markedly dilated in apical half and appear club-shaped in lateral view; inner facets of male eyes markedly enlarged ..... *timorensis*  
    Palpi slender; *m*<sub>1+2</sub> bow-shaped; inner facets of male uniform; body olive green; mangrove species .... *cuprea*
5. Mid tibia with an *ad*; basal part of wings yellowish; wing veins yellowish-brown; inner facets of male eyes markedly enlarged ..... *indica*  
    Mid tibia without an *ad*; basal part of wings not yellowish; wing veins dark brown ..... 6
6. Parafacialia black and covered with silver-gray dust; inner facets of male eyes not markedly enlarged; vibrissae inserted at vibrissal angles .....  
    ..... *coeruleifrons*  
    Parafacialia dark brown to black; inner facets of male eyes markedly enlarged; vibrissae inserted into upper part of vibrissal angles ... *fletcheri*
7. Angle of wing subangular; palpi and 3rd antennal segment brownish-orange; discal cell without hairs; 3rd and 4th abdominal segments with dark bands on the anterior margins; basal part of each wing yellowish; lower squamae light brown; inner facets of male eyes markedly enlarged ..... *lavita*  
    Angle of wing broadly rounded; palpi and antennae dark brown to black; discal cell hairy; 3rd and 4th ab-

- dominal segments without dark bands on the anterior margins; basal part of each wing not yellowish; lower squamae dark brown to black; inner facets of male eyes not markedly enlarged . . . . . 8
8. Acrostichal and intra-alar bristles absent . . . . . *claripennis*  
Acrostichal and intra-alar bristles present . . . . . 9
9. *m-m* closer to bend than to *r-m*, somewhat sigmoid-shaped; lower squamae dark brown to black . . . . . *gavisa*  
*m-m* approximately at midpoint between bend and *r-m*, rather straight; lower squamae dark brown . . . . .  
. . . . . *diffidens*

7. *O. rufitarsis* (Stein, 1920)

*Cryptolucilia rufitarsis* Stein, Tijdschr. Ent. 62 (Suppl.): 40 (1920).

*O. rufitarsis*: Emden, Fauna of India, Diptera, 7(1): 123 (1965).

MALE. Body length 7.0 to 8.0 mm. *Head*: Eyes separated at vertex by a distance equal to 0.12 of head width; *a*<sub>2</sub> light orange, *a*<sub>3</sub> brownish-orange; except at base, *pal* pale orange; *fv* obsolete; *pf* linear at middle; *pa* dark brown and silver-dusted; jowls yellowish-brown. *Thorax*: Metallic green with blue reflection, silver-dusted anteriorly and with two conspicuous vittae anteriorly; *dc* 2+4-7 (the anterior 2 *post dc* strong). *Wings*: Wing veins light brown; membrane wholly haired; *m*<sub>1+2</sub> with subangular bend. *Legs*: From coxae and femora dark brown, tibiae yellow brown, tarsi pale orange, *t*<sub>2</sub> without *ad*. *Abdomen*: Same color as thorax.

FEMALE. Body length 10 mm; eyes separated at vertex by a distance equal to 0.30 of head width; *fv* yellowish-orange; *pf* brown, mostly silver-dusted on the posterior part; color and other characters similar to

those of the male.

*Specimens examined*: 4♂♂, 1♀, Hill, C. 300 m, Sa Kao, 30 km. S.E., 3 IX 1975, R. Kano and H. Kurahashi.

*Distribution*: Burma, Indonesia, Malaysia, Simalur Island, Thailand.

8. *O. timorensis* (R.-D., 1830)

*Lucilia timorensis* R.-D., Mém. prés div. Sav. Acad. Sci. Inst. Fr. 2: 460 (1830).

*O. timorensis*: Pont, Catalog Diptera Oriental Region, 3: 465 (1977).

MALE. Body length 6.0 to 8.0 mm. *Head*: Eyes separated at vertex by a distance equal to 0.12 of head width; antennae dark brown; *pal* club-shaped in lateral side; *pa* dark brown to black. *Thorax*: Metallic green to purple blue, silver-dusted and with two conspicuous vittae anteriorly; *dc* 2+4; *sc* same color as *sc*. *Wings*: Wholly hairy membrane; wing veins dark brown; *m*<sub>1+2</sub> not strongly angulate. *Legs*: Dark brown, *t*<sub>2</sub> without *ad*. *Abdomen*: Same color as thorax.

FEMALE. Body length 5.0 to 8.0 mm; eyes separated at vertex by a distance equal to 0.30-0.32 of head width; *fv* dark brown to black; *pf* black, only slightly dusted brownish; *pa* dark brown to black and whitish-gray-dusted; color and other characters similar to those of the male.

*Specimens examined*: 8♂♂, 11♀♀, Khao Yai, 30 km. S. Pak Chong, 3, 6 X and 24-26 XII 1975, R. Kano, H. Kurahashi and S. Shinonaga; 1♂, 2♀♀, Khao Khaiw, 1, 351 m, 80 km. S. Pak Chong, 6 X 1975, H. Kurahashi; 5♂♂, 5♀♀, Sai Yok, 500 m, Kanchana Buri, 9-13, 27-29 XII 1975, S. Shinonaga; 6♂♂, 9♀♀, nr. Sai Yok, 500 m, Kanchana Buri, 6, 7, 9, 11 IX and 7 X 1975, R. Kano and H. Kurahashi; 1♂, Chiang Mai Univ., 22 IX 1975, H. Kurahashi; 1♂, 2♀♀, Doi Pui, Chiang Mai, 16, 21 IX and 17 XII 1975, R. Kano and S. Shinonaga;

4♂♂, 7♀♀, Hill, C. 300 m, Sa Kaeo, 30 km. S.E., 3 IX 1975, R. Kano, H. Kurahashi and W. Tumrasvin; 1♂, Ban Pong Din, 10 km. N.E. Doi Saket, 20 IX 1975, H. Kurahashi; 4♂♂, 1♀, Top, 2,667 m, Doi Inthanon, 19, 23 IX 1975, R. Kano and H. Kurahashi; 5♂♂, 7♀♀, Ban Yang, 1,400 m, Doi Inthanon, 17, 19, 23 IX 1975, R. Kano and H. Kurahashi; 2♂♂, 4♀♀, nr. Burma Bord., 1200 m, Fang, 26 IX 1975, R. Kano.

*Distribution:* Oriental region, New Guinea, Solomon Islands.

9. *O. cuprea* Shinonaga  
et Tumrasvin, 1977

*O. cuprea* Shinonaga et Tumrasvin, Jap. J. Sanit. Zool., 28(2): 125 (1977).

MALE. Body length 6.0 mm. *Head:* Eyes separated at vertex by a distance equal to 0.14 of head width; antennae and *pal* dark brown; *pa* black and silver-dusted. *Thorax:* Dark olive green; *dc* 2+5; *sc* same color as *sc*. *Wings:* Wholly haired; wing veins dark brown;  $m_{1+2}$  broadly rounded. *Legs:* Black;  $t_2$  without *ad*. *Abdomen:* Same color as thorax.

FEMALE. Body length 6.0 to 7.0 mm; eyes separated at vertex by a distance equal to 0.28–0.30 of head width; *fv* black; *pf* black and silver-dusted; color and other characters similar to those of the male.

*Specimens examined:* 1♂, 5♀♀, salt pond, Chon Buri, 23 XII 1975, S. Shinonaga and W. Tumrasvin.

*Distribution:* Thailand.

*Remarks:* All specimens examined were paratypes preserved in the Department of Medical Zoology, Tokyo Medical and Dental University.

10. *O. indica* (R.-D., 1830)

*Lucilia indica* R.-D., Mém. prés. div. Sav. Acad. Sci. Inst. Fr., 2: 453 (1830).

*O. indica:* Aubertin, Ann. Mag. nat.

Hist., (10)11: 141 (1933).

MALE. Body length 6.0 to 8.0 mm. *Head:* Eyes separated at vertex by a distance equal to 0.13–0.14 of head width;  $a_2$  brownish-orange,  $a_3$  dark brown; *pal* dark brown; *pa* reddish-brown to dark brown. *Thorax:* Metallic green to bronze-green; anterior vittae indistinct; *dc* 2+4–5; *sc* same color as *sc*. *Wings:* Basal part yellowish; wing veins yellowish-brown;  $m_{1+2}$  strongly angulate. *Legs:* Black;  $t_2$  with an *ad*. *Abdomen:* Same color as thorax.

FEMALE. Body length 6.0 to 8.0 mm; eyes separated at vertex by a distance equal to 0.30 of head width; *fv* dark brown to black; upper part of *pf* metallic green; *pa* dark brown and silver-dusted; color and other characters similar to those of the male.

*Specimens examined:* 2♂♂, 4♀♀, Pak Chong, 24 XII 1975, S. Shinonaga; 1♀, Khao Yai, 366 m, 30 km. S. Pak Chong, 5 X 1975, H. Kurahashi; 4♂♂, 4♀♀, Beach, C. 30 km. S. Chon Buri, 30 VIII 1975, R. Kano; 1♂, nr. Sai Yok, 500 m, Kanchana Buri, 5 IX 1975, H. Kurahashi; 1♂, Ban Pong Din, 10 km, N.E. Doi Saket, 20 IX 1975, R. Kano; 1♀, Ban Sap Bon, 30 km. E. Sara Buri, 4 X 1975, H. Kurahashi; 1♂, 4♀♀, Kasetsart Univ., Bang Khen, 31 VIII 1975, H. Kurahashi.

*Distribution:* Oriental region.

11. *O. coeruleifrons* (Macquart, 1851)

*Lucilia coeruleifrons* Macquart, Mém. Soc. Sci. Agric. Lille, 1851: 248 (1851).

*O. coeruleifrons:* Emden, Fauna of India, Diptera, 7(1): 127 (1965).

MALE. Body length 5.0 to 8.0 mm. *Head:* Eyes separated at vertex by a distance equal to 0.13–0.14 of head width;  $a_3$  black with the base narrowly yellowish-brown to reddish-brown; *pal* dark brown to black; *pa* black and silver-dusted. *Thorax:*

Metallic bluish-green or deep purple; *dc* 2+5; *sct* same color as *sc*. *Wings*: Wholly hairy membrane (except a bare longitudinal strip close to  $m_3+cu_1$ ); wing veins dark brown;  $m_{1+2}$  strongly angulate (Fig. 23). *Legs*: Black;  $t_2$  without *ad*. *Abdomen*: Metallic green or bluish-green.

**FEMALE.** Body length 7.0 to 8.0 mm; eyes separated at vertex by a distance equal to 0.29–0.30 of head width; *fv* black; *pf* dark blue, very slightly dusted; color and other characters similar to those of the male.

*Specimens examined*: 1♂, Khao Yai, 800 m, 60 km. S. Pak Chong, 3 X 1975, R. Kano; 2♂♂, Hill, C. 300 m, Sa Kaeo, 30 km. S.E., 3 IX 1975, R. Kano and H. Kurahashi; 4♂♂, 3♀♀, nr. Burma Bord., 1,200 m, Fang, 26 IX 1975, R. Kano and H. Kurahashi; 1♀, Ban Pong Din, 10 km. N.E. Doi Saket, 20 IX 1975, H. Kurahashi; 1♀, Pak Chong, 24 XII 1975, S. Shinonaga; 1♀, Ban Yang, 1,400 m, Doi Inthanon, 17 IX 1975, R. Kano; 2♀♀, Doi Huai Hwer, 1,231 m, Fang, 27 IX 1975, H. Kurahashi.

12. *O. fletcheri* Emden, 1965

*O. fletcheri* Emden, Fauna of India, Diptera, 7(1): 122 (1965).

**MALE.** Body length 8.0 to 10.0 mm. *Head*: Eyes separated at vertex by a distance equal to 0.11–0.12 of head width; antennae dark brown; *pal* dark brown; *pa* dark brown, yellowish-gray-dusted. *Thorax*: Bluish-purple; slightly silver-dusted and with two conspicuous vittae anteriorly; *dc* 2+4–5; *sct* same color as *sc*. *Wings*: Wholly hairy membrane (except a bare longitudinal strip close to  $m_3+cu_1$ ); wing veins dark brown;  $m_{1+2}$  subangulate. *Legs*: Dark brown;  $t_2$  without *ad*. *Abdomen*: Same color as thorax.

**FEMALE.** Body length 8.0 to 10.0 mm; eyes separated at vertex by a distance equal

to 0.26 of head width; frontal vitta dark brown; *pf* metallic black; color and other characters similar to those of the male.

*Specimens examined*: 28♀♀, Doi Pui, 1685 m, C. Chiang Mai, 16 IX 1975, R. Kano; 2♂♂, Ban Yang, 1,400 m, Doi Inthanon, 23 IX 1975, R. Kano and H. Kurahashi; 1♂, 1♀, nr. Top, 2,300 m, Doi Inthanon, 17 IX 1975, R. Kano and H. Kurahashi; 1♂, Top, 2,667 m, Doi Inthanon, 23 IX 1975, R. Kano; 3♂♂, 7♀♀, Khao Yai, 30 km. S. Pak Chong, 25–26 XII 1975, S. Shinonaga; 1♀, Khao Khiaw, 1,351 m, 80 km. S. Pak Chong, 3 X 1975, H. Kurahashi.

*Distribution*: Burma, India, Nepal, Sri Lanka, Thailand, Vietnam.

13. *O. lauta* (Wiedemann, 1830)

*Musca lauta* Wiedemann, Aussereurop. zweifl. Insekt., 2: 401 (1830).

*O. lauta* Malloch, Ann. Mag. nat. Hist., 9(12): 513 (1923).

**MALE.** Body length 6.0 to 8.0 mm. *Head*: Eyes separated at vertex by a distance equal to 0.12–0.14 of head width;  $a_2$  reddish-brown;  $a_3$  brownish-orange; *pa* black with silver dust. *Thorax*: Metallic purple or green; *ac* 0+1, *dc* 0+3, *ph* and *ds* absent, *st* 1+2; *sct* same color as *sc*. *Wings*: Mostly hairy at margin; wing veins light brown;  $m_{1+2}$  subangular; basicosta yellowish-orange. *Legs*: Dark brown;  $t_2$  without *ad*. *Abdomen*: Metallic green to greenish-purple with dark bands on the anterior margins of  $T_3$  and  $T_4$ .

**FEMALE.** Body length 5.0 to 8.0 mm; eyes separated at vertex by a distance equal to 0.36–0.37 of head width; *fv* black; *pf* dark purple and slightly silver-dusted on the anterior part; black bands on the anterior margins of  $T_3$  and  $T_4$  broader than those of the male; color and other characters similar to those of the male.

*Specimens examined:* 1 ♂, Kasetsart Univ. Bang Khen, 31 VIII 1975, H. Kurahashi; 2 ♀ ♀, Doi Pui, Chiang Mai, 17 XII 1975, S. Shinonaga; 1 ♂, nr. Ban Sap Bon, 30 km. E. Sara Buri, 4 X 1975, R. Kano; 4 ♂ ♂, 1 ♀, Pak Chong, 24 XII 1975, S. Shinonaga; 1 ♂, Hill, C. 300 m, Sa Kaeo 30 km. S.E., 3 IX 1975, H. Kurahashi; 5 ♂ ♂, 6 ♀ ♀, Beach, C. 30 km. S. Chon Buri, 30 VIII 1975, R. Kano.

*Distribution:* Oriental region and Australia.

14. *O. diffidens* (Walker, 1856)

*Musca diffidens* Walker, J. Proc. Linn. Soc. Lond. Zool., 1: 26 (1856).

*O. diffidens:* Séguy, Genera Insectorum, Diptera, Muscidae, 1937, p. 402.

MALE. Body length 7.0 to 9.0 mm.

*Head:* Eyes separated at vertex by a distance equal to 0.08–0.10 of head width; antennae blackish-brown; *pal* black; lowest part of *pf* with spots extending over most of *pa*; *pa* black. *Thorax:* Metallic greenish-blue, bluish-green or dark purplish-blue; vittae indistinct anteriorly; 1 extra bristle between prescutellar *ac* and *dc* (Fig. 38); *dc* 0+1; *st* 0+1; *sct* same color as *sc*. *Wings:* Discal cell with a bare longitudinal strip close to the basal part of  $m_3+cu_1$ ; wing veins light brown;  $m_{1+2}$  broadly rounded bend. *Legs:* Dark brown;  $t_2$  without *ad*. *Abdomen:* Same color as thorax.

FEMALE. Body length 7.0 to 9.0 mm; eyes separated at vertex by a distance equal to 0.24–0.26 of head width; *fv* black; spot on each *pf* not extended over *pa*; *pf* metallic black; color and other characters similar to those of the male.

*Specimens examined:* 11 ♂ ♂, 55 ♀ ♀, nr. Sai Yok, 500 m, Kanchana Buri, 6–9, IX 1975, R. Kano and H. Kurahashi; 1 ♂, 4 ♀ ♀, Sai Yok, 500 m, Kanchana Buri, 9–13, 27–29 XII 1975, S. Shinonaga; 1 ♀, Erawan Water

fall, 500 m, Kanchana Buri, 5 IX 1975, R. Kano; 2 ♂ ♂, 11 ♀ ♀, Khao Yai, 30 km. S. Pak Chong, 5, 6 X and 25–26 XII 1975, R. Kano, H. Kurahashi and S. Shinonaga; 1 ♂, 4 ♀ ♀, Khao Khiaw, 1,357 m, 80 km. S. Pak Chong, 3, 6 X 1975, H. Kurahashi; 1 ♂, Pak Chong, 24 XII 1975, S. Shinonaga; 2 ♂ ♂, Ban Pong Din, 10 km. N.E. Doi Saket, 20 IX 1975, H. Kurahashi; 2 ♀ ♀, Ban Yang, 1,400 m, Doi Inthanon, 23 IX 1975, H. Kurahashi; 1 ♀, Doi Suthep, Chiang Mai, 20–21 XII 1975, S. Shinonaga; 1 ♀, Doi Pui, 1,685 m, C. Chiang Mai, 16 IX 1975, H. Kurahashi; 1 ♂, 4 ♀ ♀, Doi Huai Hwer, 1,231 m, Fang, 27 IX 1975, R. Kano and H. Kurahashi; 4 ♀ ♀, nr. Burma Bord. 1,200 m, Fang, 26 IX 1975, R. Kano and H. Kurahashi; 3 ♂ ♂, 10 ♀ ♀, Than Kleap, 11 XI 1961, G. Imadate.

*Distribution:* Oriental region.

15. *O. gavis* (Walker, 1859)

*Musca gavis* Walker, J. Proc. Linn. Soc. Lond. Zool., 4: 138 (1859).

*O. gavis:* Pont, Catalog Diptera Oriental Region, 3: 464 (1977).

MALE. Body length 7.0 to 9.0 mm.

*Head:* Eyes separated at vertex by a distance equal to 0.10 of head width; inner facets of eyes not markedly enlarged; antennae black; *pal* black; lowest part of *pf* and upper part of *pa* each with elongated spot of silver pollinosity (Fig. 34). *Thorax:* Metallic black or purplish-blue, with two indistinct vittae and not silver-dusted anteriorly; *ac* 0+1, *dc* 0+1, *ia* and *ph* absent, *st* 0+1; *sct* same color as *sc*. *Wings:* Base of the wings slightly beyond *hv* dark brown; hair on membrane almost occupies the apical half and hind margin, but not the posterior part of apex of the discal cell; wing veins brown. *Legs:* Blackish-brown;  $t_2$  without *ad*. *Abdomen:* Same color as thorax.

**FEMALE.** Body length 7.0 to 10.0 mm; eyes separated at vertex by a distance equal to 0.28 of head width; *fv* black; *pf* metallic black, spot on each *pf* and *pa* not elongated (Fig. 35); color and other characters similar to those of the male.

*Specimens examined:* 1♂, 3♀♀, Doi Pui, 1,685 m, C. Chiang Mai, 16 IX 1975, H. Kurahashi; 1♂, 1♀, Doi Inthanon, Chiang Mai, 9 XII 1975, S. Shinonaga and H. Shima; 1♂, 1♀, Ban Yang, 1,400 m, Doi Inthanon, 17, 23 IX 1975, R. Kano and H. Kurahashi, 15♂♂, 59♀♀, Top, 2,667 m, Doi Inthanon, 19, 23 IX 1975, R. Kano and H. Kurahashi; 4♂♂, 2♀♀, Doi Suthep, Chiang Mai, 18, 20–21 XII 1975, S. Shinonaga and H. Shima.

*Distribution:* Oriental region.

16. *O. claripennis* Malloch, 1923

*O. claripennis* Malloch, Ann. Mag. nat. Hist. (9)12: 515 (1923).

**MALE.** Body length 4.0 to 5.0 mm. *Head:* Eyes separated at vertex by a distance equal to 0.12 of head width; inner facets of eyes not markedly enlarged; antennae dark brown; *pal* blackish brown; the lowest part of *pf* with small and elongated silver-dusted spot on the lowest part (this spot larger than the one on *pf*). *Thorax:* Dull purplish-blue or bluish-purple, without any vittae anteriorly; *ac* absent, *dc* 0+1, *ia* absent, *st* 0+1; *set* same color as *sc*. *Wings:* Most hairy on the apical half of the membrane and the whole hind margin; wing veins brown (Fig. 22); *m*<sub>1+2</sub> rounded. *Legs:* Dark brown, *t*<sub>2</sub> without *ad*. *Abdomen:* Same color as thorax.

**FEMALE.** Body length 6.0 mm; eyes separated at vertex by a distance equal to 0.26 of head width; *fv* black and slightly dark brown-dusted; *pf* black and on its upper part with proclinate hair and on upper half with 4–5 longer setulose hair

and bent outward; other characters similar to those of the male.

*Specimens examined:* 2♂♂, 1♀, 366 m, and 800 m, 30 km. and 60 km., S. Pak Chong, 3, 5 X and 25–26 XII 1975, R. Kano, H. Kurahashi and S. Shinonaga.

*Distribution:* Oriental region.

*Remarks:* Intra-alar bristles indistinct among the adjacent setulose hairs.

GENUS *Pyrellia* Robineau-Desvoidy, 1830

*Pyrellia* R.-D., Mém. Prés. div. Sav. Acad. Sci. Inst. Fr. 2: 462 (1830).

Metallic greenish-blue, bluish-green or dark blue with blue or purple reflections. Eyes bare, holoptic in male and dichoptic in female; antennae black, *a*<sub>3</sub> densely brownish-gray-dusted, *ar* plumose; *ac* 0+1; *dc* 2–3+5–6; *ia* 0+1; *prs* 1; *hb* 3; *ph* 1; *np* 2; *sa* 1–2; *pra* 1; *pa* 2; *as* 1; *ds* 1–2; *ls* 1; *st* 1+2–3; *ssr* bare; *pt* hairs: *trcb* present; *ms* blackish-brown; *scs* with one setulose hair; wings hyaline with light brown veins; *r*<sub>1</sub> bare; dorsal and ventral surfaces of *r*<sub>4+5</sub> setulose; *m*<sub>1+2</sub> broadly rounded and bent forward near apex; legs fuscous to black; *t*<sub>1</sub> without *p*; *t*<sub>2</sub> with a conspicuous *pv* beyond middle and several unequal *p*; *t*<sub>3</sub> with a conspicuous *pd* beyond middle; abdomen green, and if not green, concolor with thorax and without median vitta and strong bristles.

KEY TO SPECIES OF *Pyrellia*

1. Mid tibia without *ad* bristle in both sexes ..... 2
- Mid tibia with an *ad* bristle; humeral callosity (shoulder) pale silver-gray-dusted, the apical half of 5th abdominal segment with two large silver-gray-dusted spots on each side ..... *proferens*
2. Lateral part of presutural area undusted; ventral surface of *r*<sub>4+5</sub> setulose about three-fourths from node

to *r-m*; ventral surface of stem vein (at *hv*) with 2 conspicuous bristles; body highly metallic bluish-green; abdomen undusted. ♂: *t*<sub>2</sub> with extra long *ad* on basal three-fourths; *dc* 3+4; lower squamae black in both sexes . . . . . *ponti*

Lateral part of presutural area thinly silver-gray-dusted; ventral surface of stem vein bare; ventral surface of *r*<sub>4+5</sub> setulose not more than one-fourth from node to *r-m*; body black with dark blue reflections; abdomen with thinly silver-gray-dusted on anterior half. ♂: *f*<sub>2</sub> with short *av* on basal three-fourths; *dc* 2+4-5 in both sexes; lower squamae dark brown in male but light brown in female . . . . . *suchariti*

17. *P. proferens* (Walker, 1859)

*Musca proferens* Walker, J. Proc. Linn. Soc. Lond. Zool. 4: 138 (1859).

*P. proferens*: Séguy, Genera Insectorum, Diptera, Muscidae, 1937, p. 398.

MALE. Body length 4.5 to 6.0 mm. *Head*: Eyes separated at vertex by a distance equal to 0.13 to 0.14 of head width; *fv* obsolete; *pf* black, silver-dusted on apical third; *pa* black and silver-dusted. *Thorax*: Dark blue with greenish-blue or purple reflections, pale silver-gray-dusted between two black median vittae; shoulder pale silver-gray-dusted; 2+5-6 *dc*, *st* 1+2(-3), other bristles as in generic description of the genus; *sct* same color as *sc*. *Wings*: Hyaline with brown veins; *m-m* almost straight. *Legs*: *f*<sub>2</sub> with long *av* on basal two-thirds; *t*<sub>2</sub> with a small *ad* at apical fifth, 1 strong *pv* at apical fourth and with several *pd* and *p*; *t*<sub>3</sub> with 3-4 small *av*, 1 small *ad* and 1 strong *pd*. *Abdomen*: Pale olive green reflection.

FEMALE. Body length 4.5-6.5 mm; eyes

separated at vertex by a distance equal to 0.28-0.29 of head width; *fv* black; *pf* wholly metallic black, with 2 strong proclinate *ors*; *t*<sub>3</sub> with 2-3 small *av*; color and other characters similar to those of the male.

*Specimens examined*: 9♂♂, 10♀♀, nr. Burma Bord., 1,200 m, Fang, 26 IX 1975, R. Kano, H. Kurahashi and W. Tumrasvin; 2♂♂, 12♀♀, Doi Pui, 1685 m, C. Chiag Mai, 16 IX 1975, R. Kano, H. Kurahashi and W. Tumrasvin; 1♀, Fang Exp. St., 500 m, Fang, 25 IX 1975, R. Kano; 1♀, Doi Huai Hwer, 1,231 m, Fang, 27 IX 1975, H. Kurahashi; 1♀, nr. Sai Yok, 500 m, Kanchana Buri, 7 X 1975, R. Kano.

*Distribution*: Burma, Indonesia (Celebes, Lombok), India, Thailand.

18. *P. ponti* Shinonaga

et Tumrasvin, 1978

*P. ponti* Shinonaga et Tumrasvin, Jap. J. Sanit. Zool. 29: 353 (1978).

MALE. Body length 5.5 mm. *Head*: Eyes separated at vertex by a distance equal to 0.13 of head width; *fv* obsolete; *pf* black and slightly silver-dusted at apex; *pa* and jowls slightly silver-gray-dusted. *Thorax*: Shining metallic bluish-green with a broad stripe on anterior end of presutural area silver-gray-dusted between 2 broad and faint black median vittae; *dc* 3+4 (all *dc* conspicuously long); *ds* 3; *st* 1+3; other bristles as in generic description of the genus; *sct* same color as *sc*. *Wings*: Hyaline with brown veins; *m-m* slightly sigmoid-shaped. *Legs*: *f*<sub>3</sub> with a complete row of long *av*, *ad* and *pv*; *t*<sub>3</sub> with 4 *av*, a long *ad* at middle and 1 strong *pd*. *Abdomen*: Shining bright metallic green, undusted.

FEMALE. Body length 6.0 mm; eyes separated at vertex by a distance equal to 0.28 of head width; *fv* black; *pf* brightly metallic black; 2 proclinate *ors* present; *m-m* vein almost straight; *f*<sub>2</sub> with short *av*

on basal one-fourth;  $t_3$  with 3 *av*; color and other characters similar to those of the male.

*Specimens examined*: 1♂, 1♀, nr. Sai Yok, 500 m, Kanchana Buri, 6 IX 1975, R. Kano and H. Kurahashi.

*Distribution*: Thailand.

*Remarks*: The specimens examined were the holotype and paratype.

19. *P. suchariti* Shinonaga  
et Tumrasvin, 1978

*P. suchariti* Shinonaga et Tumrasvin,  
Jap. J. Sanit. Zool. 29: 352 (1978).

**MALE**. Body length 4.5 to 6.0 mm. *Head*: Eyes separated at vertex by a distance equal to 0.12 of head width; *fv* obsolete at middle; *pf* fuscous with slightly silver-gray-dusted anteriorly; *pa* dark brown to fuscous and silver-dusted. *Thorax*: Black with dark blue reflections, a broad stripe with silver-gray-dusted between 2 broad black median vittae (this silver-dusted stripe ended at presutural area and densely dusted near neck); *dc* 2+4-5 (*prst* and 3 *post dc* very strong); *ds* 1-2 (usually 1); *st* 1+3-4 (usually 3); other bristle as in generic description of the genus; *set* same color as *sc*. *Wings*: Hyaline with brown veins; lower squamae dark brown to blackish-brown. *Legs*:  $f_2$  with *av* at basal one-fourth;  $t_3$  with 3-4 *av* and 1 *ad* at middle. *Abdomen*: Same color as thorax; last segment with thinly silver-gray-dusted spots in anterior half.

**FEMALE**. Body length 4.5 to 6.0 mm; eyes separated at vertex by a distance equal to 0.27-0.29 of head width; *fv* black; *pf* shining metallic black with slightly silver-gray-dusted in anterior one-third; lower squamae light brown; silver-gray dusted spots on last abdominal segment more conspicuous than in the male.

*Specimens examined*: 20♂♂, 44♀♀, nr.

Sai Yok, 500 m, Kanchana Buri, 6, 8, 9 IX and 7, 8 X 1975, R. Kano, H. Kurahashi and W. Tumrasvin; 1♂, 4♀♀, Sai Yok, 500 m, Kanchana Buri, 9-13 XII 1975, S. Shinonaga and H. Shima; 4♀♀, Erawan w.f., Kanchana Buri, 10 XII 1975, S. Shinonaga; 1♂, 1♀, Khao Yai, 800 m, 60 km. S. Pak Chong, 6 X 1975, R. Kano and H. Kurahashi; 1♂, 2♀♀, Khao Yai, 366 m, 30 km. S. Pak Chong, 5, 6 X 1975, R. Kano and H. Kurahashi; 1♂, Hill, C. 200 m, Sa Kaeo, 3 IX 1975, H. Kurahashi.

*Distribution*: Thailand.

GENUS *Rypellia* Malloch, 1931

*Rypellia* Malloch, Ann. Mag. nat. Hist. (10)7: 190 (1931).

Body metallic black or shining dark brown; eyes with or without long hairs; arista plumose; scutum thinly dusted and with four very narrow faint undusted vittae, which are conspicuous only on presutural area where the pollinosity is denser; *ac* 0+1; *dc* 2+4 (the anterior *prst dc* very small); *ia* 0+2; *prsb* 1; *hb* 3; *ph* 2; *np* 2; *sa* 2; *pra* 1 (about as long as 2nd *np*); *pa* 2; *as* 1; *ds* 1-2; *ls* 2; *st* 1+3; *ssr* hairy; *psb* present; *pt* hairy; *hp* with some fine and short hairs in front of hind coxa; wings hyaline with  $m_{1+2}$  bending broadly rounded; dorsal and ventral surfaces of  $r_{4+5}$  setulose nearly to tip or more or less beyond *r-m*; node of  $r_1$  with 1 setulose hair; subcostal sclerite with some setulae;  $t_2$  with a strong *pd* at about apical fourth; abdomen with long hairs only on hind margins of segments but stronger at sides, hairs on 4th segment and at each side become seta-like.

All species are newly recorded from Thailand.

KEY TO SPECIES OF *Rypellia*

1. Eyes with long dense hairs; body wholly



- metallic black; lower squamae dark brown; mesothoracic spiracles brown; legs wholly black . . . . . *malaisei*  
 Eyes bare; lower squamae and mesothoracic spiracles pale yellow to orange yellow; femora and tibiae yellow . . . . . 2  
 2. ♂: Thorax and abdomen wholly black . . . . . *flavipes*  
 ♂: Thorax and abdomen not wholly black; lateral parts of post-alar surface, the lateral sides of scutellum, humeral callosity, lateral parts of mesothorax and the tip of last abdominal segment yellow . . . . .  
 . . . . . *flavipennis*

20. *R. malaisei* (Emden, 1965)

*Dasyphora (Rypellia) malaisei* Emden, Fauna of India, Diptera, 7(1): 145 (1965).

*R. malaisei*: Pont, Catalog Diptera Oriental Region, III: 468 (1977).

FEMALE. Body length 6.0 to 6.5 mm. *Head*: Eyes separated at vertex by a distance equal to 0.26–0.27 of head width; *fv* black; *pf*, *pa* and jowl black and thinly gray-dusted; *pf* with a long proclinate *ors* and 3–4 small bristles behind; antennae black, *a*<sub>3</sub> with brownish-gray-dusted; *pal* black. *Thorax*: Metallic fuscous; *as* 1, *ds* 2, *ls* 2, other bristles as in generic description of the genus; *set* metallic fuscous. *Wings*: Hyaline with dark brown veins. *Legs*: *f*<sub>2</sub> with a long *av* on basal fourth and with 3–4 long *pv* on basal half; *f*<sub>3</sub> with a row of long *pv* on basal half; *t*<sub>3</sub> with 4 *av* at middle, 1 at apical fifth, 2 *ad* at middle, 1 at basal third strongest. *Abdomen*: Wholly fuscous black.

*Specimens examined*: 54 ♀♀, Top, 2,667 m, Doi Inthanon, 17, 19, 23 IX 1975, R. Kano, H. Kurahashi and W. Tumrasvin; 2 ♀♀, nr. Top, 2,300 m, Doi Inthanon, 17 IX 1975; 2 ♀♀, Ban Yang, 1,400 m, Doi Intha-

non, 17 IX 1975, H. Kurahashi and W. Tumrasvin.

*Distribution*: Burma, Thailand.

*Remark*: No male specimen is available in our collection.

21. *R. flavipes* Malloch, 1931

*R. flavipes* Malloch, Ann. Mag. nat. Hist. (10) 7: 190 (1931).

MALE. Body length 6.0 mm. *Head*: Eyes separated at vertex by a distance equal to 0.13 of head width; *fv* obsolete; *pf*, *pa* and jowls fuscous and thinly brownish-gray-dusted; *pal* fuscous. *Thorax*: Metallic black; *as* 1, *ds* 2, *ls* 2, other bristles as in generic description of the genus; *set* metallic black. *Wings*: Yellowish near base; wing veins brown. *Legs*: Femora and tibiae yellow, coxa and tarsi infuscated; *f*<sub>2</sub> with 3 long *av* near basal third and with 3 *pv* near middle; *f*<sub>3</sub> with a complete row of long *av*, with a row of long *pv* on basal two-thirds and with several long hairs on *pv* and *v* surfaces on basal two-thirds; *t*<sub>3</sub> with 5 *av*. *Abdomen*: Metallic black, almost undusted.

*Specimen examined*: 1 ♂, Doi Pui, 1,685 m, C. Chiag Mai, 19 IX 1975, R. Kano.

*Distribution*: Burma, India, Nepal, Indonesia (Sumatra), Thailand, Japan.

*Remark*: No female specimen is available in our collection.

22. *R. flavipennis* (Emden, 1965)

*Dasyphora (Rypellia) flavipennis* Emden, Fauna of India, Diptera, 7(1): 147 (1965).

*Rypellia flavipennis*: Pont, Catalog Diptera Oriental Region, III: 468 (1977).

MALE. Body length 5.5 to 6.5 mm. *Head*: Eyes separated at vertex by a distance equal to 0.14 of head width, upper facets markedly enlarged; *fv* obsolete; *pf*, *pa* and jowls fuscous and only thinly brownish-gray-dusted; antennae dark brown, *a*<sub>3</sub> brownish-gray-dusted; basal part of *pal* brownish-

yellow but the apical part brown. *Thorax*: Thinly silver-gray-dusted; lateral side of post-alar area and *sc* yellow; *as* 1, *ds* 1, *ls* 2, other bristles as in generic description of the genus; *sct* wholly yellow or the lateral part on anterior half yellow. *Wings*: Basal part yellow with some brown veins. *Legs*: Coxa and tarsi light brown;  $f_2$  with 3 small *av* (near to *v* position) on basal half and a row of *pv* on basal half;  $f_3$  with *av* row and with long *pv* row on basal two-thirds (the foremost one strongest);  $t_3$  with 4 *av*. *Abdomen*:  $T_{1+2}$  yellow,  $T_3$  almost wholly yellow, basal part of  $T_4$  yellow,  $T_5$  black and slightly gray-dusted.

**FEMALE.** Body length 6.0 to 7.0 mm; eyes separated at vertex by a distance equal to 0.26–0.28 of head width, upper facets not enlarged; the anterior proclinate *ors* strong; *fv* black;  $a_2$  yellowish-brown; only  $T_{1+2}$ , basal corners of  $T_3$  and tip of  $T_5$  yellow; other characters similar to those of the male.

*Specimens examined*: 2♂♂, 2♀♀, Khao Yai, 30 km. S. Pak Chong, 24–26, 25–26 XII 1975, S. Shinonaga, H. Shima and W. Tumrasvin; 2♀♀, Khao Khiaw, 1,851 m, 80 km. S. Pak Chong, 6 X 1975, H. Kurahashi; 2♀♀, Doi Pui, 1,685 m, C. Chiang Mai, 16 IX 1975, R. Kano and H. Kurahashi; 1♂, Doi Huai Hwer, 1,231 m, Fang, 27 IX 1975, R. Kano; 3♀♀, Ban Yang, 1,400 m, Doi Inthanon, 17, 19 IX 1975, R. Kano; 3♂♂, nr. Top, 2,300 m, Doi Inthanon, 17 IX 1975, H. Kurahashi; 1♀, Top, 2,667 m, Doi Inthanon, 19 IX 1975, H. Kurahashi.

*Distribution*: Burma, Malaysia, Thailand.

#### SUBFAMILY STOMOXYINAE

The stomoxyinae is regarded as a subfamily of the family Muscidae. The members of the flies in this subfamily resemble the house flies, *Musca domestica*, and related species in general appearance, but the mouth part of the flies in this subfamily are

modified into a piercing organ. Arista might be hairy on upper side only or feathered. Palpi might be approximately the same length as proboscis or much shorter. Lower squamae tongue-shaped and rounded at the apical part. Pteropleuron is hairy and  $m_{1+2}$  vein bends anteriorly. All of these characters are important taxonomic features in the Stomoxyinae.

Adult flies pierce the skin and suck blood from man and animals. The man is attacked mainly by *Stomoxya*.

#### KEY TO GENERA

1. *st* 0+1; arista with long hair on upper side only ..... 2
- st* 1+1; arista with long hair on upper side only or both upper and lower sides ..... 3
2. Palpi about as long as proboscis, strongly widened towards apex and grooved internally; hind margin of eyes slightly emarginate (Fig. 31) .....  
..... *Stygeromyia*
- Palpi less than half as long as proboscis and thread-like; hind margin of eye conspicuously emarginate (Fig. 32) ..  
..... *Stomoxya*
3. Palpi less than half as long as proboscis and thread-like; arista with hairs on both upper and lower sides .....  
..... *Haematostoma*
- Palpi about as long as proboscis and strongly widened towards apex ... 4
4. Arista with hairs on both upper and lower sides (Fig. 33); notopleuron setulose ..... *Haematobosca*
- Arista with hairs on upper side only; notopleuron bare ..... *Haematobia*

GENUS *Stygeromyia* Austen, 1907

*Stygeromyia*, Austen, Ann. Mag. nat. Hist. (7)19: 445 (1907).

Eyes very large and vertically elongated; palpi widened towards apex; jowls very

narrow; *psb* weak; *prs* bare and depression; propleuron depression; posterior half of pteropleuron and upper half of hypopleuron hairy; abdomen without setae, 5th tergite with erect fine hair.

### 23. *Stygeromyia* sp.

**FEMALE.** Body length 3.0 mm. **Head:** Eyes separated at vertex by a distance equal to 0.36 of head width; *fv* black; *pf* and *pa* densely silver-gray-dusted; *pf* with 3 small proclinate bristles posteriorly; antennae dark brown, *ar* long, pectinate above and with 2 short hairs below; face deeply excavate; *pal* yellow, laterally compressed and clavate, inner surface shallowly excavate. **Thorax:** Densely golden-gray-dusted, with 3 narrow and faint brown vittae near neck; mesothorax with 3 dark brown vittae, the lateral ones broader than the central ones; only last pair of *post ac*, *prst dc* and 2 last pairs of *post dc* conspicuous, *ia* 0+1, *prsb* 1, *hb* 2, *ph* 1, *np* 2, *pra* absent, *sa* 1, *pa* 2, *as* 1, *ds* 1, *ls* 1. **Wings:** Hyaline with light brown veins and all veins bare; *m*<sub>1+2</sub> broadly and slight curved towards wing tip; squamae whitish-gray. **Legs:** All segments dark brown and slightly silver-gray-dusted, except basal half of tibiae pale yellowish; *f*<sub>1</sub> with a row of long *pd* and *pv*; *f*<sub>2</sub> with a row of *v* on basal half, a row of long *ad* on basal three-fourths; *f*<sub>3</sub> with 1 *v* near base, 1 *av* pre-apical and 2 *ad* pre-apical; *t*<sub>3</sub> with a row of long *ad*. **Abdomen:** Same color as thorax, with 2 dark brown and elongated spots on each segment except *T*<sub>5</sub> without any spots.

*Specimen examined:* 1♀, nr. Sai Yok, 500 m, Kanchana Buri, 8 IX 1975, R. Kano.

*Remark:* This specimen does not fit descriptions of *S. maculosa* written by Emden (1965) at all and unfortunately only one female specimen is available in our collection.

### GENUS *Stomoxys* Geoffroy, 1762

*Stomoxys* Geoffroy, Hist. abrég. Ins. Paris 2: 449, 538 (1762).

Eyes bare and vertically elongated, hind margin concave; *ar* plumose only on upper side; arrangement of *ors* in female irregular; *prst ac* indistinct, only 1 to 2 pairs of *post ac*, *prst dc* and *post dc* normally distinct; *ia* 0+1; *prsb* 1; *hb* 2-3; *ph* 1; *np* 2; *sa* 1; *pa* 2; *as* 1; *ds* 2-3; *ls* 2; *prs* and *pp* depression; posterior half of *pt* and upper part of *hp* hairy; wings hyaline; *r*<sub>4+5</sub> setulose on dorsal and ventral surfaces; tibiae without any submedian bristles; abdomen ovate-shaped, *T*<sub>5</sub> with long erect hairs.

### KEY TO SPECIES OF *Stomoxys*

1. Abdomen spotted, median vittae short and broad ..... 2  
Abdomen with dark transverse bands with or without median vittae .... 4
2. Third and 4th tergites each with 2 rounded dark spots laterally (Fig. 36) ..... *calcitrans*  
Third and 4th tergites each with 2 elongated dark spots laterally (Fig. 39); eyes of male separated at vertex by a distance equal to 1/5 or less of head width ..... 3
3. Hind femur with relatively long hairs on *v* surface (Fig. 30) .. *bengalensis*  
Hind femur with relatively short hairs on *v* surface ..... *siliens*
4. Palpi exceeding fore margin of mouth; antennae wholly blackish-brown ...  
..... *pulla*  
Palpi not reaching fore margin of mouth; basal part of 3rd antennal segment yellowish-orange ..... 5
5. Tibiae and tarsi pale yellowish; body size more than 4.5 mm ..... *indicus*  
Tibiae and tarsi fuscous; body size 3.5 to 4.5 mm ..... *uruma*

24. *S. calcitrans* (Linné, 1758)

*Conops calcitrans* Linné, Syst. Nat. Ed. 10, 1: 604 (1758).

*Stomoxys calcitrans* Brunetti, Rec. Ind. Mus. 4: 68 (1910).

**MALE.** Body length 4.5 to 6.0 mm. *Head:* Eyes separated at vertex by a distance equal to 0.25 of head width; *fv* black; *pf* and *pa* covered with dense silver-gray dust. *Thorax:* Brownish-gray-dusted with four dark brown vittae; bristles as in generic description of the genus. *Wings:*  $m_{1+2}$  strongly upcurved and distinctly sinuous near apex; squamae hyaline. *Legs:* Fuscous and slightly silver-dusted, only on basal one-third of tibiae pale yellowish;  $f_3$  with 1 weak but long bristle near base which length as long as femoral diameter and with a complete row of *ad* and short spinulose bristles near middle of *av* surface;  $t_3$  with a row of *av* on apical two-thirds. *Abdomen:* Same color as thorax, the abdominal pattern as shown in Fig. 36.

**FEMALE.** Body length 5.0 to 6.0 mm; eyes separated at vertex by a distance equal to 0.37–0.38 of head width; squamae more whitish than those of the male; color and other characters similar to those of the male.

*Specimens examined:* 41 ♂♂, 59 ♀♀, Kasetsart Univ., Bang Khen, 28, 31 VIII 1975, R. Kano, H. Kurahashi and W. Tumrasvin.

*Distribution:* Cosmopolitan.

25. *S. bengalensis* Picard, 1908

*S. bengalensis* Picard, Bull. Soc. ent. Fr. 1908: 21 (1908).

**MALE.** Body length 6.0 to 7.0 mm. *Head:* Eyes separated at vertex by a distance equal to 0.20–0.22 of head width; *fv* black; *pf* and *pa* densely silver-yellow-dusted; antennae yellowish-brown to brown. *Thorax:* Black with brownish-gray-dusted and with

four dark brown vittae; the bristles as in generic description of the genus. *Wings:*  $m_{1+2}$  rather strongly upcurved and distinctly sinuous in apical part; apices of  $r_{4+5}$  and  $m_{1+2}$  at equal distance from apical level of wing; squamae brown. *Legs:* Femora black; tibiae and tarsi fuscous, base of tibiae and apical part of femora yellowish;  $f_3$  with long *v* hairs (about 6) on about basal half and about as long as femoral diameter. *Abdomen:* Abdomen with wave-like posterior bands.

**FEMALE.** Body length 6.0 to 7.0 mm; eyes separated at vertex by a distance equal to 0.34 to 0.36 of head width; squamae creamy white to pale yellow; color and other characters similar to those of the male.

*Specimens examined:* 6 ♂♂, 9 ♀♀, Kasetsart Univ. Bang Khen, 31 VIII 1975, R. Kano, H. Kurahashi and W. Tumrasvin; 1 ♀, Woods and grass ld. Ayutthaya, 1 IX 1975, H. Kurahashi.

*Distribution:* Burma, India, Indonesia (Java, Sumbawa), Malaysia, Thailand, Vietnam.

*Remarks:* This species is newly recorded from Thailand.

26. *S. sitiens* Rondani, 1873

*S. sitiens* Rondani, Annali Mus. civ. Stor. nat. Giacomo Doria 4: 288 (1873).

**MALE.** Body length 4.5 to 6.0 mm. *Head:* Eyes separated at vertex by a distance equal to 0.20 of head width; *fv* dark brown to black; *pf* and *pa* densely silver-dusted; antennae dull reddish-orange to fuscous. *Thorax:* Color and characters similar to those of *bengalensis*; the bristles as in generic description of the genus. *Wings:*  $m_{1+2}$  rather strongly upcurved and sinuous in apical part, and its apex lying distinctly farther proximal than apex of  $r_{4+5}$ ; squamae yellowish-white. *Legs:* Color as in *bengalensis* but *v* hair of  $f_3$  much shorter and seldom

exceeding half the length of the femoral diameter. *Abdomen*: Abdominal pattern close to *bengalensis* but with ovate spots. (Fig. 39).

**FEMALE.** Body length 5.5 to 6.5 mm; eyes separated at vertex by a distance equal to 0.40 of head width; *fv* black; color and other characters similar to those of the male.

*Specimens examined*: 6♂♂, Kasetsart Univ. Bang Khen, 31 VIII 1975, R. Kano and H. Kurahashi; 1♀, nr. Ban Sap Bon, 30 km. E. Sara Buri, 4 X 1975, H. Kurahashi.

*Distribution*: Burma, Sri Lanka, China, Formosa, India, Laos, Malaysia, Philippines, Thailand.

27. *S. pulla* Austen, 1909

*S. pulla* Austen, Ann. Mag. nat. Hist. (8)3: 294 (1909).

**FEMALE.** Body length 3.5 to 4.0 mm. *Head*: Eyes separated at vertex by a distance equal to 0.38 of head width; *fv* black; posterior half of *pf* covered with dark brown dust, anterior half covered with dense brownish-gray dust; 2-3 proclinate *ors* noticeable; *pa* covered with dense brownish-gray dust; antennae and *ar* blackish-brown,  $a_3$  3 times as long as  $a_2$ ; palpi yellowish-orange, exceeding fore margin of mouth. *Thorax*: Blackish-brown with some brown dust, which is noticeable at neck, with 4 blackish-brown longitudinal vittae in front of suture; 1 pair of *post ac*, *prst dc* and 2 pairs of *post dc* distinct; other bristles as in generic description of the genus. *Wings*: Brown; setulose on  $r_{4+5}$  exceeding *r-m* on both surfaces;  $m_{1+2}$  strongly upcurved and sinuous; lower squamae brown, the borders darker. *Legs*: Fuscous; basal one-fifth to one-fourth of tibiae yellowish;  $t_1$  without a row of setulose hairs on *ad* surface; on *v* surface of  $f_3$  with 1 long erect hair at base but no longer than the femoral diameter. *Abdomen*: Blackish-brown,  $T_2$  to  $T_4$  with

very thinly brownish-gray dust; only  $T_5$  rather densely brownish-gray-dusted and with 2 shifting dark spots laterally; posterior margins of  $T_2$  to  $T_4$  with black transverse bands and without any longitudinal vittae (Fig. 37).

*Specimens examined*: 2♀♀, Khao Yai, 60 km. S. Pak Chong, 3 X 1975, R. Kano; 1♂, 1♀, nr. Sai Yok, 500 m, Kanchana Buri, 8 IX 1975, R. Kano.

*Distribution*: India, Thailand.

*Remarks*: The two female specimens were captured from a deer in the Khao Yai National Park. We have only one male specimen but it is broken and in bad condition. The fore tarsi agreed with the description written by Emden (1965) and its eyes separated at the vertex by a distance equal to 0.12 of head width. This species is newly recorded from Thailand.

28. *S. indicus* Picard, 1908

*S. indicus* Picard, Bull. Soc. ent. Fr. 1908: 20 (1908).

**MALE.** Body length 4.0 to 5.0 mm. *Head*: Eyes separated at vertex by a distance equal to 0.18-0.20 of head width; *fv* black and slightly silver-dusted; *pf* and *pa* covered with silver-gray dust. *Thorax*: Brownish-gray-dusted with 4 dark brown longitudinal vittae; the bristles as in generic description of the genus. *Wings*:  $m_{1+2}$  slightly upcurved at apex and hardly sinuous; lower squamae brown. *Legs*: Coxae, trochanters and femora fuscous, tibiae and tarsi pale yellowish;  $f_3$  with a weak but long *av* near base and shorter than the length of femoral diameter;  $t_3$  with 0-2 *av* at middle. *Abdomen*: Same color as thorax; the abdominal pattern as shown in Fig. 40.

**FEMALE.** Body length 4.0 to 5.5 mm; eyes separated at vertex by a distance equal to 0.34 to 0.36 of head width; squamae whitish-gray; 5th tergite without triangle

spot; other characters similar to those of the male.

*Specimens examined*: 28 ♂♂, 33 ♀♀, Kasetsart Univ., Bang Khen, 31 VIII 1975, R. Kano, H. Kurahashi and W. Tumrasvin; 1 ♀, Pak Chong, 24 XII 1975, W. Tumrasvin; 1 ♀, Bangna Nai, Bangkok, 28 VIII 1975, H. Kurahashi.

*Distribution*: Cosmopolitan.

29. *S. uruma* Shinonaga et Kano, 1966

*S. uruma* Shinonaga et Kano, Jap. J. Sanit. Zool. 17: 161 (1966).

This species was recorded from Thailand by Zumpt (1973) but we do not have a specimen in our collection.

GENUS *Haematobosca* Bezzi, 1907

*Haematobosca* Bezzi, Z. syst. Hymenopt. Dipterol. 7: 414 (1907).

Eyes bare and hind margin slightly emarginate; frons narrow in male, wide in female; arista with dorsal and ventral hair; proboscis reddish-brown; palpi laterally compressed (Fig. 33) and about as long as proboscis; vibrissal angle protruding; prosternum hairy; propleuron depression; pteropleuron setulose; hypopleuron bare; abdomen short and broad without bristles.

30. *H. sanguinolenta* (Austen, 1909)

*Bdellolarynx sanguinolenta* Austen, Ann. Mag. nat. Hist. (8)3: 290 (1909).

*H. sanguinolenta*: Shinonaga et Kano, Fauna Japonica, Muscidae I: 85 (1971).

MALE. Body length 4.0 to 5.0 mm. *Head*: Eyes separated at vertex by a distance equal to 0.20 of head width; *fv* dark brown to black; *pf* and *pa* densely yellow-dusted; antennae dark brown; *pal* yellow. *Thorax*: Dark brown and yellowish-gray-dusted with 5 dark brown longitudinal vittae, the central vitta produced only from behind suture; 1 pair of *post ac*, *prst dc* and 2-3 pairs of *post dc* conspicuous, *ia* 0+1, *prsb* 1, *hb* 3, *ph* 1,

*np* 2, *sa* 1, *pa* 2, *as* 1-2, *ds* 1, *ls* 2, *st* 1+1. *Wings*: Slightly brownish with brown veins;  $r_{4+5}$  with 3-4 very short setae near basal node,  $m_{1+2}$  slightly bending anteriorly and not markedly sinuous at apex; lower squamae brownish-gray. *Legs*: Piceous-brown except tibiae and tips of femora pale yellow; all tibiae without submedian bristles. *Abdomen*: Same color as thorax;  $T_3$  and  $T_4$  each with a pair of semi-circular brownish spots.

FEMALE. Body length 4.0 to 6.0 mm; eyes separated at vertex by a distance equal to 0.38 to 0.40 of head width; *fv* black; posterior part of *pf* with 3 proclinate *ors*; lower squamae gray; color and other characters similar to those of the male.

*Specimens examined*: 1 ♂, 15 ♀♀, Doi Pui, 1,685 m, C. Chiang Mai, 16, 21 IX, 1975, R. Kano; 1 ♂, Doi Saket, Chiang Mai, 16 XII 1975, S. Shinonaga; 2 ♀♀, Fang Exp. St., 500 m, Fang, 25 IX 1975, R. Kano; 1 ♂, Erawan w.f., 500 m, Kanchana Buri, 7 IX 1975, R. Kano; 1 ♂, Hill, C. 200 m Sa Kaeo, 3 IX 1975, H. Kurahashi; 17 ♂♂, 23 ♀♀, Khao Yai, 800 m, 60 km. S. Pak Chong, 3 X and 25-26 XII 1975, R. Kano, H. Kurahashi and S. Shinonaga; 4 ♀♀, Khao Khiaw, 1,351 m, 80 km. S. Pak Chong, 6 X 1975, H. Kurahashi.

*Distribution*: Burma, Cambodia, China, Formosa, India, Indonesia (Borneo, Lombok, Sumatra), Laos, Nepal, Philippines, Japan, Thailand, Vietnam: E. Palearctic region, Micronesia.

*Remarks*: The specimens collected from Khao Yai differ from the specimens collected from other places by the following characters: the body and wings more dark brown in color, lower squamae yellowish-brown, femora and tibiae in some specimens entirely yellow.

GENUS *Haematostoma* Malloch, 1932

*Haematostoma* Malloch, Ann. Mag. nat. Hist. (10)9: 379, 427 (1932).

Eyes bare, posterior margin emarginate; frons in male narrower than in female; arista with dorsal and ventral hair; palpi less than half as long as proboscis and thread-like; *st* 1+1; prosternum and pteropleuron hairy; hypopleuron bare;  $r_1$  bare;  $r_{4+5}$  with very fine setulae exceeding *r-m*; abdomen short and broad.

31. *H. austeni* Malloch, 1932

*H. austeni* Malloch, Ann. Mag. nat. Hist. (10)9: 427 (1932).

MALE. Body length 3.5 to 4.5 mm. *Head*: Eyes separated at vertex by a distance equal to 0.12 to 0.14 of head width; *fv* black; *pf* and *pa* very narrow and yellowish-brown-dusted; *ar* black; *pal* yellow; proboscis black, long and stout and with large labella. *Thorax*: Black and dark brown-dusted. Only broad central vitta in front of suture light brown-dusted; only last pair of *post ac* and *dc* distinct, *ia* 0+1, *prsb* 1, *hb* 2, *ph* 1, *np* 2, *sa* 1, *pa* 2, *as* 1, *ds* 1, *ls* 2; *st* 1+1. *Wings*: Dark brown with dark brown veins;  $m_{1+2}$  broadly upcurved; lower squamae dark brown. *Legs*: Dark brown;  $t_1$  and  $t_2$  without *v*; about apical half of  $t_3$  with 2 to 3 (usually 2) thin and long *v*. *Abdomen*: Same color as thorax;  $T_3$  to  $T_5$  with metallic blackish-brown bands anteriorly; without bristles.

FEMALE. Body length 3.5 to 4.0 mm; eyes separated at vertex by a distance equal to 0.36 to 0.40 of head width; 2 proclinate *ors* developed; dust on thorax denser and more brownish-gray than in male;  $t_3$  without long *v*.

*Specimens examined*: 4♂♂, 9♀♀. Khao Yai, 800 m, 60 km. S. Pak Chong, 3 X 1975, R. Kano.

*Distribution*: Burma, Indonesia (Borneo),

Laos, Malaysia, Thailand.

*Remarks*: All specimens were collected from a deer.

GENUS *Haematobia* Le Peletier et Serville, 1828

*Haematobia* Le Peletier et Serville, in Latreille et al., Encycl. meth. (Ins.) (2)10: 499 (1828).

Eyes bare, posterior margin slightly emarginate; frons in male narrower than in female; arista with hairs in only upper surface; palpi broad and length about as long as proboscis; *st* 1+1; notopleuron bare; prosternum and pteropleuron hairy; propleuron and hypopleuron bare; wings hyaline;  $r_1$  and  $r_{4+5}$  bare;  $m_{1+2}$  slightly bending anteriorly.

32. *H. exigua* de Meijere, 1930

*H. exigua* de Meijere, in Schat, Meded. Proefstn Oost-Java, (3)44: 17 (1930).

MALE. Body length 2.5 to 3.5 mm. *Head*: Eyes separated at vertex by a distance equal to 0.22 to 0.24 of head width; *fv* dark brown; *pf* and *pa* densely covered with silver-gray dust; antennae yellowish-brown; *pr* light brown. *Thorax*: Fuscous brown with whitish-gray dust, with 4 dark brown longitudinal vittae of which the 2 paramedian vittae very narrow and the outer vittae broad and conspicuous, all vittae distinct towards neck; only last pair of *post ac*, 1 pair of *prst dc* and 2 pairs of *post dc* conspicuous; *ia* 0+2-3, *prsb* 1, *hb* 2-3, *ph* 1, *np* 2, *sa* 1, *pa* 2, *as* 1, *ds* 2, *ls* 2-3; *st* 1+1; all bristles yellowish to fuscous. *Wings*: Light brown with brown veins;  $m_{1+2}$  not distinctly sinuous at apex; lower squamae grayish-white. *Legs*: Pale testaceous, the apical part of fore and mid tarsi and apical two-thirds of femora, tibiae and tarsi of hind legs slightly darkened; 2nd and 3rd segments of hind tarsi conspicuously flattened and

broadened and with long setulose hairs curled at tips. *Abdomen*: Entirely grayish-brown-dusted and with a narrow median vittae.

**FEMALE.** Body length 2.5 to 4.0 mm; eyes separated at vertex by a distance equal to 0.30 to 0.34 of head width; *fv* black; 3 proclinate *ors* on posterior half of *pf*; hind tarsi normal; color and other characters similar to those of the male.

*Specimens examined*: 1 ♂, 4 ♀ ♀, Kasetsart Univ. Bang Khen, 31 VIII 1975, R. Kano; 10 ♂ ♂, 16 ♀ ♀, Woods and grass Id., Ayutthaya, 1 IX 1975, R. Kano and W. Tumrasvin; 1 ♂, Hill, C. 300 m, Sa Kaeo, 30 km. S.E., 3 IX 1975, R. Kano.

*Distribution*: Oriental region.

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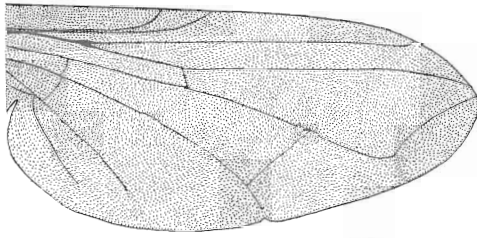
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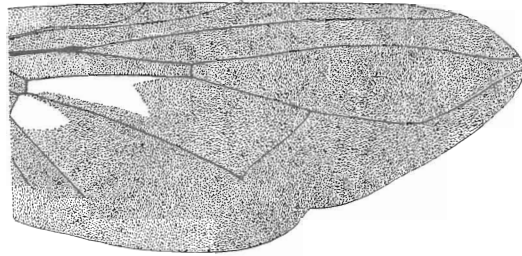


## EXPLANATION OF FIGURES

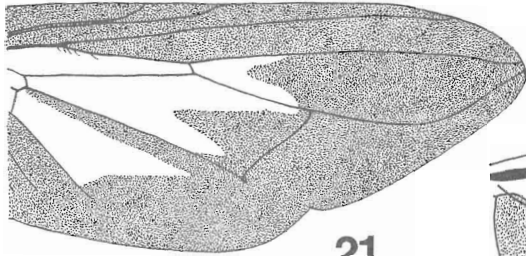
- Fig. 19. Wing of *Musca domestica*  
 Fig. 20. Wing of *Morellia hortensia*  
 Fig. 21. Wing of *Morellia quadrimis*  
 Fig. 22. Wing of *Orthellia claripennis*  
 Fig. 23. Wing of *Orthellia coeruleifrons*  
 Fig. 24. Prosternal sclerite of *Mitroplatia* sp.  
 Fig. 25. Fore femur of *Morellia quadrimis*  
 Fig. 26. Mid femur of *Morellia quadrimis*  
 Fig. 27. Hind tibia of male *Morellia nigrisquama*  
 Fig. 28. Hind femur of *Mitroplatia* sp.  
 Fig. 29. Hind tibia of *Morellia pseudonigrisquama*  
 Fig. 30. Hind femur of *Stomoxys bengalensis*  
 (male)  
 Fig. 31. Head of *Stygeromyia* sp.  
 Fig. 32. Head of *Stomoxys calcitrans*  
 Fig. 33. Head of *Haematobosca sanguinolenta*  
 Fig. 34. Head of male *Orthellia gavis*  
 Fig. 35. Head of female *Orthellia gavis*  
 Fig. 36. Abdomen of *Stomoxys calcitrans*  
 Fig. 37. Abdomen of *Stomoxys pulla*  
 Fig. 38. Thorax of *Orthellia diffidens*  
 Fig. 39. Abdomen of *Stomoxys sitiens*  
 Fig. 40. Abdomen of *Stomoxys indicus*



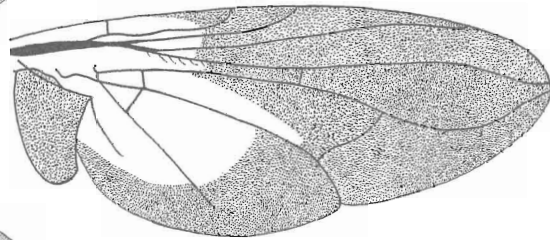
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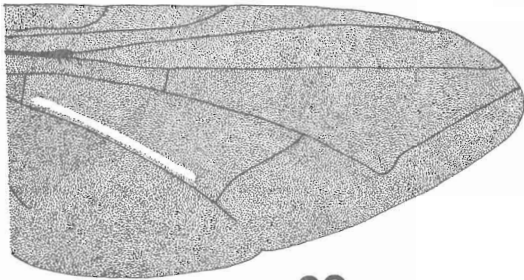
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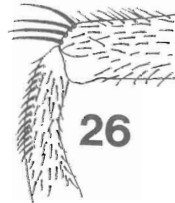
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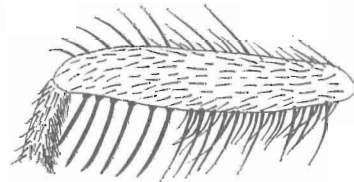
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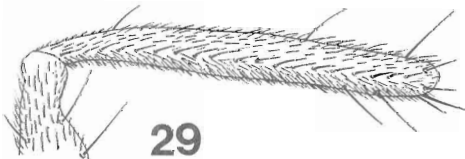
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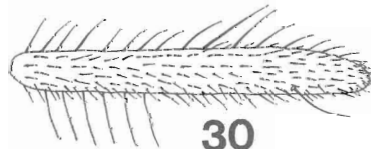
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