

STUDIES ON MEDICALLY IMPORTANT FLIES IN THAILAND VII.  
REPORT ON 42 SPECIES OF CALLIPHORID FLIES, INCLUDING  
THE TAXONOMIC KEYS (DIPTERA: CALLIPHORIDAE)

BY

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ABSTRACT

The calliphorid flies collected from different localities in Thailand were examined to study their medical importance as well as to study from the zoogeographical standpoint of view. Forty-two species of 15 genera, *Bengalia*, *Calliphora*, *Catapicéphala*, *Chrysomya*, *Hemipyrrellia*, *Hypobygiopsis*, *Lucilia*, *Melinda*, *Onesia*, *Phumosa*, *Pollenia*, *Pelleniopsis*, *Tainanina*, *Tricycleopsis* and *Verticia* belonging to both the subfamilies Calliphorinae and Chrysomyinae were found in Thailand. Many species are newly recorded from this country. The little known species, which are redescribed in detail with the illustration of the male genitalia and female ovipositors, and the key, which is revised to the genera and species, are also presented in this paper.

INTRODUCTION

The family Calliphoridae is another family in the order Diptera which is composed of a great number of species throughout the world. The adult flies are known as blow fly, blue bottle fly and green bottle fly. Several species of these flies are of great medical and veterinary importance. Some species breed in decaying animal matter but some breed in human and animal excrement, including the feces and dung, and may thus, by subsequently settling on food-stuff, transmit pathogenic organisms. This family also contains many species that cause myiasis in man and animals, especially

*Chrysomya bezziana*, being called as the true myiasis-producing fly.

Because of their medical and veterinary importance, each synanthropic species in the subfamilies Calliphorinae and Chrysomyinae from Thailand is studied and reported in this paper. The members of the subfamily Rhininae will be reported in a separate part of the series. In order to complete the taxonomic study, the species which are not medically important are also included. This paper is also the first paper on the fauna of the flies of medical importance in the subfamilies Calliphorinae and Chrysomyinae in Thailand.

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TERMINOLOGY

*Head:* *a*, antenna; *a*<sub>2</sub> and *a*<sub>3</sub>, 2nd and 3rd antennal segments; *e*, epistome; *f*, face; *fl*, facialia; *fv*, frontal vitta; *g*, gena; *m*, medianae; *mc*, metacephalon; *ocp*, occiput; *ori*, frontal bristle; *ors*, fronto-orbital bristle; *ovb*, outer vertical bristle; *pa*, parafacialia; *pal*, palpi; *pf*, parafrontalia; *vbr*, vibrissa; *vr*, vibrissaria. *Thorax:* *ac*, acrostichal bristle; *dc*, dorsocentral bristle; *h*, humerus; *hb*, humeral bristle; *ia*, intra-alar bristle; *ms*, mesothoracic spiracle; *mts*, metathoracic spiracle; *np*, notopleural bristle; *pa*, post-alar bristle; *pc*, post-alar calli; *ph*, posthumeral bristle; *pp*, propleuron; *ppb*, propleural bristle; *prs*, prosternum; *prsb*, presutural bristle; *psb*, prostigmatic bristle; *sa*, supra-alar bristle; *sc*, scutum; *sct*, scutellum; *scut*, scutellar bristle; *sq*, squama; *ssr*, suprasquamal ridge; *st*, sternopleural bristle. *Wing:* *e*, epaulet; *ba*, basicausta; *ha*, halter; *r*<sub>4+5</sub>, 4th and 5th radial vein; *r-m*, radio-medial cross-vein; *sc*, subcostal sclerite; *sq*, squama. *Leg:* *f*<sub>1-3</sub>, fore, mid- and hind femora; *ta*, tarsi; *t*<sub>1-3</sub>, fore, mid- and hind tibiae. *Abdomen:* *ep*, epandrium; *S*<sub>1-5</sub>, 1st to 5th sternites; *T*<sub>1-5</sub>, 1st to 5th tergites.

FAMILY CALLIPHORIDAE

The flies in this family are usually metallic in color, although a number of species are non-metallic. Adults are found on the excrement, human feces, animal dung, carrion, decaying animal and plant, garbage or filthy material, vegetation, flower, etc. Many species are found in the houses, settling on the foodstuff. Adult females are oviparous or larviparous. Larvae are either scavengers or parasites on insects, snails, mammals or other animals. Many of them cause myiasis in the human being and animals.

KEY TO THE SUBFAMILIES

1. Stem-vein of wing not setulose on posterodorsal surface of basal section . . . . . Calliphorinae
- Stem-vein of wing setulose on posterodorsal surface of basal section . . . . . 2
2. Protuberance below base of wing with erect hair; occiput without a bare shining band behind upper half of occipital row; epistome slightly projecting . . . . . Chrysomyinae
- Protuberance below base of wing bare or without distinct hair; occiput with a bare shining band behind upper half of occipital row; epistome projecting . . . . . Rhininae

SUBFAMILY CALLIPHORINAE

The flies belonging to this subfamily are divided into 5 tribes, Bengaliini, Calliphorini, Luciliini, Phumosiini and Poleniini. For separating this subfamily from the others, the most important criteria used is that there are no setulae on the stem-vein of the wing. The characters of propleuron, prosternum, lower squamae and suprasquamal ridge are important for the identification of the tribes.

KEY TO THE TRIBES

1. Propleuron hairy . . . . . 2
- Propleuron bare . . . . . 4
2. Lower squama hairy on upper surface . . . . . Calliphorini
- Lower squama bare on upper surface . . . . . 3
3. Suprasquamal ridge with posterior parasquamal tuft . . . . . Luciliini
- Suprasquamal ridge without posterior parasquamal tuft but with anterior one . . . . . Calliphorini
- Suprasquamal ridge without both anterior and posterior parasquamal tufts . . . . . 4

- ..... Phumosiini
- 4. Prosternum hairy; eyes dichoptic in both sexes; body with ordinary hairiness ..... Bengaliini
- Prosternum bare; eyes holoptic to subholoptic or dichoptic in male, dichoptic in female; body clothed with crinkly golden hair on thorax or ordinary hairiness ..... Polleniini

TRIBE CALLIPHORINI

KEY TO THE GENERA

- 1. Presutural intra-alar bristles absent . 2
- Presutural intra-alar bristles present . 4
- 2. Presutural acrostichal bristles 2; without facial carina ..... 3
- Presutural acrostichal bristles 0-1; facial carina well developed .. *Polleniopsis*
- 3. Eyes holoptic to subholoptic in male but dichoptic in female .... *Onesia*
- Eyes dichoptic in both sexes ..... *Tainanina*
- 4. Lower squama quite bare on upper surface; male usually with tuft of long hair on 3rd and 4th sternites ..... *Melinda*
- Lower squama more or less hairy on upper surface; male without such hair on 3rd and 4th sternites ..... 5
- 5. Lower squama entirely clothed with hair on upper surface; body bluish-black ..... *Calliphora*
- Lower squama with only group of few hair near base; body testaceous .... *Tricycleopsis*

GENUS *Melinda* Robineau-Desvoidy, 1830

*Melinda* R.-D., 1830, Mem. Pres. Div. Sav. Acad. Sci. Inst. Fr.: 439.

Small to medium-sized flies, usually blackish-brown in color; eyes bare or hairy, in male closely approximated but not

touching, in female dichoptic; 3 *post ac*; 3 *post dc*; propleura and prosternum hairy; suprasquamal ridge hairy anteriorly; stem-vein bare; lower squama bare on upper surface; 2nd sternite elongated but normal in some species; 3rd and 4th sternites usually with tufts of long hair.

KEY TO THE SPECIES

- 1. Antennae and palpi wholly black; 3rd and 4th sternites without any tufts of long hair ..... *nigripalpis*
- Antennae dark brown but some parts orange; palpi orange; 3rd and 4th sternites with tufts of long hair ... 2
- 2. Humeral and post-alar calli reddish to dark brown; scutellum largely pale yellowish at apex but darkened basally; 5th tergite entirely dark brown .. *scutellata*
- Humeral, post-alar calli and scutellum completely yellow; 5th tergite with or without marginal reddish band .... *nuortevae*

1. *M. nigripalpis* Kurahashi et Tumrasvin, 1979

*M. nigripalpis* Kurahashi et Tumrasvin, 1979, Jap. J. Sanit. Zool., 30: 301.

Specimens examined and distribution have already been reported when this species was described as a new species.

2. *M. nuortevae* Kurahashi, 1970 (Figs. 9, 13, 16, 26, 43, 51, 59, 66)

*M. nuortevae* Kurahashi, 1970, Pacif. Insects, 12: 519.

Male. Body length 6.0-7.0 mm. *Head*: Eyes holoptic and hairy; facets uniform; *fv* reddish-brown in front of lunule; *pf* and *pa* narrow, with silver-gray dusting; *pf* linear at middle, very sparsely haired at level of antennal base; *ori* 10-12 pairs; *f* and *fl* reddish-brown; *ubr* inserted just above mouth

margin; *e*, *vr* and *m* reddish-brown; *g* clothed with black hair; *mc* with black hair anteriorly and with yellow hair posteriorly; *a* dark brown, the anterior part of *a*<sub>2</sub>, and posterior and ventral parts of *a*<sub>3</sub> orange, length of *a*<sub>3</sub> 3X as long as *a*<sub>2</sub>; *pal* orange. *Thorax*: *sc* grayish-brown with uneven silver-gray dusting, denser in front of suture and with 3 dark longitudinal stripes; *h* and *pc* yellowish; *pp* and *prs* hairy; *ssr* bare posteriorly; *ms* yellow to brownish-yellow; *mts* dark brown; *set* yellow. Chaetotaxy; *ac* 2+3, *dc* 2-3+3, *ia* 1+2, *hb* 3, *ph* 2, *prsb* 1, *sa* 2, *pa* 3, *np* 2, *scut* 4+1, *st* 2+1; *ppb* and *psb* well developed. *Wings*: Hyaline; veins yellowish-brown; *r*<sub>4+5</sub> with some setulae at node above and below; lower *sq* dark yellow and bare, *ha* yellow. *Legs*: Yellow but *ta* brownish; *t*<sub>1</sub> with a row of short *ad* and 1 *p*; *t*<sub>2</sub> with 1 *ad*, 1 long and a row of short *pd*, 1 *v* and 2 *p*; *t*<sub>3</sub> with 2 long and a row of short *ad*, 2 *av*, 2 long and a row of short *pd*. *Abdomen*: Dark brown; *T*<sub>1+2</sub> undusted; *T*<sub>3</sub> to *T*<sub>5</sub> each with a narrow median stripe, broadest on *T*<sub>3</sub>, marginal bristles on *T*<sub>4</sub> and *T*<sub>5</sub> strong; *T*<sub>5</sub> with or without reddish band, but with fine erect bristles on disc; *S*<sub>2</sub> elongated; *ep* yellow.

*Specimens examined*: 19♂♂, 22♀♀, Sai Yok, 500 m., Kanchana Buri, 6, 8, 26 IX, 8 X, and 27-29 XII 1975, S. Shinonaga, H. Shima, H. Kurahashi, W. Tumrasvin; 4♂♂, Khao Yai, 24-26 XII 1975, Tumrasvin

*Distribution*: Burma and Thailand

*Remarks*: When Kurahashi (1970) described this species as a new species, he did not have the male specimen. Therefore, the above male description is described for the first time.

3. *M. scutellata* (Senior-White, 1923)  
(Figs. 2, 8, 14, 30, 36, 50, 58, 61)

*Paradichosia scutellata* S.-W., 1923, *Spolia Zeylan.*, 12: 312.

*M. scutellata*: Kurahashi, 1970, *Pacif. Insects*, 12: 530.

*Specimens examined*: 3♂♂, 2♀♀, Sai Yok, 500 m., Kanchana Buri, 27-29 XII 1975, Shinonaga, Shima; 1♂, 1♀, Doi Inthanon, 1700 m., 24 II 1979, H. Suzuki

*Distribution*: Nepal, India, Malaysia, Burma and Thailand

GENUS *Calliphora* Robineau-Desvoidy,  
1830

*Calliphora* R.-D., 1830, *Mem. Pres. Div. Sav. Acad. Sci. Inst. Fr.*: 433.

Usually large-sized flies, dull bluish-black in color, abdomen usually with slightly metallic blue reflection; eyes hairy or bare, in male closely approximated, in female dichoptic; 3 *post ac*; 3 *post dc*; *prst ia* developed; prosternum and propleura hairy; suprasquamal ridge with anterior parasquamal tuft; stem-vein bare; subcostal sclerite setulose; lower squama completely haired on upper surface; marginal bristles strong on 4th and 5th tergites, 5th tergite covered with long erect bristles on disc.

KEY TO THE SPECIES

Hair on metacephalon all black . . . *pattoni*  
Hair on metacephalon pale yellow intermixed with black hair . . . . . *vomitorea*

4. *C. pattoni* Aubertin, 1931

*C. pattoni* Aubertin, 1931, *Ann. Mag. Nat. Hist.*, (10)8: 615.

*C. pattoni*: Tumrasvin, Kurahashi, and Kano, 1976, *Bull. Tokyo Med. Dent. Univ.*, 23: 211-216.

5. *C. vomitoria* (Linné, 1758)

*Musca vomitoria* Linné, 1758, *Syst. Nat.*, Ed. 10: 595.

*C. vomitoria*: R.-D., 1830, *Essai Myod.*: 435.

*C. vomitoria*: Tumrasvin, Kurahashi, and

Kano, 1976, Bull. Tokyo Med. Dent. Univ., 23: 211-216.

*Remarks:* Specimens examined and distribution of the above 2 species are the same as in the previous study (Tumrasvin *et al.*, 1976).

GENUS *Tricycleopsis* Villeneuve, 1927

*Tricycleopsis* Vill., 1927, Revue Zool. Bot. Afr., 15: 389.

Medium-sized flies, testaceous to black in color; eyes bare, holoptic in male, dichoptic in female; *prst ac* 2; prosternum, propleura and anterior part of suprasquamal ridge hairy; stem-vein bare; each lower squama with a small group of black hair at base; sternites covered with long hair.

6. *T. paradoxa* Villeneuve, 1927

*T. paradoxa* Vill., 1927, Revue Zool. Bot. Afr., 15: 389.

Male. Body length 6.0-6.5 mm. *Head:* Eyes bare, holoptic; *fv* above lunule reddish-brown; *pf* linear at middle, with silver-gray dusting; anterior part of *pf* and posterior part of *pa* with setulae; *ori* 8-10 pairs; *g* and *mc* fuscous with dense silver-gray dusting and with black hair; *a* orange, *a*<sub>3</sub> dark brownish dorsally and apically its length 2.5X as long as *a*<sub>2</sub>; *pal* orange. *Thorax:* Testaceous but disc of dorsum and pleura partially fuscous, traces of 5 black stripes present and with dense silver-gray dusting in front of suture; *pp* and *prs* with yellow hair; *ssr* with few hair anteriorly; *ms* and *mts* yellow. *Chaetotaxy:* *ac* 2+3, *dc* 2+3, *ia* 1+2, *ib* 3, *ph* 2, *prsb* 1, *sa* 3, *pa* 2, *np* 2, *scut* 4+1, *st* 1+1; *ppb* and *psb* well developed. *Wings:* Hyaline, slightly yellowish at base and most anteriorly; *r*<sub>4+5</sub> with some setulae at node above and below; lower *sq* golden yellow with a small group of black hair at base, *ha* yellow. *Legs:* Yellow but *ta* dark brownish; *t*<sub>1</sub> with a row of

*ad* and 1 *p*; *t*<sub>2</sub> with 1 *ad*, 1 *v*, a row of short *pd* and 2 *p*; *t*<sub>3</sub> with 2 long and a row of short *ad*, 2 *av* and 2 *pd*. *Abdomen:* *T*<sub>1+2</sub> testaceous; *T*<sub>3</sub> testaceous but dark brownish posteriorly and with 1 pair of strong median marginal bristles; *T*<sub>4</sub> wholly dark brown and with strong marginal bristles; *T*<sub>5</sub> dark brown but paler posteriorly, with strong marginal bristles and a row of strong discal bristles; sternites concolorous with tergites; *ep* dark brown.

*Specimens examined:* 1♂, Fang Exp. St., 500 m., Fang, 25 IX 1975, Kurahashi; 1♂, Doi Suthep, Chiang Mai, 20-21 XII 1975, Shima; 1♂, Pak Chong, 8 XII 1974, Somjai

*Distribution:* Taiwan, Malaysia, Indonesia and Thailand

*Remark:* The female specimen is not available in our collection.

GENUS *Polleniopsis* Townsend, 1917

*Polleniopsis* Townsend, 1917, Rec. Indian Mus., 13: 201.

Small to medium-sized flies, usually dark blue to dull black in color; eyes bare, holoptic to subholoptic in male, dichoptic in female; profrons projecting; parafacialia broad; face generally with developed facial carina; vibrissae inserted distinctly above epistomal margin; *prst ac* 0-1; *prst ia* usually absent, sometimes present; *st* 2+1 or 1+1; propleura and prosternum hairy; suprasquamal ridge bare; lower squama with a group of black hair on upper surface, usually on basal half.

7. *P. pilosa* Townsend, 1917

(Figs. 48, 54, 67)

*P. pilosa* Townsend, 1917, Rec. Indian Mus., 13: 202.

Female. Body length 4.0-6.0 mm. *Head:* Eyes with sparsely minute hair (under high magnification), separated at vertex 0.34-0.36 of head width; *fv* reddish-brown; *f*

with sharp carina; *pf* and *pa* dark brown with brownish-gray dusting; *pf* and posterior part of *pa* with setulae; *ori* 6-7 pairs; *ors* 2+1; *ovb* present; *g* and *mc* black, silver-gray dusted; *g* with black hair; *mc* with black hair but yellowish posteriorly; *a* orange, *a*<sub>3</sub> dark brownish dorsally and apically, its length 2X as long as *a*<sub>2</sub>; *pal* orange. *Thorax*: Dark brown with dense brownish-gray dusting; 4-5 longitudinal stripes present; *pp* and *prs* hairy; *ssr* bare; *ms* and *mts* dark brown. *Chaetotaxy*: *ac* 0+1, *dc* 2+3, *ia* 0+2, *hb* 2, *ph* 2, *prsb* 0, *sa* 3, *pa* 2, *np* 2, *scut* 3+1, *st* 1+1; *ppb* and *psb* well developed. *Wings*: Hyaline, more yellowish anteriorly and basally; veins yellow; *r*<sub>4+5</sub> with 2-3 setulae at node above and below; lower *sq* yellow, with a group of black hair at base; *ha* yellow. *Legs*: Dark brown; *t*<sub>1</sub> with a row of small *ad* and 1 *p*; *t*<sub>2</sub> with 2 *ad*, 1 *v*, 1 *pd* and 2 *p*; *t*<sub>3</sub> with 2 *ad*, 1 *av* and 2 *pd*. *Abdomen*: Concolorous with thorax; marginal bristles strong on *T*<sub>4</sub> and *T*<sub>5</sub>.

*Specimens examined*: 1 ♀, nr. Sai Yok, 500 m., Kanchana Buri, 8 X 1975, Kurahashi; 1 ♀, Doi Saket, Chiang Mai, 16 XII 1975, Shima

*Distribution*: India and Thailand

*Remark*: The male specimen is not available in our collection.

GENUS *Onesia* Robineau-Desvoidy,  
1830

*Onesia* R.-D., 1830, Ess. Myod.: 365.

The characters of the genus *Onesia* are similar to those of *Polleniopsis* except the former genus has 2 *prst ac* and does not have facial carina at which the latter genus has 0-1 *prst ac* and the facial carina is well developed.

8. *O. parafacialis* Kurahashi  
et Tumrasvin, 1979

(Figs. 47, 55, 62)

*O. parafacialis* Kurahashi et Tumrasvin,  
1979, Jap. J. Sanit. Zool., 30: 302.

Specimens examined and distribution have already been reported when this species was described as a new species.

GENUS *Tainanina* Villeneuve, 1926

*Tainanina* Vill., 1926, Bull. Anns. Soc.  
Ent. Belg., 66: 271.

Usually small-sized flies, black to grayish-black in color; eyes bare, dichoptic in both sexes; profrons projecting; parafacialia broad, entirely setulose; female with fronto-orbital bristles but male with or without; genae broad; 3 *post ac*; 3 *post dc*; *prst ia* absent; propleura and prosternum hairy; suprasquamal ridge bare; stem-vein bare; lower squama with some microscopic hair at center of upper surface.

KEY TO THE SPECIES

Male without fronto-orbital bristles, female with 2 proclinate and 1 reclinate fronto-orbital bristles . . . . . *sarcophagoides*  
Both sexes with 1 proclinate and 1 reclinate fronto-orbital bristles . . . . . *pilisquama*

9. *T. sarcophagoides* (Malloch, 1931)

*Calliphora sarcophagoides* Mall., 1931,  
Ann. Mag. Nat. Hist., (10)7: 192.

*T. sarcophagoides*: S.-W. et al., 1940,  
Fauna Brit. India., Dipt. 6: 110.

*Specimens examined*: 2 ♂♂, 1 ♀, Khao Yai, 30 km. S. Pak Chong, 6 X 1975, Tumrasvin; 1 ♂, 1 ♀, nr. Burma Bord., 1200 m., Fang, 26 IX 1975, Kurahashi

*Distribution*: Malaysia, Philippines and Thailand

10. *T. pilisquama* (Senior-White, 1925)

*Pollenia pilisquama* S.-W., 1925, Rec. Indian Mus., 27: 84.

*T. pilisquama*: S.-W. et al., 1940, Fauna

Brit. India, Dipt. 6: 109.

*Specimens examined:* 3♂♂, 1♀, Khao Yai, 30 km. S. Pak Chong, 24–26 XII 1975, Shinonaga, Shima, Tumrasvin; 1♀, nr. Sai Yok, 500 m., Kanchana Buri, 11 IX 1975, Kurahashi

*Distribution:* India, Sri Lanka, Taiwan, Philippines and Thailand

TRIBE POLLENIINI

KEY TO THE GENERA

Eyes in male more or less subholoptic but dichoptic in female; fronto-orbital and outer vertical bristles absent in male but present in female: arista with long hair on both sides; body clothed with crinkly golden hair on thorax . . . . . *Pollenia*

Eyes dichoptic in both sexes; fronto-orbital and outer vertical bristles present in both sexes; arista with long hair on upper side but with short hair or pubescent on lower side . . . . . *Verticia*

GENUS *Pollenia* Robineau-Desvoidy,  
1830

*Pollenia* R.-D., 1830, Mem. Pres. Div. Sav. Acad. Sci. Inst. Fr.: 412.

Small-sized flies; eyes bare, more or less approximated in male; with or without facial carina; parafacialia with long setulae; vibrissae inserted more or less above mouth margin; genae broad; thorax usually with crinkly golden hair; propleura, prosternum and suprasquamal ridge bare; subcostal sclerite with some fine bristles or bare; stem-vein bare;  $R_5$  petiolate or open; lower squama bare on upper surface.

11. *P. chotei* Kurahashi et  
Tumrasvin, 1979  
(Figs. 52, 57, 65)

*P. chotei* Kurahashi et Tumrasvin, 1979, Jap. J. Sanit. Zool., 30: 303.  
Specimens examined and distribution

have already been reported when this species was described as a new species.

GENUS *Verticia* Malloch, 1927

*Verticia* Mall., 1927, Ann. Mag. Nat. Hist., 20: 388.

Small-sized flies, testaceous in color; eyes bare, dichoptic in both sexes; face sunk between facialia; parafacialia and parafacialia setulose; fronto-orbital bristles and outer vertical bristles present in both sexes; arista with long hair on upper side but with short hair or pubescent on lower side; propleura, prosternum and suprasquamal ridge bare;  $r_{4+5}$  with broadly rounded curve; lower squama divergent from scutellum; tergite without discal bristles; 1st and 2nd sternites overlapping sides of tergites.

12. *V. fasciventris* Malloch, 1927  
(Figs. 5, 20, 28, 41)

*V. fasciventris* Mall., 1927, Ann. Mag. Nat. Hist., 20: 391.

Male. Body length 5.5 mm. *Head:* Eyes bare, dichoptic; frons at narrowest point 0.24 of head width; *fv* yellow; *pf* and *pa* yellow, yellow-dusted, entirely setulose; *ori* 9–10 pairs; *ors* 1+1; *ovb* present; *g* and *mc* yellow with short black bristles; *a* testaceous-yellow, length of  $a_3$  5X as long as  $a_2$ ; *pal* yellow. *Thorax:* Testaceous-yellow with indistinct longitudinal stripes; *pp*, *prs* and *ssr* bare. Chaetotaxy; *ac* 3+4, *dc* 2+4, *ia* 1+3, *hb* 4, *ph* 2, *prsb* 1, 1 additional bristle located between *post ia* and *sa*, *sa* 3, *pa* 3, *np* 2, *scut* 5+1, *st* 1+1; *ppb* and *psb* well developed. *Wings:* Hyaline; veins yellow;  $r_{4+5}$  with setulae above and below, the above ones extending from node beyond *r-m*, but with 1–2 minute ones below at node; lower *sq* yellow and bare; *ha* yellow. *Legs:* Yellow;  $t_1$  with 3 *ad* and 1 *p*;  $t_2$  with 1 long and 2 short *ad* and 2 *p*;  $t_3$  with 4 *ad* and 3 *pd*. *Abdomen:* All tergites with mar-

ginal bristles but longest on  $T_4$  and  $T_5$ ; from  $T_3$  to  $T_5$  each with narrow marginal brown band interrupted at middle;  $S_1$  and  $S_2$  overlapping sides of  $T_{1+2}$  and posterior part of  $T_3$ ; *ep* yellow.

*Specimen examined:* 1 ♂, nr. Sai Yok, 500 m., Kanchana Buri, 8 X 1975, Kurahashi

*Distribution:* Malaysia and Thailand

*Remark:* The female specimen is not available in our collection.

TRIBE LUCILINI

KEY TO THE GENERA

- 1. Supraspiracular convexity clothed with conspicuous setulose erect hair ... 2  
Supraspiracular convexity pubescent ..  
..... *Lucilia*
- 2. Legs with long fringe in male but unfringed in female; posterior bristle on front tibia of female located at about 2/5 to 1/2 from apex; 1st pair of *post ac* usually at same level with or slightly anterior to the 2nd pair of *post dc* ...  
..... *Hypopygiopsis*
- Legs unfringed in both sexes; posterior bristle on front tibia of female located not more than 1/3 from apex; 1st pair of *post ac* usually at same level with or slightly posterior to the 2nd pair of *post dc* ..... *Hemipyrellia*

GENUS *Lucilia* Robineau-Desvoidy, 1830

*Lucilia* R.-D., 1830, Mem. Pres. Div. Sav. Acad. Sci. Inst. Fr.: 452.

Medium-sized flies, brightly metallic green, blue, purple or copper in color; eyes holoptic or dichoptic in male; parafro-ntalia and parafacialia usually with bright silver dusting; *post ac* 2-3; *post dc* 3; propleura and prosternum hairy; suprasqua-mal ridge with posterior parasquamal tuft;

supraspiracular convexity hairy; stem-vein bare; subcostal sclerite pubescent or hairy; lower squama bare on upper surface.

KEY TO THE SPECIES

- 1. *Post ac* 3 pairs; basicosta light brown; subcostal sclerite pubescent; body cupreous in color ..... *cuprina*
- Post ac* 2 pairs; basicosta fuscous black; subcostal sclerite with several up-standing hair; body metallic green, blue or purple in color ..... 2
- 2. Anterior pair of *post ac* usually more advanced than the second pair of *post dc*; 3rd to 5th abdominal tergites without dark marginal bands posteri-orly ..... *porphyrina*
- Anterior pair of *post ac* on the level with or slightly posterior to the 2nd pair of *post dc*; 3rd to 5th abdominal tergites with dark marginal bands posteriorly ..... 3
- 3. Anterior part of upper squama of male creamy or fuscous, usually with a tuft of blackish-brown (sometimes brown) hair at the inner lower margin, upper squama of female entirely creamy; narrowest part of male frons some-times broader than the distance be-tween both posterior ocelli; meta-cephalon usually with black hair; oc-ciput with more than 2 irregular rows of black postocular setae; frons in-dex in female 0.24-0.25 .. *papuensis*
- Anterior part of upper squama creamy, with a tuft of yellowish-white hair at the inner lower margin; lower squama usually infuscated; narrowest part of male frons narrower than the distance between both posterior ocelli; meta-cephalon with several yellowish-hair; occiput with only one row of black postocular setae; frons index in female 0.19-0.20 ..... *sinensis*



13. *L. porphyrtina* (Walker, 1857)

*Musca porphyrtina* Walker, 1857, J. Proc. Linn. Soc. Lond., 1: 24.

*L. porphyrtina*: Aubertin, 1933, Linn. Soc. J. Zool., 38: 410.

*L. porphyrtina*: Tumrasvin, Kurahashi, and Kano, 1977, Bull. Tokyo Med. Dent. Univ., 24: 2.

14. *L. papuensis* Macquart, 1842

*L. papuensis* Macq., 1842, Dipt. Exot., 2: 141.

*L. papuensis*: Tumrasvin, Kurahashi, and Kano, 1977, Bull. Tokyo Med. Dent. Univ., 24: 3.

15. *L. sinensis* Aubertin, 1933

*L. sinensis* Aubertin, 1933, J. Linn. Soc. Lond., 38: 497.

*L. sinensis*: Tumrasvin, Kurahashi, and Kano, 1977, Bull. Tokyo Med. Dent. Univ., 24: 4.

16. *L. cuprina* (Wiedemann, 1830)

*Musca cuprina* Wied., 1830, Auss. Zweifl. Ins., 2: 654.

*L. cuprina*: Shannon, 1926, Proc. Ent. Soc. Wash., 28: 131.

*L. cuprina*: Tumrasvin, Kurahashi, and Kano, 1977, Bull. Tokyo Med. Dent. Univ., 24: 4.

GENUS *Hypopygiopsis* Townsend, 1916

*Hypopygiopsis* Townsend, 1916, Proc. U.S. Natn. Mus., 51: 300.

Usually large-sized flies, brightly metallic green, blue or purple; eyes subholoptic in male but dichoptic in female; *post ac* 2; *post dc* 3; propleura and prosternum hairy; suprasquamal ridge with posterior para-squamal tuft; supraspiracular convexity hairy; subcostal sclerite hairy; lower squa-

ma bare on upper surface; legs fringed in male but unfringed in female; femora more or less swollen in male but normal in female.

KEY TO THE SPECIES

Parafrontalia, parafacialia, face, genae and metacephalon yellow and clothed with golden dust; hair on genae and metacephalon yellowish-orange; antennae entirely yellowish-orange; hair on supra-spiracular convexity yellow; all sternites yellowish-orange, with densely long orange hair (except on male 5th sternite, blackish) . . . . . *tumrasvini*

Parafrontalia, parafacialia, face, genae and metacephalon dark brown to fuscous, clothed with silver dust; hair on genae black and hair on metacephalon whitish; antennae dark brown; hair on supra-spiracular convexity black; all sternites dark brown with dense long black hair . . . . . *infumata*

17. *H. tumrasvini* Kurahashi, 1977

*H. tumrasvini* Kurahashi, 1977, Kontyû, 45: 556.

Specimens examined and distribution have already been reported when this species was described as a new species.

18. *H. infumata* (Bigot, 1877)

*Somomyia infumata* Bigot, 1877, Anns. Soc. Ent. Fr., 7: 42.

*H. infumata*: Kurahashi, 1977, Kontyû, 45: 559.

Specimens examined and distribution are same as in the previous study by Kurahashi (1977).

GENUS *Hemipyrellia* Townsend, 1918

*Hemipyrellia* Townsend, 1918, Insecutor Inscit. Menst., 6: 154.

Medium-sized flies, brightly metallic

green or blue; eyes in male holoptic or dichoptic but dichoptic in female; parafacialia, parafacialia, face, genae and metacephalon with dense silver-gray dust; *ac* 2+2; *st* 2+1; propleura and prosternum hairy; suprasquamal ridge with posterior parasquamal tuft; supraspiracular convexity hairy; subcostal sclerite hairy; lower squama bare on upper surface; legs unfringed.

#### KEY TO THE SPECIES

Eyes in male holoptic, dichoptic in female; 3rd antennal segment entirely orange; female abdomen with very thick dust, especially on the 5th one; 3rd tergite metallic purplish-blue, without marginal bristles; 2nd sternite of male with a group of extra long hair posteriorly . . . . . *pulchra*

Eyes subholoptic in male, dichoptic in female; 3rd antennal segment entirely dark brown but sometimes orange ventrally; dust on female abdomen not so thick; 3rd tergite metallic green to cupreous-green with weak marginal bristles; 2nd sternite of male without group of long hair posteriorly . . . . . *ligurriens*

#### 19. *H. pulchra* (Wiedemann, 1830)

*Musca pulchra* Wied., 1830, Auss. Zweifl. Inst., 2: 406.

*H. pulchra*: Aubertin, 1931, Proc. Zool. Soc. Lond., 2: 503.

*Specimens examined*: 2♀♀, Nam Tok Mae Klang, Doi Inthanon, 18 IX 1975, Tumrasvin; 1♀, Khao Yai, 366 m., 30 km. S. Pak Chong, 5 X 1975, Kurahashi; 1♀, Hill, c. 300 m., Sakao, 30 km. SE., 3 IX 1975, R. Kano; 1♂, 15♀♀, Beach, c. 30 km. S. Chon Buri, 30 VIII 1975, Kano, Kurahashi, Tumrasvin; 1♀, Kanchana Buri, 18 VII 1964, Kano; 1♂, 15♀♀, nr. Sai Yok, 500 m., Kanchana Buri, 6, 7 IX, 8 X 1975,

Kano, Kurahashi, Tumrasvin

*Distribution*: India and Thailand

#### 20. *H. ligurriens* (Wiedemann, 1830)

*Musca ligurriens* Wied., 1830, Auss. Zweifl. Ins., 2: 655.

*H. ligurriens*: Aubertin, 1931, Proc. Zool. Soc. Lond., 2: 504.

*Specimens examined*: 13♂♂, 5♀♀, nr. Sai Yok, 500 m., Kanchana Buri, 6, 8, 9, 11 IX, 7, 8 X, 9–13 XII 1975, Kano, Kurahashi, Shinonaga, Tumrasvin; 4♂♂, 4♀♀, Salt Pond, 6 km. N. Chon Buri, 2 IX 1975, Kurahashi; 12♂♂, Woods & grass ld., Ayutthaya, 1 IX 1975, Kurahashi; 6♂♂, 17♀♀, Hill, c. 300 m., Sa Kaeo, 30 km. SE., 3 IX 1975, Kano, Kurahashi, Tumrasvin; 1♂, 3♀♀, Beach, c. 30 km. S. Chon Buri, 30 VIII 1975, Kano, Kurahashi, Tumrasvin; 12♂♂, 3♀♀, Sam Sane, Bangkok, 29 VIII, 1975, Kano, Kurahashi; 6♂♂, 3♀♀, Chiang Mai Univ., 22 IX 1975, Kano, Kurahashi, Tumrasvin; 11♂♂, 7♀♀, Bangna Nai, Bangkok, 28 VIII 1975, Kano, Kurahashi; 6♂♂, Fang Exp. St., 500 m., Fang, 25 IX 1975, Kurahashi; 4♂♂, 2♀♀, Nam Tok Mae Klang, Doi Inthanon, 18 IX 1975, Kano, Kurahashi, Tumrasvin; 5♂♂, 2♀♀, Ban Pong Din, 10 km. NE. Doi Saket, 20 IX 1975, Kano, Kurahashi, Tumrasvin; 1♂, 2♀♀, Ban Yang, 1400 m., Doi Inthanon, 17, 19 IX 1975, Kano, Tumrasvin; 2♂♂, Kasetsart Univ., Bang Khen, 31 VIII 1975, R. Kano, H. Kurahashi; 14♂♂, 2♀♀, Khao Yai, 800 m., 60 km. and 366 m., 30 km. S. Pak Chong, 3, 5, 6 X 1975, Kano, Kurahashi; 1♂, 1♀, Top, 2667 m., Doi Inthanon, 23 IX 1975, Kano; 2♂♂, Doi Saket, 300 m., c. Chiang Mai, 15 IX, 16 XII 1975, Kurahashi, Shima; 1♀, Erawan w.f., 500 m., Kanchana Buri, 5 IX 1975, Kano; 1♂, 1♀, Mahidol Univ., Bangkok, 26 VIII, 2 IX 1975, Kurahashi; 1♀, Thon Buri, 27 XII 1961, G. Imadate

*Distribution:* India, Sri Lanka, China, Japan, Philippines, Malaysia, Indonesia and Thailand

TRIBE PHUMOSIINI

GENUS *Phumosia* Robineau-Desvoidy,  
1830

*Phumosia* R.-D., 1830, Mem. Press. Div. Sav. Acad. Sci. Inst. Fr.: 427.

Medium-sized flies; testaceous-brown to dull black in color; eyes bare, holoptic in male but dichoptic in female; parafacialia without setulae; vibrissae at level or slightly above mouth margin; *prst ia* present; *st* 1+1 or 2+1; propleura and prosternum hairy; suprasquamal ridge bare; supraspiracular convexity clothed with conspicuous setulose fine hair; lower squama bare on dorsal surface.

KEY TO THE SPECIES

Dorsum entirely testaceous-orange; hind tibia with 3 *ad* ..... *testacea*  
Dorsum dark brown; hind tibia usually with 2 *ad* ..... *indica*

21. *P. indica* (Surcouf, 1914)

(Figs. 7, 18, 35, 46, 53, 60, 63)

*Caiusa indica* Surcouf, 1914, Arch. Mus. Nat. Paris, 6: 53.

*P. indica*: James, 1971, Pacif. Insects, 13: 9.

Male. Body length 6.5–8.0 mm. *Head*: Eyes bare, holoptic; *fv* in front of lunule reddish-brown; *pf* linear at middle, silver-dusted; *ori* 7–8 pairs; *pa* dark brown but reddish-brown posteriorly, silver-dusted, without setulae; *f* and *e* brown, slightly silver-gray dusted; *vbr* inserted slightly above mouth margin; *vr* and *m* reddish-brown; *g* and *mc* black, whitish-gray dusted, with black hair; *a* orange, *a*<sub>3</sub> dark brownish dorsally, its length 2.5X as long as *a*<sub>2</sub>; *pal*

orange. *Thorax*: Dark brown and yellow to testaceous-orange on *h*, lateral margins and prescutellar area slightly gray-dusted but denser in front of suture and with 2 narrow inconspicuous brown longitudinal stripes in front of suture; *pp* and *prs* with yellow hair; *ssr* bare; *ms* and *mts* yellow. *Chaetotaxy*; *ac* 2+1, *dc* 2–3+4–5, *ia* 1+3, *hb* 3, *ph* 3, *prsb* 1, *sa* 3, *pa* 2, *np* 2, *scut* 4+1, *st* 1+1; *ppb* and *psb* well developed. *Wings*: Hyaline, slightly yellowish at base; veins light brown; *r*<sub>4+5</sub> with blackish setulae extending about 1/2 way from basal node to *r-m*, but extending less than 1/2 way below; lower *sq* brownish-yellow; *ha* yellow. *Legs*: Yellow; *t*<sub>1</sub> with 1 *p*, and 2–3 *ad*; *t*<sub>2</sub> with 1 *ad*, 1 *v*, 1 *pd* and 2 *p*; *t*<sub>3</sub> with 2 *ad*, 2 *av* and 1–2 *pd*. *Abdomen*: Testaceous-orange; *T*<sub>1+2</sub> with or without dark brown marginal band; *T*<sub>3</sub> with a dark brown marginal band and with weak marginal bristles; *T*<sub>4</sub> dark brown on anterior 2/3 to entirely dark brownish; *T*<sub>5</sub> entirely dark brown, shining metallic, whitish-gray-dusted; *S*<sub>1</sub> and *S*<sub>2</sub> yellow; *S*<sub>3</sub> to *S*<sub>5</sub> testaceous-orange to brown.

Female. Body length 7.0–8.0 mm.; eyes separated at vertex 0.34–0.36 of head width; *fv* black; *pf* black, silver-gray dusted; *ori* 8–11 pairs; *ors* 2+1; *ovb* present. Other characters similar to those of the male.

*Specimens examined*: 2♂♂, 7♀♀, Hill, c. 300 m., Sa Kao, 30 km. SE., 3 IX 1975, Kano, Kurahashi; 5♂♂, 4♀♀, Erawan w.f., Kanchana Buri, 5 IX, 10 X 1975, Kano, Kurahashi; 1♀, Doi Saket, 300 m., c. Chiang Mai, 15 IX 1975, Kurahashi; 2♀♀, Woods & grass ld., Ayutthaya, 1 IX 1975, Kurahashi; 2♀♀, nr. Sai Yok, 500 m., Kanchana Buri, 6 IX 1975, Kano; 1♂, 2♀♀, Khao Yai, 366 m. and 800 m., 30 km. and 60 km. S. Pak Chong, 6 X 1975, Kano; 1♂, Chiang Mai Univ., 22 IX 1975, Tumrasvin

*Distribution*: India, Sri Lanka, Taiwan.

Malaysia, Indonesia and Thailand

22. *P. testacea* (Senior-White, 1923)  
(Figs. 10, 15, 33, 40, 49, 56, 64)

*Caiusa testacea* S.-W., 1923, *Spolia Zeylan.*, 12: 310.

*P. testacea*: James, 1977, *Catalog Dipt. Orient. Reg.*, 3: 538.

Male. Body length 5.0–7.0 mm. *Head*: Eyes bare, holoptic; *pf* and *pa* dark brown with silver-gray dusting; *pf* with sparsely short and fine yellow setulae; *ori* 7–9 pairs; *pa* bare, reddish posteriorly; *f* and *e* testaceous-orange, slightly silver-gray dusted; *vbr* slightly above mouth margin; *m* and *vr* reddish-brown; *g* and *mc* black with whitish-gray dusting and with black hair; *a* orange but *a*<sub>3</sub> dark-brownish dorsally, its length 2.5X as long as *a*<sub>2</sub>; *pal* orange. *Thorax*: Testaceous-orange, slightly darkened between the narrow black median longitudinal stripes in front of suture and with thin silver-gray dusting; *pp* and *prs* with yellow hair; *ssr* bare; *ms* and *mts* yellow. *Chaetotaxy*: *ac* 2+1–2, *dc* 2+4, *ia* 1+3, *hb* 3, *ph* 2, *prsb* 1, *sa* 3, *pa* 2, *np* 2, *scut* 3–5+1–2, *st* 1+1; *ppb* and *psb* well developed. *Wings*: Hyaline, slightly yellowish-brown anteriorly, especially near base; veins yellowish-brown; *r*<sub>4+5</sub> with blackish setulae above and below extending about 1/2 or slightly beyond 1/2 way from basal node to *r-m*; lower *sq* brownish-yellow, bare on upper surface; *ha* yellow. *Legs*: Yellow; *t*<sub>1</sub> with 4–5 *ad* and 1 *p*; *t*<sub>2</sub> with 1 *ad*, 1 *v*, 1 *pd* and 2 *p*; *t*<sub>3</sub> with 3 *ad*, 2 *av*, 2 *pd*. *Abdomen*: Same color as thorax but *T*<sub>4</sub> and *T*<sub>5</sub> blackish (probably due to postmortem) *T*<sub>3</sub> with weakly developed marginal bristles but well developed on *T*<sub>4</sub> and *T*<sub>5</sub>; sternites yellow; *ep* yellow.

Female. Body length 6.0–7.0 mm.; eyes separated at vertex 0.30–0.34 of head width; *fv* reddish-black to black; *pf* black with

silver-gray dusting and with short black setulae; *ori* 10 pairs; *ors* 2+1; *ovb* present; *t*<sub>3</sub> with 2–3 *ad*, 2 *av* and 2–3 *pd*. Other characters similar to those of the male.

*Specimens examined*: 1 ♂, Erawan w.f., Kanchana Buri, 5 IX, 10 X 1975, Kano, Kurahashi; 3 ♂ ♂, 2 ♀ ♀, Hill, c. 300 m., Sa Kao, 3 IX 1975, Kano, Kurahashi; 2 ♂ ♂, 5 ♀ ♀, nr. Sai Yok, 500 m., Kanchana Buri, 6, 8, 11 IX, 7 X 1975, Kano, Kurahashi, Tumrasvin; 1 ♀, Khao Yai, 366 m., 30 km. S. Pak Chong, 5 X 1975, Kano; 1 ♀, Ban Yang, 1400 m., Doi Inthanon, 17 IX 1975, Kurahashi

*Distribution*: India, Sri Lanka, Philippines, Malaysia and Thailand

#### TRIBE BENGALIINI

#### KEY TO THE GENERA

Fronto-orbital bristles present in both sexes; proboscis slender; *st* 2+1; 3rd tergite always with 1 pair of strong median marginal bristles; body with brightly metallic coloration . . . . . *Catapicephala*  
Fronto-orbital bristles present in female only; proboscis stout; *st* 1+1; 3rd tergite without strong median marginal bristles; body dull brown to testaceous . . . . .  
. . . . . *Bengalia*

#### GENUS *Catapicephala* Macquart, 1851

*Catapicephala* Macq., 1851, *Mem. Soc. Sci. Agric. Lille*, 1850: 210.

Usually large-sized flies, brightly metallic green, blue or purple in color; eyes bare, dichoptic in both sexes; parafacialia without setulae; at least 1 pair of fronto-orbital bristles and outer vertical bristles present in both sexes; palpi long, protruding beyond mouth margin; antennae very long; *ac* 2–3+3–4; *st* 2+1; propleura bare; prosternum hairy; suprasquamal ridge and supraspiracular convexity bare; wings in-

fuscated; stem-vein bare; lower squama bare on upper surface;  $T_3$  with 1 pair of strong median marginal bristles.

## KEY TO THE SPECIES

1. Mid-tibia with 2 *al*; *ors* 2+2; frons index 0.26–0.28; claws and pulvilli very short and stout; metacephalon covered with white hair and mixed with several black hair anteriorly; female unknown ..... *kurahashii*  
Mid-tibia with 1 *ad*; one pair of reclinate *ors* well developed; frons index less than 0.23; claws and pulvilli very long, longer than the last tarsal segment in male, normal in female; metacephalon with white hair only . . . . . 2
2. Palpi brown; antennae entirely fuscous; 6th and 7th sternites reddish-orange in female; *ors* 2+1 in both sexes . . . . . *michikoe*  
Palpi orange; antennae orange, darkened apically; 6th and 7th sternites black in female; *ors* 0+1 in male, 2+1 in female ..... *sinica*

23. *C. kurahashii*, Tumrasvin et Kano, 1977

*C. kurahashii* Tumrasvin et Kano, 1977, Jap. J. Sanit. Zool., 28: 127.

Specimens examined and distribution have already been reported when this species was described as a new species.

24. *C. michikoe* Tumrasvin et Kano, 1977

*C. michikoe* Tumrasvin et Kano, 1977, Jap. J. Sanit. Zool., 28: 129.

Specimens examined and distribution have already been reported when this species was described as a new species.

25. *C. sinica* Fan, 1965

*C. sinica* Fan, 1965, Key Common Synanthr. Flies China: 195.

*C. sinica*: Tumrasvin et Kano, 1977, Bull. Tokyo Med. Dent. Univ., 28: 127.

GENUS *Bengalia* Robineau-Desvoidy, 1830

*Bengalia* R.-D., 1830, Mem. Pres. Div. Sav. Acad. Sci. Inst. Fr.: 425.

Medium to large-sized flies, testaceous to brown in color; eyes bare, dichoptic in both sexes; parafrontalia and parafacialia with setulae entirely; fronto-orbital bristles developed in female but not in male; outer vertical bristles present in both sexes; vibrissae inserted at level just above mouth margin; clypeus projecting; palpi long, protruding beyond the mouth margin; proboscis stout; *prst ac* absent; *st* 1+1; propleura bare; prosternum, suprasquamal ridge and supraspiracular convexity bare; wings hyaline, clear to light brown; stem-vein bare; protuberance below base of wing rounded or pointed; lower squama bare on upper surface; hind tibia fringed or unfringed; 5th tergite with or without strong discal bristles.

Senior-White *et al.* (1940) used the numbers of spines on fore tibia and mid-femur of the male as the important characters for identification of the species. We found that those characters were unreliable, even in the same specimen in which the number of spines on each left and right tibia and femur was still different. Moreover, the shape of the posterior projection of the 5th sternite and the ventral projection of the epandrium of the same species also vary slightly among the specimens collected from the different localities. Therefore, as in the sarcophagid flies, only the genitalic characters seem to be the most reliable for

the identification of the species. At the present time, as only the males are re-described and keyed in this paper, the identification of the female is still questionable.

#### KEY TO THE SPECIES

1. Protuberance below the base of wing pointed; abdomen not tessellated; 4th sternite with 1 pair of long and strong bristles in male; small to medium-sized ..... *labiata*
- Protuberance below base of wing rounded; abdomen slightly to heavily tessellated; 4th sternite without such bristles; medium to large-sized ... 2
2. Fifth tergite with 1 pair of discal bristles;  $T_{1+2}$  and  $T_3$  with 1 strong marginal bristle on each lateral side; hind tibia more or less fringed (in *pseudovaricolor* unfringed) ..... 6
- Fifth tergite without discal bristles;  $T_{1+2}$  and  $T_3$  with lateral marginal bristles; hind tibia never fringed ..... 3
3. Hair on pteropleuron wholly yellowish ..... 4
- Hair on pteropleuron never wholly yellowish ..... 5
4. Body yellowish-brown; genae with only yellow hair; parafacialia with yellow setulae; vibrissae inserted just above mouth margin; upper and lower squamae brown, border of upper squama yellowish; fore femur with long fringe on anteroventral surface in male; fore tibia with distinct protuberance and with stout spines rearranged in a continuous row in male; 4th tergite with 1 pair of strong median marginal bristles; projection of 5th sternite not symmetrical ....  
..... *asymmetria*
- Body brown, much paler on lateral margins of thorax; genae with short brown setulae beyond anterior half, remainder yellowish; parafacialia with black setulae; vibrissae inserted beyond mouth margin; upper and lower squamae yellowish-white, border of upper squama brown; fore femur without fringe on anteroventral surface in male; fore tibia without distinct protuberance, stout spines rearranged in a discontinuous row in male; 4th tergite without median marginal bristles ..... *terova*
5. Upper squama with a tuft of yellow hair on inner lower margin and yellow-ciliated. In male fore tibia with stout spines on protuberance; posterior paramere stout and beak-like at apex; outer forceps with free margin bent backward apically in lateral view ...  
..... *chiangmaiensis*
- Upper squama with a tuft of brown hair on inner lower margin and brown cilia in male; posterior paramere slender and slightly curved at apex; outer forceps emarginated anteriorly in lateral view .... *siamensis*
6. Mid-tibia double-fringed in male ....  
..... *emarginata*
- Mid-tibia unfringed in male ..... 7
7. In male fore tibia with 2-3 long and 2-5 short stout *av* spines; outer forceps with free margin nearly straight on lateral view ..... *bezzii*
- In male fore tibia with several small spines; outer forceps emarginated on lateral view ..... 8
8. Hind tibia unfringed, with only a few of long *av* on anterior half in male ..  
..... *pseudovaricolor*
- Hind tibia conspicuously fringed in male ..... *varicolor*
25. ***B. labiata*** Robineau-Desvoidy,  
1830  
(Figs. 11, 24, 29, 42)

*B. labiata* R.-D., 1830, Mem. Pres. Div. Sav. Acad. Sci. Inst. Fr.: 426.

Male. Body length 7.0–10.0 mm. *Head*: Eyes bare, dichoptic, frons at narrowest point 0.25–0.27 of head width; *fv* reddish-brown but yellowish-brown most anteriorly, with black setulae; *ori* 8 pairs; *ovb* present; *pa* yellow, yellow-dusted, with yellow setulae but with only few black ones most posteriorly; *f* and *fl* yellow, with yellow dusting; *vbr* inserted at level of mouth margin; *e*, *vr*, and *m* yellow; *vr* with yellow setulae; *g* yellow with black setulae, only few yellow hair present most posteriorly; *mc* yellow, with yellow hair; *ocp* yellowish-brown; *a* yellow but *a*<sub>3</sub> darkened dorsally, length of *a*<sub>3</sub> 2.5X as long as *a*<sub>2</sub>; *pal* pale yellow; proboscis yellow to light brownish-yellow. *Thorax*: Blackish-gray, yellowish laterally, traces of 2 narrow longitudinal stripes present; *pp* bare; *prs* with yellow hair; pleural parts mostly yellow; *ssr* bare; *ms* and *mts* yellowish-white. Chaetotaxy; *ac* 0+1, *dc* 2+4, *ia* 1+2, *hb* 2, *ph* 2, *prsb* 1, *sa* 4, *pa* 2, *np* 2, *scut* 3+0, *st* 1+1; *ppb* and *psb* well developed. *Wings*: Hyaline; veins brown; *e* and *ba* yellow; *sc* yellow and bare; *r*<sub>4+5</sub> with setulae above and below extending more than 1/2 way from basal node to *r-m*; lower *sq* yellow, bare on upper surface; *ha* yellow. *Legs*: Yellow; *f*<sub>1</sub> with fringe on anteroventral surface; *t*<sub>1</sub> without protuberance, with 3–4 long stout spines on plain-margined anteroventral surface, 3 *ad* and 1 *p*; *f*<sub>2</sub> with a double comb of erect stiff hair at apex; *t*<sub>2</sub> with 2 *p*, without *ad*; *t*<sub>3</sub> with 2 *ad* and 2–3 *av*. *Abdomen*: Yellow to brownish-yellow but darkened on *T*<sub>4</sub> and *T*<sub>5</sub>, with brown marginal band on each tergite, band on *T*<sub>1+2</sub> never interrupted, on *T*<sub>3</sub> and *T*<sub>4</sub> varied from interrupted to not interrupted, but on *T*<sub>5</sub> always interrupted; *T*<sub>1+2</sub> and *T*<sub>3</sub> with some fine marginal bristles on lateral sides; a row of marginal

bristles on *T*<sub>4</sub> varied from completed to incomplete; *T*<sub>5</sub> without discal bristles, with a row of marginal bristles; sternites yellow, generally darkened on *S*<sub>4</sub> and *S*<sub>5</sub>; *S*<sub>1</sub> with yellow hair; *S*<sub>2</sub> and *S*<sub>3</sub> with yellow hair, each sternite with 1 pair of marginal bristles and some black hair on lateral corner of posterior margin; *S*<sub>4</sub> with yellow hair, with 1 pair of extra long and strong median marginal bristles and with several black hair posteriorly and laterally; *S*<sub>5</sub> with black hair, posterior projection brown; *ep* black but yellowish posteriorly.

*Specimens examined*: 11 ♂♂, nr. Sai Yok, 500 m., Kanchana Buri, 6, 7, 8, 11 IX, 7, 8 X 1975, Kano, Kurahashi, Tumrasvin; 2 ♂♂, Sai Yok, 500 m., Kanchana Buri, 9–13 XII 1975, Shinonaga, Shima; 1 ♂, Erawan w.f., 500 m., 9–13 XII 1975, Shinonaga; 2 ♂♂, Khao Yai, 366 m. and 800 m., 30 km. and 60 km. S. Pak Chong, 5, 6 X 1975, Kano; 2 ♂♂, Fang Exp. St., 500 m., Fang, 25 IX 1975, Kano, Tumrasvin; 1 ♂, Ban Pong Din, 10 km. NE. Doi Saket, 20 IX 1975, Kurahashi

*Distribution*: India, Malaysia, Indonesia and Thailand

27. *B. asymmetria* Kurahashi  
Tumrasvin, 1979

*B. asymmetria* Kurahashi et Tumrasvin, 1979, Jap. J. Sanit. Zool., 30: 297.

Specimens and distribution have already been reported when this species was described as a new species.

28. *B. torosa* (Wiedemann, 1819)  
(Figs. 3, 19, 32, 38)

*Musca torosa* Wied., 1819, Zool. Mag. 3: 21.

*B. jejuna*: S.-W., 1924, Spolia Zeylan., 13: 104.

Male. Body length 11.0–12.5 mm. *Head*: Eyes bare, dichoptic, frons at narrowest

point 0.30 of head width; *fv* slightly reddish-brown, but slightly darkened posteriorly, covered with black setulae; *pf* brown, with brownish-yellow dusting and with black hair; *ori* 9–10 pairs; *ovb* present; *pa* yellow to brownish-yellow and sometimes slightly darkened posteriorly, with yellow dusting, covered with black setulate but sometimes with yellowish ones most anteriorly; *f* and *fl* yellow, with yellow dusting; *vbr* inserted distinctly above mouth margin; *e* yellow; *vr* and *m* yellowish-orange; *vr* with only yellow setulae; *g* brownish-yellow with short brown hair beyond anterior half, the remainder yellowish; *mc* yellow with yellow hair; *ocp* brown; *a* orange to brownish-orange, *a<sub>3</sub>* dark brownish dorsally and on the outer surface, its length 2.5X as long as *a<sub>2</sub>*; *pal* pale yellow with black setulae; proboscis yellowish-brown. **Thorax:** Brown, much paler on lateral margins, with yellowish-brown dusting and with several traces of brown longitudinal stripes; *pp* bare; *prs* with yellow hair; pleural parts only slightly darkened; *ssr* bare; *ms* and *mts* yellow. Chaetotaxy; *ac* 0+1, *dc* 2–4 (if 4, the anterior 2 fine)+4, *ia* 1+2, *hb* 2, *ph* 2, *prsb* 1, *sa* 2, *pa* 2, *np* 2, *scut* 4+0, *st* 1+1; *ppb* and *psb* well developed. **Wings:** Hyaline; veins brownish-yellow; *c* and *ba* yellow; *sc* yellow and bare; *r<sub>4+5</sub>* with setulae above and below extending more than 1/2 way from basal node to *r-m*; lower *sq* yellowish-white, bare on upper surface; *ha* yellow. **Legs:** Yellow; *f<sub>1</sub>* without fringe; *t<sub>1</sub>* without distinct protuberance, stout spines rearranged in a discontinuous row, the anterior group with 2 rather long, the posterior group with 5–6 but 3–4 ones longest and also with some minute spines near by, 4 *ad* and 1 *p*; *f<sub>2</sub>* with 5–6 closely-set flat and stout *pv* spines at apex; *t<sub>2</sub>* with 1 *ad* and 2 *p*; *t<sub>3</sub>* with 2–3 *ad* and 2 *av*. **Abdomen:**

Pale brown, slightly darkened on *T<sub>5</sub>*, slightly tessellated; each tergite with a narrow brown longitudinal and a median band; each lateral side of *T<sub>1+2</sub>* and *T<sub>3</sub>* without marginal bristles; *T<sub>4</sub>* without strong median marginal bristles, with only a complete row of short marginal bristles; *T<sub>5</sub>* without discal bristles but with a complete row of well developed marginal bristles; sternites yellow, slightly darkened on *S<sub>5</sub>*; *S<sub>1</sub>* with yellow hair; *S<sub>2</sub>* with yellow hair and with 1 pair of marginal bristles and some black hair on lateral corner of posterior margin; *S<sub>3</sub>* with yellow hair anteriorly and with black hair posteriorly and also with 1 pair of marginal bristles on lateral corner of posterior margin; *S<sub>4</sub>* with black hair but with yellow hair most anteriorly and with 1 pair of marginal bristles on lateral corner of posterior margin; *ep* black.

*Specimens examined:* 1♂, N. Nayok, 22 IV 1972, P.G.; 1♂, Pukae, 12 I 1974, Arcom; 1♂, Bang Khen, 26 VIII 1973, Sumon; 1♂, Rai Suwan, 9 VII 1974, Suwapee

*Distribution:* India, Sri Lanka, Malaysia, Indonesia, Philippines and Thailand

29. *B. chiangmaiensis* Kurahashi et Tumrasvin, 1979

*B. chiangmaiensis* Kurahashi et Tumrasvin, Jap. J. Sanit. Zool., 30: 298.

Specimens examined and distribution have already been reported when this species was described as a new species.

30. *B. siamensis* Senior-White, 1924  
(Figs. 12, 21, 25, 37)

*B. siamensis* S.-W., 1924, Spolia Zeylan., 13: 106.

Male. Body length 13.0 mm. **Head:** Eyes bare, dichoptic, frons at the narrowest point 0.32 of head width; *fv* yellowish-brown but dark brownish posteriorly,



covered with black setulae; *pf* brown, grayish-yellow dusted, with black setulae; *ori* 9 pairs; *ovb* present; *pa* yellow, yellow dusting, with conspicuously large dark brown fleck most posteriorly, with yellow setulae but with blackish ones most posteriorly; *f* and *fl* yellow with yellow dusting; *vbr* inserted just above mouth margin; *e* yellow; *vr* brownish-orange with some brown setulae; *m* yellow; *g* yellow, with some black hair but with yellow hair most posteriorly; *mc* yellow, with yellow hair; *ocp* brown; *a*<sub>2</sub> brownish-orange, *a*<sub>3</sub> brown, paler ventrally, its length 2.5X as long as the 2nd; *pal* yellow; proboscis brownish-orange. *Thorax*: Brown, grayish-brown dusted; traces of 2 longitudinal stripes present; *pp* bare; *prs* with yellow hair; pleural parts dark brown; *ssr* bare; *ms* and *mts* yellow. *Chaetotaxy*: *ac* 0+1, *dc* 2+4, *ia* 1+2 (presutural one fine), *hb* 2, *ph* 2, *prsb* 1, *sa* 4, *pa* 2, *np* 2, *scut* 3+0, *st* 1+1; *ppb* and *psb* well developed. *Wings*: Light brown to slightly infuscated; veins brown; *e* and *ba* yellow; *sc* yellowish-brown; *r*<sub>4+5</sub> with setulae above and below extending more than 1/2 way from basal node to *r-m*; lower *sq* yellowish-brown, bare on upper surface; *ha* yellow. *Legs*: Yellow, but anterior and apical surfaces of *f*<sub>1</sub>, apical half of *f*<sub>2</sub> and anterior part of *f*<sub>3</sub> brownish; *f*<sub>1</sub> with fringe; *t*<sub>1</sub> without protuberance, with 5-6 long stout spines on plain-margined anteroventral surface (of which the anterior 2-3 ones longest) intermixed with some short spines, 3 *ad* and 1 *p*; *f*<sub>2</sub> with 6 closely-set flat and stout posteroventral spines at apex; *t*<sub>2</sub> with 1 *ad* and 2 *p*; *t*<sub>3</sub> with 2 *ad* and 2-3 *av* without fringe. *Abdomen*: Brown, darkened on *T*<sub>4</sub> and *T*<sub>5</sub>, slightly tessellated, with 1 broad dark band on each tergite (narrowest on *T*<sub>1+2</sub>); *T*<sub>1+2</sub> and *T*<sub>3</sub> without lateral marginal bristles; *T*<sub>4</sub> with 1 pair of median marginal bristles and with 2 marginal bristles

on each lateral side; *T*<sub>5</sub> without discal bristles but with a row of marginal bristles; sternites yellow but dark brownish on *S*<sub>5</sub>; *S*<sub>1</sub> with yellow hair; *S*<sub>2</sub> with yellow hair and with a pair of long marginal bristles and some bristle-like hair on lateral corner of posterior margin and also with 2 bristle-like hair on posterior margin; *S*<sub>3</sub> with yellow hair and with 1 pair of long marginal bristles on lateral corner of posterior margin and also with several bristle-like hair on lateral margin and 1 pair of such hair on posterior margin; *S*<sub>4</sub> slightly brownish posteriorly, with black hair except yellowish ones most posteriorly and with 1 pair of long marginal bristles on lateral corner of posterior margin and also with several bristle-like hair on lateral margin and 1 pair of such hair on posterior margin; *S*<sub>5</sub> brown but dark brownish anteriorly, posterior projection metallic dark brown.

*Specimens examined*: 1♂, Chiang Mai, 1200 m., 11 IV 1966, J. Sedlacek; 1♂, Pak Chong, 3 VII 1971, Yuwadee

*Distribution*: Thailand

31. *B. emarginata* Malloch, 1927

(Figs. 1, 17, 27, 39)

*B. emarginata* Mall., 1927, Ann. Mag. Nat. Hist., 20: 412.

Male. Body length 11.0-14.0 mm. *Head*: Eyes bare, dichoptic, frons at the narrowest point 0.29 of head width; *fv* light reddish-brown but darkened posteriorly, covered with black setulae; *pf* dark brown, brownish-gray dusted, with some black setulae; *ori* 8-9 pairs; *ovb* present; *pf* yellow, yellow dusting, with conspicuously dark brown fleck most posteriorly and with black setulae; *f* and *fl* yellow, with yellow dusting; *vbr* inserted just above mouth margin; *e*, *vr* and *m* yellow; *vr* with short yellow setulae (sometimes 4-5 brown setulae present); *g* and *mc* yellow, yellow dusted,

covered with yellow hair; *ocp* yellowish-brown; *a*<sub>2</sub> brownish-orange, *a*<sub>3</sub> dark brown but orange at base, its length 2.5X as long as the 2nd; *pal* yellow; proboscis brownish-orange. *Thorax*: Brown, with grayish-brown dusting, traces of 2 brown longitudinal stripes present; *pp* bare; *prs* with yellow hair; pleural parts dark brown; *ssr* bare; *ms* yellow; *mts* light brown. Chaetotaxy: *ac* 0+1, *dc* 4-5+4, *ia* 1+2 (presutural one fine), *hb* 2-3, *ph* 2-3, *prsb* 1, *sa* 4, *pa* 4, *np* 2, *scut* 4+1, *st* 1+1; *ppb* and *psb* well developed. *Wings*: Light brown; veins brown; *e* and *ba* yellow; *sc* yellow and bare; *r*<sub>4+5</sub> with setulae above and below extending more than 1/2 way from basal node to *r-m*; lower *sq* white, bare on upper surface; *ha* yellow. *Legs*: Yellow; all femora brownish; *f*<sub>1</sub> with fringe; *t*<sub>1</sub> without protuberance, with several minute spines on plain-margined anteroventral surface, 3-4 *ad* and 1 *p*; *f*<sub>2</sub> with 7-8 closely set flat and stout posteroventral spines at apex; *t*<sub>2</sub> with 1 *ad*, 2-3 *p* and thin fringe on about apical half of anteroventral and posteroventral surfaces; *f*<sub>3</sub> heavily fringed on anteroventral and posteroventral surfaces; *t*<sub>3</sub> with 2 *ad* and heavily fringed on anteroventral and posteroventral surfaces. *Abdomen*: Pale brown, darkened on *T*<sub>4</sub> and *T*<sub>5</sub>, with a broad black marginal band on each tergite (*T*<sub>1+2</sub> narrowest) and with heavily silver tessellation; each lateral side of *T*<sub>1+2</sub> and *T*<sub>3</sub> with 1 strong marginal bristle; *T*<sub>4</sub> with 1 pair of strong median marginal bristles and with 2-3 strong marginal bristles on each lateral side; *T*<sub>5</sub> with 2 strong discal bristles and a row of strong marginal bristles; sternites yellow, darkened on *S*<sub>5</sub>; *S*<sub>1</sub> with yellow hair; *S*<sub>2</sub> with yellow hair but with black hair on posterior margin and with 1 pair of median marginal bristles; *S*<sub>3</sub> with yellow hair but with black hair on lateral and posterior margins and with 1 pair of median

marginal bristles; *S*<sub>4</sub> with yellow hair and with several black hair on posterior half and also on lateral margin and with 1 pair of marginal bristles; *S*<sub>5</sub> dark brown, covered with black hair; *ep* dark brown.

*Specimens examined*: 6♂♂, nr. Sai Yok, 500 m., Kanchana Buri, 8, 11 IX 1975, Kurahashi, Tumrasvin; 1♂, Sai Yok, 500 m., Kanchana Buri, 9-13 XII 1975, Shima; 1♂, Erawan w.f., Kanchana Buri, 10 XII 1975, Shinonaga; 1♂, Pukae, 5 VIII 1971, 14 VII 1974, Pacharee; 1♂, Bang Khen, 10 XII 1978, Sawake

*Distribution*: China, Singapore, Taiwan and Thailand

### 32. *B. bezzii* Senior-White, 1923

(Figs. 4, 23, 31, 44)

*B. bezzii* S.-W., 1923, Spolia Zeylan., 12: 306.

*Male*. Body length 9.0-11.0 mm. *Head*: Eyes bare, dichoptic, frons at the narrowest point 0.31 of head width; *fv* reddish-brown, with black setulae; *pf* dark brown, with brownish-gray dusting, covered with black setulae; *ori* 7-8 pairs; *ovb* present; *pa* yellow, yellow-dusted, with conspicuously dark brown fleck most posteriorly, with black setulae; *f* and *fl* yellow-dusted; *vbr* inserted just above mouth margin; *e* and *vr* yellow; *vr* with some brown setulae; *m* yellowish-orange; *g* and *mc* yellow, yellow-dusted, covered with yellow hair; *ocp* brown; *a*<sub>2</sub> reddish-brown, *a*<sub>3</sub> dark brown but orange near base, its length 2.5X as the 2nd; *pal* yellow; proboscis brownish-orange. *Thorax*: Brown, grayish-brown-dusted, paler at sides; traces of 2 narrow brown median and some longitudinal stripes present; *pp* bare; *prs* with yellow hair; pleural parts dark brown; *ssr* bare; *ms* pale yellow; *mts* yellow to light brown. Chaetotaxy: *ac* 0+1, *dc* 2+4, *ia* 0-1+2 (presutural one fine), *hb* 2, *ph* 2, *prsb* 1, *sa*

4, *pa* 2, *np* 2, *scut* 3+1-2 (usually 1), *st* 1+1; *ppb* and *psb* well developed. *Wings*: Pale brown; veins brown; *e* and *ba* yellow; *sc* yellow and bare; *r*<sub>4+5</sub> with setulae above and below extending more than 1/2 way from basal node to *r-m*; lower *sq* white, bare on dorsal surface; *ha* yellow. *Legs*: *f*<sub>1</sub> largely brownish but paler at base; *f*<sub>2</sub> entirely brownish; *f*<sub>3</sub> brownish but apical part of anterior surface, ventral and posterior surfaces yellowish; *f*<sub>1</sub> fringed; *t*<sub>1</sub> without protuberance, with 2-3 long and 2-5 short and stout spines on plain-margined anteroventral surface, 3 *ad* and 1 *p*; *f*<sub>2</sub> with closely-set 8-9 flat and stout posteroventral spines at apex; *t*<sub>2</sub> with 1 *ad* and 2 *p*; *f*<sub>3</sub> with thin *av* and *pv* fringe; *t*<sub>3</sub> with 3 *ad*, 1 *av*, thin *av* fringe and thin and short *pv* fringe. *Abdomen*: Brown but slightly darkened on *T*<sub>4</sub> and with heavy silver-gray dusting; each tergite with rather broad black marginal band (on *T*<sub>1+2</sub> narrowest); from *T*<sub>1+2</sub> to *T*<sub>4</sub> each with a fine black median stripe; *T*<sub>1+2</sub> and *T*<sub>3</sub> with some weakly developed marginal bristles laterally; *T*<sub>4</sub> with 1 pair of strong median marginal bristles and with 2 more pairs laterally; *T*<sub>5</sub> with 1 pair of strong discal bristles and with a row of strong marginal bristles posteriorly; *S*<sub>1</sub> to *S*<sub>3</sub> yellow with yellow hair, *S*<sub>2</sub> with 2 pairs of fine hair-like marginal bristles on lateral corner of posterior margin; *S*<sub>3</sub> with several black hair on posterior lateral margin; *S*<sub>4</sub> dark brown with yellow hair and with several black hair and 1 pair of hair-like bristles on lateral corner of posterior margin; *S*<sub>5</sub> dark brown, covered with black hair except for anterior part with yellow ones; *ep* black.

*Specimens examined*: 5 ♂♂, Bang Khen, I, 8, 9 X 1972, 20 V 1973, Surapol, Saree, Voranut, Pramote; 1 ♂, Bang Piad, 11 IX 1965, Pikul; 1 ♂, Rachadamneon, 13 V 1974, Auaychai; 1 ♂, Bangkok, 15 V 1973, Preeda;

7 ♂♂, Pukae, 10 X, 5 V, 25 VIII, 8, 9 X 1972, 22 II 1974, Kiatsom, Isara, Vichian, Narong, Sugalaya, Veerachai, Dejpol; 5 ♂♂, Sai Yok, 500 m., Kanchana Buri, 27-29 XII 1975, Shima; 2 ♂♂, nr. Sai Yok, 500 m., Kanchana Buri, 6 IX, 7 X 1975, Kano, Kurahashi; 2 ♂♂, Kanchana Buri, 29 VII 1971, 7 VIII 1972, Arjcharee, Anake; 1 ♂, Doi Inthanon, 1300 m., 20 II 1975, Suzuki; 1 ♂, Rai Suwan, 10 III 1972, Vutti; 1 ♂, Pisanuloke 22 V 1973, Jarae; 1 ♂, Pak Chong, 5 VIII 1967, O.S.

*Distribution*: India, Sri Lanka, China, Japan (Ryukyu), Taiwan, Malaysia, Philippines and Thailand

33. *B. pseudovaricolor* Kurahashi et Tumrasvin, 1979

*B. pseudovaricolor* Kurahashi et Tumrasvin, 1979, Jap. J. Sanit. Zool., 30: 300.

Specimens examined and distribution have already been reported when this species was described as a new species.

34. *B. varicolor* (Fabricius, 1805)  
(Figs. 6, 22, 34, 45)

*Musca varicolor* Fab., 1805, Syst. Antliat.: 296.

*B. varicolor*: S.-W., 1924, Spolia Zeylan., 13: 106.

Male. Body length 11 mm. *Head*: Eyes bare, dichoptic, frons at the narrowest point 0.26 of head width; *fv* reddish-brown, with black setulae; *pf* dark brown with grayish-brown dusting, covered with black setulae; *ori* 8-9 pairs; *ovb* present; *pa* yellow, yellow-dusted, with conspicuously dark brown fleck most posteriorly, with brown setulae; *f* and *fl* yellow, yellow dusting; *vbr* inserted just above mouth margin; *e* and *vr* yellow; *vr* with some brown setae; *m* yellowish-orange; *g* and *mc* yellow, yellow-dusted, covered with yellow hair; *ocp* brown; *a*<sub>2</sub>

reddish-brown,  $a_3$  dark brown but orange near base, its length 2.5X as long as the 2nd; *pal* yellow; proboscis brownish-orange. *Thorax*: Brown, brownish-orange dusted, paler at sides, traces of 2 narrow brown median and some longitudinal stripes present; *pp* bare; *prs* with yellow hair; pleural parts dark brown; *ssr* bare; *ms* yellow; *mts* light brown. Chaetotaxy; *ac* 0+1, *dc* 2+4, *ia* 0+2, *hb* 2, *ph* 2-3, *prsb* 1, *sa* 4, *pa* 2, *np* 2, *scut* 3+0; *st* 1+1; *ppb* and *psb* well developed. *Wings*: Pale brown; veins brown; *e* and *ba* yellow; *sc* yellow and bare;  $r_{4+5}$  with setulae above and below extending more than 1/2 way from basal node to *r-m*; lower *sq* pale yellow, bare on upper surface; *ha* yellow. *Legs*: Yellow;  $f_1$  and  $f_2$  entirely brownish;  $f_3$  brownish but lower part of anterior surface and about basal half of posterior surface yellowish;  $f_1$  unfringed;  $t_1$  without protuberance, with several minute spines on plain-margined anteroventral surface, 3 *ad* and 1 *p*;  $f_2$  with 7-9 closely-set stout and flat spines at apex;  $t_2$  with 1 *ad* and 2 *p*;  $f_3$  with very thin fringe;  $t_3$  with 2 *ad*, 1 *av*, thin *av* and *pv* fringe. *Abdomen* pale yellow, slightly tessellated; each tergite with rather broad black marginal band;  $T_{1+2}$  to  $T_4$  each with a fine black median stripe; each lateral side of  $T_{1+2}$  and  $T_4$  with 1 strong marginal bristle;  $T_4$  with 1 pair of strong median marginal bristles and with a row of marginal bristles;  $S_1$  yellow with yellow hair;  $S_2$  yellow with yellow hair and with 2 long black marginal bristles and some fine black hair on posterior margin;  $S_3$  yellow with short and fine yellow hair anteriorly, lateral and posterior sides with black hair and with 2 long black marginal bristles;  $S_4$  yellow but dark brownish posteriorly, with black hair and 2 long black marginal bristles;  $S_5$  dark brown, covered with black hair; *ep* black.

*Specimens examined*: 1 ♂, Nakhon Nayok

Prov., Khao Yai Nat. Park, 5 VI 1965, P.D. Ashlock; 1 ♂, nr. Burma Bord., 1200 m., Fang, 26 IX 1975, Tumrasvin

*Distribution*: India, Laos, Viet Nam, Taiwan, Malaysia, Indonesia and Thailand

*Remarks*: We studied and compared all characters of *varicolor*, *bezzii* and *emarginata* in detail and we were sure that these 3 species were distinct.

#### SUBFAMILY CHRYSOMYINAE

The flies in this subfamily are all metallic in coloration. The presence of distinct setulae on the posterodorsal surface of basal section of stem-vein of wing, lower squama entirely hairy on upper surface, the subalar knob with erect hair, and the poorly developed bristles on the thoracic dorsum are the main characters of the members of this subfamily.

#### GENUS *Chrysomya* Robineau-Desvoidy, 1830

*Chrysomya* R.-D., 1830, Mem. Pres. Div. Sav. Acad. Sci. Inst. Fr.: 444.

Small to medium-sized flies, usually metallic green, blue or purple in color; eyes large and bare, in male holoptic or dichoptic, upper 2/3 of male facets uniform or remarkably enlarged but female facets always uniform; *prst ac* absent; propleura and prosternum hairy; suprasquamal ridge usually with anterior parasquamal tuft, sometimes short hair present posteriorly in some species; subcostal sclerite hairy; 5th tergite with many fine erect bristles on disc.

#### KEY TO THE SPECIES

1. Mesothoracic spiracles white; facets of male eyes small and uniform . . . . . 2
- Mesothoracic spiracles brown to black; facets on upper 2/3 of male eyes remarkably enlarged but lower 1/3 small (all facets uniform in *bezziana*)

- and *villeneuvei*) . . . . . 3
2. Eyes dichoptic in both sexes; fronto-orbital bristles absent in both sexes; sternopleural bristles 0+1; 3rd and 4th tergites with marginal dark bands posteriorly, only 3rd tergite with a narrow longitudinal median stripe; dorsal and ventral surfaces of 5th tergite with black hair only; usually small-sized, 4.0–6.0 mm. . . . *nigripes*  
 Eyes holoptic in male; fronto-orbital bristles absent in male; sternopleural bristles 1+1; 3rd and 4th tergites with marginal dark bands posteriorly and with longitudinal median stripes on 3rd to 5th tergites; dorsal surface of 5th tergite with black hair intermixed with white hair but with only white hair on ventral surface; body size 6.5–9.0 mm. . . . . *albiceps ruffacies*
3. Eyes dichoptic in both sexes; one strong reclinate fronto-orbital and outer vertical bristles present in both sexes; face sunk deeply between inflated parafacialia; femora greatly swollen in male, less so in female; apical half of *pv* row on each mid-femur comb-like in male, not so conspicuous in female; each tarsal segment in male short and stout, normal in female; disc of 5th tergite of male clothed with dense short hair, but minute or almost bare in female . . . . *villeneuvei*  
 Eyes holoptic or only slightly separated in male, reclinate fronto-orbital and outer vertical bristles absent in male; apical half of mid-femur without comb-like *pv* row in both sexes; tarsal segment normal; disc of 5th tergite with many fine erect bristles in both sexes . . . . . 4
4. Parafacialia and genae yellowish-orange, both covered with yellowish-white hair; 3rd antennal segment entirely orange; anterior half of upper squama whitish and covered with white hair dorsally; 5th tergite with white hair intermixed with black hair on dorsal surface, but with only white hair on ventral surface . . . . . 5  
 Parafacialia and genae fuscous, both covered with black hair; 3rd antennal segment not entirely orange; anterior half of upper squama white to blackish-gray and covered with dark brown to black hair dorsally or bare; 5th tergite with only black hair on both dorsal and ventral surfaces . . . . . 6
5. Eyes in male with remarkably enlarged facets on upper 2/3, the lower 1/3 with small facets; lower squamae dark brown with dark brown hair dorsally . . . . . *megacephala*  
 Eyes in male with only small facets and uniform; lower squamae white to yellowish-white and with white or black hair dorsally . . . . . *bezziana*
6. Anterior half of upper squama whitish and bare dorsally, anterior margin yellowish-white to slightly light brown, posterior margin dark brown; male head hemispherical distinctly in profile . . . . . *chani*  
 Anterior half of upper squama never pure whitish and covered with dark brown to black hair dorsally, anterior and posterior margins dark brown; male head flattened in profile . . . . . 7
7. Posthumeral bristles absent (sometimes weakly developed in female); body large in size, 12.0–13.0 mm. . . . .  
 . . . . . *thanomthini*  
 Posthumeral bristles well developed; body not more than 10 mm. in length . . . . . *pinguis*
35. *C. villeneuvei* Patton, 1922  
*C. villeneuvei* Patton, 1922, Indian J.

Med. Res., 8: 567.

*Specimens examined:* 22♂♂, 14♀♀, nr. Sai Yok, 500 m., Kanchana Buri, 6, 8, 9, 11 IX, 7 X 1975, Kano, Kurahashi; 16♂♂, 14♀♀, Erawan w.f., 500 m., Kanchana Buri, 7, 10 IX 1975, Kano, Kurahashi; 6♂♂, 5♀♀, Khao Yai, 366 m. and 800 m., 30 km. and 60 km. S. Pak Chong, 3, 5, 6 X 1975, Kano, Kurahashi; 3♂♂, 2♀♀, Khao Khiaw, 1351 m., 80 km. S. Pak Chong, 3, 6, 10 1975, Kurahashi; 2♂♂, 3♀♀, Doi Pui, 1685 m., c. Chiang Mai, 16 IX 1975, Kano, Kurahashi; 3♂♂, 7♀♀, Nam Tok Mae Klang, Doi Inthanon, 18 IX 1975, Kano, Kurahashi; 1♂, 3♀♀, Ban Pong Din, 10 km. N.E. Doi Saket, 20 IX 1975, Kurahashi; 6♀♀, Ban Yang, 1400 m., Doi Inthanon, 17 IX 1975, Kano, Kurahashi; 3♂♂, 1♀, Fang Exp. St., 500 m., Fang, 25 IX 1975, Kurahashi; 2♂♂, 1♀, Doi Huai Hwer, 1231 m., Fang, 27 IX 1975, Kurahashi; 2♂♂, 2♀♀, nr. Burma Bord., 1200 m., Fang, 26 IX 1975, Kurahashi

*Distribution:* India, Sri Lanka, Malaysia, Indonesia and Thailand

### 36. *C. nigripes* Aubertin, 1932

*C. nigripes* Aubertin, 1932, Ann. Mag. Nat. Hist., 9: 26.

*Specimens examined:* 7♂♂, 4♀♀, nr. Sai Yok, 500 m., Kanchana Buri, 6, 8, 11 IX 1975, Kano, Kurahashi; 2♂♂, 15♀♀, Erawan w.f., 500 m., Kanchana Buri, 5, 7 IX 1975, Kano, Kurahashi; 2♂♂, Khao Khiaw, 1351 m., 80 km. S. Pak Chong, 6 X 1975, Kurahashi; 2♂♂, nr. Ban Sap Bon, 30 km. E. Sara Buri, 4 X 1975, Kurahashi; 3♂♂, Khao Yai, 366 m., 30 km. S. Pak Chong, 6 X 1975, Kurahashi; 2♂♂, 2♀♀, Ban Pong Din, 10 km. N.E. Doi Saket, 20 IX 1975, Kano, Kurahashi; 2♂♂, 6♀♀, Nam Tok Mae Klang, Doi Inthanon, 18 IX 1975, Kano, Kurahashi; 3♂♂, Fang Exp. St., 500 m., Fang, 25 IX 1975, Kurahashi;

3♂♂, 1♀♀, Doi Huai Hwer, 1231 m., Fang, 27 IX 1975, Kano, Kurahashi; 2♂♂, nr. Burma Bord., 1200 m., Fang, 26 IX 1975, Kurahashi

*Distribution:* India, Sri Lanka, Malaysia and Thailand

### 37. *C. chani* Kurahashi, 1979

*C. chani* Kurahashi, 1979, J. Med. Ent., 16: 288.

*Specimens examined:* 27♂♂, 22♀♀, nr. Sai Yok, 500 m., Kanchana Buri, 6, 9, 11 IX, 7, 8 X, 9-13 XII 1975, Kano, Kurahashi, Shinonaga; 2♂♂, 1♀, Erawan w.f., 500 m., Kanchana Buri, 5 IX 1975, Kano, Kurahashi; 10♂♂, 3♀♀, Khao Yai, 366 m., 30 km. S. Pak Chong, 5 X 1975, Kano, Kurahashi; 6♂♂, Khao Khiaw, 1351 m., 80 km. S. Pak Chong, 6 X 1975, Kurahashi; 2♂♂, 4♀♀, Hill, c. 300 m., Sa Kaeo, 30 km. S.E., 3 IX 1975, Kurahashi; 10♂♂, 4♀♀, Ban Pong Din, 10 km. N.E. Doi Saket, 20 IX 1975, Kurahashi, Tumrasvin; 1♀, Nam Tok Mae Klang, Doi Inthanon, 18 IX 1975, Kano; 6♂♂, Fang Exp. St., 500 m., Fang, 25 IX 1975, Kurahashi, Tumrasvin; 2♂♂, 5♀♀, Doi Huai Hwer, 1231 m., Fang, 27 IX 1975, Kano, Kurahashi; 1♀, Ban Yang, 1400 m., Doi Inthanon, 23 IX 1975, Tumrasvin; 1♂, nr. Burma Bord., 1200 m., Fang, 26 IX 1975, Kurahashi

*Distribution:* Malaysia, Singapore, Philippines and Thailand

### 38. *C. albiceps rufifacies*

(Macquart, 1843)

*Lucilia rufifacies* Macq., 1843, Mem. Soc. Sci. Agric. Lille, 1842: 303 (1843: 146).

*C. rufifacies*: Bezzi, 1927, Bull. Ent. Res., 17: 235.

*Specimens examined:* 8♂♂, 11♀♀, nr. Sai Yok, 500 m., Kanchana Buri, 6, 11 IX, 7 X, 9-13, 27-29 XII 1975, Kano, Shinonaga, Kurahashi; 2♀♀, Erawan w.f., 500 m.,

Kanchana Buri, 5 IX 1975, Kano; 8♂♂, 2♀♀, Sam Sane, Bangkok, 29 VIII 1975, Kano, Kurahashi; 2♂♂, 4♀♀, Bangna Nai, Bangkok, 28 VIII 1975, Kano, Kurahashi, Tumrasvin; 1♀, Bangkok, 22 IX 1961, Imadate; 1♂, Kasetsart Univ., Bang Khen, 31 VIII 1975, Kurahashi; 2♂♂, Beach, c. 30 km. S. Chon Buri, 30 VIII 1975, Kano, Kurahashi; 1♂♂, 3♀♀, Salt Pond, 6 km. N. Chon Buri, 2 IX 1975, Kurahashi; 4♂♂, 8♀♀, Hill, c. 200 m., Sa Kaeo, 3 IX 1975, Kurahashi, Tumrasvin; 3♂♂, 10♀♀, nr. Ban Sap Bon, 30 km. E. Sara Buri, 4 X 1975, Kurahashi; 3♂♂, 1♀, Khao Yai, 366 m., 30 km. S. Pak Chong, 5 X 1975, Kurahashi; 4♂♂, 1♀, Woods & grass ld., Ayutthaya, 1 IX 1975, Kurahashi; 1♂, 1♀, Chiang Mai Univ., 22 IX 1975, Kurahashi; 6♂♂, 2♀♀, Ban Pong Din, 10 km. N.E. Doi Saket, 20 IX 1975, Kano, Kurahashi; 2♂♂, 11♀♀, Nam Tok Mae Klang, Doi Inthanon, 18 IX 1975, Kano, Kurahashi

*Distribution:* Oriental region and Australia

39. *C. pinguis* (Walker, 1858)

*Lucilia pinguis* Walker, 1858, Trans. Ent. Soc. Lond., 4: 213.

*C. pinguis:* Aubertin, 1932, Ann. Mag. Nat. Hist., 9: 28.

*Specimens examined:* 27♂♂, 38♀♀, nr. Sai Yok, 500 m., Kanchana Buri, 6, 9, 11 IX, 7, 8 X 1975, Kano, Kurahashi; 26♂♂, 7♀♀, Erawan w.f., Kanchana Buri, 5, 7, 8, 9 IX 1975, Kano, Kurahashi; 22♂♂, 19♀♀, Khao Yai, 800 m., 30 km. and 60 km. S. Pak Chong, 3, 5, 6 X, 25–26 XII 1975, Kano, Kurahashi, Tumrasvin; 13♂♂, 24♀♀, Khao Khiaw, 1351 m., 80 km. S. Pak Chong, 3, 6 X 1975, Kurahashi; 8♂♂, 27♀♀, Doi Pui, 1685 m., 16 IX 1975, Kano, Kurahashi; 6♂♂, 1♀, Doi Suthep, Chiang Mai, 20–21 XII 1975, Shinonaga, Shima; 6♂♂, 10♀♀, Ban Yang, 1400 m., Doi Inthanon, 17, 23

IX 1975, Kano, Kurahashi; 5♂♂, 10♀♀, Top, and nr. Top, 2300–2667 m., Doi Inthanon, 17, 23 IX, 19 XII 1975, Kano, Kurahashi, Shima; 1♂, Fang Exp. St., 500 m., Fang, 25 IX 1975, Kurahashi; 1♂, nr. Burma Bord., 1200 m., Fang, 26 IX 1975, Kurahashi

*Distribution:* India, Sri Lanka, China, Korea, Japan, Taiwan, Malaysia, Indonesia and Thailand

40. *C. megacephala* (Fabricius, 1794)

*Musca megacephala* Fab., 1794, Syst. Ent., 4: 317.

*C. megacephala:* Séguéy, 1928, Encycl. Ent., B II, Dipt., 4: 101.

*Specimens examined:* 4♂♂, 1♀, nr. Sai Yok, 500 m., Kanchana Buri, 6, 11 IX, 8 X 1975, Kano, Kurahashi; 6♂♂, 1♀, Erawan w.f., 500 m., Kanchana Buri, 5, 10 IX 1975, Kano, Kurahashi; 3♂♂, 4♀♀, Kanchana Buri, 18 VII 1964, Kano; 5♂♂, 4♀♀, Bangna Nai, Bangkok, 28 VIII 1975, Kano, Kurahashi, Tumrasvin; 2♀♀, Bangkok, 23 VII 1964, Kano; 3♂♂, 2♀♀, Beach, c. 30 km. S. Chon Buri, 30 VIII, 1975, Kano, Tumrasvin; 6♂♂, 3♀♀, Khao Yai, 366 m., 30 km. S. Pak Chong, 5, 6 X, 24–26 XII 1975, Kurahashi, Shima; 2♂♂, 2♀♀, Khao Yai, 800 m., 60 km. S. Pak Chong, 3 X 1975, Kano; 2♂♂, 3♀♀, Woods & grass ld., Ayutthaya, 1 IX 1975, Kurahashi; 1♂, 1♀, Khao Khiaw, 1351 m., 80 km. S. Pak Chong, 3 X 1975, Kurahashi; 2♂♂, 3♀♀, Hill, c. 200 m., Sa Kaeo, 3 IX 1975, Kurahashi; 4♀♀, nr. Ban Sap Bon, 30 km. E. Sara Buri, 4 X 1975, Kurahashi; 2♀♀, Sara Buri, 3 X 1961, and 2 X 1975, Imadate, Kano; 4♂♂, 2♀♀, Ban Pong Din, 10 km. N.E. Doi Saket, 20 IX 1975, Kano, Kurahashi; 1♀, Chiang Mai, 2 XI 1961, Imadate; 1♂, 2♀♀, Chiang Mai Univ., 22 IX 1975, Kurahashi; 8♂♂, 14♀♀, Nam Tok Mae Klang, Doi Inthanon, 18 IX 1975, Kano, Kurahashi;

2♂♂, 4♀♀, Ban Yang, 1400 m., Doi Inthanon, 17 IX 1975, Kano, Kurahashi; 1♂, Top, 2667 m., Doi Inthanon, 23 IX 1975, Kano; 1♀, Fang Exp. St. 500 m., Fang, 25 IX 1975, Tumrasvin; 5♂♂, 1♀, nr. Burma Bord., 1200 m., Fang, 26 IX 1975, Kurahashi; 1♂, 1♀, Doi Huai Hwer, 1231 m., Fang, 27 IX 1975, Kurahashi

*Distribution:* Oriental region, Australia and S. Pacific Islands

41. *C. bezziana* Villeneuve, 1914

*C. bezziana* Vill., 1914, Revue Zool. Bot. Afr., 3: 430.

*Specimens examined:* 1♂, Fang Exp. St., 500 m., Fang, 25 IX 1975, Kurahashi; 1♀, nr. Burma Bord., 1200 m., Fang, 26 IX 1975, Kano; 1♀, Ban Pong Din, 10 km. N.E. Doi Saket, 20 IX 1975, Kurahashi; 1♀, nr. Top, 2300 m., Doi Inthanon, 17 IX 1975, Kurahashi; 1♀, nr. Sai Yok, 500 m., Kanchana Buri, 8 X 1975, Tumrasvin

42. *C. thanomthini* Kurahashi et Tumrasvin, 1977

*C. thanomthini* Kurahashi et Tumrasvin, 1977, Kontyû, 45: 242.

*Specimens examined* and distribution have already been reported when this species was described as a new species.

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## EXPLANATION OF FIGURES

## Plate 1. Fifth Sternites of Male

- Fig. 1. *Bengalia emarginata*  
 Fig. 2. *Melinda scutellata*  
 Fig. 3. *Bengalia torosa*  
 Fig. 4. *B. bezzii*  
 Fig. 5. *Verticia fasciventris*  
 Fig. 6. *Bengalia varicolor*  
 Fig. 7. *Phumosia indica*  
 Fig. 8. Tufts of hair on 3rd and 4th sternites of male *Melinda scutellata*  
 Fig. 9. Tufts of hair on 3rd and 4th sternites of male *Melinda nuortevae*  
 Fig. 10. *Phumosia testacea*  
 Fig. 11. *Bengalia labiata*  
 Fig. 12. *B. siamensis*  
 Fig. 13. *Melinda nuortevae*

## Plate 2. Phallosomes and Anterior and Posterior Parameres

- Fig. 14. *Melinda scutellata*  
 Fig. 15. *Phumosia testacea*  
 Fig. 16. *Melinda nuortevae*  
 Fig. 17. *Bengalia emarginata*  
 Fig. 18. *Phumosia indica*  
 Fig. 19. *Bengalia torosa*  
 Fig. 20. *Verticia fasciventris*  
 Fig. 21. *Bengalia siamensis*  
 Fig. 22. *B. varicolor*  
 Fig. 23. *B. bezzii*  
 Fig. 24. *B. labiata*

## Plate 3. Epandrium, Inner and Outer forceps (Lateral View)

- Fig. 25. *Bengalia siamensis*  
 Fig. 26. *Melinda nuortevae*  
 Fig. 27. *Bengalia emarginata*  
 Fig. 28. *Verticia fasciventris*  
 Fig. 29. *Bengalia labiata*  
 Fig. 30. *Melinda scutellata*  
 Fig. 31. *Bengalia bezzii*  
 Fig. 32. *B. torosa*  
 Fig. 33. *Phumosia testacea*

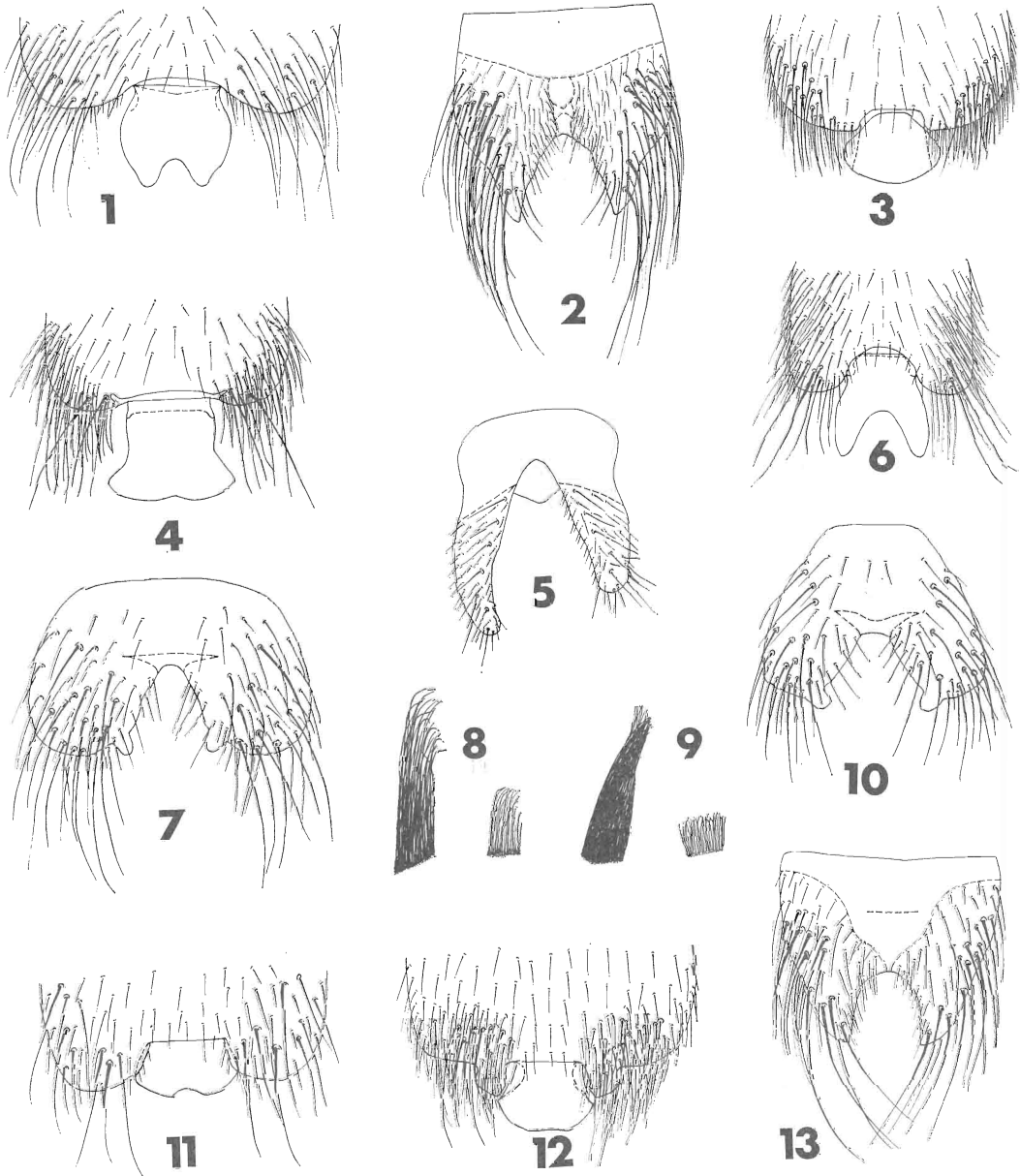
- Fig. 34. *Bengalia varicolor*  
 Fig. 35. *Phumosia indica*

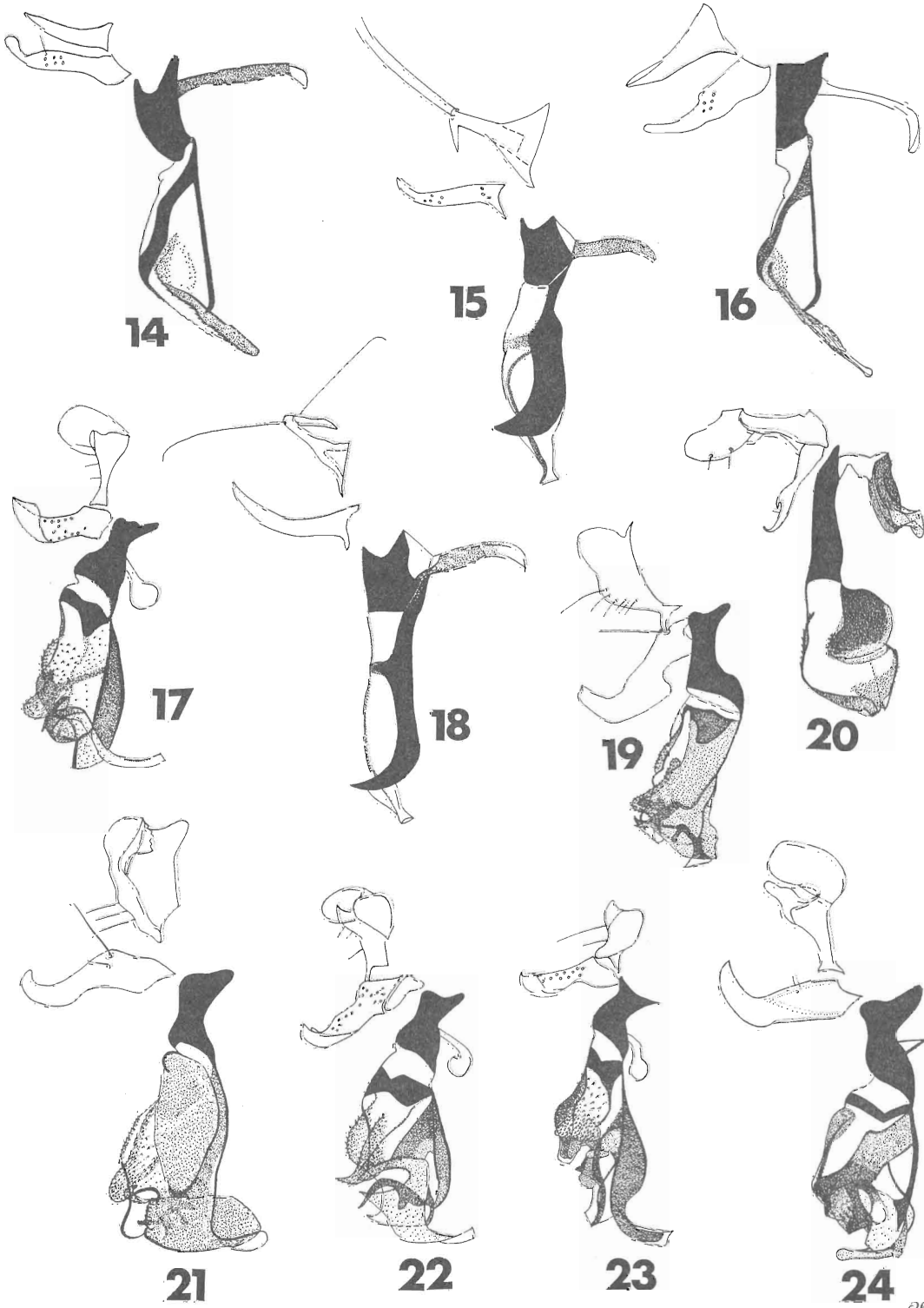
## Plate 4. Inner and Outer Forceps (Posterior View)

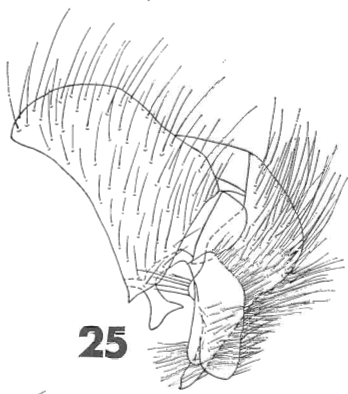
- Fig. 36. *Melinda scutellata*  
 Fig. 37. *Bengalia siamensis*  
 Fig. 38. *B. torosa*  
 Fig. 39. *B. emarginata*  
 Fig. 40. *Phumosia testacea*  
 Fig. 41. *Verticia fasciventris*  
 Fig. 42. *Bengalia labiata*  
 Fig. 43. *Melinda nuortevae*  
 Fig. 44. *Bengalia varicolor*  
 Fig. 45. *B. varicolor*  
 Fig. 46. *Phumosia indica*

## Plate 5. Sternites of Female (Figs. 47-53), 6th to 9th Tergites of Female (Figs. 54-60) and 6th to 9th Sternites of Female (Figs. 61-67)

- Fig. 47. *Onesia parafacialis*  
 Fig. 48. *Polleniopsis pilosa*  
 Fig. 49. *Phumosia testacea*  
 Fig. 50. *Melinda scutellata*  
 Fig. 51. *M. nuortevae*  
 Fig. 52. *Pollenia chotei*  
 Fig. 53. *Phumosia indica*  
 Fig. 54. *Polleniopsis pilosa*  
 Fig. 55. *Onesia parafacialis*  
 Fig. 56. *Phumosia testacea*  
 Fig. 57. *Pollenia chotei*  
 Fig. 58. *Melinda scutellata*  
 Fig. 59. *M. nuortevae*  
 Fig. 60. *Phumosia indica*  
 Fig. 61. *Melinda scutellata*  
 Fig. 62. *Onesia parafacialis*  
 Fig. 63. *Phumosia indica*  
 Fig. 64. *P. testacea*  
 Fig. 65. *Pollenia chotei*  
 Fig. 66. *Melinda nuortevae*  
 Fig. 67. *Polleniopsis pilosa*







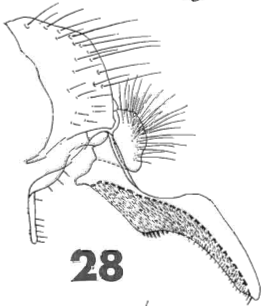
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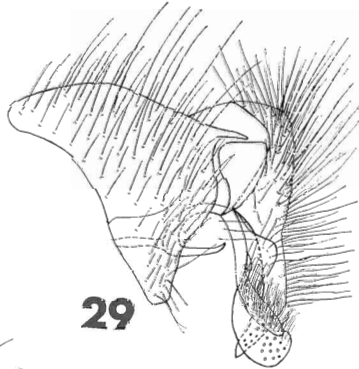
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**27**



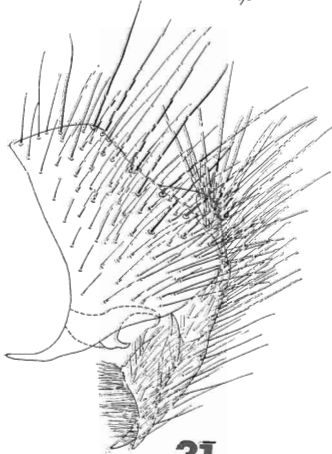
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**29**



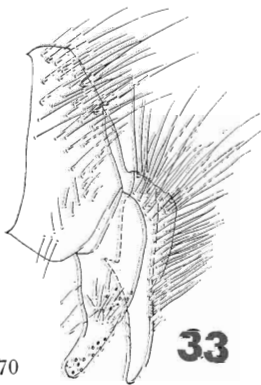
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**31**



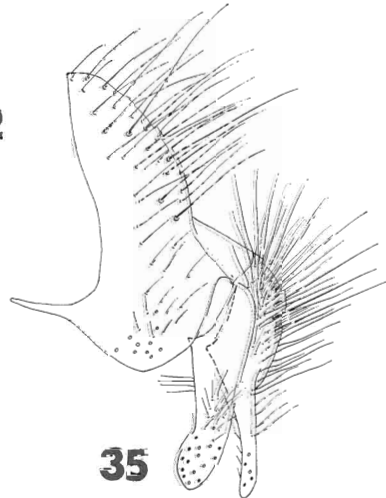
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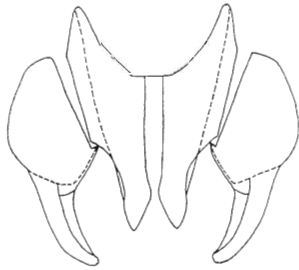
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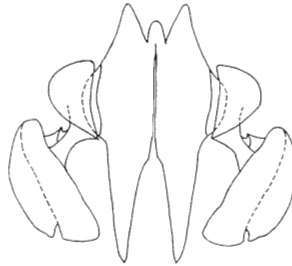
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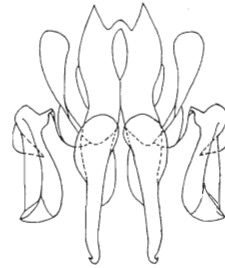
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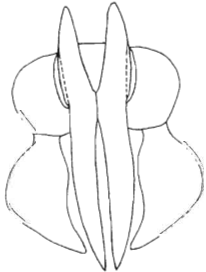
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**37**



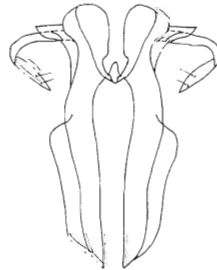
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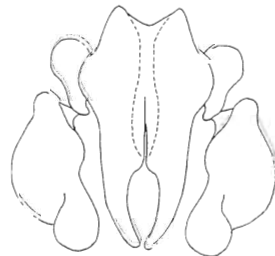
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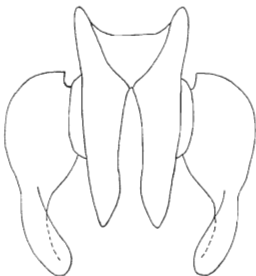
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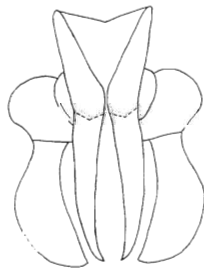
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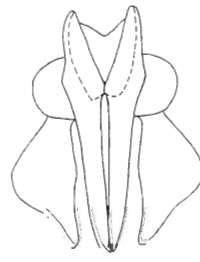
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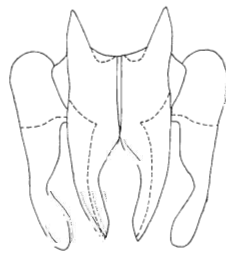
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**44**



**45**



**46**

