Pacific Insects 12 (3): 519-542 30 October 1970

TRIBE CALLIPHORINI FROM AUSTRALIAN AND ORIENTAL REGIONS, I. *MELINDA*-GROUP (Diptera: Calliphoridae)[1]

By **Hiromu Kurahashi**[2]

Abstract: *Paradichosia* Senior-White and *Paurothrix* Bezzi are synonymized with the *Melinda* Robineau-Desvoidy, mainly based upon the comparative morphology of the sexual organs in both sexes. Sixteen species of the *Melinda* and 1 of the *Tricycleopsis*, including 6 species and 1 subspecies described as new, are treated in this revision of the Australian and Oriental Calliphorini. These new forms are *Melinda ponti*, *M. vanemdeni*, *M. nuortevae*, *M. elegans*, *M. pusilla indica*, *M. malaisei*, and *M. maai*. The phylogenetic relationships between *Melinda* and *Onesia* and *Calliphora* are briefly discussed here.

This is the first study in a series on Australian and Oriental Calliphorini of the family Calliphoridae, which concerns a revision of the genus group *Melinda-Tricycleopsis*. This paper proposes subdividing the tribe based upon the comparative morphology of male and female genitalia. However, this concept is only briefly discussed here for the purpose of taxonomic convenience. The study on this subject will be published in a separate paper.

Research was mainly carried out at the B. P. Bishop Museum, Honolulu, including the use of their specimens, under the chairmanship of Dr J. Linsley Gressitt. Study of additional collections including types was made possible through the kindness of entomologists in different museums and institutes. The names of these institutes and museums to which the specimens belong are cited in the list of material examined throughout the text.

The area under study consists of the Indian Subcontinent, East Indies, New Guinea, Australia, New Zealand, Subantarctic islands, Melanesia, Polynesia and Micronesia. These localities are generally accepted as being in the Oriental and Australian Regions.

In the areas mentioned above, the genus *Melinda* was first revised by Senior-White et al. (1940) to include 3 species — *Melinda kocki* Malloch, *M. grisea* Malloch and *M. sumatrana* (Malloch). Further detailed examinations are required to determine if they belong to the true *cognata*-group or the *Melinda* of the present author, or not.

It is likely that the *Paradichosia* Sen.-White, 1923 is fundamentally identical to *Melinda* although some species have a few specialized characters in the external morphology. Senior-White et al. (1940) well redescribed the 9 Oriental species known up to the time. Bezzi (1927) and Malloch (1930) described *Paurothrix* for the 3 Samoan

1. Partial results of a grant to Bishop Museum from the United States National Institute of Health (AI-01723).

2. Department of Entomology, B. P. Bishop Museum, Honolulu, Hawaii 96818. Present address: Department of Anatomy, School of Medicine, Kanazawa University.

species. Examination of *Paurothrix bisetosa* Malloch indicates that it quite agrees with the genus *Melinda*. In the classification proposed below, these 2 genera will be synonymized with *Melinda* of the present author, and 6 species and 1 subspecies are described here as new.

Tricycleopsis Villeneuve, 1927 is recognized as another genus of the *Melinda*-group, which has been considered to be included into the genus *Calliphora* by Malloch (1927) and Senior-White et al. (1940). The evidence in male genitalia suggests it is more closely allied to *Melinda* than *Calliphora*, and belongs to the present group.

Key to subfamilies of Calliphoridae

1. Stem-vein of wing not setulose on posterodorsal surface of basal section ..... Subfamily Calliphorinae
   Stem-vein with distinct setulae on posterodorsal surface of its basal section 2
2. Occiput with a bare shining band behind upper 1/2 of occipital row; epistome projecting ..... Subfamily Rhiniinae
   Occiput without a bare shining band behind upper 1/2 of occipital row; epistome not much projecting ..... Subfamily Chrysomyiinae

Key to tribes of Calliphorinae

1. Propleura bare 2
   Propleura hairy 3
2. Prosternum hairy ..... Tribe Bengaliini
   Prosternum bare ..... Tribe Polleniini
3. Thoracic squama more or less hairy on upper surface ..... Tribe Calliphorini
   Thoracic squama quite bare 4
4. Posterior part of suprasquamal ridge with a tuft of black setulose erect hairs on a small well-defined black sclerite (posterior parasquamal tuft) ..... Tribe Luciliini
   Posterior parasquamal tuft absent 5
5. Anterior part of suprasquamal ridge bare; distance between right and left of presutural *ac* rather large, as shown in fig. 1a; mesothoracic spiracle rather large, remarkably swollen ..... Tribe Phumosiini
   Anterior part of suprasquamal ridge usually hairy, if not so, a distance between right and left of presutural *ac* small as shown in fig. 1b; mesothoracic spiracle smaller, not swollen ..... Tribe Calliphorini

Tribe CALLIPHORINI

The tribe Calliphorini is comprised of members of closely allied species of similar appearance, which are commonly called the blow flies. Several different criteria separate them into some 20 genera. *Calliphora* Robineau-Desvoidy is a group of most familiar flies which are of economic and medical importance throughout their geographical range, sometimes cosmopolitan in extent. They are generally oviparous and breed in animal carcasses, animal dung, and human feces. Some species are known as the primary sheep-maggot fly which causes myiasis in Australia and New Zealand. Near the group there are several related genera such as *Aldrichina* Townsend, *Triceratopyga* Rohdendorf, *Xenocalliphora* Malloch, *Acronesia* Hall and *Eucalliphora* Townsend.

Xenocalliphora is a peculiar genus indigenous to a limited area in the Australian Region.

Melinda Robineau-Desvoidy and *Onesia* Robineau-Desvoidy are other famous representatives of this tribe. Not much is known regarding the biology of these flies. They seem to be parasitic according to field observations and anatomical evidence. A few species of *Melinda* have been reared from land snails, and some species of *Onesia* from earthworms. *Polleniopsis* Townsend, *Pseudonesia* Villeneuve and *Melindopsis* Kurahashi are closely allied to the genus *Onesia*. *Onesia* was relegated to a subgenus of *Polleniopsis* in my previous work (Kurahashi 1964).

An interesting group which seems to be related to the ancestral stock of *Calliphora* is found in the Holarctic Region. It consists of *Onesiomima* Rohdendorf, *Cynomyopsis* Townsend, *Cyanus* Hall, *Cynomyia* Rob.-Desvoidy, and *Cynomyiomima* Rohdendorf.

Pericallimyia Vill., *Zernyiella* Zumpt, *Ochromelinda* Vill. and *Adichosina* Vill. which seem to be representatives of this tribe, are indigenous to the Ethiopian Region. I believe that these genera have some phylogenetic relationship to *Calliphora*. It, however, must be stated that the propleura may be bare or hairy in these genera, and in some cases within the same species. The hairy propleuron is a feature which is of great importance for all other genera of Calliphorini. The relationship between these Ethiopian genera of Calliphorini and the tribe Bengaliini must be studied in the future in relation to hairiness of propleura. Tribe Phumosiini should be clarified on the basis of anatomical comparison. Our knowledge of the so-called testaceous calliphorid flies has never been satisfactory in regard to phylogeny. Comparative morphology of testaceous flies should help clarify the significance of the hairy propleura in the Calliphorini.

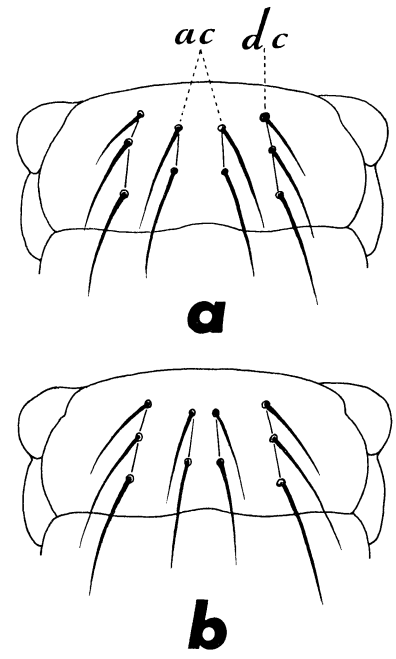

Fig. 1. Thoracic chaetotaxy: a, *Calliphora*-type; b, *Onesia*-type.

There is some doubt whether the tribe Calliphorini really represents a monophyletic group. Its relationships to other tribes must be fully studied to solve the question. I recognize the tribe as possibly being monophyletic and consisting of 3 to 5 sister-groups.

Characters used

The characters used in the classification of the tribe Calliphorini are: color, dusting, the presence or absence of hairs, chaetotaxy and genitalic structures. These have been proved of value in separating genera and species.

In the Australian and Oriental Calliphorini, some peculiar features which have never occurred in same groups from other zoogeographical regions were observed. For example, the eyes bear conspicuous hairs or are widely separated from each other even in the male in some species of *Calliphora* and *Melinda*. The setulose subcostal sclerites

are observed in *Xenocalliphora* Malloch. In most of *Calliphora*, the body coloration looks different from that of extralimital blow flies, being usually testaceous yellow to fulvous in part, or entirely bronzy with conspicuous tesselation. *Melinda* also has the body and legs generally testaceous in part, or wholly dark bronzy. Hardy (1937) used coloration to separate the main divisions. Patton (1934-1935) used a few structural characters of the terminalia in subdividing, resulting in the formation of three groups in *Calliphora* s. lat. Hardy (1947) also considered features of the terminalia, especially the male genitalia.

Characters used here follow those of Hardy and Patton. In addition some unfamiliar characters are adopted in this present series (fig. 1-2). Along the suprasquamal ridge, are 3 tufts of hairs found in the calliphorid thorax, namely tympanic, anterior parasquamal and posterior parasquamal tufts. The occurrence of the first and last is recognized as the most important feature of the tribe Luciliini. The posterior parasquamal tuft is completely lacking in the tribe Calliphorini. The presence or absence of tympanic and anterior parasquamal tufts will be often discussed in the classification of the present study. In some instances the tufts are poorly developed and consist of only a few hairs.

The present work attempts to apply the presutural acrostichal bristles to practical identification. Although they sometimes vary between types, it makes identification possible without examining the fine structures of the sex organs. The number of presutural *ac* is primarily important : presutural *ac* commonly 1 in the genus *Polleniopsis*, only a few exceptions occur in other genera where it usually varies from 2 to 3. The number of presutural *ac* 2 or 3 can be useful in the classification of species.

The relative position of presutural *ac* to presutural *dc* or each other *ac* is of secondary importance for classification of genera and tribes. The *Onesia*-type is shown in

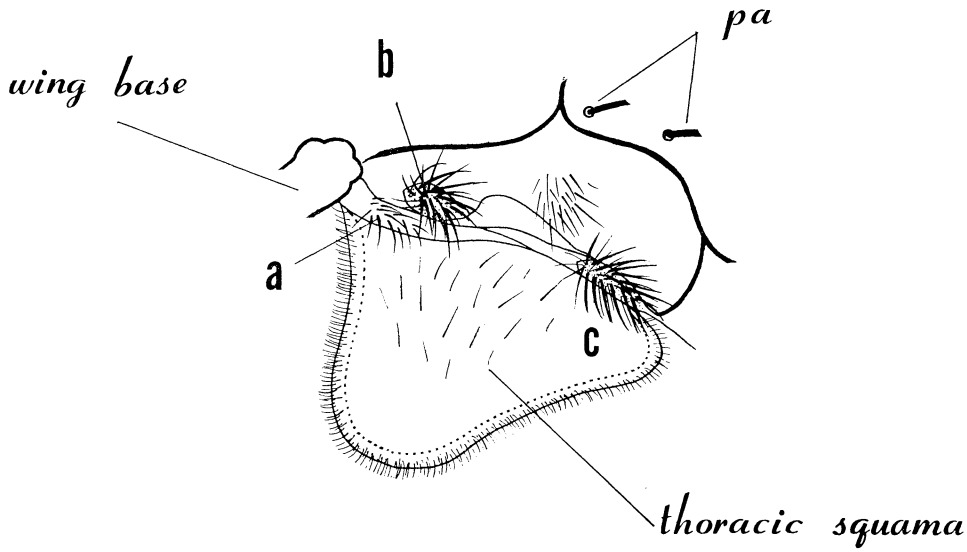

Fig. 2. Tufts of hairs present along suprasquamal ridge: a, anterior parasquamal tuft; b, tympanic t.; c, posterior parasquamal t.

fig. 1b where the rows of presutural *ac* are closely approximated to each other, as being more or less separated from the row of presutural *dc*. The *Calliphora*-type, shown in fig. 1a, exhibits that the rows presutural *ac* are widely separated from each other by a distance equal to or more than that between anterior and posterior bristles on each longitudinal line.

The ovipositor is specially modified in certain groups of viviparous Calliphorid flies where two different types are observed. The *Onesia*-type has a short, stout ovipositor which looks like that of *Sarcophaga* (fig. 3, A). The *Melinda*-type is further characteristic. The ovipositor is rather long with corneous elongate tergites. The 9th tergite seems to be combined with the 8th and usually form a shovel-shaped plate. The oviparous calliphorid flies have the common ovipositor which may well be primitive both to those of the 2 types mentioned above.

The internal female sexual organ differs. The uterovaginal tube of the flies which have the *Onesia*-type ovipositor has a straight tube with large lateral sacs after mating. On the other hand, the *Melinda*-type ovipositor is accompanied with the uterovaginal tube coiled after mating (fig. 3, C). The straight, simple shaped uterovaginal tube is observed in the oviparous calliphorid flies having the *Calliphora*-type ovipositor. Among these 3 types of female sexual organs the last is undoubtedly ancestral, and the former 2 may have been independently derived from the last respectively.

Some features of the aedeagus have been considered for grouping species (Hardy 1947). In *Onesia* the harpes or paraphallus, struts of Hardy, are fused together at their base for an appreciable distance but vary in length of fusion within the species. The harpes of the *Melinda* and *Calliphora* are distinctly separated at their base and for their entire length. *Melinda* also differs from the *Calliphora* in the poorly developed vesicae or hypophallus (fig. 3, a). The *Polleniopsis* usually has fused harpes except for several exceptions which have more or less separated harpes.

Phylogeny and taxonomic problems

I have examined the sexual organs of Japanese calliphorid flies (ms. in preparation). Morphology and biology divide the tribe Calliphorini into 3 genus groups—*Melinda*-group, *Calliphora*-group and *Onesia*-group—which have each evolved in different ways. Their phylogenetic relationships are illustrated in fig. 3. Preliminary notes are given in the diagnosis of each genus or genus group.

There are some questions regarding definition of the genera: (1) a reliable criterion to separate the genera *Melinda* and *Onesia* has never been found. (2) Australian authority has intended to combine *Onesia* with the genus *Calliphora*. These 3 genera were erected by Rob.-Desvoidy in 1830 and have been considered to be distinct although he placed them near each other. Later on, different opinions have appeared and they are in fact, closely allied to each other.

The history of the first problem was fully mentioned by Schumann (1964). Schiner (1862) and almost all other early entomologists placed *Melinda* as a synonym of *Onesia* or as the subdivided taxon of the genus, subgenus *Melinda* or species-groups of *cognata*-type and *sepulchralis*-type. Hendel (1901) and almost all other recent authorities lean toward the original idea of Rob.-Desvoidy in separating from *Onesia* a few species under

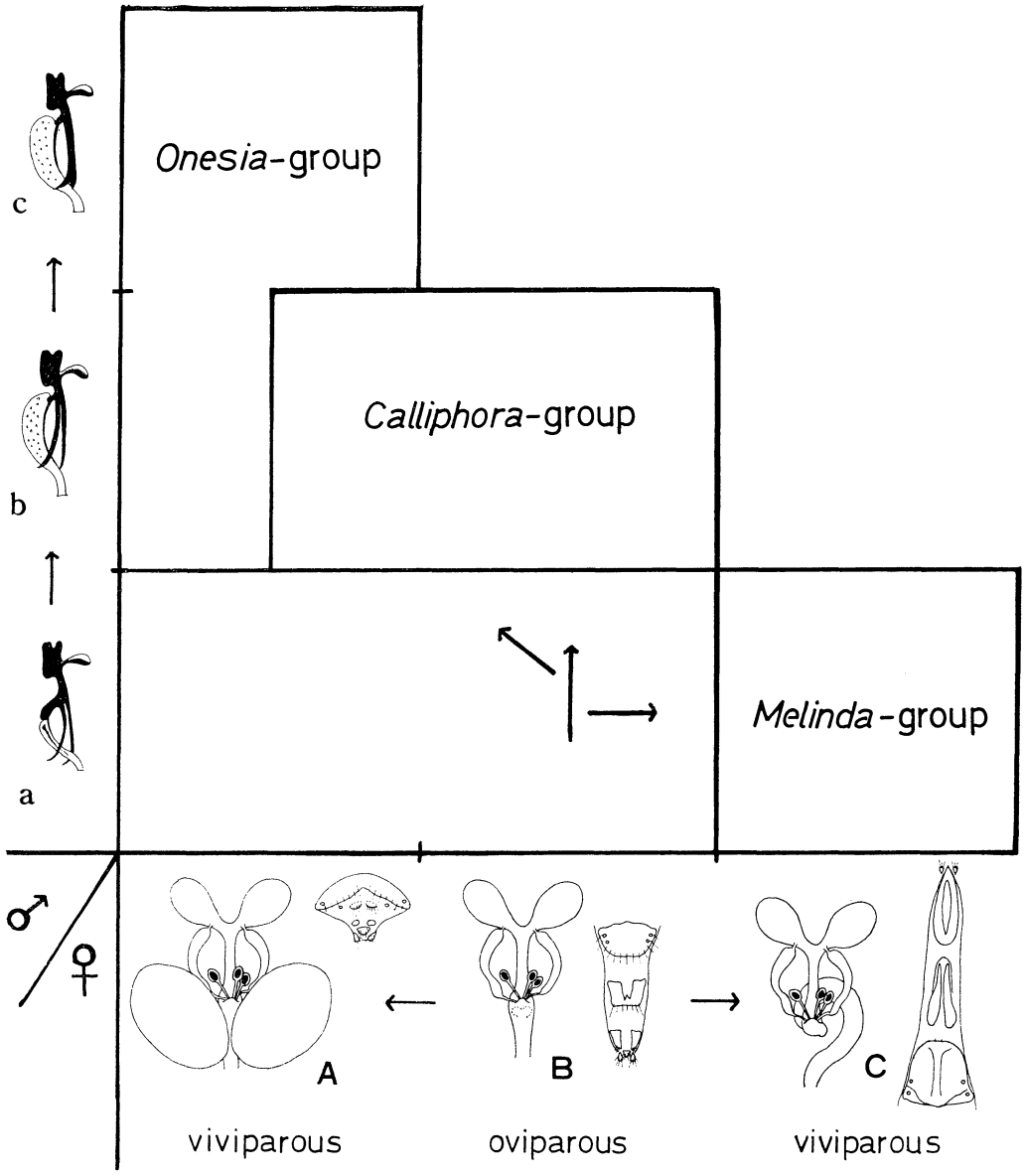

Fig. 3. Probable phylogenetic relationships between groups: a-c, aedeagi represent each group; A-C, internal female sexual organs and ovipositors represent each group.

the generic name of *Melinda*. Keilin (1919) well discussed the systematic position of *Melinda* and its relationship to the genus *Onesia*. He separated *Melinda* from *Onesia* not only by differential characters of the adult flies, but also by a comparative study of their life history and larval morphology. The characters and life history are summarized in his work based upon the type-species of genera. His work is most

reliable and he clarifies the relation between the 2 genera expressing also that we must examine separately and in chronological order all we know of the life history of species belonging to both genera in the near future.

A previous study (Kurahashi 1964) contains an error as do those of other contemporary authors (Zumpt 1956; Schumann 1964; Kano & Shinonaga 1968). The true *cognata*-type must be selected from the *Melinda* of these authors, and combined with the Oriental *Paradichosia*. The rest such as *Melinda pusilla* (Meigen), *M. pruinosa* (Enderlein) and *M. agilis* (Meigen) must be included in the genus *Onesia*.

G. H. Hardy contributed to the phylogeny of the genus *Calliphora* s. lat. as well as many other groups of Diptera. His work (1937) is excellent and draws attention to the evolution of *Calliphora*. In his series of works (1937, 1940 & 1947), *Onesia* is treated as a subgenus of *Calliphora* based upon the fact that the Australian *Calliphora* have a diverse appearance which has progressively changed from subgenus *Onesia* to subgenus *Calliphora* through *Proekon* Surcouf. *Onesia* Rob.-Desvoidy has page-priority over *Calliphora* which is at present widely used and more familiar than the former. For convenience of taxonomic practice, *Onesia* may be treated as an independent genus because its life history and morphology of its sex organs are so highly specialized.

Genus **Melinda** Rob.-Desvoidy

Melinda Rob.-Desvoidy, 1830, *Ess. Myod.*: 439 (type-species: *Musca cognata* Meigen, 1910).

Paradichosia Sen.-White, 1923, *Spol. Zeyl.* **12**: 311 (type-species: *Paradichosia scutellata* Sen.-White, 1923. **New Synonymy.**

Gymnadichosia Villeneuve, 1927, *Rev. Zool. Afr.* **40**: 388 (type-species: *Gymnadichosia pusilla* Vill., 1927).

Paurothrix Bezzi, 1927, *Bull. Ent. Res.* **17**: 239 (type-species: *Paurothrix xiphophora* Bezzi, 1927). **New Synonymy.**

Xerophilophaga Enderlein, 1933, *Mitt. Deut. Ent. Ges.* **4**: 120 (p. part), (type-species: *Melinda gentilis* Rob.-Desvoidy, 1830).

Distinguished from the other Oriental and Australian genera of Calliphorinae by the following characters:

Diagnosis: Thoracic squama quite bare; both tympanic and anterior parasquamal tufts developed; 3rd and 4th sternites often with a remarkable tuft of hairs, 2nd sternite sometimes rather elongate; ♂ genitalia small, withdrawn almost from sight; aedeagus with primitive harpes distinctly separated from one other for a distance from base to apex; vesicae poorly developed; ♀ internal and external genitalia extremely characteristic; ovipositor long, with corneous tergites specially adapted to viviparous habit, especially 8th and 9th combined tergite shovel-shaped; uterovaginal tube developed into a large cavity, which is rolled spirally on itself, and contains a large number of eggs which are hatched within its tube.

Ovipositor in *Melinda okazakii* Kano is an exception because its tergites are not so specially modified. The 9th tergite, however, is not as found in other species of *Melinda*. It may be combined with 8th tergite to form a small shovel. Internal sex organs of 5 Japanese species belonging to the *Paradichosia* of Kurahashi (1965), have been examined.

Bionomics: Viviparous. *Melinda itoi* Kano is a parasite of the land snail *Acusta despecta sieboldiana* (Pfeiffer) (Ito 1962; Kano & Shinonaga 1968). European species,

Melinda caerulea (Meigen) is also parasitic in the land snails *Helicella virgata* Costa and *Goniodiseus rotundata* Müller (Keilin 1919).

DISTRIBUTION: Throughout the Old World tropical regions, and partly invading the Palaearctic Region such as North Africa, Europe, China and Japan. In the Australian Region, Fiji and the Samoa Islands are known as its habitat.

Melinda ponti Kurahashi, new species

♂. *Head*: Eyes densely hairy, closely approximated but not touching; frontal stripe reddish black, reduced to a line at narrowest point of frons; parafrontalia and parafacialia narrow, silver-dusted, setulose at level of antennal bases; ca. 7 pairs of *ori* present on anterior 1/2 of parafrontalia; face dark gray dusted, without median carina; epistome brown, slightly projecting forward; facialia dark brown, silver-dusted, with a series of fine setulose hairs on lower 2/3; vibrissae long; vibrissaria, medianae and lower parts of parafacialia brown; jowls black, gray-dusted, clothed with fine hairs; post-jowls clothed with both black and yellow hairs; antennae dark brown, 3rd segment 3× as long as 2nd; arista blackish, long-plumose; palpi orange, blackish-haired.

Thorax: Black, silver-dusted on anterior parts of dorsum and pleura; 3 broad metallic black longitudinal stripes indicated on dorsum under certain incidence of light; 2 fine black submedian longitudinal stripes also present anteriorly; humeri black, silver-dusted, with black hairs; posterior calli reddish black; scutellum dark, brown apically; prosternum and propleura brownish hairy, metapleura, pteropleura, notopleura and sternopleura blackish haired; supraspiracular convexity short, pubescent; pleurotergite with fine black hairs; post-alar declivity dark red, with black hairs, a few yellow hairs sometimes present among black ones; suprasquamal ridge with anterior parasquamal tuft, tympanic tuft also present; mesothoracic spiracle brown, metathoracic one dark brown. Chaetotaxy; *ac* 2+3, *dc* 2-3+3, *ia* 1+2, *h* 2-3, *ph* 2-3, *prs* 1, *sa* 3, *pa* 2, *n* 2, *sc* 3+1, *st* 1+1, propleural and prostigmatic bristles present.

Wings: Hyaline; vein brown; epaulet blackish; basicosta brown; subcostal sclerite brown, yellowish pubescent; node of 2nd and 3rd longitudinal veins with a few black setulae above and below; bend of 4th vein forming a right angle; squamae dark brown, alar squama pale on base, thoracic one bare on upper surface. Halteres yellow.

Legs: Front coxa largely black in front; femora and tibiae fulvous yellow; femora with a dark patch sharply limited on anterior surface of apical 1/2; tarsi black; front tibia with 1 *p*; mid tibia with 1 *ad*, 1 *pd*, 2 *p* and 1 *v*; hind tibia with 2-3 *pd*, 2-3 *ad* and 2-3 *av*, the bristles on hind tibia fine, rather long (fig. 6b).

Abdomen: Black, ventral sides of 1st and 2nd combined tergite and latero-ventral sides of 3rd brown; 4th and 5th with gray dusting which produces an irregular pattern; fine decumbent marginal bristles on 3rd tergite; erect marginal bristles on 4th and 5th, and discal bristles on the latter; 2nd sternite large, black, 3rd and 4th each with a characteristic tuft of hairs (fig. 5c).

♀. Eyes haired, separated at vertex slightly less than .25 width of head; frontal stripe reddish black, parallel-sided, about 3× as wide as a parafrontalia at level of anterior ocellus; ca. 6 pairs of *ori* present; *ors* 2+1; *oc* strong; *ov* and *iv* well developed; 3rd antennal segment reddish basally. *Legs*: Hind tibial bristles not exceptionally long and slender. Thorax and abdomen similar to those of ♂ except genitalic characters.

Length: 6.5-7.5 mm.

Holotype ♂, Kambaiti, 2100 m, NE Burma, 1.V.1934, R. Malaise. Paratype ♀, Same as type, but 11.V.1934. The holotype is preserved in the Stockholm Museum. The

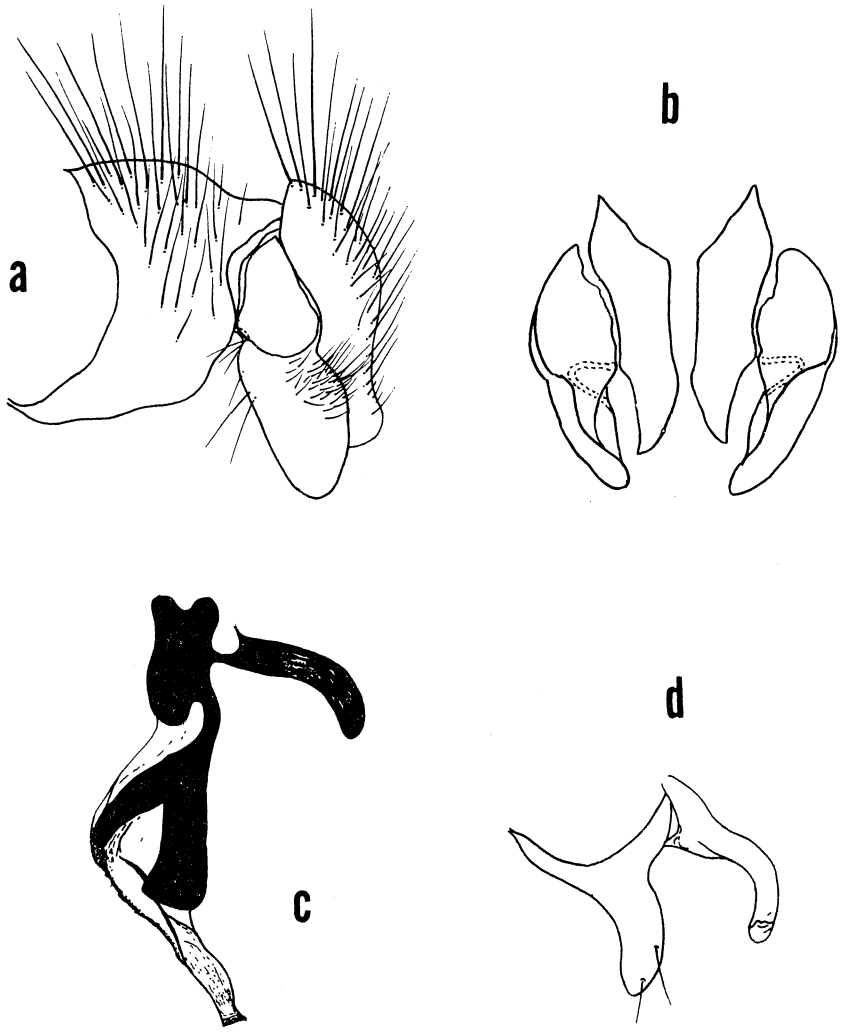

Fig. 4. *Melinda ponti* Kurahashi, n. sp., ♂ genitalia; a, cerci and paralobi, lateral view; b, cerci and paralobi, caudal view; c, aedeagus, lateral view; d, anterior and posterior parameres, lateral view.

paratype is deposited in the Museum Zoologicum Universitatis, Helsinki.

BIONOMICS: Unknown.

DISTRIBUTION: NE Burma.

Relationships: The present new species is closely allied to *Melinda tsukamotoi* Kano from Japan, but differs from it in the ♂ genitalia. The ♂ of *M. ponti* Kurahashi, n. sp. is also distinguished from that of *M. tsukamotoi* by the hind tibial bristles being rather fine and long, and the tufts of 3rd and 4th sternites. It is difficult to separate the ♀ of both species. The coloration of humeri is, however, different between the

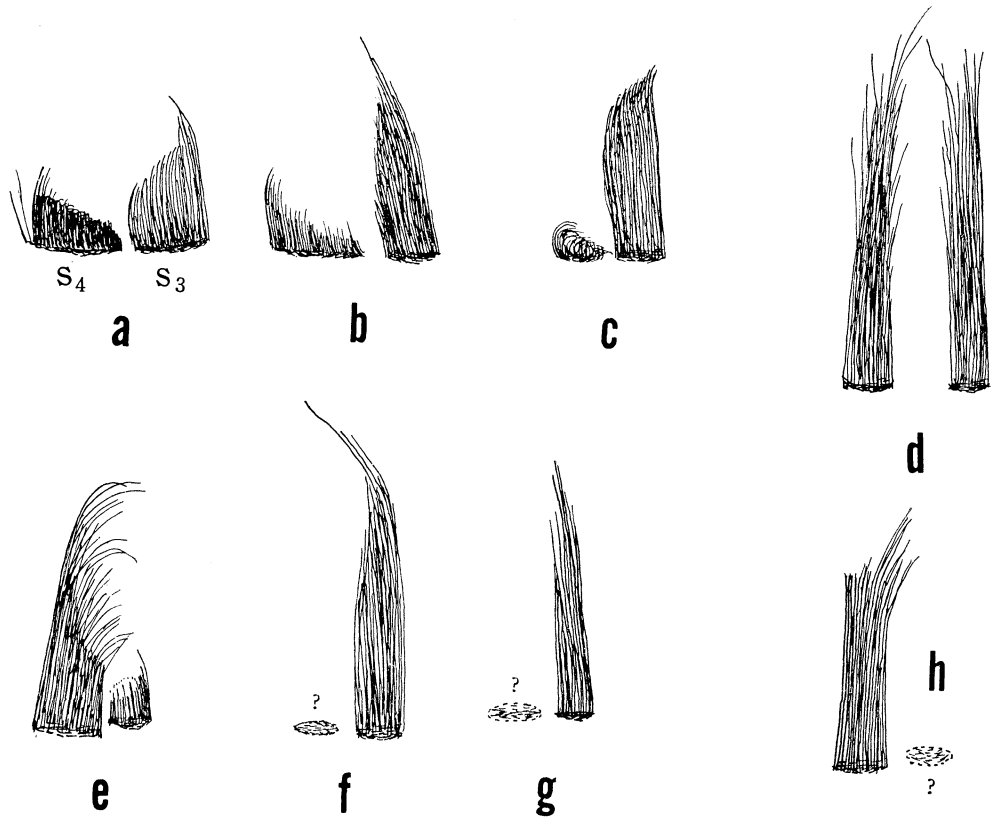

Fig. 5. Tufts of hairs on 3rd and 4th sternites: a, *Melinda tsukamotoi* Kano; b, *M. scutellata* (Sen.-White); c, *M. ponti* Kurahashi, n. sp.; d, *M. vanemdeni* Kurahashi, n. sp.; e, *M. abdominalis* (Malloch); f, *M. crinitarsis* (Villeneuve); g, *M. dubia* (Malloch); h, *M. nigricans* (Villeneuve).

♀ of both species. It is black in *M. ponti* n. sp., red in *M. tsukamotoi*. The spring form of the latter has the humeri and legs entirely black.

Melinda crinitarsis (Villeneuve), n. comb.

Paradichosia crinitarsis Vill., 1927, *Rev. Zool. Afr.* 40: 219.—Sen.-White et al., 1940, *Fauna Brit. India*, Dipt. 6: 63.

Type-locality: Koshun, Taiwan; Type in the Deutsches entomologisches Institut, Berlin.

Length: 10.0-11.0 mm.

SPECIMEN EXAMINED. TAIWAN: Type ♂, Koshun, ?.VI.1908, H. Sauter, (DEI).

BIONOMICS: Nothing is known.

DISTRIBUTION: Taiwan.

Melinda vanemdeni Kurahashi, new species

♂. *Head*: Eyes hairy, closely approximated but not touching; frontal stripe reddish brown, reduced to a fine line at narrowest point of frons; parafrontalia and parafacialia narrow, silver-dusted, parafrontalia very sparsely setulose at level of antennal bases, also with about 10 *ori*; face yellow-gray dusted, without median carina; epistome pale brown, slightly projecting forward; facialia brown, yellow-gray dusted, with a series of fine setulose hairs on lower 1/2; vibrissae developed; vibrissaria, medianae and lower parts of parafacialia red, yellowish and golden-dusted, medianae narrow, sparsely setulose; jowls black, yellow-gray dusted, clothed with golden yellow soft hairs entirely, several black hairs present on anterior parts of jowls; occiput clothed with golden soft hairs besides rows of black post-orbital bristles; antennae red-orange, the 3rd segment largely darkened distally, about 3× as long as 2nd; arista black, long plumose; palpi orange, with several long yellow hairs as well as black one; probosis yellow and black-haired.

Thorax: Black, silver and yellow-gray dusted on dorsum and pleura, 3 broad metallic black longitudinal stripes indicated on dorsum under certain incidence of light, 2 fine black submedian longitudinal stripes also present anteriorly; humeri, posterior calli and lateral sides of dorsum reddish; scutellum black, reddish apically and laterally; prosternum and pleura clothed with fine yellow hairs, metapleura and pteropleura also with black hairs on upper parts; supraspiracular convexity short pubescent; pleurotergite with fine brown and black hairs; post-alar declivity dark red, with yellow soft hairs on anterior 1/2, also with black hairs on posterior 1/2; humeri and notopleura yellow, black-haired; suprasquamal ridge with anterior parasquamal tuft of fine yellow hairs, tympanic tuft also present; mesothoracic spiracle orange, metathoracic one dark brown. Chaetotaxy: *ac* 2+3, *dc* 2+3, *ia* 1+2, *h* 3, *ph* 2, *prs* 1, *sa* 2, *pa* 2-3, *n* 2, *sc* 4+1, *st* 2+1, anterior lower one fine, propleural and prostigmatic bristles present.

Wings: Brownish hyaline; veins brown; epaulet largely black, reddish basally; basicosta brown; subcostal sclerite brown, yellowish pubescent; node of 2nd and 3rd longitudinal veins with a few black setulae above and below; bend of 4th vein forming a right angle; squamae yellowish brown, alar squama whitish basally, thoracic one bare. Halteres orange.

Legs: Orange, except for dark tarsal segments; front tibia with 1 *p*; mid tibia with 1 *ad*, 1 *pd*, 2-3 *p* and 1 *v*; hind tibia with 2-3 *pd*, 2-3 *ad* and 2-3 *av*, the bristles on hind tibia not unusually long.

Abdomen: 1st and 2nd combined tergite yellow, with a median dark stripe; 3rd yellow, silver-dusted, with a median dark stripe and a marginal dark band, sometimes the band reduced; 4th and 5th mainly brownish black with silver dusting which produces an irregular pattern; fine decumbent marginal bristles on 3rd tergite; erect marginal bristles on 4th and 5th, and discal bristles on latter; 2nd sternite large, orange; 3rd and 4th sternites each with a tuft of long dark hairs (fig 5d).

♀. Eyes densely haired, separated at vertex by slightly less than .25 width of head; frontal stripe dark red, parallel-sided, about 3× as wide as a parafrontalia at level of anterior ocellus; parafacialia and parafrontalia setulose, parafrontalia silver-dusted, darkened toward vertex; ca. 7 *ori* present; *ors* 2+1; *oc* developed; *ov* and *iv* developed; 3rd antennal segment elongate, about 3.5× as long as 2nd, largely darkened except base, sometimes entirely dark brown. Thorax: prosternum and propleura covered with yellow soft hairs, soft hairs on mesopleura, pteropleura and sternopleura more or less melanized; center of post-alar declivity with a tuft of black and yellow hairs; *st* 1+1; presutural *ia* sometimes absent. *Abdomen*: Mainly brownish black, sides and venter of 1st and 2nd combined and 3rd tergites reddish; sternite dark brown to black. Legs and wings similar to those of ♂.

Length: 9.0-11.5 mm.

Holotype ♂, Kambaiti, 2100 m, NE Burma, 28.V.1934, R. Malaise. Paratypes: 2 ♂♂, 3 ♀♀, Kambaiti, 600 & 2100 m, NE Burma, 11.V.1934, 18.V.1934, 24.V.1934, 26.V.1934, 4.VI.1934, R. Malaise. The holotype and 3 paratypes are preserved in the Museum Zoologicum Universitatis Helsinki. Two paratypes in the Stockholm Museum.

BIONOMICS: Unknown.

DISTRIBUTION: NE Burma.

Relationships: This new species is closely allied to *Melinda abdominalis* (Malloch). The latter has the following characteristics which distinguish itself from *vanemdeni*: scutellum entirely orange, notopleura and sides of scutum also orange; pteropleura, mesopleura and sternopleura blackish hairy; tuft of hairs on ♂ 3rd sternite conspicuously shorter than that on 4th (fig. 5e).

Melinda abdominalis (Malloch), n. comb.

Paradichosia abdominalis Mall., 1931, *Ann. Mag. Nat. Hist.* ser. 10, **7**: 198.—Sen.-White et al., 1940, *Fauna Brit. India,* Dipt. **6**: 59.

Type-locality: Pahang, Federated Malay States; in BMNH.

Length: 8.0 mm.

SPECIMEN EXAMINED. MALAY PENINSULA: Holotype ♂, Pahang, Gunong Jahan Padang, 1500 m, 12.XII.1921, H. M. Pendlebury (BMNH).

BIONOMICS: Nothing is known.

DISTRIBUTION: India (United Prov., Mussoorie) and Malay (Sen.-White et al., 1940).

Melinda scutellata (Sen.-White), n. comb.

Paradichosia scutellata Sen.-White, 1923, *Spol. Zeyl.* **12**: 312.—Sen.-White et al., 1940, *Fauna Brit. India,* Dipt. **6**: 61.

Type-locality: Darjeeling District, India; in BMNH.

Length: 7.0 mm.

SPECIMENS EXAMINED. NEPAL: 1 ♂, Damp evergreen oak forest above Sangu, 2550 m,

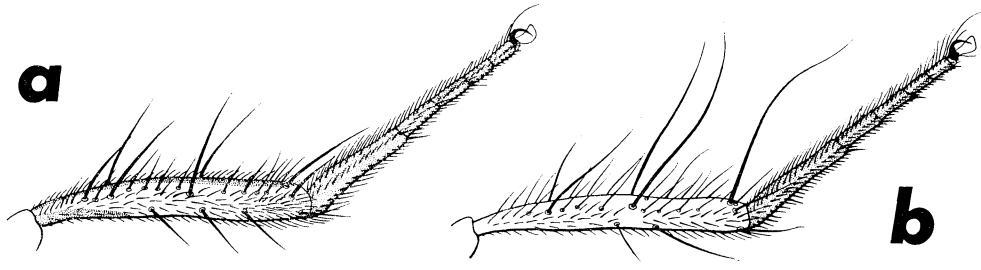

Fig. 6. Hind tibial bristles in ♂, anterior view of left tibia: a, *Melinda tsukamotoi* Kano; b, *M. scutellata* (Sen.-White).

Taplejung Distr., 2-26.XI.1961, R. L. Coe (BMNH). INDIA: Holotype ♂, Mungpoo, 870-1560 m, Darjeeling Dist., Sikkim, 5.II.1920, G. E. Shaw (BMNH); 1 ♂, Darjeeling, 8-19.V.1917, (BMNH). BURMA: 1 ♂, Lohit River, Mishmi Hills, 30.III.1935, M. Steele (BMNH); 3 ♀♀, Kambaiti, 2000 m, 25.IV.1934, 24.V.1934, 4.VI.1934, R. Malaise (MZH); 1 ♀, Kambaiti, 2100 m, 5.V.1934, Malaise (BMNH). MALAY PENINSULA: 3 ♂♂, Gunong Benom, 1800 m, Pahang, 31.VII.1925, I. H. N. Evans, 31.VII.1926, (BMNH).

BIONOMICS: Nothing is known.

DISTRIBUTION: Nepal, India, Burma and Malay.

Melinda nuortevae Kurahashi, new species

♀. *Head*: Eyes hairy, separated at vertex by a distance slightly more than .20 total width of head; frontal stripe black, slightly narrowed toward vertex, width about 2× that of a parafrontalia at level of anterior ocellus; parafacialia and parafrontalia silver white, sparsely setulose, with irregularly shifting dark spots; parafrontalia darkened toward vertex; ori 6-7; *ors* 2+1; *oc* strong; *ov* and *iv* strongly developed; *poc* present; occipital hairs rather strong; face dark, gray-dusted, without median carina; epistome dark, slightly projecting forward; facialia with fine black hairs on lower 1/2; medianae and vibrissaria dark brown; jowls black, dark gray-dusted, clothed with black fine hairs, equal to 1/8 height of head; post-jowls and occiput concolorous with jowls, clothed with yellow hairs; 2 rows of post-orbital bristles developed; antennae dark brown, 2nd antennal segment and base of 3rd reddish, the 3rd about 3× as long as 2nd; arista dark brown, long plumose; palpi orange.

Thorax: Dark gray, with uneven silver-gray dusting, humeral and post-alar calli reddish orange; scutellum rufous except for dark disc; dorsum of thorax with indications of 3 broad and 2 narrow black stripes anteriorly; prosternum and propleura yellowish, hairy; sternopleura, mesopleura and pteropleura clothed with both black and yellow hairs; notopleura blackish hairy; supraspiracular convexity pubescent; pleurotergite blackish setulose; post-alar declivity with both yellow and black hairs; suprasquamal ridge with anterior parasquamal and tympanic tufts; mesothoracic spiracle brown, metathoracic one dark brown. Chaetotaxy; *ac* 2+3, *dc* 2+3, *ia* 1+2, *h* 3, *ph* 2, *prs* 1, *sa* 3, *pa* 3, *sc* 4+1, *st* 2+1, propleural and prostigmatic bristles developed.

Wings: Hyaline, rather yellowish; vein brown; epaulet dark brown; basicosta light brown; subcostal sclerite light brown, pubescent; node of 2nd and 3rd longitudinal veins with several black setulose hairs above and below; 4th longitudinal vein bent with a right angle; squamae brown, alar squama whitish on base, thoracic one bare on upper surface.

Legs: Fulvous yellow, tarsi and anterior surface of coxae darkened; front coxa with yellowish soft hairs in front of basal 1/2; front tibia with 1 *p* and a row of short *ad*; mid tibia with 1 *ad*, 2 *pd*, 2 *p* and 1 *v*; hind tibia with 2 *ad*, 2 *av* and 2 *pd*, these bristles short.

Abdomen: Blackish gray with patches of silver tomentum which form a shifting pattern; posterior margin of 5th tergite reddish banded; 1 strong marginal bristle present on sides of 1st and 2nd combined tergite; fine decumbent marginal bristles on 3rd; erect marginals on 4th and 5th, and discals also on latter; abdominal hairs black.

♂. Unknown.

Length: 7.0 mm.

Holotype ♀, Kambaiti, 2000 m, NE Burma, 6.IV.1931, R. Malaise. Paratypes: 2 ♀♀, Kambaiti, 2100 m, NE Burma, 11.V.1934, 30.V.1934, Malaise. The type specimens are preserved in the Museum Zoologicum Universitatis Helsinki. One paratype is deposited

in the Stockholm Museum.

BIONOMICS : Unknown.

DISTRIBUTION : NE Burma.

Relationships. This new species is closely allied to ♀ of *M. scutellata* (Sen.-White), but differs from it in its humeral and posterior calli being red and the abdominal tip reddish banded. The scutellum of *M. nuortevae* n. sp. is largely or almost wholly reddish in color.

Melinda nigricans (Villeneuve), n. comb.

Paradichosia nigricans Vill., 1927, *Rev. Zool. Afr.* **40**: 387.—Sen.-White et al., 1940, *Fauna Brit. India,* Dipt. **6**: 63.—Hennig, 1941. *Ent. Beih. Berl.-Dahlem* **8**: 180.

Type-locality : Chip-Chip, Taiwan ; in the Deutsches entomologisches Institut, Berlin.

Length : 5.0-6.0 mm.

SPECIMEN EXAMINED. TAIWAN : Type ♂, Chip-Chip, ?.III.1909, H. Sauter, (DEI).

BIONOMICS : Nothing is known.

DISTRIBUTION : Taiwan.

Melinda dubia (Malloch), n. comb.

Paradichosia dubia Mall., 1931, *Ann. Mag. Nat. Hist.* ser. 10, **7**: 197. —Sen.-White et al., 1940, *Fauna Brit. India,* Dipt. **6**: 60.

Type-locality : Montes Tengger, Java ; in BMNH.

This species is closely similar to *M. nigricans* (Villeneuve) except for its scutellum and femora being entirely blackish.

Length: 5.0-6.0 mm.

SPECIMENS EXAMINED. JAVA : Holotype ♂, Allotype ♀, Montes Tengger, 1200 m, ?.?. 1890, H. Fruhstorfer (BMNH).

BIONOMICS : Nothing is known.

DISTRIBUTION : Java.

Melinda elegans Kurahashi, new species

♂. *Head*: Eyes sparsely covered with microscopic minute hairs, separated at narrowest point of frons by width of anterior ocellus ; frontal stripe reddish, more or less obliterated at narrowest point ; parafrontalia and parafacialia narrow, yellow silver dusted, with very sparse hairs, parafrontalia with ca. 5 fine *ori* ; face dark brown, wholly yellow-gray dusted, without median carina ; epistome yellowish gray, not prominent ; facialia dark brown, densely yellow-gray dusted, bare, some black setulae however present just above vibrissae ; vibrissae long ; peristomal bristles black, strong ; medianae and vibrissaria red ; jowls and post-jowls dark, covered with yellowish gray dusting, clothed with yellow hairs, a few black hairs present on anterior parts of jowls; occiput gray-dusted, with yellow hairs except for black postorbital hairs ; antennae

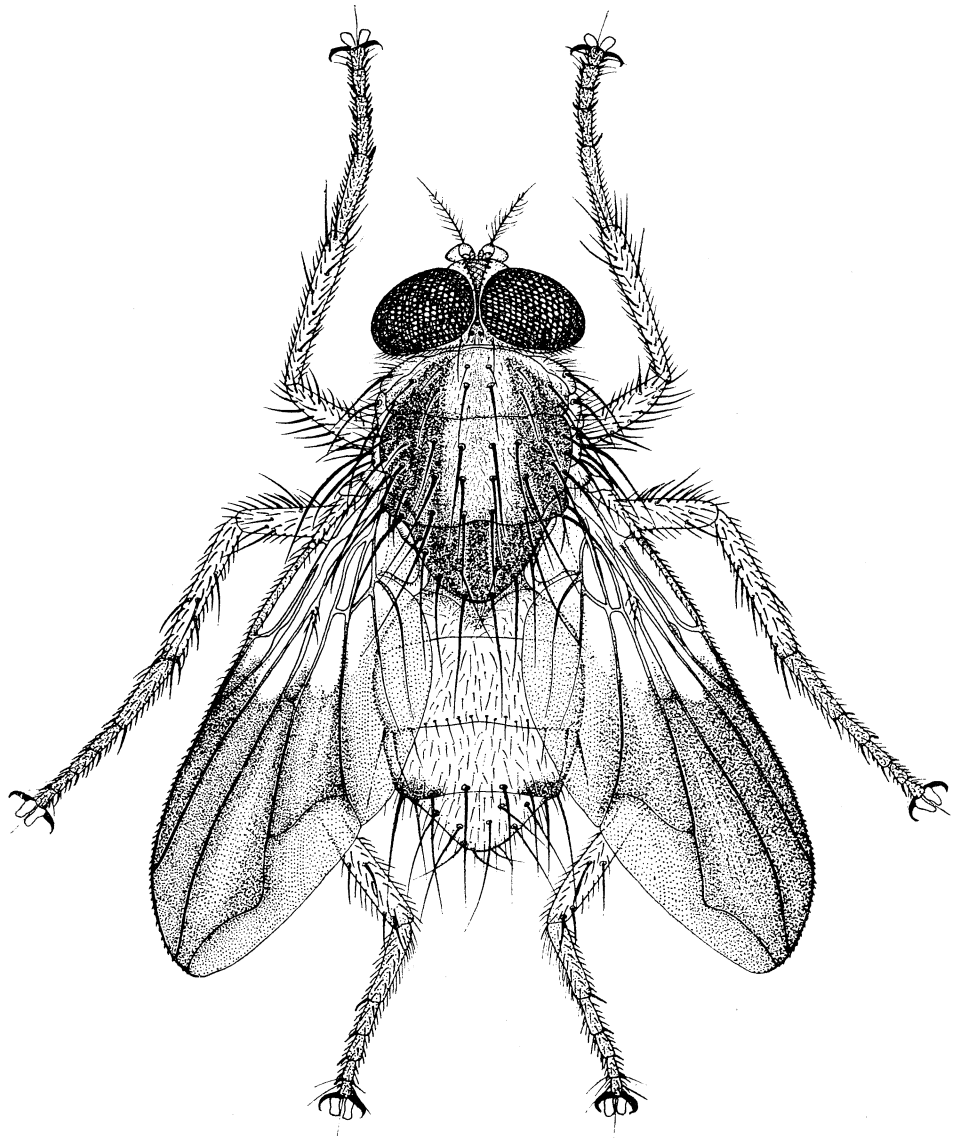

Fig. 7. *Melinda elegans* Kurahashi, n. sp. ♂.

bright orange, the 3rd antennal segment 3.5 × as long as 2nd, the 2nd without long hairs; arista dark brown, long-plumose towards tip; palpi bright orange.

Thorax: Black except for bright orange humeri, notopleura, supraspiracular convexity, pleurotergite and prosternum, yellow-gray and golden dusted in parts, broad median golden stripe present on dorsum; scutellum concolorous with thoracic dorsum; propleura brownish hairy, the other pleura covered with brownish and blackish hairs; prosternum yellowish hairy; supraspiracular convexity pubescent; pleurotergite blackish setulose; post-alar declivity black, with blackish hairs; suprasquamal ridge not observed; thoracic spiracles blackish brown.

Chaetotaxy; *ac* 1+3, *dc* 2+3, *ia* 0+2-3, *h* 1, *ph* 1, *prs* 1, *sa* 3, *pa* 2, *n* 2, *sc* 3+1, *st* 1+1, propleural and prostigmatic bristles present.

Wings: Dark brown on apical 1/2, basal 1/2 bright orange; epaulet and basicosta bright orange; subcostal sclerite orange, yellow pubescent; node of 2nd and 3rd longitudinal veins with a few black setulae above and below; bend of 4th longitudinal vein forming a rounded angle; R_5 open; squamae yellowish orange, thoracic one bare. Halteres brown.

Legs: Brown, tibiae and tarsi slightly darkened; front tibia with several *ad* and 1 *p*; mid tibia with 1 *ad*, 1 *pd*, 2 *p* and 1 *v*; hind tibia with 2 *ad*, 2 *pd* and 2 *av*.

Abdomen: Bright orange except for dark lateral hind margin of 4th tergite; no abdominal pattern indicated; abdominal hairs and bristles black, the latter developed at hind margin of 4th and 5th tergites, the 1st and 2nd combined and 3rd tergites with marginal bristles only at both lateral hind margins; sternites orange, 2nd sternite large, 3rd and 4th each with a tuft of black hairs; hypopygium inconspicuous; ♂ genitalia not examined.

♀. Unknown.

Length: 6.5 mm.

Holotype ♂ (BISHOP 9195), Lami, Viti Levu, Fiji Islands, ?.III.1951, N. L. H. Krauss. The holotype specimen is preserved in the B. P. Bishop Museum, Honolulu.

BIONOMICS: Unknown.

DISTRIBUTION: Fiji Is.

Relationships. This new species can be easily distinguished fom other allied species by its characteristic coloration of body and wings.

Melinda pusilla pusilla (Villeneuve), n. comb.

Gymnadichosia pusilla Vill., 1927, *Rev. Zool. Afr.* **15**: 388.—Villeneuve, 1933, *Bull. Ann. Soc. Ent. Belg.* **73**: 196.—Hennig, 1941, *Ent. Beih. Berl.-Dahlem* **8**: 180.
Paradichosia pusilla: Sen.-White et al., 1940, *Fauna Brit. India,* Dipt. **6**: 64.—Zumpt, 1956, *Lind., Fliegen Pal. Reg.* **64i**: 57.—Kano & Shinonaga, 1968, *Fauna Jap.,* Calliphoridae: 45.
Paradichosia japonica: Hori, 1961, *Sci. Rep. Kanazawa Univ.* **7**: 103.—Kurahashi, 1965, *Kontyû* **33**: 52.—Kano & Shinonaga, 1965, *Addend. Ann. Prof. Rep.* 406 M. L. 1965: 3.

Type-locality: Taiwan; in DEI.

Length: 6.0 mm.

SPECIMENS EXAMINED. TAIWAN: Type ♂, Tainan, ?.III.1909, H. Sauter, (DEI); 1 ♀, Fenkihu Hsien, 1370 m, Chiayi, 10-12.IV.1965 (BISHOP). S. CHINA: 1 ♀, Yung An, Fukien, 6.VII.1940, T. C. Maa (BISHOP). BURMA: 2 ♂♂, 1 ♀, Kambaiti, 2000 m, 6.IV. 1934, 18.IV.1934, 4.VI.1934, R. Malaise (MZH).

BIONOMICS: Adults are found on the leaves and twigs of trees standing along streams in woods and mountains.

DISTRIBUTION: Taiwan, S. China, Burma, and [Japan].

Melinda pusilla indica Kurahashi, new subspecies

This subspecies is easily distinguished from *M. p. pusilla* (Villeneuve) by the following characteristics: eyes hairy; sternopleura clothed only with yellowish soft hairs, the

other pleura also more or less yellow-haired ; presutural *ia* absent.

Length: 7.5-9.0 mm.

Holotype ♂, Mussoorie, United Prov., India, 20-26.VI.1905 (ex. coll. Brunetti). Paratypes: 1 ♂, 1 ♀, India, ? (pres. by E. Brunetti) (BMNH). The types are preserved in the British Museum (Nat. Hist.).

BIONOMICS: Unknown.

DISTRIBUTION: India.

Melinda pusilla tribulis (Villeneuve), n. comb.

Gymnadichosia pusilla var. *tribulis* Vill., 1933, *Bull. Ann. Soc. Ent. Belg.* **73**: 196.
Paradichosia pusilla var. *tribulis*: Zumpt, 1956. *Lind., Fliegen Pal. Reg.* **64i**: 57.

Type-locality: Szechuan, China ; in USNM.

Villeneuve described the present form as follows: antennae reddish basally ; scutellum entirely black ; legs yellow, but femora darkened dorsally ; preapical *d* on hind tibia normal in length ; abdominal bristles fine ; eyes closely approximated.

No available material.

BIONOMICS: Unknown.

DISTRIBUTION: China (Palaearctic).

KEY TO SUBSPECIES OF M. PUSILLA VILLENEUVE

1. Legs entirely yellow; scutellum at least fulvous yellow on apex 2
   Legs yellow, femora blackish on dorsal sides; scutellum entirely black ..... **M. pusilla tribulis** (Vill.)
2. Eyes hairy; presutural *ia* absent; sternopleura yellowish hairy ..... **M. pusilla indica** Kurahashi n. subsp.
   Eyes bare; presutural *ia* present; sternopleura blackish hairy ..... **M. pusilla pusilla** (Vill.)

Melinda flavibasis (Malloch), n. comb.

Paradichosia flavibasis Mall., 1931, *Ann. Mag. Nat. Hist.* ser. 10, **7**: 196.—Sen.-White et al., 1940, *Fauna Brit. India*, Dipt. **6**: 60.

Type-locality: Tjibodas, Java ; in BMNH.

This species is similar to *Melinda okazakii* Kano from Japan, but differs from it in the following characteristics: front coxa largely orange in front; femora fulvous yellow, without a dark patch sharply limited on apical 1/2; epaulet brown; mesothoracic spiracle brown.

Length: 7.0 mm.

SPECIMEN EXAMINED. JAVA: Holotype ♂, Tjibodas, 25-28.III.1904, K. Kraepelin (BMNH).

BIONOMICS: Nothing is known.

DISTRIBUTION: Java.

Melinda malaisei Kurahashi, new species

♂. *Head*: Eyes bare, closely approximated but not touching; frontal stripe black, slightly reddish anteriorly, obliterated at narrowest point of frons; parafrontalia and parafacialia silver white, narrow, sparsely setulose; parafrontalia darkened toward vertex; face dark, gray dusted, without median carina; epistome dark, not prominent; facialia with fine hairs on lower 1/2; medianae and vibrissaria dark red; jowls black, dark, dark gray dusted, clothed with black fine hairs; post-jowls and occiput concolorous with jowls, clothed with black and yellow hairs; antennae dark brown, the 3rd segment about 2.5 × as long as 2nd; arista dark brown, long-plumose; palpi brown with black hairs.

Thorax: Bluish black, covered with silver-white dusting; posterior calli slightly reddish, 3 broad metallic black longitudinal stripes indicated on dorsum under certain incidence of light; scutellum concolorous with thoracic dorsum; prosternum and propleura hairy; sternopleura, mesopleura and notopleura blackish hairy; supraspiracular convexity pubescent; pleurotergite blackish setulose; post-alar declivity with black hairs; suprasquamal ridge with anterior parasquamal tuft, tympanic tuft more or less developed; thoracic spiracles blackish brown. Chaetotaxy; *ac* 2+3, *dc* 2+3, *ia* 1+2, *h* 3, *ph* 2, *prs* 1, *sa* 3, *pa* 2-3, *n* 2, *sc* 3-4+1, *st* 1+1, propleural and prostigmatic bristles developed.

Wings: Hyaline, slightly brown-tinged entirely; veins brown; epaulet black; basicosta brown; subcostal sclerite brown, pubescent; node of 2nd and 3rd longitudinal veins with several black setulose hairs above and below; 4th longitudinal vein bent with a right angle; squamae brown, alar squama whitish on base, thoracic one bare on upper surface.

Legs: Black, tibiae brownish; front tibia with 1 *p* and a row of short *ad*; mid tidia with 2 *ad*, 1 *pd*, 3 *p* and 1 *v*; hind tibia with 2*av*, 2 *pd* and a row of *ad*; the bristles on the hind tibia usually short, weak.

Abdomen: Entirely bluish black, with patches of whitish silver tomentum which form a shifting pattern; fine decumbent marginal bristles on 3rd, erect marginals on 4th and 5th, and discals on latter; abdominal hairs black.

♀. *Head*: Eyes separated at vertex by a distance slightly less than 1/3 total width of head; frontal stripe parallel-sided, width about 3.5× that of a parafrontalia at level of anterior ocellus; jowls slightly less than .25 head-height; *ori* 6-7, *ors* 2+1, *oc* strong, *iv* and *ov* strongly developed, *poc* present, occipital hairs rather strong. Otherwise as described for ♂ except genitalic characters.

Length: 7.5-8.0 mm.

Holotype ♂, Kambaiti, 2100 m, NE Burma, 28.IV.1934, R. Malaise. Paratype ♀, Kambaiti, 600 m, NE Burma, 25.IV.1934, Malaise. The holotype is preserved in the Stockholm Museum, the paratype in the Museum Zoologicum Universitatis Helsinki.

BIONOMICS: Unknown.

DISTRIBUTION: NE Burma.

Melinda maai Kurahashi, new species

♀. *Head*: Eyes sparsely covered with microscopic minute hairs, or almost bare, separated at vertex by a distance slightly less than .33 total width of head; frontal stripe dark red to black, parallel-sided, width equal to 4.0 that of a parafrontalia at level of anterior ocellus; parafrontalia and parafacialia narrow, silver dusted, sparsely setulose, parafrontalia darkened toward vertex, with ca. 7 pairs of *ori*; *ors* 2+1, *oc* developed, *iv* and *ov* strongly developed, *poc* divergent, 1

occ present; face blackish, without median carina; facialia blackish, with black setulae on lower 1/3 of distance from vibrissae to antennal bases; vibrissae strong; epistome dark, not remarkably projecting forward; vibrissaria and medianae dark red, medianae narrow; jowls black, silver-gray dusted, clothed with fine long black hairs; post-jowls concolorous with jowls, clothed with black hairs, sometimes a few brownish hairs present on posterior limited areas of post-jowls and lower part of occiput; antennae black, the 3rd antennal segment 3× as long as 2nd; arista blackish brown, long-plumose on basal 2/3; palpi blackish brown to black, with black hairs.

Thorax: Black, silver and gray dusted, especially on dorsum and pleura, sometimes brown along sutures, 3 broad longitudinal dark stripes clearly indicated on anterior parts of dorsum; humeri and scutellum concolorous with thoracic dorsum; lateral wall of post-alar declivity partly reddish, sometimes wholly; pleura covered only with black hairs but propleura sparsely hairy; prosternum blackish hairy; supraspiracular convexity pubescent; pleurotergite blackish setulose; post-alar declivity with black hairs; suprasquamal ridge with anterior parasquamal tuft, only a few black hairs present on tympanic plate; thoracic spiracles blackish brown. Chaetotaxy; *ac* 1+3, *dc* 2+3, *ia* 0+2, h 3, *ph* 3, *prs* 1, *sa* 3, *pa* 2, *n* 2, *sc* 3+1, *st* 1+1, a few propleural and prostigmatic bristles present.

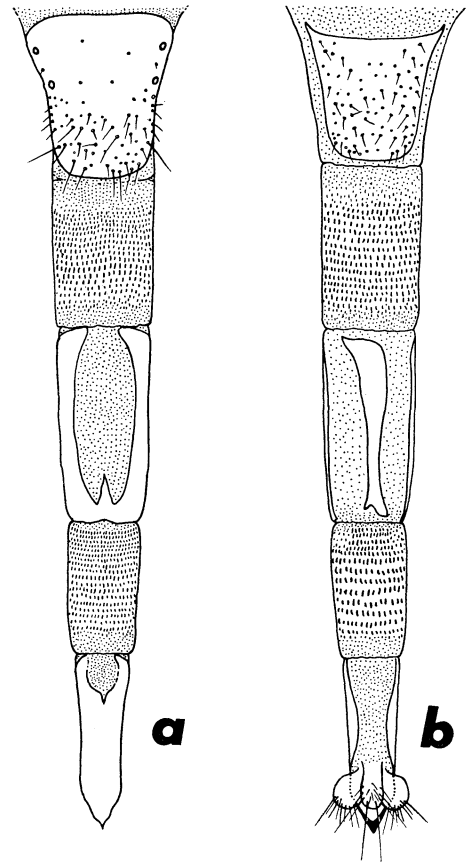

Fig. 8. *Melinda maai* Kurahashi, n. sp., ovipositor: a, dorsal view; b, ventral view.

Wings: Brownish hyaline; epaulet blackish; basicosta fuscous; subcostal sclerite brown, covered with tawny pubescence; node of 2nd and 3rd longitudinal veins with a few black setulae above and below; 4th longitudinal vein bent with an obtuse angle; squamae light brown, thoracic one bare. Halteres yellow.

Legs: Black, slightly reddish on tibiae and femora; front tibia with several *ad* and 1 *p*; mid tibia 1 *a*, 1 *pd*, 2 *p*, and 1 *v*; hind tibia with 2-3 *ad*, 2 *pd*, and 2 *av*.

Abdomen: Entirely black, metallic, thinly covered with silver and gray dust; 3rd to 5th tergites with poorly developed marginal bristles; ovipositor elongate, as shown in fig. 8, 8th tergite combined with 9th, strongly chitinized, corneous shiny brown.

♂. Unknown.

Length: 6.5-7.0 mm.

Holotype ♀ (Bishop 9196), Shaowu, Fukien, S. China, 25.IV.1943, T. C. Maa. Paratypes: 2 ♀♀, Shaowu, Fukien, S. China, 25.IV.1943, T. C. Maa. The type-specimens are preserved in the B. P. Bishop Museum, Honolulu.

BIONOMICS : Unknown.

DISTRIBUTION : S. China (Fukien).

Relationships: The present species is closely allied to *M. nitidapex* (Villeneuve) and *M. itoi* Kano, but differs from them in its legs being wholly fuscous to black, the black palpi and the light brown squamae.

Melinda xiphophora (Bezzi), n. comb.

Paurothrix xiphophora B., 1927, *Bull. Ent. Res.* **17** (3) : 239.—Malloch, 1930, *Ins. Samoa* **4** : 235.

Type-locality : Savaii Isl., Samoa ; ? in BISHOP.

I could not find the type of this species in Bishop Museum although it is indicated in the original description to be there.

Length : 7.0-8.0 mm.

BIONOMICS : Nothing is known.

DISTRIBUTION : Samoa.

Melinda auriceps (Malloch), n. comb.

Paurothrix auriceps Mall., 1930, *Ins. Samoa* **4** : 236.

Type-locality : Samoa ; in Hamburg Zoological Museum.

No available material.

Length : 9.0 mm.

BIONOMICS : Nothing is known.

DISTRIBUTION : Samoa.

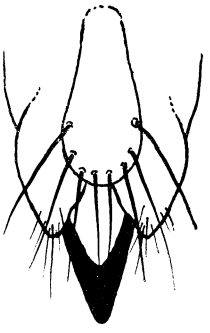

Fig. 9. *Melinda bisetosa* (Bezzi). Ventral view of terminal segment of ovipositor.

Melinda bisetosa (Bezzi), n. comb.

Paurothrix bisetosa Bezzi, 1927, *Bull. Ent. Res.* **17** (3) : 239.—Malloch, 1930, *Ins. Samoa* **4** : 235.

Type-locality : Savaii Isl., Samoa ; in BISHOP.

The terminal segment of ovipositor is illustrated in fig. 9.

Length : 5.5 - 9.0 mm.

SPECIMENS EXAMINED. SAMOA : Cotype ♀, Vaea, 330 m, Upolu, 25.IV.1924, E. H. Bryan, Jr. Paratype ♀, Salailua, Savaii, 23.V.1924, Bryan (BISHOP).

BIONOMICS : Nothing is known.

DISTRIBUTION : Samoa.

KEY TO SPECIES OF MELINDA

1. Eyes bare, actually scant, very short pile usually noticeable at high magnifications 2
   Eyes hairy 8
2 (1). Scutellum entirely black 3
   Scutellum with at least apex yellowish ; 1st and 2nd combined and 3rd abdominal

segments testaceous yellow ..... **pusilla pusilla** (Villeneuve)
3 (2). Humeri, notopleura and abdomen bright orange; wings dark brownish on apical 1/2, basal 1/2 yellowish ..... **elegans** Kurahashi*
Humeri, notopleura and abdomen not orange, usually metallic black, blue or bronzy, more or less grayish dusted 4
4 (3). Presutural *ac* 1; presutural *ia* absent 6
Presutural *ac* 2; presutural *ia* present or absent 5
5 (4). Presutural *ia* present ..... **malaisei** Kurahashi*
Presutural *ia* absent ..... **auriceps** (Malloch)
6 (4). Thoracic squama dark brown; external *ph* absent; palpi brownish 7
Thoracic squama light brown to yellow; external *ph* well developed; palpi blackish ..... **maai** Kurahashi*
7 (6). Antennae brownish; palpi brown; *st* 1+1 ..... **xiphophora** (Bezzi)
Antennae blackish; palpi dark brown; *st* 1-2+1 ..... **bisetosa** (Bezzi)
8 (1). Scutellum entirely black 9
Scutellum with at least apex yellowish 10
9 (8). Femora and tibiae entirely fulvous yellow; hind tibia with submedian *ad* and preapical *d* not over 3× as long as tibial diameter; hind tarsus with normal hairing above; wings quite conspicuously yellow at base ..... **flavibasis** (Malloch)
All femora black; tibiae brown-yellow; the submedian *ad* and preapical *d* more than 3× as long as tibial diameter; hind tarsus with dorsal hairs longer than usual, forming a short fringe; wings not yellow at base; squamae fuscous...**dubia** (Malloch)
10 (8). Front coxa yellow in front; femora fulvous yellow entirely; none of the hind tibial bristles exceptionally long or slender in both sexes 11
Front coxa fuscous in front; femora fulvous yellow, but with a dark patch sharply limited on anterior surface of apical 1/2; a few hind tibial bristles rather long or slender in ♂ ..... **ponti** Kurahashi*
Front coxa fuscous in front; femora fulvous yellow or dark brown entirely; 1 or 2 of hind tibial bristles in ♂, 2-3× as long as tibial diameter 14
11(10). Scutellum entirely semi-pellucid yellow; sternopleura covered with black fine hairs; metathoracic spiracle dark brown; yellowish hairs present on post-jowls and occiput; 1st-3rd tergites of abdomen semi-pellucid yellow, with black apices and black median vitta sharply limited ..... **abdominalis** (Malloch)
Scutellum with only apex or apical margin yellow, black at base 12
12(11). Sternopleura at least in part covered with yellow or brown soft hairs; front coxa with yellow hairs in front of basal part 13
Sternopleura covered with black hairs; front coxa only with black hairs ..... **crinitarsis** (Villeneuve)
13(12). Metathoracic spiracle dark brown; yellow hairs present on posterior parts of jowls, post-jowls and occiput; squamae brown ..... **vanemdeni** Kurahashi*
Metathoracic spiracle pale yellow; yellow hairs present on post-jowls and occiput, jowls blackish hairy ..... **pusilla indica** Kurahashi*
14(10). Femora and tibiae fulvous yellow; body brassy shining, black, tessellated on abdomen, not yellow on basal 1/2 of abdomen; hind tarsi in ♂ not fringed on posterodorsal surface 15
Front and mid femora dark brown, all tibiae dull yellow; body metallic bluish black, slightly pruinose on abdomen; hind tarsi in ♂ fringed on posterodorsal surface ..... **nigricans** (Villeneuve)
15(14). Humeral and posterior calli red; sternopleura with yellowish soft hairs; 5th tergite

---

* Described as new.

in ♀ with orange apex; scutellum largely reddish..... **nuortevae** Kurahashi*
Humeral and posterior calli dark, sometimes metallic; sternopleura covered with black hairs; abdomen in both sexes entirely black; scutellum largely black except for narrow reddish margin ..... **scutellata** (Sen.-White)

Genus **Tricycleopsis** Villeneuve

Tricycleopsis Vill., 1927, *Rev. Zool. Afr.* **15**: 388 (type-species: *Tricycleopsis paradoxa* Vill., 1927).

Calliphora (*Pseudocalliphora*) Malloch, 1927, *Suppl. Ent.* **16**: 51 (type-species: *Calliphora* (*Pseudocalliphora*) *semifulva* Mall., 1927).

Diagnosis: Thoracic squama sparsely black setulose at base, these hairs sometimes hard to see and very easily rubbed off; subcostal sclerite usually tawny pubescent; eyes bare; presutural *ac* 2, bristles arranged as shown in fig. 1a; ♂ genitalia small, with primitive harpes which is distinctly separated from one other in a distance from harpes basis to apex; vesicae poorly developed; ♀ internal and external genitalia not examined.

BIONOMICS: Nothing is known.

DISTRIBUTION: SE Asia.

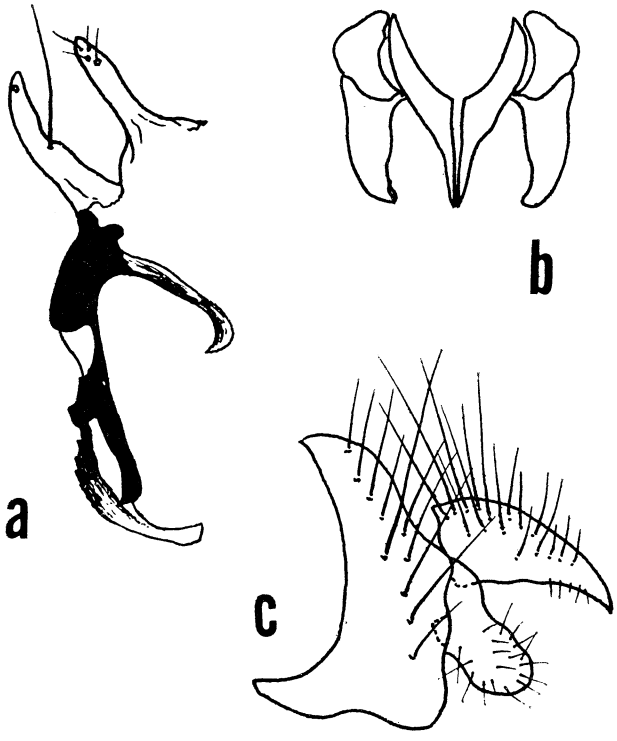

Fig. 10. *Tricycleopsis paradoxa* Villeneuve, ♂ genitalia: a, aedeagus and parameres; b, cerci and paralobi, caudal view; c, cerci and paralobi, lateral view.

Tricycleopsis paradoxa Villeneuve

Tricycleopsis paradoxa Vill., 1927, *Rev. Zool. Afr.* **15**: 389 (Sept. 15).

Calliphora paradoxa: Sen.-White et al., 1940, *Fauna Brit. India*, Dipt. **6**: 37.

Calliphora (*Pseudocalliphora*) *semifulva* Malloch, 1927, *Suppl. Ent.* **16**: 51 (Nov. 10).

Type-locality: Taiwan; in DEI.

The ♂ genitalia are illustrated in fig. 10.

Length: 6.5–7.0 mm.

SPECIMEN EXAMINED. SABAH (British N. Borneo): 1 ♂, Tenompok, 1460 m, Jesselton, 48 km E, 26–31.I.1959, T. C. Maa (BISHOP).

BIONOMICS: Nothing is known.

DISTRIBUTION: Taiwan, Malay (Sen.-White et al., 1940), Sumatra (Malloch, 1927) and Borneo.

Acknowledgements: I wish to express my sincere appreciation to Dr J. Linsley Gressitt, Chair-

man, Department of Entomology, B. P. Bishop Museum, Honolulu for making possible my study of the excellently preserved collection of Indo-Australian Calliphorini. I am grateful also to Prof. Dr Maurice T. James, Department of Entomology, Washington State University, Prof. Dr Katsushige Hori, Department of Biology, Kanazawa University, and Prof. Dr Rokuro Kano and Mr Satoshi Shinonaga of the Department of Medical Zoology, Tokyo Medical and Dental University for their valuable suggestions and constant encouragement given me during the course of this study.

During the preparation of this study, I was fortunate to receive assistance from Mr Adrian C. Pont, Department of Entomology, British Museum (Nat. Hist.), Dr Pekka Nuorteva, Division of Entomology, Zoological Museum, Helsinki, and Dr habil Günter Morge of the Deutsches Entomologisches Institut, Berlin. They sent me type-specimens as well as many other excellent materials of identified and unidentified calliphorids, thus enabling me to determine the exact status of dubious specimens.

REFERENCES

Bezzi, M. 1927. Some Calliphoridae (Dipt.) from the South Pacific Islands and Australia. *Bull. Ent. Res.* **17**: 231-47.

Hall, D. G. 1948. The blowflies of North America. Thomas Say Fond., Washington: 477.

Hardy, G. H. 1937. Notes on genus *Calliphora* (Diptera). Classification, synonymy, distribution and phylogeny. *Proc. Linn. Soc. N. S. Wales* **62**: 17-26.

1940. Notes on Australian Muscoidea, V. Calliphoridae. *Proc. Roy. Soc. Qld.* **51**: 133-46.

1947. Notes on Australian Muscoidea, VI. *Calliphora* in Australia and New Zealand. *Proc. Roy. Soc. Qld.* **57**: 53-56.

Hendel, F. 1901. Beitrag zur Kenntniss der Calliphorinen (Dipt.). *Wien. Ent. Zeits.* **20**: 28-33.

Ito, Syusiro. 1962. The land snail control by parasitic Calliphorid fly. *Rep. Res. Minist. Educ. Agr.* **3**: 25 (in Japanese).

Kano, R. & S. Shinonaga. 1968. Calliphoridae (Insecta: Diptera) *In Fauna Japonica.* Biological Society of Japan, Tokyo: 181.

Keilin, D. 1919. On the life-history and larval anatomy of *Melinda cognata* Meigen (Diptera, Calliphorinae) parasitic in the snail *Helicella* (*Heliomanes*) *virgata* da Costa, with an account of the other Diptera living upon molluscs. *Parasitology* **11**: 430-55.

Kurahashi, H. 1964a. Studies on the Calypterate Muscoid flies from Japan II. Revision of the genera *Melinda* and *Onesia* (Diptera, Calliphoridae). *Kontyû* **32**: 384-89.

1964b. Studies on the Calypterate Muscoid flies from Japan III. Revision of the genus *Polleniopsis* (Diptera, Calliphoridae). *Kontyû* **32**: 484-89.

1965. Studies on the Calypterate Muscoid flies from Japan IV. Revision of the genus *Paradichosia*, with description of two new species (Diptera, Calliphoridae). *Kontyû* **33**: 46-52.

Malloch, J. R. 1927. *Fauna Sumatrensis.* Family Calliphoridae (Diptera). Suppl. Ent. **16**: 50-56.

1930. Insects of Samoa and other Samoan terrestrial *Arthropoda*, part 6, Diptera, fasc. **5**: 215-37.

Patton, W. S. 1935. Studies on the higher Diptera of medical and veterinary importance. A revision of the genera of the subfamily Calliphorinae based on a comparative study of the male and female terminalia. The genus *Calliphora* Robineau-Desvoidy (sens. lat.): A practical guide to the Australian species. *Ann. Trop. Med. Parasit.* **29**: 19-32.

Patton, W. S. & Emory C. Cushing. 1934. Studies on the higher Diptera of medical and veterinary importance. A revision of the genera of the subfamily Calliphorinae based on a comparative

study of the male and female terminalia, the genus *Calliphora* Robineau-Desvoidy (sens. lat.). *Ann. Trop. Med. Parasit.* **28**: 205-16.

Schiner, J. R. 1862-64. *Fauna Austriaca.* Die Fliegen (Diptera), I (1862), II (1864), Wien. (fide Williston, 1908).

Schumann, H. 1964. Revision der Gattung *Onesia* Robineau-Desvoidy, 1830 (Diptera: Calliphoridae). *Beitr. Ent.* **14**: 915-38.

Senior-White, R. 1923. The Muscidae testaceae of the Oriental region. *Spol. Zeyl.* **12**: 294-314.

Senior-White, R., D. Aubertin, and **J. Smart.** 1940. Family Calliphoridae *In Fauna British India,* Diptera **6**: 288.

Villeneuve, J. 1927. Mydaires superieurs noveaux de lile de Formose. *Rev. Zool. Afr.* **15**: 387-397.

Zumpt, F. 1956a. Calliphorinae *In Lindner's Fliegen palaeark. Reg.* **64 i**: 140.

1956b. Calliphoridae (Diptera, Cyclorrhapha), part I: Calliphorini and Chrysomyiini, *Expl. Parc Natn. Albert. Mission.* **87**: 200.