

# Taxonomic notes on Oriental Tachinidae (Insecta: Diptera) II: Genus *Thecocarcelia* Townsend<sup>1)2)</sup>

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**Keywords:** Systematics, Tachinidae, Insecta, Diptera, new species, Oriental Region.

**Abstract:** Oriental species of the genus *Thecocarcelia* Townsend are revised, and include the following seven species: *T. nigrapex* sp. n., *T. parnarae* Chao, *T. oculata* (Baranov), *T. ochracea* sp. n., *T. sumatrana* (Baranov), *T. hainanensis* Chao, and *T. linearifrons* (Wulp). *Thecocarcelia thrix* (Townsend) and *T. laticornis* Chao are recognized as junior synonyms of *T. sumatrana* (Baranov). The generic definition of *Thecocarcelia* is reviewed and a key to Oriental species is provided.

## 1. Introduction

*Thecocarcelia* Townsend is a small genus known from warm temperate to tropical areas of the Old World. Crosskey (1976) characterized this genus and recorded four species from the Oriental Region, but no detailed study has been made on these morphologically similar species. I report here seven species, including two new species, of the genus from the Region as a result of my recent examination of Oriental tachinid material including type specimens.

The genus is sometimes treated in a broad sense, including species of hesperiid parasitoids of the genus *Argyrophylax* Brauer et Bergenstamm, 1891 (Mesnil, 1975; Herting, 1983; Herting & Dely-Draskovits, 1993). In this paper I follow Crosskey (l.c.) in the treatment of the genus, because there appears to remain some problems with the generic definition of the genus as discussed below. Most Oriental species of the genus *Argyrophylax* were revised in detail by Crosskey (1963) and there is no difficulty to identify them in practice, even though some of *Argyrophylax* might be transferred to *Thecocarcelia*. In recent years some species were described from southern China as belonging to *Thecocarcelia* (Liang & Chao, 1990; Sun et al., 1992), but most of them do not fall into *Thecocarcelia* as defined here.

## 2. Materials and methods

Material has been studied from the following collections:

- Biosystematics Laboratory, Graduate School of Social and Cultural Studies, Kyushu University, Fukuoka (BLKU)
- Department of Entomology, The Natural History Museum, London (BMNH)
- Department of Natural Sciences, Bishop Museum, Honolulu (BPBM)
- Instituut voor Systematiek en Populatiebiologie, Zoologisch Museum, Universiteit van Amsterdam, Amsterdam (ZMA)
- Kunming Institute of Zoology, Academia Sinica, Kunming (KIZ)
- National Science Museum, Natural History, Tokyo (NSM)
- Projekt Gruppe Entomologie, Deutsches Entomologisches Institut, Eberswalde (DEI)
- U. S. National Museum of Natural History, Smithsonian Institution, Washington, D. C. (USNM).

Terminology and measurements follow those cited in the first paper of this series (Shima, 1997).

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3. A Revision of Oriental species of the genus *Thecocarcelia* Townsend

3.1. Genus *Thecocarcelia* Townsend

*Thecocarcelia* Townsend, 1933: 471. Type species:

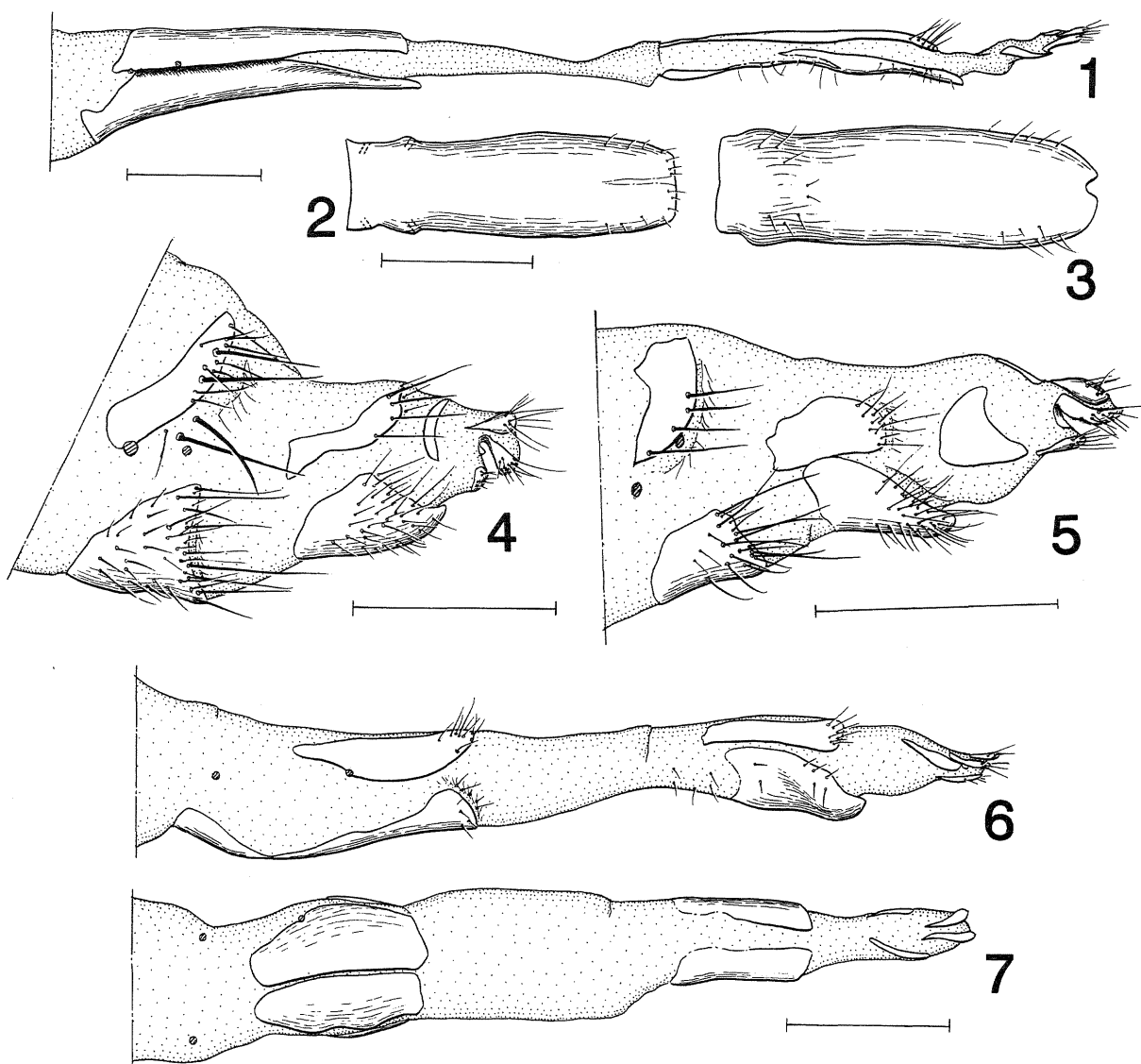
*Argyrophylax pematoprocta* Brauer et Bergengstamm, 1891 (= *Masicera acutangulata* Macquart, 1851) by original designation.

*Thelycarcelia* Townsend, 1933: 475. Type species:

*Thelycarcelia thrix* Townsend, 1933 (= *Masicera sumatrensis* Baranov, 1932) by original designation.

Male & female. Head: Usually with dense, whitish pollinosity; antenna black; arista dark brown; palpus reddish yellow or dark brown. Vertex about 1/3 of

head width; frontal vitta narrower than fronto-orbital plate at middle; parafacial narrowed below; gena very narrow, usually less than 1/10 of eye height, or rarely wider; lower margin of face only weakly warped forward. Inner vertical setae strong, parallel to each other; outer vertical seta well developed, about 1/2 as long as inner seta; 2 postvertical setae; 2 postocellar setae; ocellar seta developed, rarely very small; 2 reclinate orbital setae, anterior seta stronger than posterior seta; strong proclinate orbital setae always present in female, sometimes present in male; 5-6 frontal setae; vibrissa strong, nearly level with lower margin of face; occiput without black hairs behind a row of postocular setae. Eye very large, bare. Antenna long and wide, almost reaching to lower margin of face. Arista with 2nd aristomere sometimes slightly



Figs. 1-7. Female genitalia. Fig. 1. *Thecocarcelia acutangulata*, lateral view; Fig. 2, same, 6th abdominal tergum in dorsal view; Fig. 3. same, 6th abdominal sternum in ventral view. Fig. 4. "*Thecocarcelia*" *apta*, lateral view. Fig. 5. *Argyrophylax cinerella*, lateral view. Fig. 6. "*Thecocarcelia*" *nigrotibialis*, lateral view; Fig. 7. same, ventral view. Scales 1 mm for Figs. 1-3, 0.5 mm for Figs. 4-7.

elongate, 3rd aristonere thickened on basal 1/2-2/5. Palpus rather slender, weakly clavate.

Thorax: Black in ground color, usually with grayish white pollinosity. Four postpronotal setae, basal 3 setae standing in a straight line; proepisternal seta developed, about 3/5 as long as proepimeral seta; 3+3 *ac*; 3+4 *dc*; 2+2 katepisternal setae; 2 lateral scutellar setae; apical scutellar setae rather strong, usually crossed horizontally.

Wing: Hyaline, sometimes tinged with pale yellow; tegula black; basicosta dark brown. Second costal sector bare below; base of vein  $R_{4+5}$  usually with 2 rather strong setulae dorsally and 1 fine setula ventrally; bend of vein M right-angled.

Legs: Black; pulvilli pale brown. Fore tibia with 2 *p* setae; mid tibia with 1-3 *ad*, 2 *pd* and 1 *v* setae. Claws and pulvilli always very short in female, sometimes in male.

Abdomen: Black in ground color, usually with grayish white pollinosity on anterior portion of each tergum. Syntergum 1+2 excavated to hind margin; 2nd and 3rd terga each with 2 median marginal setae and with 1 lateral marginal seta on each side; 4th tergum with a row of strong marginal setae.

Male genitalia. Cerci close to each other on apical 2/3 to 4/5 portion, in lateral view nearly straight; surstylus shorter than cerci, with rather dense hairs; gonopod long, with row of hairs on posterior margin; paramere rounded in lateral view, with minute setulae on middle portion; epiphallus present; distiphallus rather long, curved ventrally on distal portion.

Female genitalia. Elongate; 6th tergum entire, not divided into hemitergites, flat or semi-cylindrical; 6th sternum long, free from intersegmental membrane on posterior portion, with small incision on posterior margin; 7th sternum narrow and long, free from intersegmental membrane on posterior portion, posterior margin rounded and weakly curved ventrally; 8th tergum reduced to small and obliquely elongate hemitergites.

*Remarks.* *Thecocarcelia* as defined herein may be easily distinguished from *Argyrophylax* by the combination of the following characters: occiput without black hairs behind a row of postocular setae, strong outer vertical seta in both sexes, 4 katepisternal setae, 2 lateral scutellar setae and well developed proepisternal seta.

### 3.2. Problems of generic definition of *Thecocarcelia*

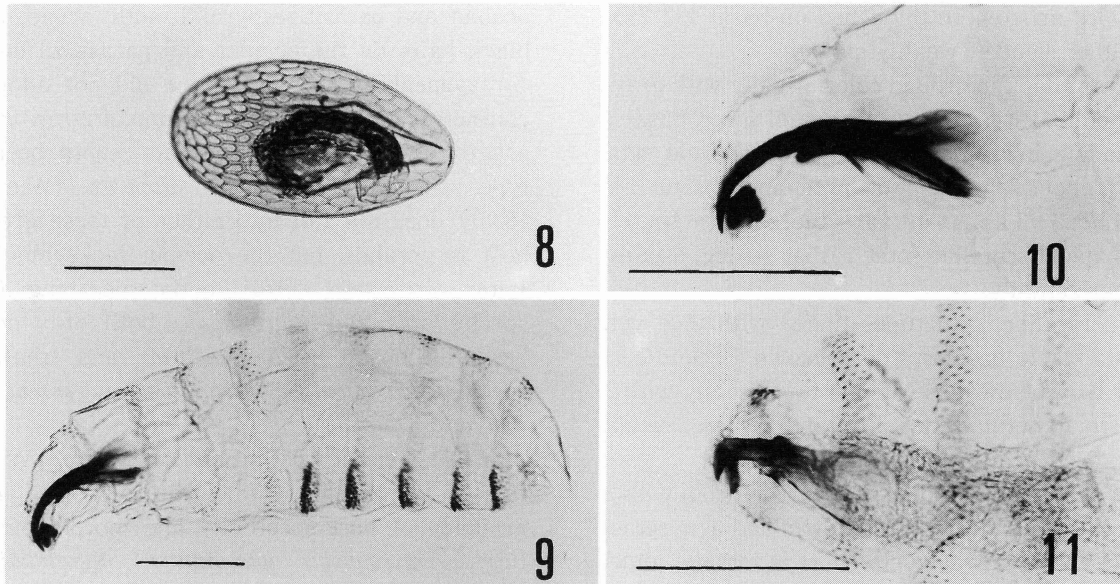
The genus *Thecocarcelia* is very similar to the genus *Argyrophylax* Brauer & Bergenstamm in many morphological characters. In his systematic review of the Oriental and Australasian species of *Argyrophylax*, Crosskey (1963) noted that the species could be assigned to two groups on the basis of their host specificity and morphology: (1) black hairs on the

occiput and parasitize pyralid moth larvae; (2) lack black hairs on the occiput and parasitize hesperiids (or zygaeniids). However, he did not adopt these characters in the generic definition of *Argyrophylax* or suggest division into two separate genera, because the type species (*Argyrophylax albincisa* (Wiedemann, 1830)) does not fall into either of these groups. Its host is pyralids, but the occiput lacks black hairs. Later Crosskey (1976) maintained the Oriental species *apta* and *nigrotibialis*, both of which have hesperiid hosts, in *Argyrophylax* and treated four species (*thrix*, *oculata*, *linearifrons* and *sumatrana*) as *Thecocarcelia*.

The generic definition of *Thecocarcelia* was revised by Mesnil (1975), who adopted Crosskey's grouping of host specificity and morphological features. *Argyrophylax apta* and *A. nigrotibialis* were transferred to *Thecocarcelia*, making this genus host specific to Hesperidae. In Mesnil's keys to Palearctic and Oriental species of *Thecocarcelia*, this genus is characterized in the eryciine genera by the bare eye, narrow gena (narrower than profrons), strong and horizontally crossed apical scutellar setae and 4 or 3 katepisternal setae. Mesnil also moved the Japanese species *atricauda*, of which host was unknown, from *Argyrophylax* to *Thecocarcelia* probably based on its similar morphology.

Although "*Thecocarcelia*" *apta* and "*T.*" *nigrotibialis* have the same host specificity as species of *Thecocarcelia* sensu Crosskey (1976), their female genitalia are fairly different. In *Thecocarcelia* sensu Crosskey the female genitalia are very elongate, the distal portion of the 6th abdominal sternum is free from the intersegmental membrane, with a small but distinct incision on the posterior margin, and the free apical portion of the 7th sternum is rounded (Figs. 1, 3). In contrast, "*Thecocarcelia*" *apta* has short female genitalia and the 6th and 7th abdominal sterna are not modified (Fig. 4). It is rather similar to the structure in *Argyrophylax cinerella* Mesnil (Fig. 5), which has pyralid hosts, and "*Thecocarcelia*" *atricauda*, of which the host is unknown. The female genitalia of "*Thecocarcelia*" *nigrotibialis* are rather elongate, but the 6th and 7th sterna lack the modifications (Figs. 6, 7) in *Thecocarcelia* sensu Crosskey. The characteristics of the female genitalia appear to suggest that the parasitizing habits of *apta*, *nigrotibialis* and other *Thecocarcelia* species differ from each other.

Moreover, the egg of *apta* are rather small and its chorion hard with a reticulate structure (Fig. 8). The egg of species of *Thecocarcelia* sensu Crosskey is large and its chorion is very thin and membranous (Fig. 9). The egg of "*Thecocarcelia*" *nigrotibialis* resembles that of species of *Thecocarcelia* sensu Crosskey in size and its chorion, but the mouthhook of its 1st instar larva is strongly curved at the apex (Fig. 11) compar-



Figs. 8-11. Egg and 1st instar larvae. Fig. 8. "*Thecocarcelia*" *apta*., egg. Fig. 9. *Thecocarcelia oculata*, 1st instar larva, showing thin and membranous chorion on ventral portion; Fig. 10. same, apical portion. Fig. 11. "*Thecocarcelia*" *nigrotibialis*, apical portion of 1st instar larva. Scales 0.1 mm.

ed to the straight and very sharp mouthhook in *Thecocarcelia* species (Fig. 10).

On the basis of the differences discussed above, it appears difficult to view *apta* and *nigrotibialis* as congeneric with *Thecocarcelia* sensu Crosskey, as they seem to have fairly different parasitic strategies as illustrated in their morphology. At present the data on the host specificity, immature stages and parasitizing habits of these flies are limited. Detailed morphological structure of the male genitalia has also not been studied on these species. In addition, *Argyrophylax albincisa*, the type species of *Argyrophylax*, is from the West Indies and New World species of *Argyrophylax* appear to differ significantly from Oriental species (c.f. Thompson, 1963). It is possible that all Oriental species now placed in *Argyrophylax*, including *apta*, *nigrotibialis* and *atricauda*, must be placed in another genus (or genera) when more detailed data are obtained. I retain the genus *Thecocarcelia* in the sense of Crosskey until the species of *Argyrophylax* and *Thecocarcelia* can be studied in more detail.

3.3. Key to the Oriental species of *Thecocarcelia*

- 1. Mid tibia with only 1 *ad* seta; male without proclinate orbital seta .....2
- Mid tibia with 2-4 *ad* setae; male with 1 or 2 proclinate orbital setae .....3
- 2. Ocellar seta very fine hair-like, inserted slightly anterior to midway between anterior and posterior ocelli; gena rather wide, at least 1.5 times as wide as fore tibia; lower margin of face well produced forward, slightly extending beyond vibrissal base; antenna with 1st flagellomere

- about 4.5 times as long as pedicel in male, 4 times in female; male claws and pulvilli distinctly shorter than 5th tarsomere; frontal vitta about 1/2 as wide as fronto-orbital plate at middle .....*linearifrons* (Wulp)
- Ocellar seta strong, as long as anterior recalculate orbital seta, inserted just behind anterior ocellus; gena subequal in width to fore tibia; face only slightly warped forward at lower margin; 1st flagellomere about 6.5 times as long as pedicel in male; male claws and pulvilli rather long, at least subequal in length to 5th tarsomere; frontal vitta about 5/8 as wide as fronto-orbital plate at middle .....*hainanensis* Chao
- 3. Palpus dark brown, at most narrowly paler on ventrodistal portion; ocellar seta inserted level with anterior ocellus or slightly posterior to level of its middle .....4
- Palpus reddish yellow, darkened at basal 1/2; ocellar seta inserted just behind anterior ocellus .....6
- 4. Dorsum of 3rd abdominal tergum with thin, whitish pollinosity on anterior 1/3, 4th on 3/5, 5th with very thin, whitish pollinosity on narrow anterior margin and appearing mostly black; gena rather wide, about 6/7 as wide as 1st flagellomere .....*nigrapex* sp. n.
- 3rd abdominal tergum with rather dense, grayish-white pollinosity on anterior 2/3, 4th on 4/5 and 5th on 1/2; gena about 1/2 as wide as 1st flagellomere .....5
- 5. Male with 2 proclinate orbital setae; female 6th abdominal sternum with a rather wide U-

- shaped incision on posterior margin.....  
.....*oculata* (Baranov)
- Male with only 1 proclinate orbital seta; female with a shallow and rather wide V-shaped incision on posterior margin of 6th abdominal sternum .....*parnarae* Chao
- 6. Wing distinctly tinged with pale brown between costa and vein  $R_{4+5}$ ; lower calypter pale brownish; fronto-orbital plate and thoracic dorsum with yellowish-white pollinosity; abdominal dorsum with pale, yellowish-white pollinosity on anterior 2/5 of 3rd tergum, 1/2 of 4th and 2/5 of 5th .....*ochracea* sp. n.
- Wing hyaline, only slightly and evenly tinged with pale yellow; lower calypter white; head with dense, whitish pollinosity, or at most with pale yellowish-white pollinosity near vertex; abdomen with whitish or pale yellowish-white pollinosity on anterior 3/4-4/5 of 3rd and 4th terga and 1/2-2/3 of 5th .....  
.....*sumatrana* (Baranov)

fronto-orbital plate grayish on posterior 1/2; genal dilation pale grayish; palpus dark brown, apex narrowly pale brown. Vertex about 0.33 of head width; frontal vitta weakly widened anteriorly, only slightly narrower than fronto-orbital plate at middle; parafacial narrowed below, about 4/5 as wide as 1st flagellomere at middle height; gena about 0.12 of eye height; lower margin of face weakly warped forward, nearly level with vibrissal angle; face nearly as long as frons in profile. Ocellar seta inserted just behind anterior ocellus, 1.5 times as long as outer vertical seta and subequal in length to anterior reclinate orbital seta; proclinate orbital seta slightly longer than anterior reclinate orbital seta; lowest frontal seta nearly level with apex of pedicel; fronto-orbital plate with dense fine hairs which descend to level of lowest frontal seta in 1-2 lines; parafacial with row of fine hairs on lower 1/3 close to anterior eye margin. Antenna with 1st flagellomere about 6 times as long as pedicel. Arista with 2nd aristemere about 2 times as long as wide, 3rd aristemere thickened on basal 1/2. Palpus about 2/3 as long as 1st flagellomere.

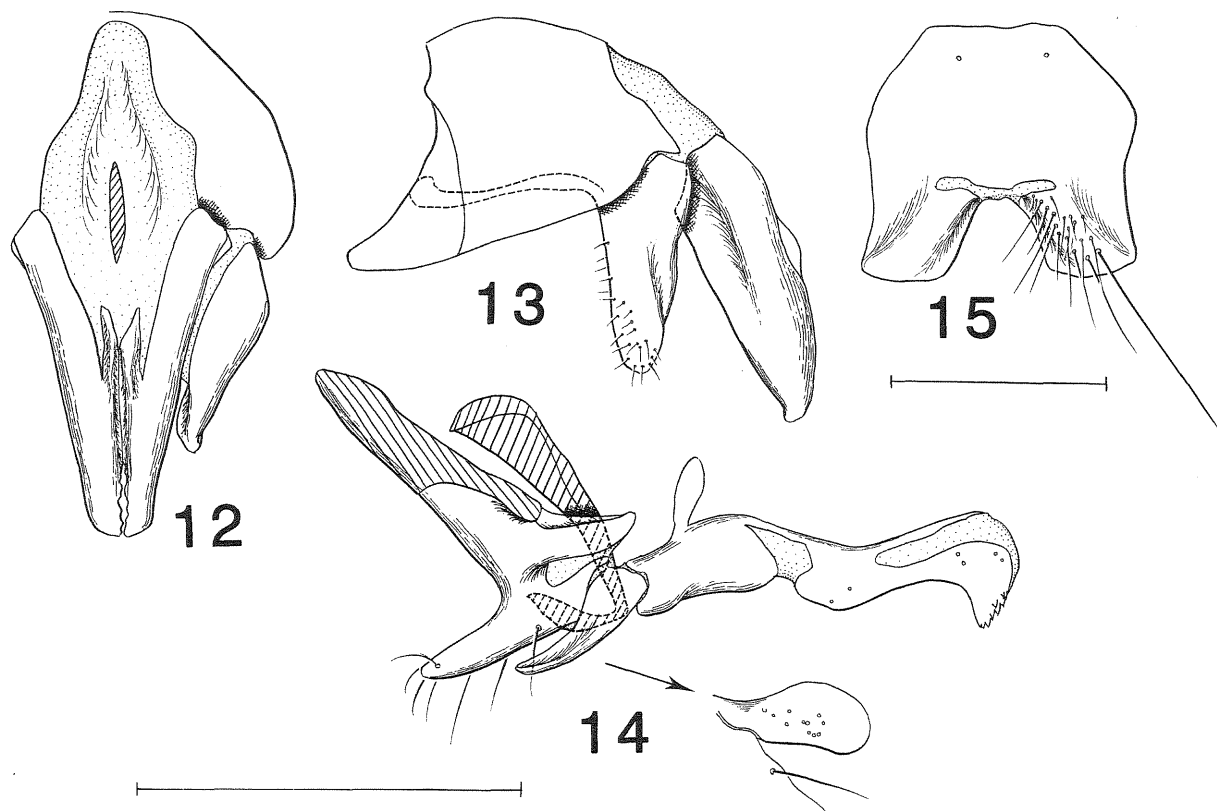
Thorax shining black in ground color, with rather thin, grayish-white, to somewhat bluish pollinosity, with 4 narrow and marginally diffusing longitudinal vittae on dorsum. Distance between bases of subapical scutellar setae subequal to distance between

***Thecocarcelia nigrapex* sp. nov.**

(Figs. 12-15)

Holotype male, THAILAND: Kanchana Buri, Sai Yok, 9. ix.1975, R. Kano (BLKU).

Male. Head with dense, whitish pollinosity,



Figs. 12-15. Male genitalia of *T. nigrapex* sp. n. Fig. 12. Epandrium, cerci and surstylus in dorsal view; Fig. 13, same in lateral view; Fig. 14. hypandrium, gonopod, paramere and aedeagus in lateral view; Fig. 15. 5th abdominal sternum in ventral view. Scales 0.5 mm.

basal and subapical setae of corresponding side.

Wing hyaline, slightly tinged with pale yellow; lower calypter pale yellowish-white. Relative lengths of costal sectors 2nd, 3rd and 4th approximately as 1:2:1; vein M from dm-cu crossvein to its bend about 2 times as long as distance between the bend and wing margin.

Mid tibia with 3 *ad* setae, upper one short; hind tibia with a closely set row of *ad* setae. Claws and pulvilli very short.

Abdomen shining black, with rather thin, whitish pollinosity on anterior 1/2 of 3rd tergum and anterior 3/5 of 4th; 5th tergum only with slightly and narrowly grayish-white pollinosity on anterior margin and appearing almost shining black; pollinosity diffusing and becoming thinner posteriorly on 3rd and 4th terga; mid dorsal longitudinal vitta weakly visible on 3rd and 4th terga. Hairs on dorsum very dense, fine and suberect, strong and erect on 5th; 5th tergum with irregular row of strong marginal setae, discal setae indistinct among strong, erect hairs.

Male genitalia. Cerci in dorsal view broadly separated on basal 2/5, in lateral view wide, tapered at apical 2/3; surstylus about 2/3 as long as cercus, with rather dense fine hairs on ventral and apical portion.

Female. Unknown.

Body length, ca. 7.6 mm; wing length, ca. 6 mm.

Host. Unknown.

Distribution. Thailand.

*Remarks.* This species is distinct in its shining black thorax and abdomen and broad frontal vitta, parafacial and gena. The holotype specimen has 1-2 rows of several fine hairs on lower portion of the parafacial, but it is possibly an aberrant in the specimen.

### ***Thecocarcelia parnarae* Chao**

(Figs. 16, 17, 29-31)

*Thecocarcelia parnarae* Chao, 1976: 335 - Herting, 1983: 60

- Liang & Chao, 1990: 363 (key), 365 (illustration of male and female genitalia) - Herting & Dely-Draskovits, 1993: 220.

Material examined: NEPAL: 1 male, Narayani, Hetauda-Chitwan, 23.vii.1990, K. Kanmiya: INDIA: 1 female, Kanartaka St., Nagarahole (720 m), 9-11.x.1993, H. Shima; 2 males, Tamir Nadu St., Gudalur (1,200 - 1,500 m), 6 - 9.x.1993, H. Kurahashi: THAILAND: 1 female, Kao Yai, 800 m, 60 km S. Pak Chong, 6.x.1975, R. Kano; 1 male, Chaing Mai, Doi Saket, 16.xii.1975, H. Shima; 1 male, Sai Yok, Kanchana Buri, 3.ix.1975, R. Kano; 13 males, 3 females, same locality, 9-13.xii.1975, H. Shima & S. Shinonaga (all in BLKU): VIETNAM: 1 male, 1 female, Lao Cai Prov., Lao Cai to Sapa, 800-1,200m, 6-7.x.1995, K. Kurahashi (NSM): INDONESIA: 1 male, Java, Pelabuhanratu, 17.xi.1973, H. Shima; 2 females, Java,

Tjemere, 400-1,400 m, 19-25.xi.1973, S. Shinonaga & H. Shima; 1 male, Lombok, Suranadi, 100 m, 19-21.xii.1973, H. Kurahashi (all in BLKU): CHINA: 1 female, Yunnan Prov., Baoshang, Tengchong, Reshui, 1,450 m, 11.ix.1996, H. Shima (KIZ).

Male. Head with dense, silvery-white pollinosity, upper fronto-orbital plate narrowly grayish; antenna with apex of pedicel narrowly reddish; palpus dark brown, apex sometimes narrowly pale brown. Vertex 0.3-0.32 of head width; frontal vitta nearly parallel-sided, about 1/2 as wide as fronto-orbital plate at middle; parafacial well narrowed below, about 2/3 as wide as 1st flagellomere at middle height; gena 0.75-0.8 of eye height; lower margin of face only weakly warped forward, not over vibrissal angle; face longer than frons in profile (6:5). Ocellar seta inserted at level of anterior ocellus or slightly posterior to level of its middle, subequal in length to anterior reclinate orbital seta; 1 proclinate orbital seta, subequal in length to anterior reclinate orbital seta; lowest frontal seta nearly level with base of arista; fronto-orbital plate with fine short and rather sparse hairs which do not descend below base of antenna. Antenna with 1st flagellomere 6.5-7 times as long as pedicel. Arista with 2nd aristemere as long as wide, 3rd aristemere thickened on basal 1/2-2/5. Palpus about 1/2 as long as 1st flagellomere.

Thorax black in ground color, with dense, grayish-white pollinosity, dorsum sometimes with pale yellowish-white pollinosity, and 4 narrow, distinct longitudinal vittae; scutellum slightly paler at apex. Distance between bases of subapical scutellar setae subequal to distance between basal and subapical setae of corresponding side.

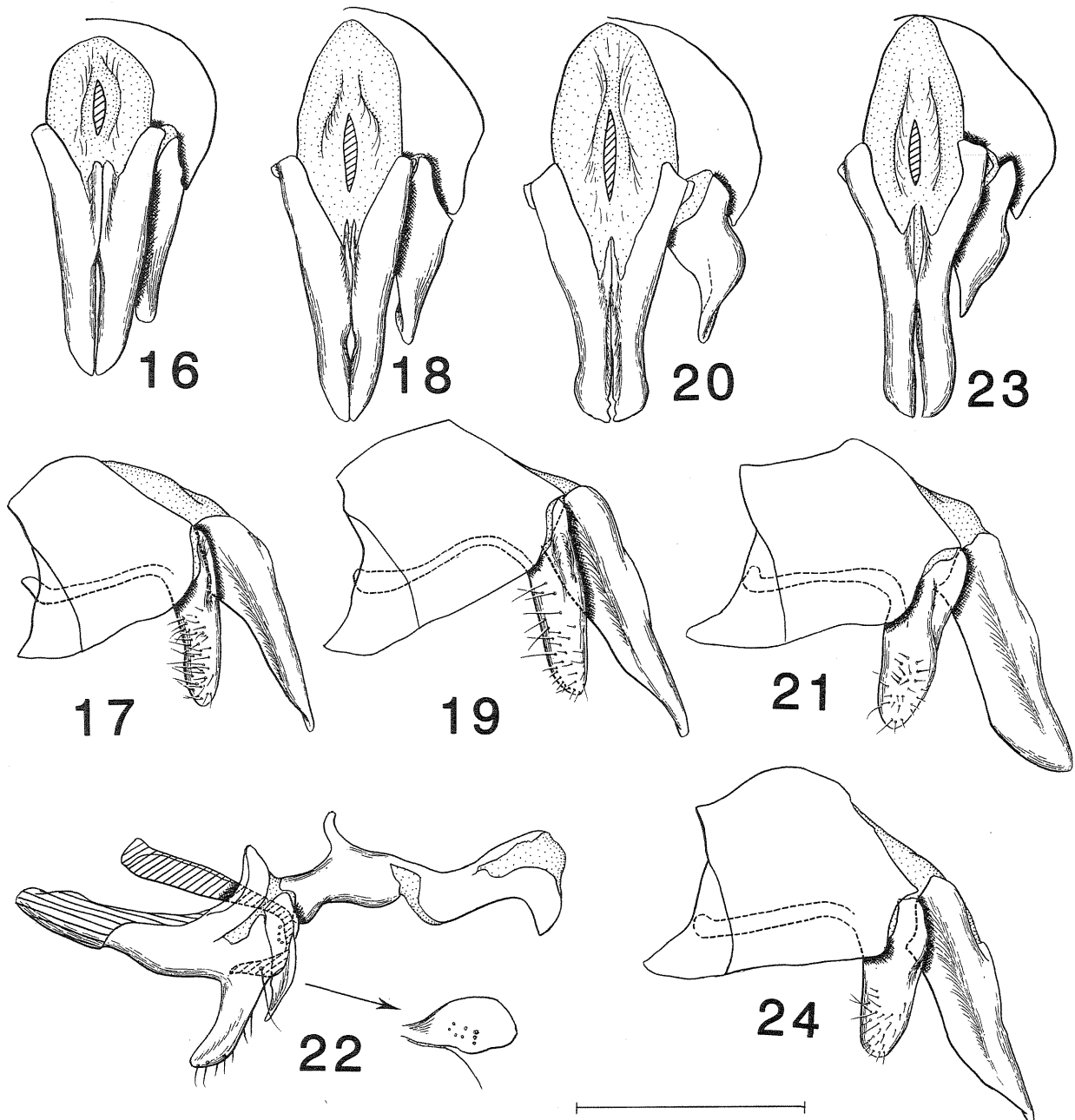
Wing hyaline, slightly and evenly tinged with pale yellow; lower calypter white. Relative lengths of costal sectors 2nd, 3rd and 4th approximately as 3.5:2.5; vein M from dm-cu crossvein to its bend about 1.5 times as long as distance between the bend and wing margin.

Mid tibia with 2 long *ad* setae; hind tibia with regular row of separated *ad* setae. Claws and pulvilli very short.

Abdomen with rather thin, whitish pollinosity on anterior 1/2-3/5 of 3rd tergum, 2/3-3/4 of 4th and 1/2 of 5th, pollinosity diffusing and becoming thinner posteriorly on each tergum and with weakly tessellate appearance; mid dorsal longitudinal vitta indistinct. Fifth tergum with irregular rows of strong discal and weak marginal setae mixed with rather long erect hairs.

Male genitalia. Cerci in dorsal view close to each other on apical 4/5 portion, in lateral view rather slender, evenly tapered to apex; surstylus about 4/5 as long as cerci, with dense long hairs.

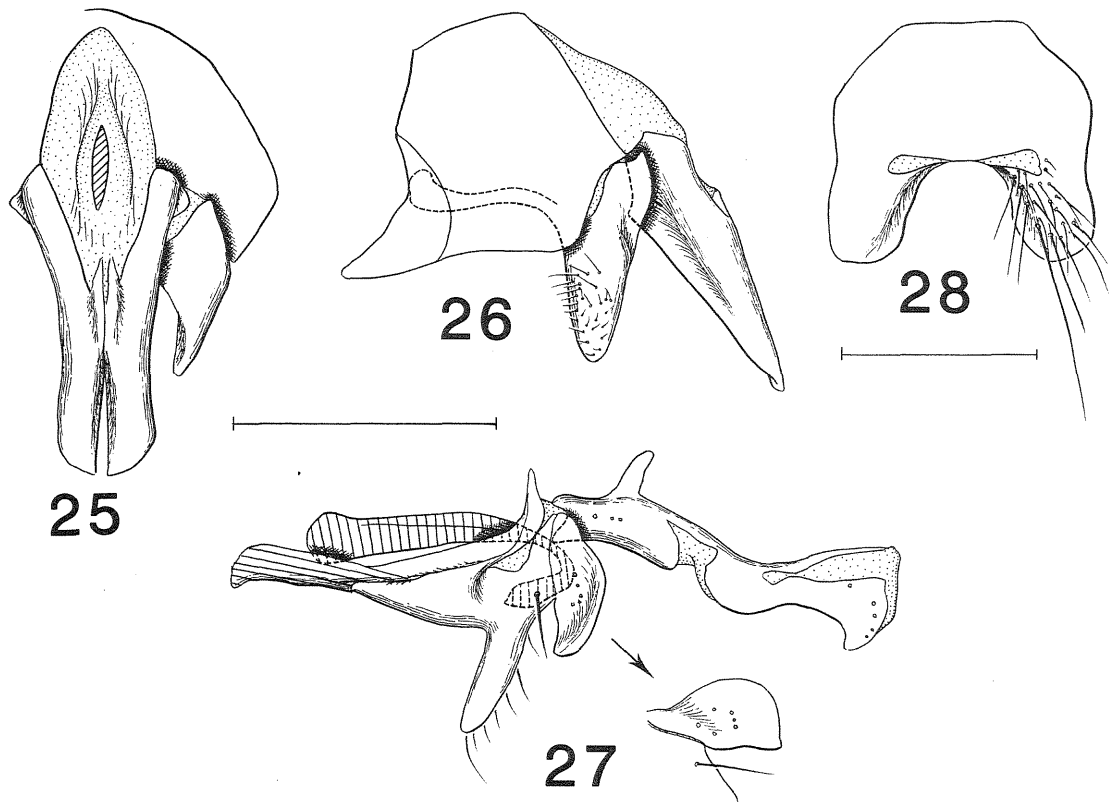
Female. Very closely resembling male, and differ-



Figs. 16-24. Male genitalia. Figs. 16. *T. parnarae*, epandrium, cerci and surstylus in dorsal view; Fig. 17. same, lateral view. Fig. 18. *T. oculata*, epandrium, cerci and surstylus in dorsal view; Fig. 19. same, lateral view. Fig. 20. *T. sumatrana*, epandrium, cerci and surstylus in dorsal view; Fig. 21. same, lateral view; Fig. 22. same, hypandrium, gonopod, paramere and aedeagus in lateral view. Fig. 23. *T. hainanensis*, epandrium, cerci and surstylus in dorsal view; Fig. 24. same, lateral view. Scale 0.5 mm.

ing only as follows: Upper fronto-orbital plate and ocellar triangle sometimes with pale yellowish-white pollinosity; interfrontal area slightly wider, about  $\frac{5}{8}$  as wide as fronto-orbital plate at middle; 2 subequally long proclinate orbital setae, subequal in length to ocellar and anterior reclinate orbital setae; 1st flagellomere 5-5.5 times as long as pedicel; 3rd aristemere thickened on basal  $\frac{2}{5}$ ; mid tibia with 3 *ad* setae, median seta rather short; abdominal dorsum with more dense and broad pollinosity. Female genitalia:

6th tergum semi-cylindrical, posterior margin truncate; 6th sternum longer than 6th tergum, constricted on anterior  $\frac{1}{5}$ , posterior margin with V-shaped incision, apical portion acute and curved dorsally in lateral view; 6th and 7th spiracles on ventrolateral margin of anterior  $\frac{1}{4}$  of 6th tergum; 7th tergum not divided into hemitergites, subequal in length to 6th tergum, posterior margin rounded, rather densely haired on posterior portion; 7th sternum narrowed on anterior  $\frac{2}{5}$  portion, slightly curved ventrally in lat-



Figs. 25-28. Male genitalia of *T. ochracea* sp. n. Fig. 25. Epandrium, cerci and surstylus in dorsal view; Fig. 26, same in lateral view; Fig. 27. hypandrium, gonopod, paramere and aedeagus in lateral view; Fig. 28. 5th abdominal sternum in ventral view. Scales 0.5 mm.

eral view.

Body length, 5.6-7.3 mm; wing length, 4.6-5.6 mm.

Host. LEPIDOPTERA: HesperIIDae: *Parnara guttata* (Bremer et Grey) (China; Chao, 1976).

Distribution. Nepal, India, Thailand, Vietnam, Indonesia (Java, Lombok), China (Fujiang, Yunnan, Guangxi, Hainan; Zhejiang, Hubei).

*Remarks.* This species is characterized in the male having only 1 proclinate orbital seta and is easily distinguished from others by this feature. The female of this species is very similar to other species, but differs from them in the shape of the distal incision of the 7th abdominal sternum. It is probable that Liang & Chao (1990) erroneously labelled their illustrations of the male genitalia of *T. parnarae* as *T. hainanensis* (Fig. 2, c, d).

### *Thecocarcelia oculata* (Baranov)

(Figs. 9, 10, 18, 19, 32-34)

*Masicera oculata* Baranov, 1935: 554 - Sabrosky & Crosskey, 1969: 46.

*Thecocarcelia oculata* (Baranov): Crosskey, 1976: 233 - Mesnil, 1975: 1389 (as syn. of *thrix*) - Herting, 1983: 60 (as syn. of *thrix*).

Type material examined: Holotype female, FORMOSA (TAIWAN), Kankau (Koshun), 7. vii. 1912, H. Sauter (DEI); paratype, 1 male, same locality as

holotype, viii.1912 (USNM).

Male. Head with dense, white, somewhat silvery pollinosity, upper fronto-orbital plate grayish; palpus dark brown, apex sometimes narrowly pale brown. Vertex 0.32-0.35 of head width; frontal vitta nearly parallel-sided, about 5/8 as wide as fronto-orbital plate at middle; parafacial well narrowed below, 3/5-4/5 as wide as 1st flagellomere at middle height; gena 0.7-0.75 of eye height; lower margin of face only weakly warped forward, not over vibrissal angle; face only slightly longer than frons in profile. Ocellar seta inserted at level of anterior ocellus or slightly posterior to level of its middle, subequal in length to anterior reclinate orbital seta; proclinate orbital setae slightly shorter than anterior reclinate orbital seta; lowest frontal seta nearly level with apex of pedicel; fronto-orbital plate with fine short and rather sparse hairs which do not descend below base of antenna. Antenna with 1st flagellomere 5.5-5.6 times as long as pedicel. Arista with 2nd aristemere as long as wide, 3rd aristemere thickened on basal 2/5. Palpus slightly less than 2/3 as long as 1st flagellomere.

Thorax black in ground color, with dense, grayish-white pollinosity, dorsum with 2 narrow inner and 2 rather broad outer longitudinal vittae, outer vitta diffusing marginally; scutellum slightly paler at apex. Distance between bases of subapical scutellar setae



subequal to distance between basal and subapical setae of corresponding side.

Wing hyaline, slightly and evenly tinged with pale yellow; lower calypter white. Relative lengths of costal sectors 2nd, 3rd and 4th approximately as 1:2:1; vein M from dm-cu crossvein to its bend about 1.5 times as long as distance between the bend and wing margin.

Mid tibia with 2 long *ad* setae; hind tibia with regular row of separated *ad* setae. Claws and pulvilli very short.

Abdomen with rather thin, whitish pollinosity on anterior 2/3 of 3rd tergum, with rather dense pollinosity on anterior 3/4 of 4th and 1/2 of 5th, pollinosity diffusing and becoming thinner posteriorly on 3rd tergum; mid dorsal longitudinal vitta indistinct. Fifth tergum with irregular rows of strong discal and weak marginal setae mixed with rather long erect hairs.

Male genitalia. Cerci in dorsal view close to each other on apical 2/3, in lateral view rather evenly tapered to apex; surstylus about 2/3 as long as cercus, rather densely haired.

Female. Very closely resembling male, and differing only as follows: Parafacial only slightly narrower than 1st flagellomere at middle height; gena about 0.08 of eye height; facial length subequal to frontal one in profile; 1st flagellomere 4-4.5 times as long as pedicel; abdominal pollinosity dense; 5th abdominal tergum rather conical, about 1.2 times as long as 4th tergum. Female genitalia: 6th tergum semi-cylindrical, posterior margin truncate; 6th sternum narrow, posterior margin with rather wide U-shaped incision; 6th and 7th spiracles situated on ventrolateral margin of anterior 1/7 and 2/7 of 6th tergum, respectively; 7th tergum not separated into hemitergites, about as long as 6th tergum; 7th sternum narrow and long, rather densely haired on posterior portion, posterior margin broadly rounded.

Body length, 7.3-7.9 mm; wing length, 5.6-6 mm.

Hosts. LEPIDOPTERA: Hesperidae: *Borbo zelleri* Lederer (Java; Crosskey, 1976); *Parnara guttata guttata* (Bremer et Grey) (Japan); *Pelopidas mathias* (Fabricius) (India, Malaysia; Crosskey, 1976).

Distribution. India, Malaysia, Indonesia (Java) China (Taiwan); Japan (Honshu, Kyushu).

*Remarks.* This species is sometimes treated as a synonym of *T. thrix* (Townsend) (= *T. sumatrana*), but their male and female genitalia are fairly different from each other. This species seems to be more closely allied to *T. parmarae* rather than to *T. sumatrana*, because of the resemblance of many morphological features.

### *Thecocarcelia ochracea* sp. nov.

(Figs. 25-28)

Holotype male, MALAYSIA, Sabah, Papar, 50 km SW Kota Kinabalu, 13-15. xi.1975, S. Shinonaga (BLKU).

Male. Head with dense, white pollinosity, fronto-orbital plate broadly yellowish; palpus reddish-yellow, brownish on basal 2/5. Vertex about 0.29 of head width; frontal vitta nearly parallel-sided, about 5/8 as wide as fronto-orbital plate at middle; parafacial well narrowed below, about 3/5 as wide as 1st flagellomere at middle height; gena about 0.08 of eye height; lower margin of face weakly warped forward, not over vibrissal angle; face nearly as long as frons in profile. Ocellar seta inserted just behind anterior ocellus, slightly longer than outer vertical seta and about 2/3 as long as anterior reclinate orbital seta; proclinate orbital seta subequal in length to anterior reclinate orbital seta; lowest frontal seta nearly level with apex of pedicel; fronto-orbital plate with rather dense fine short hairs which do not descend below level of base of pedicel. Antenna with 1st flagellomere about 7 times as long as pedicel. Arista with 2nd aristemere about 2 times as long as wide, 3rd aristemere thickened on basal 2/5. Palpus about 2/3 as long as 1st flagellomere.

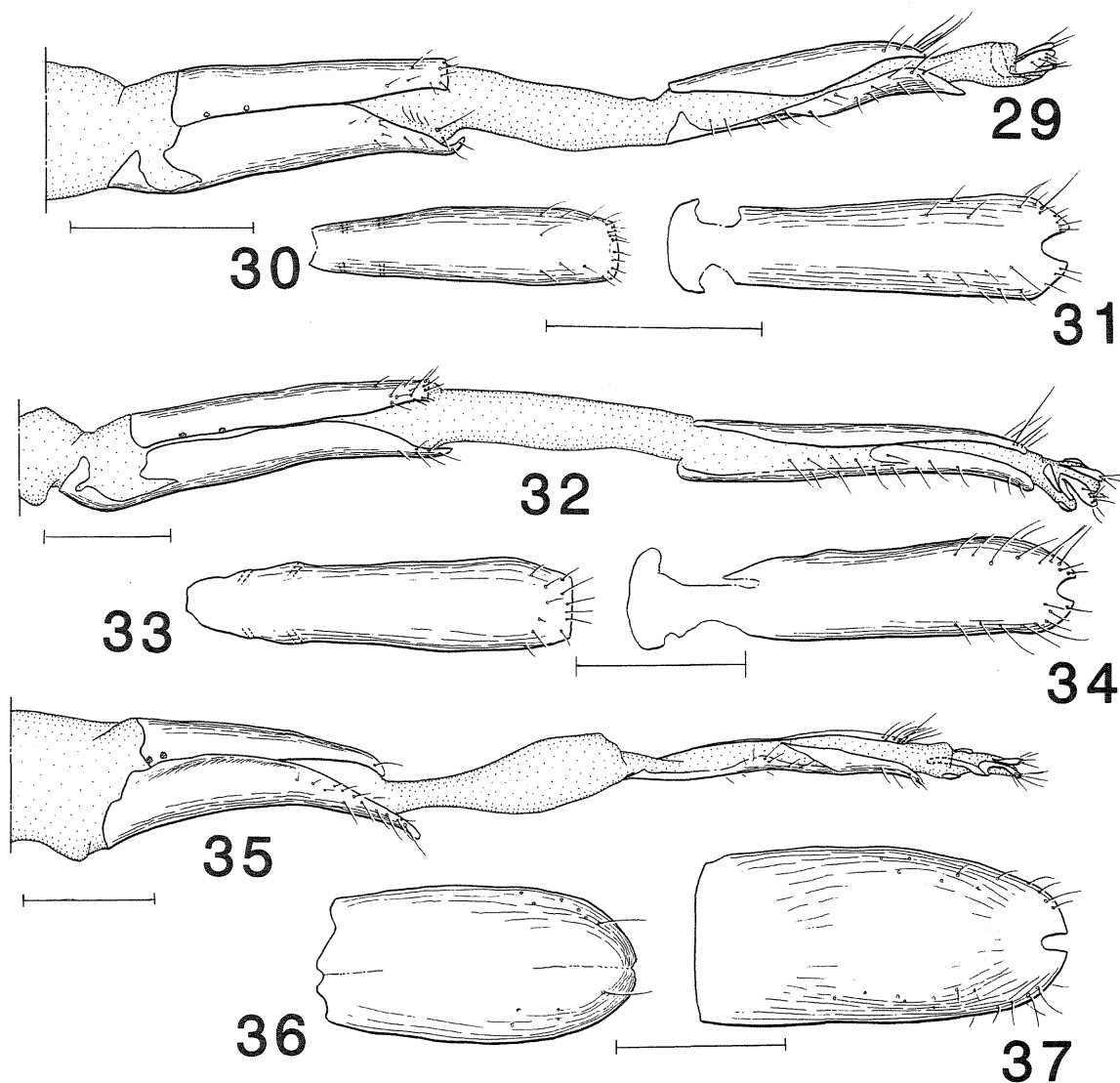
Thorax black in ground color, with rather dense, grayish-white pollinosity, dorsum with pale, yellowish pollinosity, and 4 rather narrow longitudinal vittae. Distance between bases of subapical scutellar setae slightly less than distance between basal and subapical setae of corresponding side (10:12).

Wing hyaline, distinctly tinged with pale brown on anterior portion, especially between costa and vein  $R_{4+5}$ ; lower calypter pale brown. Relative lengths of costal sectors 2nd, 3rd and 4th approximately as 1:2:1; vein M from dm-cu crossvein to its bend about 1.5 times as long as distance between the bend and wing margin.

Mid tibia with 3 *ad* setae, middle one short; hind tibia with row of separated *ad* setae. Claws and pulvilli very short.

Abdomen shining black, with rather thin, pale yellowish gray-white pollinosity on anterior 1/2 of 3rd tergum, 3/5 of 4th and 1/2 of 5th, the pollinosity diffusing and becoming thinner posteriorly on each tergum; mid dorsal longitudinal vitta weakly visible on 3rd tergum. Hairs on dorsum dense, fine, short and suberect, stronger and sparser on posterior terga, erect on 5th; 5th tergum with rows of rather short discal and strong marginal setae mixed with strong hairs.

Male genitalia. Cerci in dorsal view widely separated from base to basal 2/5, apical 2/5 portion very narrowly separated from each other, in lateral view evenly tapered to apex; surstylus about 2/3 as long as cercus, with dense and rather short hairs on apical 2/3.



Figs. 29-37. Female genitalia. Figs. 29. *T. parnarae*, lateral view; Fig. 30. same, 6th abdominal tergum in dorsal view; Fig. 31. same, 6th abdominal sternum in ventral view. Fig. 32. *T. oculata*, lateral view; Fig. 33. same, 6th abdominal tergum in dorsal view; Fig. 34. same, 6th abdominal sternum in ventral view. Fig. 35. *T. sumatrana*, lateral view; Fig. 36. same, 6th abdominal tergum in dorsal view; Fig. 37. same, 6th abdominal sternum in ventral view. Scales 1mm.

Female. Unknown.

Body length, ca. 8 mm; wing length, ca. 6.6 mm.

Host. Unknown.

Distribution. Malaysia (Sabah).

*Remarks.* This species is distinct in its pale yellowish pollinose body and pale brownish lower calypter. The ocellar setae are short in this species compared to those of other species of this genus, except for *T. linearifrons*.

***Thecocarcelia sumatrana* (Baranov)**

(Figs. 20-22, 35-37)

*Sturmia sumatrana* Baranov, 1932: 1 - Sabrosky & Crosskey, 1969: 51.

*Thelycarcelia thrix* Townsend, 1933: 475. **syn. nov.**

*Thecocarcelia sumatrana* (Baranov): Crosskey, 1976: 233.

*Thecocarcelia thrix* (Townsend): Crosskey, 1976: 233 - Mesnil, 1975: 1389 - Herting, 1983: 60 - Herting & Dely-Draskovits, 1993: 220.

*Thecocarcelia laticornis* Chao, 1976: 337. **syn. nov.** - Herting, 1983: 60 (as syn. of *thrix*) - Chao & Liang, 1984: 91 (key), 92 (illustration) - Liang & Chao, 1990: 363 (key), 365 (illustration of male and female genitalia) - Sun et al., 1992: 1189 - Herting & Dely-Draskovits, 1993: 220 (as syn. of *thrix*).

Type material examined: Holotype female of *Sturmia sumatrana* Baranov, INDONESIA, N. O. Sumatra, Medan, iv.1928, J. C. v. d. Meer Mohr (USNM); holotype male of *Thelycarcelia thrix* Townsend (genitalia dissected, in vial), FORMOSA (TAIWAN), Kankau, ix. 1912, H. Sauter (DEI).

Other material examined: INDIA: 3 females,

Tamil Nadu State, Gudalur (1,200–1,500m), 6–9.x.1993, H. Kurahashi & M. Iwasa; 1 male, 1 female, Kerala State, Wynad (720 m), 11.x.1993, H. Kurahashi: THAILAND: 2 males, 2 females, Sai Yok, Kanchana Buri, 10–11.ix.1975, H. Kurahashi; 2 males, same locality, 9–13, xii.1975, S. Shinonaga & H. Shima (all in BLKU): VIETNAM: 1 female, Vinh Phu Prov., Mt. Tam Dao (930–1,230 m), 21–27.ix.1995, H. Kurahashi (NSM): MALAYSIA: 2 males, 1 female, Malaya, 30 mls N Tapah (300–600 m), 28.x.1975, H. Shima: PHILIPPINES: 1 female, Mindanao Is., Bukidnon, Mt. View Colleges, 15 km NW Valencia, 2,200 m, 22–23.iv.1968, M. D. Delfinado (BPBM): CHINA: 1 female, Yunnan Prov., Xishuangbanna, Menla, 4.viii.1990, X. Lin (KIZ); 3 males, 1 female, Yunnan, Xishuangbanna, Menlung, 6–9.viii.1990, H. Shima (BLKU, KIZ).

Male. Head with dense, white, somewhat silvery pollinosity, upper fronto-orbital plate slightly pale yellowish-gray; antenna with apex of pedicel sometimes narrowly reddish; palpus reddish-yellow, rather weakly darkened at basal 1/2–1/3. Vertex 0.3–0.32 of head width; frontal vitta nearly parallel-sided, 1/2–5/8 as wide as fronto-orbital plate at middle; parafacial well narrowed below, about 1/2 as wide as 1st flagellomere at middle height; gena about 0.08–0.09 of eye height; lower margin of face only weakly warped forward, not over vibrissal angle; facial length slightly longer than frontal one in profile (4:3.5). Ocellar seta inserted just behind anterior ocellus, subequal in length to anterior reclinate orbital seta; proclinate orbital setae slightly longer than anterior reclinate orbital seta; 5–6 frontal setae, lowest seta nearly level with apex of pedicel; fronto-orbital plate with fine, short and rather sparse hairs which do not descend below base of antenna. Antenna with 1st flagellomere 6–6.5 times as long as pedicel. Arista with 2nd arisotomere slightly longer than wide, 3rd arisotomere thickened on basal 2/5. Palpus slightly less than 2/3 length of 1st flagellomere.

Thorax black in ground color, with dense, grayish-white pollinosity, pale yellowish on disc of scutum, dorsum with 4 narrow longitudinal vittae, outer vitta rather wide on presutural area; scutellum slightly paler at apex. Distance between bases of subapical scutellar setae slightly less than distance between basal and subapical setae of corresponding side (2:1.8).

Wing hyaline, slightly tinged with pale yellow especially on anterior portion; lower calypter white. Relative lengths of costal sectors 2nd, 3rd and 4th approximately as 3 : 5.5 : 3; vein M from dm-cu crossvein to its bend about 1.5 times as long as distance between the bend and wing margin.

Mid tibia with 2 long *ad* setae; hind tibia with regular row of separated *ad* setae. Claws and pulvilli

very short.

Abdomen with rather thin, whitish pollinosity on anterior 3/4–4/5 of 3rd tergum, with rather dense pollinosity on 3/4 of 4th and 1/2–3/5 of 5th, pollinosity becoming rather thinner posteriorly on 3rd tergum; mid dorsal longitudinal vitta indistinct. Hairs fine short dense and suberect, strong and erect on 5th tergum; 5th tergum with rather regular rows of strong discal and marginal setae mixed with long erect hairs.

Male genitalia: Cerci in dorsal view widely separated from each other on basal portion, converging at midlength and close to each other on apical 1/2, apical portion weakly expanded, in lateral view broad, nearly straight, apical 1/5 portion tapered to apex; surstylus short, about 2/3 as long as cerci, with rather dense long hairs on apical 1/2.

Female. Very closely resembling male, and differing only as follows: Facial length subequal to frontal length; 1st flagellomere 5–5.5 times as long as pedicel; abdominal dorsum with more dense, whitish pollinosity. Female genitalia: 6th tergum broad, flattened, posterior margin rounded; 6th and 7th abdominal spiracles both situated on anteroventral corner of 6th tergum; 6th sternum broad, weakly curved ventrally, posterior margin with a deep U-shaped incision; 7th tergum long, longer than 6th tergum, narrowly divided into 2 long hemitergites, with dense fine hairs on posterior portion; 7th sternum long, broadly membranous on anterior portion, rounded and weakly curved ventrally on posterior margin.

Body length, 6.2–7.9 mm; wing length, 5.2–6.2 mm.

Hosts. LEPIDOPTERA: Hesperidae: *Parnara guttata guttata* (Bremer et Grey) (Japan); *Potanthus flavus* (Murray) (Japan).

Distribution. India, Thailand, Vietnam, Malaysia (Malaya), Indonesia (Sumatra), Philippines (Mindanao), China (Yunnan, Guangxi, Taiwan; Hunan, Zhejiang); Japan (Hokkaido, Honshu, Kyushu).

*Remarks.* Crosskey (1976) treated both *T. sumatrana* and *T. thrix* as distinct species, but many features of the type specimens of these species are almost identical, except a few sexual dimorphic characters. The original description of *T. laticornis* Chao corresponds well with *T. sumatrana* and the illustrations of the head and the male and female genitalia of Liang & Chao (1990) of this species exhibit quite well the characteristics of *T. sumatrana*. The male and female genitalia of this species are very similar to those of the Palearctic species *T. acutangulata* (Macquart, 1851).

#### *Thecocarcelia hainanensis* Chao

(Figs. 23, 24)

*Thecocarcelia hainanensis* Chao, 1976: 337 – Liang & Chao, 1990: 363 (key), 364 (illustrations).

Materials examined: CHINA: 1 male, Yunnan, Xishuangbanna, Xiaomengyang, 4.x.1989, H. Shima (BLKU); 1 male, Xishuangbanna, Mengyang, 6.x.1989, H. Shima (KIZ).

Male. Head with dense, whitish, somewhat silvery pollinosity, upper fronto-orbital plate slightly pale yellowish; palpus reddish-yellow, darkened on basal 1/2. Vertex 0.28-0.29 of head width; frontal vitta nearly parallel-sided, about 5/7 as wide as fronto-orbital plate at middle; parafacial well narrowed below, about 3/5 as wide as 1st flagellomere at middle height; gena about 0.1 of eye height; lower margin of face only slightly warped forward, not over vibrissal angle; face slightly longer than frons in profile (28:25). Ocellar seta inserted just behind anterior ocellus or slightly more posteriorly, slightly longer than anterior reclinate orbital seta; proclinate orbital seta absent; lowest frontal seta nearly level with base of arista; fronto-orbital plate with fine short and rather sparse hairs which do not descend below level of apex of pedicel. Antenna with 1st flagellomere about 6.5 times as long as pedicel. Arista with 2nd aristomere as long as wide, 3rd aristomere thickened on basal 2/5. Palpus slightly less than 3/5 length of 1st flagellomere.

Thorax black in ground color, with dense, grayish-white pollinosity, weakly pale yellowish on postsutural scutum, and 4 narrow longitudinal vittae; scutellum slightly paler at apex. Distance between bases of subapical scutellar setae slightly shorter than distance between basal and subapical setae of corresponding side (10:13).

Wing hyaline, slightly and evenly tinged with pale yellow; lower calypter white. Relative lengths of costal sectors 2nd, 3rd and 4th approximately as 2:3.5:2; vein M from dm-cu crossvein to its bend slightly longer than distance between the bend and wing margin (10:13).

Mid tibia with only 1 long *ad* seta; hind tibia with regular row of separated *ad* setae. Claws and pulvilli rather elongate, slightly longer than 5th tarsomere in fore leg.

Abdomen with rather dense, grayish-white, somewhat bluish pollinosity on anterior 3/4 of 3rd tergum, 4/5 of 4th and 1/2 of 5th, pollinosity diffusing and becoming thinner posteriorly on 3rd tergum; mid dorsal longitudinal vitta weakly present on 3rd tergum. Fifth tergum with irregular rows of strong discal and weak marginal setae mixed with rather long, erect hairs.

Male genitalia. Cerci in dorsal view broadly separated from each other from base to basal 1/4, apical 1/3 portion narrowly separated from each other, in lateral view wide, tapered at apical 1/3; surstylus short, with rather fine hairs on apical 1/2.

Female. Not examined.

Body length, 7.1-7.6 mm; wing length, 6-6.2 mm.

Host. Unknown.

Distribution. China (Hainan, Yunnan).

*Remarks.* In general appearance this species very closely resembles the Palearctic species *T. acutangulata*. This species is, however, different from it in having long claws and pulvilli in the male and only 1 *ad* seta on the mid tibia. The male genitalia of this species also resemble those of *acutangulata*, but its cercus is broader in lateral view and surstylus shorter than in *acutangulata*. The male genitalia illustrated by Liang & Chao (1990) as *parmarae* (Fig. 3, c, d) correspond well to those of this species. They might have misarranged this illustration.

### *Thecocarcelia linearifrons* (Wulp)

*Masicera linearifrons* Wulp, 1893: 166 - Wulp, 1896: 131.

*Thecocarcelia linearifrons* (Wulp): Crosskey, 1967: 103 - Crosskey, 1976: 233.

*Erycia bezzii* Baranov, 1934: 44. - Sabrosky & Crosskey, 1969: 41 - Crosskey, 1967: 103 (as syn. of *linearifrons*).

*Thecocarcelia bezzii* (Baranov): Crosskey, 1976: 233.

Type material examined: Lectotype female of *Masicera linearifrons* Wulp, INDONESIA, Java, Piepers (ZMA); 2 male paralectotypes of *M. linearifrons*, same data as lectotype (ZMA); lectotype female of *Erycia bezzii* Baranov, MALAYSIA, Kuala Lumpur, Imbi Road, 24.viii.1931, ex *Telicota palmarum* (BMNH).

Male. Head with dense, white pollinosity, upper fronto-orbital plate near vertex grayish; apical portion of pedicel and base of 1st flagellomere narrowly reddish; palpus reddish yellow, narrowly darkened at base. Vertex about 0.26 of head width; frontal vitta nearly parallel-sided, slightly less than 1/2 of fronto-orbital plate at middle; parafacial well narrowed below, about 2/3 as wide as 1st flagellomere at middle height; gena 0.16-0.17 of eye height; lower margin of face well produced forward, slightly over vibrissal angle; face subequal in length to frons in profile. Ocellar seta fine hair-like, inserted slightly anterior to midway between anterior and posterior ocelli; proclinate orbital seta absent; lowest frontal seta nearly level with apex of pedicel; fronto-orbital plate densely haired on its entire width, the hairs not descending below apex of scape. Antenna falling short of lower margin of face by about 2/3 length of pedicel; 1st flagellomere 4.2-4.6 times as long as pedicel. Arista with 2nd aristomere as long as wide, 3rd aristomere thickened on basal 1/3. Palpus slender, slightly widened anteriorly.

Thorax black, with dense, grayish-white pollinosity, and 4 narrow longitudinal vittae; scutellum slightly and narrowly paler at apex. Apical scutellar setae rather short, suberect; distance between bases of subapical scutellar setae slightly less than distance between basal and subapical setae of corresponding

side.

Wing hyaline; lower calypter white. Relative lengths of costal sectors 2nd, 3rd and 4th approximately as 1.5:2.5:1.5; vein M from dm-cu crossvein to its bend about 2 times as long as distance between the bend and wing margin.

Mid tibia with 1 long *ad* seta; hind tibia with regular row of separated *ad* setae. Claws and pulvilli short.

Abdomen black, with dense, whitish pollinosity on anterior 2/3 of each 3rd and 4th terga and 3/4 of 5th, the pollinosity diffusing and becoming thinner posteriorly; mid dorsal longitudinal vitta present on 3rd tergum, rather diffusing marginally. Fifth tergum with short discal and marginal setae.

Female. Closely resembling male, and differing only as follows: Vertex 0.25-0.27 of head width; frontal vitta about 1/2 of fronto-orbital plate at middle or slightly wider; face only slightly longer than frons in profile; 2 strong proclinate orbital setae present; fronto-orbital plate with very fine, short and rather sparse hairs; antenna with 1st flagellomere 4-4.5 times as long as pedicel; apical scutellar setae rather strong, crossed horizontally; abdomen with dense, whitish pollinosity on anterior 3/5-2/3 of each 3rd to 5th terga; 5th abdominal tergum elongate and conical, subequal in length to 3rd and 4th terga combined, without distinct discal and marginal setae, with rather long, erect hairs.

Body length, 7.5-8 mm.

Hosts. LEPIDOPTERA: Hesperidae: *Cephrenes palmarum* (Moore) (Malaysia; Crosskey, 1976); *Haidari irava* Moore (Malaysia; Crosskey, 1976).

Distribution. Malaysia (Malaya), Indonesia (Java).

*Remarks.* This species is rather aberrant in this genus because of its wide gena and fine ocellar seta. I have not examined the male and female genitalia of this species and tentatively assign it to *Thecocarcelia*.

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