

# AMERICAN MUSEUM *Novitates*

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY  
CENTRAL PARK WEST AT 79TH STREET, NEW YORK, N.Y. 10024  
Number 2964, 31 pp., 69 figs. February 27, 1990

## Revision of *Zygothrica* (Diptera: Drosophilidae), Part II. The First African Species, Two New Indo-Pacific Groups, and the *bilineata* and *samoensis* Species Groups

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### ABSTRACT

Seventeen species in the genus *Zygothrica* are treated, 13 of which are described as new. Among them is the first record from Africa, *Z. africana* n. sp., for a unique specimen from Uganda, representing a plesiomorphic clade in the genus. Two other plesiomorphic clades are represented by *Z. kokodana* n. sp., from Papua New Guinea (the *kokodana* species group, new group), and by *Z. paleovitta* n. sp. from Malaysia (the *paleovitta* species group, new group). The remaining new species belong to the Indo-Pacific *samoensis* species group, ranging from the Malay Peninsula to Fiji, and to the Neotropical *bilineata* species

group. In the *samoensis* group they are: *leptorostra*, *aliunota*, *orientalis*, *malaysiana*, *wau*, *vietnamensis*, *prosopeiona*, *carsoni*, and *britannia*, species nova. In the *bilineata* group is *flavifrons* n. sp., based on a unique specimen from Trinidad. Distributions of widespread species, such as *Z. bilineata* (Williston) and *Z. samoensis* Mall., are documented; *Z. fijiana* Takada is found to range from New Guinea to Fiji. Descriptions are accompanied by illustrations, particularly of the terminalia, and by keys. Removed from *Zygothrica* and placed in the subgenus *Dudaica* of *Drosophila* is *malayana* (Takada).

### INTRODUCTION

This revision, the second part of my monograph on the genus *Zygothrica*, follows the format of the first part (Grimaldi, 1987). The last part (III) will be the remaining Neotrop-

ical taxa, which comprise the great bulk of the species in the genus. That last part, or perhaps a short paper thereafter, will discuss biogeographic patterns. Several recent papers

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on drosophilid faunas indicate the presence of only two species of *Zygothrica* from the Indo-Pacific area (Hardy and Kaneshiro, 1981; Okada, 1981). The review of the Micronesian drosophilids (Wheeler and Takada, 1964), covering the area from the Palau (north) to the Bonin and (east) to the Gilbert Islands, revealed no *Zygothrica* present there. The present study is based on all Old World *Zygothrica* specimens in the major collections of the world museums, which still stands as mute testimony that a revision of this group of species is even near completion. A total of 420 specimens, belonging to 16 species, were examined, with over half of the species represented by 10 or fewer specimens. There is no doubt that intensive, specialized collecting in Indo-Pacific forests, particularly by sweep netting over various fungi, would reveal yet a diverse new fauna.

Some undescribed species in Grimaldi (1987) were given names, in quotation marks. As argued previously, that paper is not the original source of those names; those names are nomenclaturally valid when they appear in this paper without quotations, with a diagnosis, and with a designated holotype. I tentatively presented those names in 1987 to facilitate discussing the species used in my analysis of higher relationships with later descriptive papers, instead of using a less efficient numbering technique. Abbreviations for depositories, standard measurements, standard terms, and other methods are given in Grimaldi (1987). Added here is the measurement of relative proboscis length, which is length of the postmentum + prementum divided by total length of head.

#### ACKNOWLEDGMENTS

It is my pleasure to thank the following people for their help: Neal Evenhuis, for providing a nice collection of Indo-Pacific *Zygothrica* to study; Peter Cranston (now at the Australian National Collection) and the rest of the BMNH dipterists for their hospitality during my stay there; Jean David and Shane McEvey, for sending the series of *Z. samoensis* on loan; Brian Pitkin, for the loan of types; Julian Stark, for doing the measurements; and Gerhard Bächli and Toyohi Okada for reviewing this manuscript.

## TAXONOMY

### THE AFRICAN SPECIES

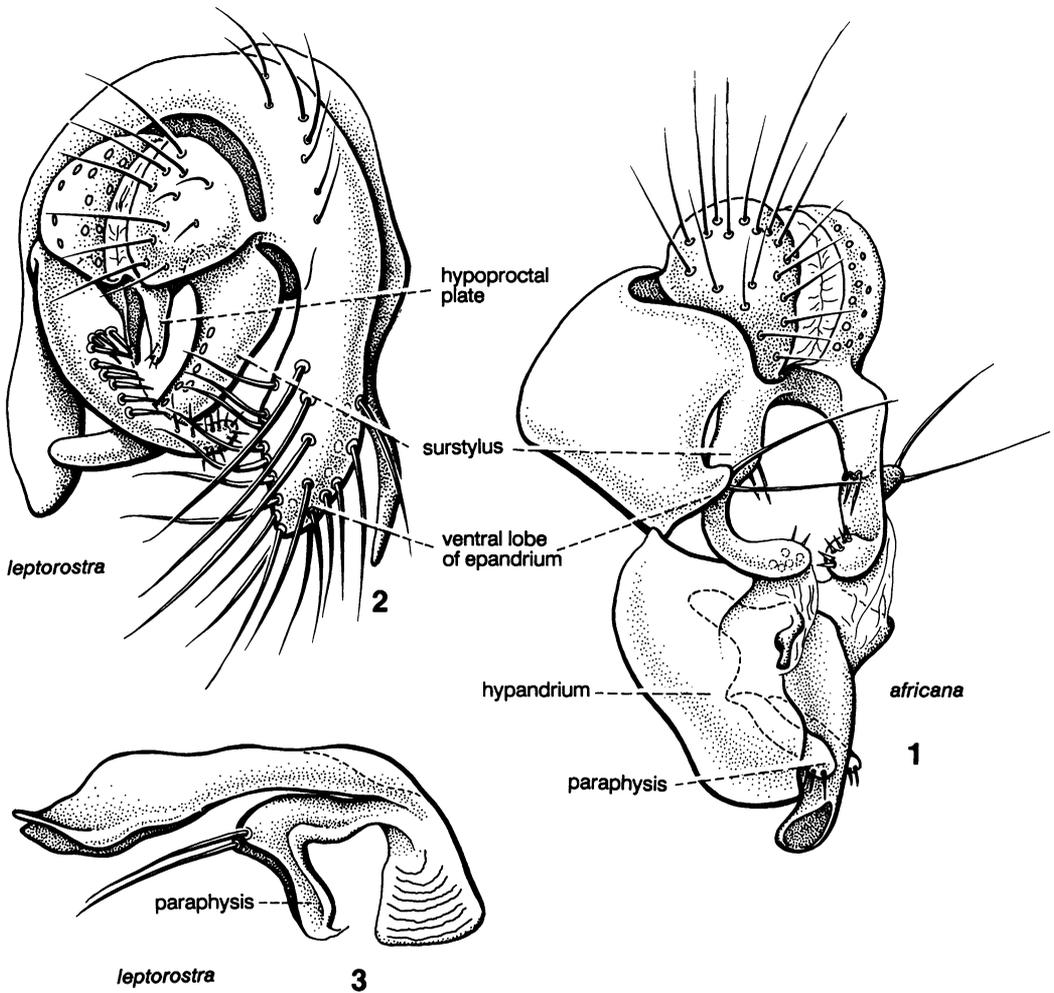
#### *Zygothrica africana*, new species

Figure 1

**DIAGNOSIS:** Eyes with dense, short pilosity; notum brown with pair of faint yellow, incomplete vittae; inner vertical seta nearly anterior to outer vertical. Proboscis yellow, projected, narrow. Male with narrow, pendulous surstylus, pair of long fine setae on each; ventral epandrial lobe small; aedeagus simple, unadorned, tubular.

**DESCRIPTION:** Frontal orbital plates yellow, parallel. Frontal vittae light brown, divided by median yellow vitta with width ca.  $\frac{1}{2}$  that of frontal vitta width, running full length of front. Eyes with short, dense, interfacetal setulae. Ocellar triangle dark brown between ocelli; triangle not shiny or large, without distinctive borders. Proclinate orbital seta slightly closer to anterior reclinate than to frontal lunule. Anterior reclinate midway between ipsilateral orbitals. Posterior reclinate midway between anterior reclinate and inner vertical setae. Lengths of orbital setae approximately equal. Ocellar setae relatively short: ca. equal to lengths of orbitals, divergent and extended to middle of frontal vitta. Inner vertical seta nearly directly anterior to outer vertical. Face tan, with protuberant oral margin. Carina narrow, prominent, forming fossae with protuberant oral margin in which antennae lie. Cheek white, with brown spot at base of vibrissa. Vibrissa subtended by 6–7 minute subvibrissal setulae and 1 long cheek seta. Flagellomere 1 light brown, covered with short fine setulae (not long ones, as in most *Hirtodrosophila*). Pedicel yellow. Arista with 4 dorsal and 2 ventral branches; no minute medial branches. Proboscis yellow, narrow, projected anteriorly; postmentum of labium forming acute angle with portion of proboscis connected to oral cavity. Labellum narrow, equal in width to labium, with long setae on each lobe. Palpi yellow, small, with 6–7 longer setae ventrally. Clypeus yellow, narrow, no wider than proboscis.

Notal ground color light brown, with 2 faint, diffuse, light and incomplete paramedian vittae, extended to slightly past anterior dorsocentrals. Acrostichals in 6 rows. Pleura



Figs. 1–3. Male terminalia. 1. *Zygothrica africana* n. sp., holotype. 2, 3. *Zygothrica leptorostra* n. sp. 2. Epandrium with associated structures, posterior view. 3. Aedeagus and paraphyses, lateral view.

completely yellow. Notopleural edge with diffuse, dark brown stripe, extended from post-pronotal lobe to wing base. Legs completely light yellow. Male fore femur with ventral row of 9 long setae, length of proximal 5 are twice the femur width. Halter knob light brown, base yellow. Wing hyaline, no infuscation at base. Tergites dark brown, with inverted yellow triangle on tergites I and II.

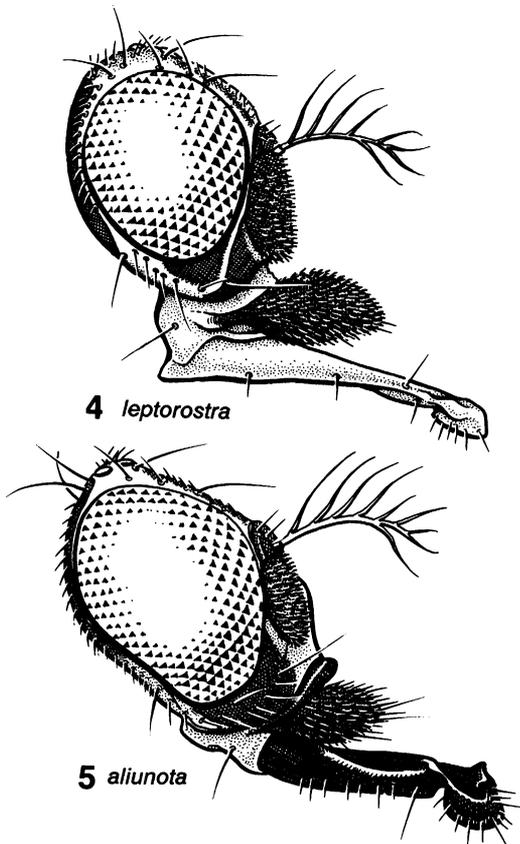
Epandrium (male) dark brown, with pair of small ventral lobes, each with pair of long, fine setae. Surstylus long, pendulous, with 6–7 apical, fine and small prensisetae; pair of fine, sharp prensisetae midway along mesal surface, on small lobe. Hypandrium rounded, cuplike, with pair of small sclerotized flanges

flanking basiphallus. Endophallus simple, tubular, unadorned, extended to slightly past hypandrial margin.

**HOLOTYPE:** Male, **Uganda:** Namwamba Valley, 6500 ft, Ruwenzori Range, XII/35, F. W. Edwards. British Museum East African Expedition, BM 1935-203. Genitalia dissected (DAG). Measurements: HD = 0.54; ED = 0.41; PL = 0.46; ThL = 0.97; WL = 2.39; C.I. = 3.5; 4-V = 1.53.

**ETYMOLOGY:** Referring to Africa, and the first instance of this predominantly Neotropical genus on that continent.

**DISCUSSION:** Known only from the single male holotype. If the female were known, the morphology of the oviscapt and spermathe-



Figs. 4, 5. Lateral views of *Zygothrica* heads.  
4. *Z. leptorostra* n. sp. 5. *Z. aliunota* n. sp.

cae could potentially be more informative about relationships to or within *Zygothrica*. As is, external and male genital morphology indicate no close relationship to the Indo-Pacific *samoensis* species group, and, in fact, it is simply the carina and proboscis that indicate a relationship in *Zygothrica*. The species is apparently quite plesiomorphic compared to most *Zygothrica* species, and autapomorphic in other aspects (such as the genitalic modifications). Perhaps a new species group should be erected for this species, but it would be prudent to first obtain additional material.

### SAMOENSIS SPECIES GROUP

#### CLADE 2.1

**DIAGNOSIS:** A morphologically distinctive and obviously monophyletic group, possess-

ing the following features (numbers in parentheses refer to numbers of apomorphies discussed in Grimaldi [1987]): Frontal vittae dark brown to black; narrow median frontal vitta present (58); face with anterolateral facial corners splayed (36); proboscis with long, sclerotized, narrow, postmentum (65), and small labellum, which is usually heavily melanized (except in *leptorostra*, n. sp.); palpi very broad (59); notum and scutellum dark brown to black, contrasting with entirely light yellow to white pleura and having distinct notopleural border; wing with diffuse, light brown basal infuscation (63); halter knob black (62); spermatheca small and membranous (64) (not in *leptorostra*, which may be a primitive feature of this species, see below); oviscapt (female) with 4–6 (not 5–6, as originally described in Grimaldi [1987]) lateral, ovisensilla pegs. The species are Indo-Pacific in distribution, occurring from Thailand to Fiji (apomorphy 61).

#### *Zygothrica leptorostra*, new species

Figures 2–4, 50, 58

**DIAGNOSIS:** A distinctive species, for its long, thin, yellow proboscis and small labella; very broad, flat, black palpi, evenly covered with short sensilla and with very few long, apical-marginal setae; males possessing very large, pendulous ventral epandrial lobes; epandrial lobe with 2 combs of long setae; surstyli also long and pendulous; hypoproctal plates present; spermathecal capsule elongate and sclerotized.

**DESCRIPTION:** Frontal orbital plates light yellow, graded to black near anterior reclinate orbital setae. Frontal vittae light, dull brown, converged from apex of ocellar triangle to frontal lunule. Eyes dark red, virtually bare. Ocellar triangle small, black, bordering area just outside ocelli. Orbital setae far back on front; all lie on dorsal half of front. Anterior reclinate seta slightly closer to proclinate than to posterior reclinate, length slightly more than  $\frac{1}{2}$  that of other orbitals. Posterior reclinate about midway between anterior reclinate and inner vertical. Outer vertical posterolateral to inner vertical. Ocellar setae extended to slightly past base of proclinate orbitals. Some specimens with deep red ocelli, others with light yellow ocelli. Occiput and postocciput black. Face tan and black; an-

tennal fossae dark brown, oral margin between cheek and base of carina dark brown. Carina tan, protuberant, narrow; dark brown color extended up sides. Cheek yellow, with dark brown spot just below eye. Pedicel yellow. Flagellomere 1 dark brown, yellow at proximal end; covered with fine, short sensilla. Arista with 3–5 (generally 4) dorsal and 1 ventral branch; branches spaced evenly and far apart. Proboscis yellow, with long, narrow, and projected postmentum; labrum elongate, length about  $\frac{3}{4}$  that of postmentum; labellum small, about same width as apex of postmentum. Palpi black, laterally flat and broad; long, length ca.  $\frac{1}{2}$  that of postmentum; evenly covered with fine, short sensilla; with only 2–3 moderately long, apical marginal setae.

Notum and scutellum ground color dark brown to black; subscutellum and postnotum lighter brown. Pleura white to light yellow; notopleural margin distinct. Halter knob black, base yellow. Wing hyaline, with slight smoky-brown infuscation at base. Legs entirely light yellow. Male fore femur with 2–3 long (length  $1\frac{1}{2} \times$  width of femur), ventral setae.

Tergites 2–5 dark brown, t5 with small yellow, diffuse median spot in some specimens; t6–8 light yellow. Oviscapt yellow, with 4 lateral and 14–15 marginal ovisensilla pegs. Oviprovector scales simple, triangular. Spermathecal capsule elongate, cylindrical; surface smooth, with basal collar; introvert extended ca.  $\frac{4}{5}$  length of capsule. Hypo/epiproct (♀) yellow. Cerci (♂) yellow. Epandrium short, yellow, with large posterior pair of pendulous ventral lobes and thin anterior pair. Posterior ventral epandrial lobes bear long, fine, evenly spaced setae: lateral row of 4, medial-marginal row of ca. 9–10 curved setae, and lateral-marginal row of ca. 6–7 shorter, straight setae. Surstylus long, nearly equal to length of epandrial lobes, tapered apicad, slightly crescentic; with 3 fields of prenisetae: dorsal row of 3+ mesal row of 6 prenisetae, of same size, and apical group ca. 12 fine, short, scattered prenisetae. Hypandrium with anterior margin squared. Pair of hypoproctal plates present; elongate and narrow, with 3–4 minute sensilla at apex. Endophallus simple, short, about twice the length from apex of aedeagal apodeme to paraphysis. Aedeagal apodeme truncate, laterally flat. Distiphallus

unadorned, with apex flared laterally into 2 liplike flanges.

MEASUREMENTS: ♂: HD = 0.60 (0.58–0.63); ED = 0.48 (0.47–0.49); PL = 0.64 (0.56–0.69); ThL = 1.05 (1.01–1.12); WL = 1.94 (1.91–1.99) (N = 4); ♀: HD = 0.62 (0.61–0.64); ED = 0.50 (0.47–0.51); PL = 0.76 (0.67–0.79); ThL = 1.18 (1.13–1.30); WL = 2.20 (2.11–2.25) (N = 5); ♂ + ♀: C.I. = 2.23 (1.75–3.15); 4-V = 2.15 (1.40–2.45).

HOLOTYPE: Male, Papua New Guinea: Kokoda, 1200 ft IV/33, L. E. Cheeseman, "on fungus," BM 1933-427. Genitalia not dissected. In BM(NH). Measurements: HD = 0.61; ED = 0.49; PL = 0.62; ThL = 1.12; WL = 1.98; C.I. = 2.25; 4-V = 1.99.

ETYMOLOGY: *Lepto*, meaning thin, and *rostra*, nose, for the long and thin, white proboscis.

MATERIAL EXAMINED: A large series of 60♂ and ♀, with the same collecting data as the holotype. All are paratypes. 5♂ and 5♀ are retained in the AMNH collections, the remainder are in the BM(NH). Others: Malaysia: Pahang, King George V National Park, Gua 'Che Yatim, XII/16/58, L. W. Quate (1♀) (BPBM).

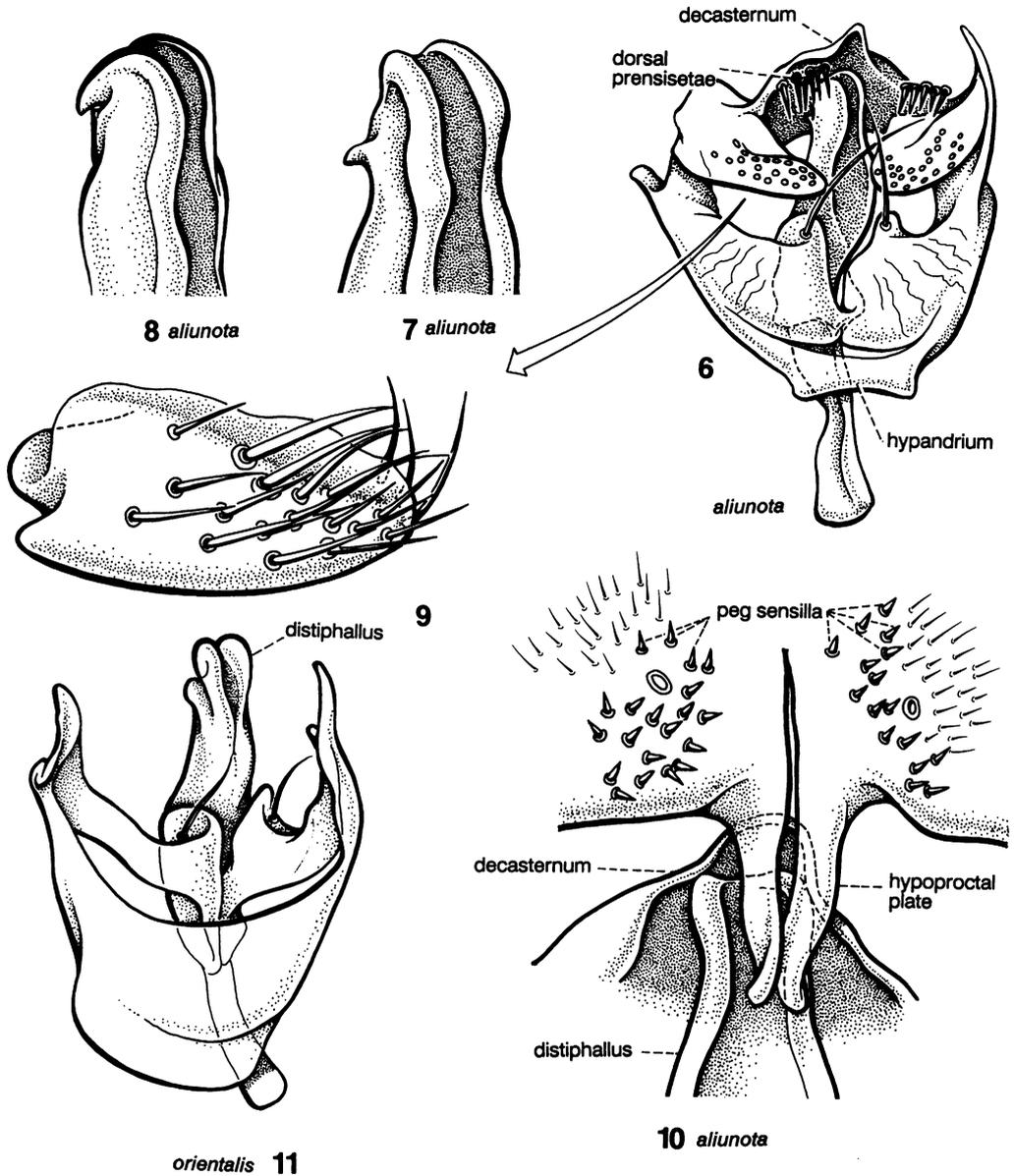
DISCUSSION: This species is probably the sister group to the rest of the *samoensis* group. Features which I believe are primitive at the level of this species group are the following. The spermatheca is large, cylindrical, and sclerotized, similar to that of the Neotropical species *Z. bilineata*, instead of being reduced in size and sclerotization. The proboscis lacks melanization. However, as discussed in the species group diagnosis, *leptorrostra* possesses all the other apomorphies diagnostic for the *samoensis* group. Apparently, then, the long and thin proboscis in this species is a convergent development with that seen in the Neotropical species *Zygothrica spiculirostris* and *Z. tenuirostris*, which are placed in the *hypandriata* species group (clade 4.3 of Grimaldi [1987]).

*Zygothrica aliunota*, new species

Figures 6–10, 22, 39, 59

*Zygothrica* "aliunota"; Grimaldi, 1987: 140, 148 (placement of undescribed species).

DIAGNOSIS: Males with large, dark, apical wing spot; arista generally with 6 or 7 dorsal branches; notum and tergites unicolorous



Figs. 6–11. Male terminalia of new species in the *samoensis* group. 6–10. *Z. aliunota*. 6. Hypandrium + aedeagus + surstyli + decasternum. 7, 8. Variation in distiphallus shape (7, holotype, from Kuala Lumpur, Malaysia; 8, from Los Banos, Phillipines). 9. Surstylus, lateral view. 10. Ventromedial surface of cercus, and apical medial portions of decasternum and distiphallus. 11. *Z. orientalis* hypandrium and aedeagus.

dark brown to black; palp dark brown and large, with long dense apical setae. Spermathecal capsule small and membranous. Surstylus with ca. 20 setiform prensisetae and 5 or 6 stouter dorsal prensisetae. Aedeagus simple; distiphallus with small preapical

tooth, sometimes with 2. Hypoproctal plates present, with ca. 20 stout sensilla pegs at base of each. Hypandrium short, truncate.

DESCRIPTION: Frontal orbital plates light yellow. Frontal vittae dull, dark brown, finely striate, converged for most of frons; with faint,

short light vitta at anterior apex of ocellar triangle. Eyes bare or virtually so. Ocellar triangle black, dull, not well defined. Anterior reclinate orbital seta fine, short; length and thickness ca.  $\frac{1}{2}$  that of posterior reclinate; midway between other 2 ipsilateral orbitals. Posterior reclinate midway between anterior reclinate and inner vertical. Relative lengths of orbital setae: 1:1.5:2 (ant. reclinate : proclinate : post. reclinate). Ocellar setae extended to bases of proclimates. Vertical setae longer than posterior reclimates. Inner vertical seta in line with ipsilateral orbitals, medial to outer vertical. Face mostly white, including carina, antennal fossae, and medial portion of oral margin; cheeks, lateral parts of oral margin, and clypeus dark brown. Carina protuberant, extended anteriorly to same level as antennae. Pedical yellow. Flagellomere 1 light brown, with short sensilla. Arista with 4–7 (generally 6 or 7) dorsal and 1 or 2 ventral branches. Proboscis dark brown, except for basal membrane. Labellum small, of same thickness as postmentum. Palpi dark brown, laterally flat, broad, and long (height ca.  $\frac{1}{2}$  that of the length), with 5–10 longer, marginal apical setulae.

Notal ground color unicolorous and evenly dark brown to black. Acrostichals in 6 rows; pair of prescutellar acrostichals ca. twice as long as others. Anterior dorsocentral length  $\frac{1}{2}$  that of posterior dorsocentrals. Pleura and legs light yellow to white, with distinct notopleural margin. Male fore femur with comb of ca. 10 fine setae on ventral surface. Halter knob dark brown, base yellow. Wing with light basal infuscation; dark apical spot extended from just before  $R_{2+3}$  to apex of wing (males only, females without spot).

Tergites black, anterior corners t6 yellow; t7 entirely yellow. Oviscapt with 4 (nos. a–d) lateral and 11 marginal ovisensilla pegs (specimen from Singapore Island), others: 4–5 laterals and 9–10 marginals (specimens from Sarawak and Pahang, Malaysia). Oviprovector scales simple, triangular. Spermathecal capsule reduced; membranous, wrinkled, and small; diameter ca.  $2\frac{1}{2} \times$  that of spermathecal duct. Hypo/epiproct yellow. Epandrium (t8) yellow. Hypoproctal plates present; thin, long, with ca. 20 minute but stout peg sensilla at base and on ventromedial surface of cercal lobes. Surstylus simple, lobe-shaped, with ca.

20 setiform prensisetae. 5–6 stouter dorsal prensisetae are on the membrane attached to decasternum (in holotype, other specimens [from Sarawak and Selangor, Malaysia], with 7–8 dorsals). Decasternum well developed, with apical protuberance into which distiphallus and apices of hypoproctal plates fit. Hypandrium very short, with truncate anterior margin. Endophallus simple, slightly longer than aedeagal apodeme. Distiphallus with small retrorse tooth, sometimes with another, smaller tooth proximally.

MEASUREMENTS:  $\delta$ : HD = 0.72 (0.66–0.77); ED = 0.56 (0.43–0.63); PL = 0.73 (0.60–0.81); ThL = 1.27 (1.05–1.38); WL = 2.46 (2.15–2.66) (N = 6);  $\text{♀}$ : HD = 0.66 (0.62–0.69); ED = 0.55 (0.50–0.60); PL = 0.59 (0.54–0.64); ThL = 1.15 (1.03–1.24); WL = 2.21 (2.07–2.37) (N = 4);  $\delta + \text{♀}$ : C.I. = 3.63 (3.35–4.24); 4-V = 1.75 (1.56–1.80).

HOLOTYPE: Male, **Malaysia**: nr. Kuala Lumpur, XII/75, Forbes Robertson. Genitalia dissected (DAG). In the AMNH. Measurements: HD = 0.67; ED = 0.57; PL = 0.55; ThL = 1.21; WL = 2.27; C.I. = 3.35; 4-V = 1.78.

ETYMOLOGY: Meaning “another spot,” for the repeated convergent nature of the apical wing spots in *Zygothrica*, particularly among the Neotropical species.

MATERIAL EXAMINED: **Borneo**: North Borneo (SE), Forest Camp, 19 km N Kalabakan, 25/X/62 (2 $\delta$ , 2 $\text{♀}$ ) (BPBM). **Malaysia**: Pahang: Pasoh Forest, Simpang Pertang, 29–30/XII/72, A. E. Stubbs BMNH 1974–87 (2 $\delta$ , 2 $\text{♀}$ ); Gua 'Che Yatim, King George V National Park, XII/16–17/58, Gressitt, Maa & Quate (15 $\delta$ , 3 $\text{♀}$ ) (BPBM); Selangor, between Pokok Sena and Kuala Nerang, 1/I/73, A. E. Stubbs BMNH 1974–87 (1 $\delta$ ); **Singapore Island**: Bukit Timah Nature Reserve, 20/XII/72, A. E. Stubbs BMNH 1974–87 (5 $\delta$ , 4 $\text{♀}$ : paratypes series, in BM[NH]). **Philippines**: Manila, Los Banos, 29/VII/68, Throckmorton & Lin (1 $\delta$ ) (AMNH). **Sarawak**: Foot of Mt. Dulit, Junction of rivers Tinjar and Lejok, 2500 ft, 15/IX/32, “on fungus in primitive forest,” Oxford Univ. Exped., B. M. Hobby & A. W. Moore, BM 1933-254 (7 $\delta$ , 7 $\text{♀}$ ).

DISTRIBUTION: Mid altitudes from peninsular Malaysia to Sarawak.

DISCUSSION: It would be interesting to eventually see this species alive. The males

undoubtedly display by semaphoring the wings in a manner similar to that described for some Neotropical, apical spot-winged species (Grimaldi, 1987). The major difference between this species and the Neotropical ones is that the apical wing spot in *aliunota* is sexually dimorphic.

***Zygothrica orientalis*, new species**

Figures 11, 56, 57

*Zygothrica* "orientalis"; Grimaldi, 1987: 140, 148 (placement of undescribed species).

**DIAGNOSIS:** Face tan to light brown; palp dark brown, broad, with small apical brush of long setae. Notum and tergites evenly dark brown to black. Spermathecal capsule small, membranous. Oviscapt with 6 lateral ovisensilla pegs. Hypandrium long as wide; distiphallus with apical lips and small dorsal lobe.

**DESCRIPTION:** Frontal orbital plates narrow, width ca.  $\frac{1}{3}$  that of one frontal vitta; dull yellow to tan. Frontal vitta dull, flat dark brown; finely striate; converged from apex of triangle to frontal lunule; sometimes with faint, incomplete, median mita. Eyes dull red-brown; bare. Ocellar triangle black between ocelli only; small, margins indistinct and at outer limits of ocelli. Anterior reclinate midway between ipsilateral orbitals. Posterior reclinate slightly closer to inner vertical than to anterior reclinate. Relative lengths of orbital setae: 1:1.5:1.5 (ant. reclinate : proclinate : post. reclinate). Ocellar setae extended to bases of proclimates. Inner vertical seta in line with ipsilateral orbitals, anteromedial to outer vertical. Verticals ca.  $1.5\times$  length of posterior reclinate. Face tan to light brown, including antennal fossae. Cheeks and lateral oral margins dark brown. Carina, clypeus, and gena yellow to light brown. Flagellomere 1 light brown to yellow, with short sensilla. Pedicel ochre. Arista with 4–6 dorsal and 2 ventral branches. Proboscis with dark brown postmentum and labella, except for basal membrane; labella width equal to that of postmentum. Palpi dark brown, broad, with long apical setae (length ca.  $\frac{1}{2}$  that of palp).

Notal ground color unicolorous and evenly dark brown to black-brown. Pleura and legs entirely light yellow to whitish; notopleural margin distinct. Male fore femur with short

row of 3 fine ventral setae, 1 prominent preapical dorsolateral seta. Subcutellum and postnotum light brown. Halter knob dark brown, base yellow. Wing hyaline, with faint, light brown basal infuscation. Anterior dorso-central seta ca.  $\frac{1}{2}$  length of posterior dorso-central. Acrostichals in 6 rows, with 2 pairs of large prescutellars, lengths twice that of other acrostichals.

Tergites dark brown to black.  $t_7$  yellow, anterior corners  $t_6$  yellow. Oviscapt with 6 (nos. a–f) lateral and 10 marginal ovisensilla pegs (pegs e + f are supernumerary), position of laterals variable. Oviprovector scales simple, triangular. Spermathecal capsule reduced, small, membranous. Hypo/epiproct yellow. Hypoproctal plate present. Epan-drium yellow. Surstylus very similar to that of *aliunota*, with 5–7 dorsal prensisetae and 20 (Thailand) to 23 (Phillipines) setiform, surstylar prensisetae. Hypandrium about as long as wide. Gonopods extended to nearly same level as apex of distiphallus. Endophallus simple, about  $1.5\times$  as long as aedeagal apodeme. Distiphallus with pair of distinct apical lips and small dorsal lobe.

**MEASUREMENTS:**  $\delta$ : HD = 0.67 (0.63–0.72); ED = 0.56 (0.50–0.59); PL = 0.62 (0.47–0.67); ThL = 1.14 (1.07–1.21); WL = 2.07 (1.90–2.24) (N = 5);  $\text{♀}$ : HD = 0.69 (0.67–0.72); ED = 0.58 (0.56–0.60); PL = 0.64 (0.57–0.67); ThL = 1.24 (1.21–1.25); WL = 2.13 (2.07–2.23) (N = 7);  $\delta$  +  $\text{♀}$ : C.I. = 2.37 (1.87–2.95); 4-V = 2.00 (1.70–2.34).

**HOLOTYPE:** Male, **Philippines:** Manila, Los Banos, 30/VI/68, F. J. Lin. Genitalia not dissected. In the AMNH. Measurements: HD = 0.73; ED = 0.63; PL = 0.54; ThL = 1.21; WL = 2.11; C.I. = 2.36; 4-V = 1.93.

**ETYMOLOGY:** In reference to the Orient, for the widespread nature of this species in the region.

**MATERIAL EXAMINED:** **Celebes:** Marino, 9/XII/73, S. Shinonaga, (1 $\delta$ , 1 $\text{♀}$ ). **Philippines:** same collection data as holotype, 5 $\text{♀}$ , 3 $\delta$  (paratype series—in the AMNH); Cavite, Tagaytay, 29/VI/68, F. J. Lin (3 $\text{♀}$ ) (AMNH); Mindoro, San Jose, 1/30/45, E. S. Ross (1 $\text{♀}$ , 1 $\delta$ ) (CAS). **Thailand:** Erawan Water Fall, 10/IX/75, H. Kurahashi (2 $\text{♀}$ , 5 $\delta$ ) (in TSM) (this locality is probably Arawa Kholng, a stream on the Malay Peninsula at 12°08'N, 99°15'E).

**DISTRIBUTION:** Occurs from the Malay Peninsula to Celebes and the Phillipines.

**DISCUSSION:** This is one of the morphologically cryptic species in the group, best identified by dissection of the male and female genitalia. For females collected without associated males they are relatively easy to identify, given the six lateral ovisensilla pegs, which no other species in the group has.

*Zygothrica samoensis*

Figures 12–16, 20, 54

*Zygothrica samoensis* Malloch, 1934: 278 (BMNH), by original designation. Wheeler and Kambyssellis, 1966: 542 (new Samoan records, illustration male genitalia). — Takada, 1976: 66 (redescription, Samoan record, host). — Bock, 1982: 152 (redescription, genitalic illustration, Australian distribution). — McEvey and Bock, 1982: 693 (new Queensland record).

**DIAGNOSIS:** Most easily distinguished from other species of the group by the following combination of features: flagellomere 1 light brown; face light brown; palpi and proboscis dark brown; wing hyaline and very light brown, with slight basal infuscation; 2 pairs of prescutellar acrostichal setulae present; spermathecal capsule membranous and small; hypandrium very short; surstyli small and lobelike, with only 2–3 stout prensisetae and ca. 10 finer, setiform prensisetae; 3–8 dorsal prensisetae; distiphallus distinctly tapered toward apex; paraphyses pointed, separated by a variable distance.

**MEASUREMENTS:** ♂: HD = 0.73 (0.61–0.88); ED = 0.61 (0.51–0.75); PL = 0.67 (0.58–0.77); ThL = 1.27 (1.08–1.60); WL = 2.25 (1.97–2.58) (N = 5); ♀: HD = 0.71 (0.55–0.84); ED = 0.59 (0.44–0.71); PL = 0.71 (0.47–0.86); ThL = 1.27 (0.99–1.31); WL = 2.26 (1.81–2.80) (N = 5); ♂ + ♀: C.I. = 2.92 (2.37–3.63); 4-V = 1.88 (1.73–2.08).

**LECTOTYPE:** Female, with only the following labels on the specimen: “Pres. [presented] by P. A. Buxton/ BM 1934-97.” Specimen examined, but genitalia not dissected. In the BM(NH). Malloch’s description includes the following type locality in the collection data: **Samoa:** Upolu, Malololelei, 2000’, 30/XI/24, Buxton and Hopkins. Measurements: HD = 0.77; ED = 0.63; PL = 0.73; ThL = 1.33; WL = 2.39; C.I. = 3.28; 4-V = 1.77.

**MATERIAL EXAMINED:** **American Samoa:** Tutuila Island: Leone area, 27/VI–5/VIII/62, M. R. Wheeler (5♀, 6♂) (AMNH); Malaiami

V. X/54, C. P. Hoyt (3♂, 4♀) (BPBM). **Australia:** Northern Queensland: Mossman Gorge, 5 km W Mossman, swept in rainforest, 28/V/80, S. McEvey (1♂); Gordon Creek, Iron Range, 1.5 km E Cook’s Hut, 12°43’S, 143°19’E, ex: rainforest fungus, 10/V/81, S. McEvey; Mulgrave Ravine, Forest Rd., 14 km S Gordonvale Rd., in rainforest, 26/IV/80, S. McEvey (1♀); Palmerston National Park, VI/83, off fungi, P. Parsons (2♂, 2♀); Cairns, Whitfield Ravine Forest Reserve, 19/IV/67, D. H. Colless (1♂) (all in ANIC). **French Polynesia:** Tahiti, II/86, J. David (1♀); Moorea, II/86, J. David (1♂ + ♀) (MHN, Paris); Society Islands: Raiatea Island, Uturoa, 0–100 m, II/72, N. L. H. Krauss (1♂) (BPBM). **New Hebrides:** Malekula, Ounua, III–IV/29, L. E. Cheeseman, BM 1929-343 (7♂, 8♀) (BMNH). **Papua New Guinea:** Brown River, nr. Port Moresby, X/61, H. L. Carson (4♂, 3♀) (AMNH). **Solomon Islands:** Guadalcanal, “1944,” C. O. Berg (2♂, 2♀) (AMNH). **Western Samoa:** Savai’i, Safune, 12/V/24, Bryan (4♂, 3♀ in paratype series, in BMNH; plus 12 ♂ and ♀ from same collection as BM series). In addition: Savai’i, Palauli, II/55, N. L. H. Krauss (3♂, 2♀) (BPBM).

**DISTRIBUTION:** From Northern Queensland, (southern?) New Guinea, to the Solomon and Samoan Islands.

**DISCUSSION:** This is probably the most widespread and common species in the group. Takada (1976) mentioned having caught two males on a *Ganoderma* fungus (Polyporaceae) from Apia, Western Samoa. If the drawing in his paper of the male genitalia from one of these specimens is correct (e.g., shape of the distiphallus), then the identity of his specimens as *Z. samoensis* must be suspect.

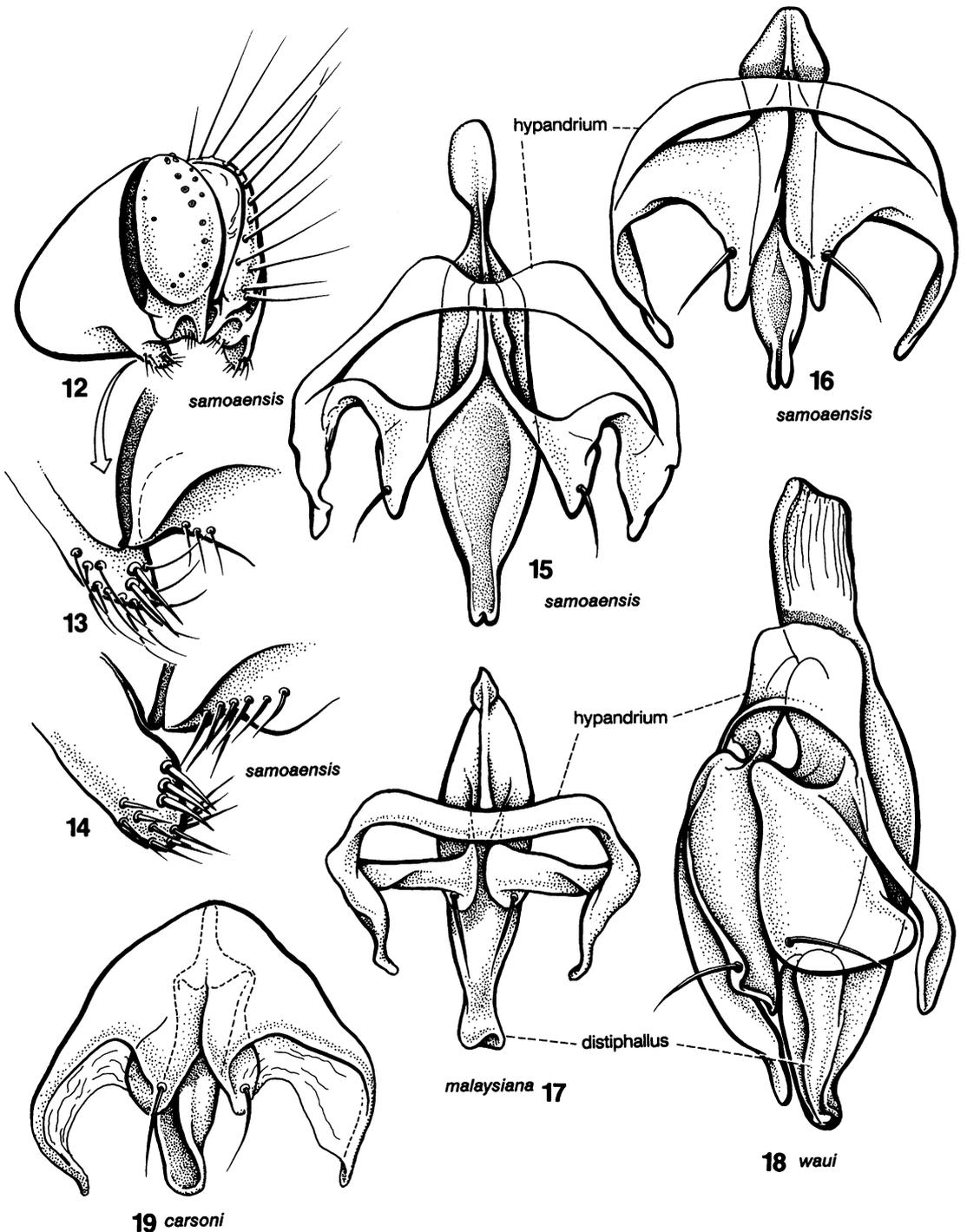
*Zygothrica malaysiana*, new species

Figures 17, 51

*Zygothrica* “malaysiana”; Grimaldi, 1987: 140, 148 (placement of undescribed species).

**DIAGNOSIS:** Very similar externally to most other species in the group. Face and carina ochre, antenna light brown, proboscis and palpi black-brown. Male genitalia provide the best source of reliable features: hypandrium very short, ribbonlike; aedeagus fusiform, with an apical knob.

**DESCRIPTION:** Frontal orbital plates ochre. Frontal vittae black-brown, finely striate; with



Figs. 12-19. Males terminalia. 12-16. *Z. samoensis* Mall. 12. Epandrium + cerci. 13, 14. Surstylus variation (13, American Samoa; 14, Northern Queensland). 15, 16. Aedeagal variation (15, Northern Queensland; 16, American Samoa). 17. *Z. malaysiana* n. sp., aedeagus and hypandrium. 18. *Z. waii* n. sp., aedeagus and hypandrium. 19. *Z. carsoni* n. sp., aedeagus and hypandrium.

a faint, incomplete, median vitta, the anteriormost end faded to yellow. Eyes dull red-brown; bare. Ocellar triangle black between ocelli; small, borders not well defined. Anterior reclinate orbital seta small and fine, midway between ipsilateral orbitals; ca.  $\frac{1}{2}$  thickness and length of posterior reclinate orbital. Posterior reclinate slightly closer to anterior reclinate than to inner vertical. Ocellar setae extended to bases of proclimates. Inner verticals slightly medial to line connecting ipsilateral orbitals. Face ochre to light brown, including antennal fossa and lateral oral margin. Carina, clypeus, and pedicel ochre. Flagellomere 1 light brown, with short sensilla. Arista with 4–5 dorsal and 2 ventral branches. Proboscis with black-brown postmentum, basal membrane light; labellum small and dark. Palpi dark brown, broad, flat, with long apical setae.

Notum and scutellum black-brown, evenly colored. Acrostichals in 6 even rows, with 1–2 pairs prescutellar acrostichals  $2.5 \times$  length of others. Anterior dorsocentral setae small,  $\frac{1}{2}$  length of posterior dorsocentrals. Pleura and legs entirely light yellow to white. Notopleural margin distinct. Male fore femur with row of 6 ventral, fine setae, 1 prominent preapical, dorsolateral seta. Subscutellum and postnotum light brown. Halter knob black-brown, base light yellow. Wing hyaline, with very faint basal infuscation.

Tergites entirely dark brown to black-brown; anterolateral corners of tV yellow; tVI yellow. Oviscapt with 4 lateral (a–d) and 12 marginal ovisensilla pegs. Oviprovector scales simple, triangular. Spermathecal capsule reduced: small, membranous, wrinkled. Hypo/epiproct yellow; epandrium yellow. Surstylus small and lobate, with 19–22 prensisetae; 9 dorsal prensisetae. Hypandrium very reduced in length, ribbonlike. Gonopods large, project  $\frac{1}{2}$  length of distiphallus. Endophallus simple, fusiform. Distiphallus unadorned, tapered apicad, then with an apical knob.

MEASUREMENTS:  $\delta$ : HD = 0.65 (0.57–0.68); ED = 0.54 (0.47–0.57); PL = 0.61 (0.53–0.70); ThL = 1.11 (0.94–1.23); WL = 2.00 (1.78–2.20) (N = 4);  $\varphi$ : HD = 0.70 (0.63–0.78); ED = 0.57 (0.52–0.67); PL = 0.66 (0.58–0.71); ThL = 1.18 (1.05–1.31); WL = 2.11 (1.89–2.30) (N = 4);  $\delta + \varphi$ : C.I. = 2.32 (1.59–3.47); 4-V = 2.02 (1.75–2.27).

HOLOTYPE: Male, **Malaysia**: Sabah, 14 km W Kundasang, 1450 m, 13/VIII/83, G. F. Hevel & W. E. Steiner. Genitalia not dissected (in Natural History Museum, Smithsonian Institution [NHSI]). Measurements: HD = 0.58; ED = 0.47; PL = 0.53; ThL = 0.98; WL = 1.79; C.I. = 1.77; 4-V = 1.97.

ETYMOLOGY: Pertaining to the country of the type locality.

MATERIAL EXAMINED: 4 $\delta$ , 1 $\varphi$ , with same data as the holotype (paratype series [in NHSI]). Others: **Malaysia**: Sabah, Kuala Penyu, 10/VIII/83, Hevel & Steiner (1 $\delta$ , 2 $\varphi$ ) (NHSI); Penang, 15–19/VII/71, H. Ikeda (1 $\varphi$ ) (TSM); Pahang, King George V National Park, Gua 'Che Yatim, XII/16/58, L. W. Quate (1 $\delta$ ) (BPBM).

DISTRIBUTION: Borneo to peninsular Malaysia.

DISCUSSION: Another morphologically cryptic species, like *orientalis*, which should be dissected for detailed examination of the male genitalia for proper identification. Because of the cryptic nature of many of the *samoensis* group species, and the reliance upon male genitalia in many cases, it is preferable to have female specimens that are associated with males in the same collecting series.

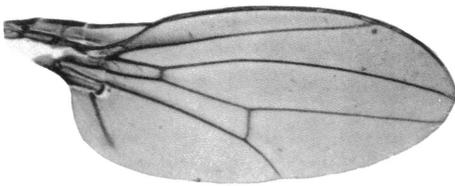
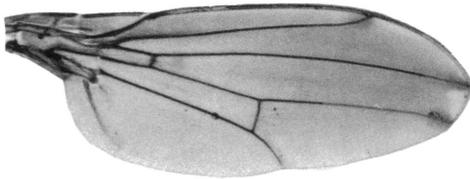
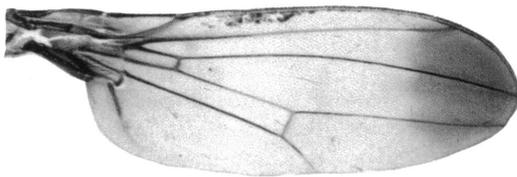
### *Zygothrica wau*, new species

Figure 18

*Zygothrica* "wau"; Grimaldi, 1987: 140, 148 (placement of undescribed species).

DIAGNOSIS: Also a difficult species to distinguish from *samoensis*, and most reliably identified on the basis of male genitalia: hypandrium small; paraphyses very broad; aedeagus slender and arched, with distinctive swollen, apical labia and dorsoapical knob; aedeagal apodeme laterally flattened; hypoproctal plates present, long.

DESCRIPTION: Frontal orbital plates narrow, yellow. Frontal vittae velvety black-brown, with thin median yellow vitta. Yellow near frontal lunule. Eyes dull red-brown; bare. Ocellar triangle black between ocelli; small, with borders indistinct. Anterior reclinate slightly closer to posterior reclinate than to proclinate. Posterior reclinate midway between anterior reclinate and inner vertical. Relative lengths of orbital setae: 1:1.3:1.3 (ant.

20 *samoensis*21 *carsoni*22 *aliunota*

Figs. 20–22. Wings of selected *Zythrica* species, *samoensis* group.

reclinate : proclinate : post. reclinate). Ocellar setae extended to bases of proclينات. Inner verticals in line with ipsilateral reclينات (proclinate slightly medial to this line). Face ochre on oral margin and part of antennal fossae. Carina light brown. Cheek, down to frontal genal suture, and clypeus, dark brown. Gena yellow; postocciput dark brown. Pedicel, flagellomere 1 light brown. Flagellomere with short sensilla. Arista with 4 dorsal and 2 ventral branches. Proboscis dark brown, sclerotized, narrow; with small labella. Basal membrane white. Palpi dark brown, flat, broad, with apical tuft of longer setae than covers most of palp.

Notum and scutellum unicolorous dark brown to black. Subscutellum and postnotum lighter brown. Acrostichals in 6 rows, with 2 pairs prescutellar acrostichals twice the length of other acrostichals. Pleura and legs entirely light yellow to white. Notopleural margin distinct. Halter knob black, base light yellow. Wing hyaline with light basal infuscation. Ventral surface of male fore femur with fine, short setae; without obvious setal comb. Ter-

gites entirely black-brown; t6 with anterolateral corners yellow; t7 yellow. Oviscapt with 4 lateral and 12 marginal ovisensilla pegs, very similar to that of *samoensis*. Oviprovector scales simple, triangular. Spermathecal capsule reduced: small, membranous. Hypo/epiproct, epandrium, yellow. Surstylus small, lobate, with 5 dorsal and ca. 20 surstylar prensisetae. Hypoproctal plates present and elongate. Hypandrium small, narrow, ca. 1/2 width of that across paraphyses. Paraphyses broad, cuplike. Endophallus long, narrow, slightly arched. Aedeagal apodeme laterally flattened. Distiphallus with pair of swollen apical lips/lobes on ventral surface and small dorsal apical knob.

MEASUREMENTS: ♂: HD = 0.66 (0.56–0.72); ED = 0.56 (0.49–0.60); PL = 0.55 (0.53–0.57); ThL = 1.11 (1.01–1.24); WL = 2.04 (1.85–2.30) (N = 3); ♀: HD = 0.66 (0.56–0.75); ED = 0.55 (0.48–0.58); PL = 0.64 (0.54–0.70); ThL = 1.19 (0.94–1.41); WL = 2.17 (1.82–2.47) (N = 4); ♂ + ♀: C.I. = 2.80 (2.32–3.47); 4-V = 2.09 (1.56–2.71).

HOLOTYPE: Male, Papua New Guinea: Wau, 4/IX/77, T. Okada. Genitalia not dissected. In the AMNH. Measurements: HD = 0.60; ED = 0.52; PL = 0.61; ThL = 1.01; WL = 1.94; C.I. = 2.16; 4-V = 2.25.

ETYMOLOGY: Patronym, named for the biological field station at Wau, New Guinea, which is the type locality, and to honor the contributions that this facility has made to field biology in New Guinea.

MATERIAL EXAMINED: Same collecting data as the holotype (2♂, 1♀). Papua New Guinea: Bulolo, 23/VIII/77, T. Okada (1♀) (TSM); Lake Kutuba, 1000 m, 7/II/78, R. Kano (1♀) (TSM) (all the above is the paratype series, in TSM); Kokoda, 1200 ft, IV/33, L. E. Cheeseman, BM 1933-427 (2♂) (BMNH). Also, Wau: Morobe District, Mt. Missim, 1600 m, 17/III/66, J. L. Gressitt (1♂) (BPBM).

*Zythrica carsoni*, new species

Figures 19, 21, 60

DIAGNOSIS: Very easy to distinguish externally from other members of the species group, by having a pair of light, paramedian, incomplete notal vittae; notum coffee-brown; and wings dusky brown and hyaline with faint brown spots at the apices of veins  $R_{2+3}$ ,  $R_{4+5}$ ,

and  $M_1$ . Virtually the only diagnostic genitalia characters are the shape and size of the hypandrium and aedeagus, while other genitalic features are quite similar to those of *samoensis*.

**DESCRIPTION:** Frontal orbital plates white. Frontal vittae dull light brown; narrow, barely wider than frontal orbital plates, with light median vitta. Eyes light, dull red; bare. Ocellar triangle small, black between ocelli. Anterior reclinate slightly closer to proclinate than to posterior reclinate. Posterior reclinate closer to inner vertical than to anterior reclinate. Inner verticals and all ipsilateral orbitals in line. Ocellar setae extended to bases of proclimates. Face mostly white, with lateral edges of antennal fossae light brown. Carina white, prominent, somewhat bulbous on anteroventral surface. Cheek dark brown, extended to lateral oral margins. Pedicel ochre. Flagellomere 1 light brown, with short sensilla. Arista with 6–7 dorsal and 2 ventral branches. Clypeus light brown. Proboscis with sclerotized, projecting, dark brown postmentum; labella dark brown, small. Palpi light brown, broad, laterally flattened; apex with small tuft of longer setulae.

Notal and scutellum ground color brown. Notum with pair of paramedian, incomplete, yellow vittae. Vittae separated by distance ca. twice their width; extend from anterior margin of notum to anterior dorsocentral seta. Notopleural margin distinct. Scutellum sometimes with faint, light, median vitta. Anterior dorsocentrals small, ca.  $\frac{1}{3}$  length and thickness of posterior dorsocentrals. Acrostichals in 8 rows, with 2 pairs prescutellars ca. twice the length of other acrostichals. Halter knob dark brown, base light yellow. Wing hyaline, entirely light brown, with light brown spots at apices of  $R_{2+3}$ ,  $R_{4+5}$ , and  $M_1$ , and a clear hyaline window between  $R_{4+5}$  and  $M_1$ .

Tergites dark brown; very faint, light inverted triangle on  $t_2$ .  $t_7$  yellow. Oviscapt with 4 lateral and 15 marginal ovisensilla pegs. Oviprovector scales simple, triangular. Spermathecal capsule reduced: small, membranous. Hypo/epiproct, epandrium, yellow. Surstylus small, lobate, with 8 dorsal and 12–13 surstylar (3–4 large medial) prensisetae. Hypandrium wide and short, tapered to narrow apex. Endophallus short, not extended past level of gonopods, comprised mostly of

distiphallus. Distiphallus with wide ventral groove, scoop shaped.

**MEASUREMENTS:**  $\delta$ : HD = 0.81 (0.71, 0.91); ED = 0.65 (0.57, 0.73); PL = 0.73 (0.71, 0.76); ThL = 1.36 (1.21, 1.52); WL = 2.55 (2.26, 2.85) (N = 2);  $\text{♀}$ : HD = 0.84 (0.76–0.94); ED = 0.67 (0.61–0.74); PL = 0.71 (0.59–0.79); ThL = 1.44 (1.27–1.57); WL = 2.59 (2.40–2.87) (N = 4);  $\delta + \text{♀}$ : C.I. = 2.46 (2.22–2.60); 4-V = 1.71 (1.55–1.87).

**HOLOTYPE:** Male, Papua New Guinea: Brown River, nr. Port Moresby, X/61, H. L. Carson. Genitalia not dissected. In AMNH. Measurements: HD = 0.86; ED = 0.71; PL = 0.72; ThL = 1.44; WL = 2.59; C.I. = 2.78; 4-V = 1.52.

**ETYMOLOGY:** Patronym, in honor of Dr. Hampton L. Carson, *Drosophila* biologist extraordinaire and collector of the series of specimens.

**MATERIAL EXAMINED:** 4 $\text{♀}$ , 2 $\delta$ , with same collecting data as the holotype, which is the paratype series (in AMNH).

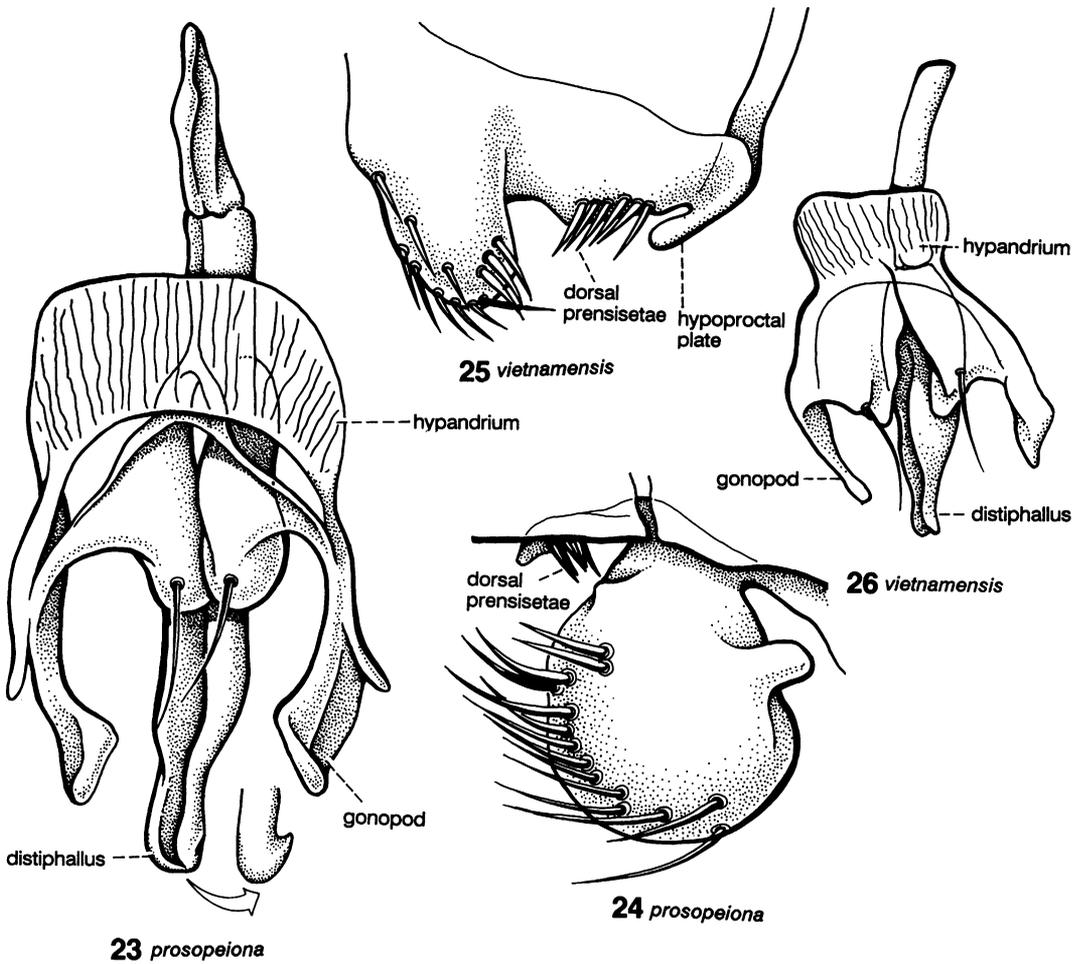
**DISCUSSION:** Somewhat unusual for the *samoensis* group is that this species is externally distinctive for both males and females (only *leptorostra* is as well). In fact, external features more easily distinguish these specimens than do the minute genitalic modifications.

### *Zygothrica prosopeiona*, new species

Figures 23, 24

**DIAGNOSIS:** Externally distinguished by the black-brown facial band, lying on the oral margin and running over the ventral half of the carina; carina is very narrow and not protuberant; pedicels and flagellomere 1 brown. Male genitalia with large hypandrium, large gonopods, and aedeagus with wide ventral groove and conspicuous retrorse hook on dorsoapical surface. Female unknown.

**DESCRIPTION:** Frontal orbital plates yellow, narrow. Frontal vittae dark, velvety brown, width of half the vitta ca. twice that of the frontal orbital plate; with very faint, light median vitta. Eyes dull brown-red, bare. Ocellar triangle black between ocelli. Anterior reclinate midway between proclinate and posterior reclinate. Proclinate slightly shorter than posterior reclinate; anterior reclinate is shortest orbital. Posterior reclinate is midway be-



Figs. 23–26. Male terminalia. 23, 24. *Z. prosopeiona* n. sp., holotype. 23. Aedeagus + hypandrium + paraphyses. 24. Surstylus, detail. 25, 26. *Z. vietnamensis*, holotype. 25. Surstylus with dorsal prensisetae. 26. Aedeagus + hypandrium + paraphyses.

tween anterior reclinate and inner vertical. Inner vertical medial to outer vertical, in line with ipsilateral orbitals. Postocciput dark brown. Pedicel, flagellomere 1 brown; latter with short sensilla. Arista with 4–5 dorsal, 1 ventral branch. Carina very narrow, even at edge, not very protuberant. Oral margin with median, facial cleft; lateral oral margins slightly splayed. Dorsal half of carina white, ventral half, down to oral margin, and cheek below frontogenal suture, dark brown (cheek above this is yellow). Clypeus broad, flat, black-brown, without conspicuously long apical setae. Proboscis with postmentum and

labellum narrow, sclerotized, black-brown. Postmentum straight and projecting.

Notum and dorsal half of scutellum dark brown, with no markings. Pleura and legs entirely light yellow. Ventral half of postpronotal lobe yellow. Notopleural margin distinct. Acrostichals in 8 irregular rows, with 2 pairs of larger prescutellars. Anterior dorsocentral ca.  $\frac{1}{3}$  length of posterior dorsocentral. Wing hyaline light brown. Halter knob brown, base light. Male fore femur without ventral row of conspicuous long setae.

Tergites dark brown, except tV + VI, which are yellow. Epandrium yellow, with flat, trun-

cate ventral lobes. Hypoproctal plates present; small, apices lie beneath surstyli; similar to those of *vietnamensis* n. sp. Surstylus flat, round, with small lateral lobe; possessing 14 setiform prenisetae, all on medial margin. Six small dorsal prenisetae present, lying on narrow sclerotized shelf beneath ventral margin of cercus. Hypandrium nearly as long as broad. Paraphysis with a single, long fine seta. Gonopods large, extended nearly to level of distiphallus apex. Aedeagus simple, straight, with wide ventral groove. Dorsal apex of distiphallus with conspicuous retrorse hook.

**HOLOTYPE:** Male, unique specimen, **New Guinea:** NW, Swart Valley, Karubaka, 1450 m [3°35'S, 138°28'E], 6/XI/58, J. L. Gressitt. Genitalia dissected (DAG). In the BPBM. Measurements: HD = 0.84; ED = 0.70; PL = 0.82; ThL = 1.58; WL = 2.95; C.I. = 3.76; 4-V = 1.61.

**ETYMOLOGY:** From the Greek, *prosopeion*, meaning mask, referring to the dark brown band on the oral margin and over the face.

*Zygothrica vietnamensis*, new species

Figures 25, 26, 55

**DIAGNOSIS:** Distinguished best by a dark face (light to medium brown), proboscis that is basally lighter than the other portions, and the genitalia. Male with surstylus small, row of 6 dorsal prenisetae, hypandrium constricted then slightly flared apically; gonopods large; aedeagus fusiform and apically tapered. Oviscapt with 6 lateral ovisensilla pegs, 2 of which are small.

**DESCRIPTION:** Frontal orbital plates yellowish. Frontal vittae flat, dark brown, finely striate, with faint, light median vitta extended from anterior ocellus to ptilinal suture. Eyes dull red-brown, bare. Ocellar triangle small, black between ocelli. Anterior reclinate midway between proclinate and posterior reclinate. Posterior reclinate midway between anterior reclinate and inner vertical. Relative lengths of orbitals: 1:1.2:1.2 (ant. reclinate : proclinate : post. reclinate). Inner vertical medial to outer vertical, in line with ipsilateral orbitals. Face narrow, ca.  $\frac{1}{3}$  the width of head at this level. Carina narrow, protuberant. Face, carina, and cheek brown. Oral margin protuberant, lateral facial mar-

gin splayed. Pedicels yellow to brown; flagellomere 1 light brown, with short sensilla. Arista with 5–6 long dorsal, 2 ventral branches. Clypeus narrow, apex exposed at oral margin with small knob. Palp dark brown, flat, broad, with long apical setae typical for most of group. Proboscis with long, narrow postmentum; postmentum dark brown on apical half, light brown to tan on proximal half. Labellum small, sclerotized, dark brown.

Notum and dorsal surface of scutellum dark brown, without markings. Pleura and legs entirely light yellow; notopleural margin distinct. Halter knob dark brown, base light yellow. Wing hyaline, with slight basal infuscation. Acrostichals apparently in 8 irregular rows, with 2 pairs large prescutellars. Male fore femur without ventral row of long setae.

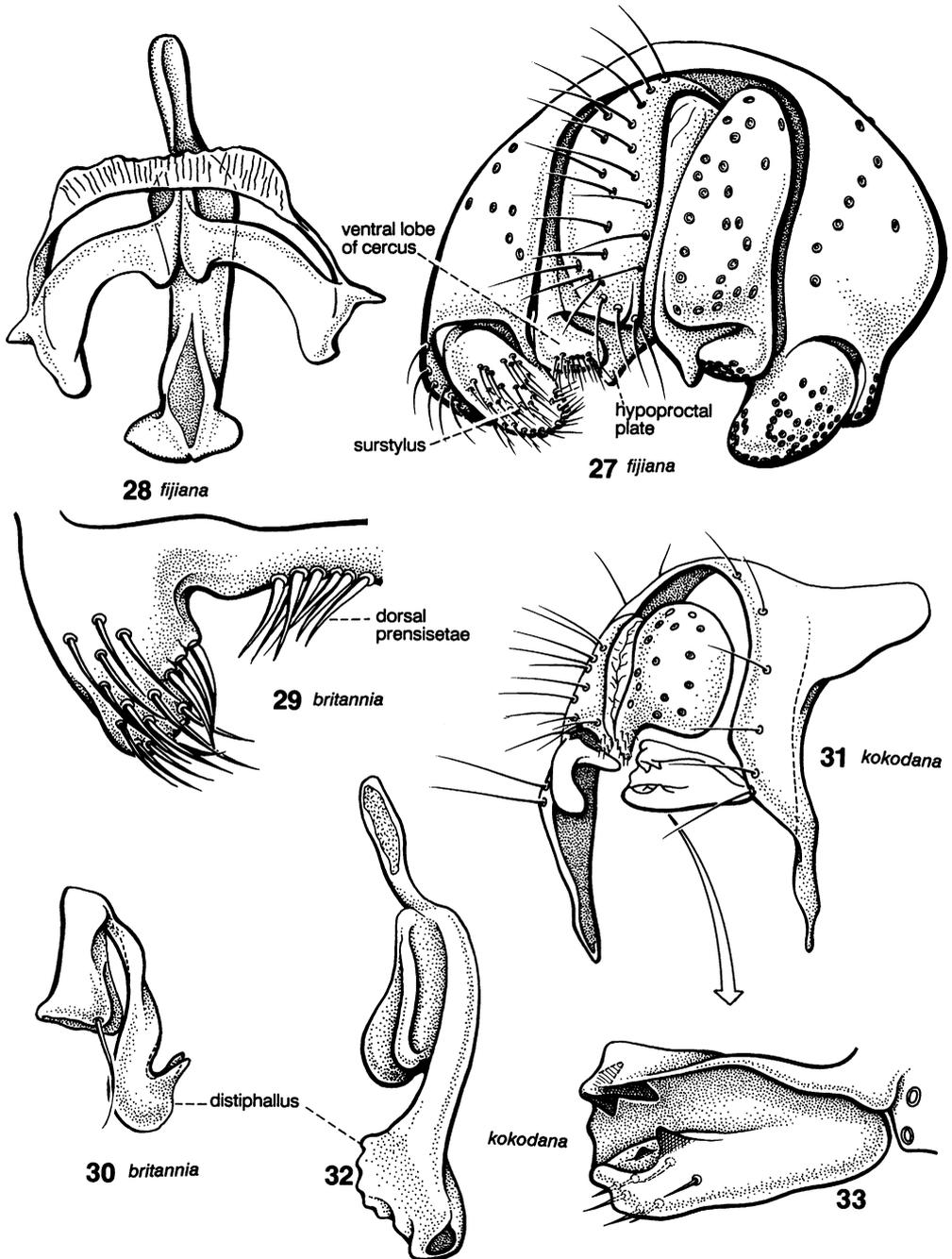
Tergites dark brown, except tV + VI; former with median brown square, tVI yellow. Oviscapt with 12 marginal and 6 lateral ovisensilla pegs, the 2 most proximal ones quite small. Oviprovector scales large, simple, triangular. Spermatheca small, membranous. Surstylus small, lobate, similar to most members of group; with 9–10 fine, lateral prenisetae and 3 stouter, medial ones; row of 6 dorsal prenisetae. Hypoproctal plates present, small, apically rounded. Hypandrium constricted, then slightly flared apically. Gonopods large, extended nearly the length of aedeagus. Each paraphysis bilobed, bearing 1 long, fine seta. Aedeagus short, slightly longer than aedeagal apodeme; fusiform; tapered apically to a small lobe.

**MEASUREMENTS:** ♂: HD = 0.69; ED = 0.57; PL = 0.76; ThL = 1.28; WL = 2.31 (N = 1); ♀: HD = 0.77; ED = 0.66; PL = 0.53; ThL = 1.38; WL = 2.58 (N = 1); ♂ + ♀: C.I. = 3.71; 4-V = 1.96.

**HOLOTYPE:** Male, **South Vietnam:** Fyan, 900–1000 m [Ngoc So'n: 15°46'N, 108°22'E], 11/VII–9/VIII/61, N. R. Spencer. Genitalia dissected (DAG). In BPBM. Measurements: HD = 0.83; ED = 0.71; PL = 0.85; ThL = 1.55; WL = 2.63; C.I. = 3.32; 4-V = 1.76.

**ETYMOLOGY:** In reference to the only country from which this species is known.

**MATERIAL EXAMINED:** **South Vietnam:** Dak Song, 76 km SW Ban Me Thout, 870 m, 19–21/V/60, S. & L. Quate (1♀) (BPBM); Ban Me



Figs. 27–33. Male terminalia. 27, 28. *Z. fijiana* Takada. 27. Epandrium and cerci. 28. Aedeagus and hypandrium. 29, 30. *Z. britannia* n. sp. 29. Surstylus. 30. Aedeagus and paraphyses, lateral view (hypandrium not shown). 31–33. *Z. kokodana* n. sp. 31. Epandrium with cerci and surstyli. 32. Aedeagus and paraphyses (hypandrium not shown). 33. Surstylus, detail, lateral surface.

Thout, 500 m, 20–24/XII/60, C. M. Yoshimoto (1♀) (BPBM). Both specimens are paratypes.

*Zygothrica fijiana*

Figures 27, 28, 53

*Zygothrica fijiana* Takada, 1976: 68; by original designation.

**DIAGNOSIS:** A distinctive species, most notable for it being the largest member of the *samoensis* group. It also has the following diagnostic combination of characteristics: frontal vittae velvety black, finely striate; anterior reclinate orbital closer to proclinate than to posterior reclinate; ocellar setae extended to slightly beyond bases of proclimates; face yellow; carina protuberant but short, due to oral margin with deep median notch; arista with 6 dorsal and 1 ventral, short branches; male fore femur with ventral row 4–5 fine, light-colored setae; oviscapt with 6–7 lateral, 13–14 marginal ovisensilla pegs; spermathecal capsule membranous, small; surstylus lobate, with ca. 40 setiform, fine prensisetae; hypoproctal plates broad, short; ca. 20 fine dorsal prensisetae situated on a stout ventral cercal lobe; hypandrium short and wide, anterior margin slightly crenulate; distiphallus with pair of lateral, finlike, flanges.

**MEASUREMENTS:** ♂: HD = 0.88 (0.76–0.96); ED = 0.69 (0.61–0.75); PL = 0.72 (0.64–0.76); ThL = 1.58 (1.44–1.69); WL = 2.39 (2.24–2.48) (N = 3); ♀: HD = 0.80 (0.78, 0.83); ED = 0.63 (0.62, 0.65); PL = 0.68 (0.66, 0.70); ThL = 1.42 (1.39, 1.45); WL = 2.30 (2.26, 2.33) (N = 2); ♂ + ♀: C.I. = 1.89 (1.50–2.23); 4-V = 2.06 (1.82–2.24).

**HOLOTYPE:** Male, Fiji: Levuka, Draiba, VII/29/73, H. Takada. In the Biological Laboratory, Sapporo University (BLSU), Hokkaido, Japan. Type not examined.

**MATERIAL EXAMINED:** 1♂, 1♀, with same collection data as the holotype (BLSU). Also, Fiji: Ovalu, Levuka, 0–150 m, III/69, N. L. H. Krauss (1♂) (BPBM). New Guinea (NW): Ifar [River], Cyclops Mountains [Cycloop Geb: 12°55'S, 133°03'E], 300–500 m, 28–30/VI/62. J. L. Gressitt (1♂, 1♀) (BPBM). New Hebrides: Lamenu Island [Lamenu], 0–10 m, I/76, N. L. H. Krauss (1♂) (BPBM).

**DISCUSSION:** This species has no obvious close relationship to just *Z. samoensis*, un-

like what was stated by Takada (1976). Many aspects of its morphology are autapomorphic, such as the shape of the distiphallus, the surstyli, ventral cercal lobes, the frontal portion of the oral margin, and the large body size. Takada also mentioned that *Z. fijiana* differs from *samoensis* by the latter having a light-colored halter knob, which is not the case. (*Samoensis* has, like all the species in this group, a black halter knob.) The distribution is now known to range from New Guinea to Fiji.

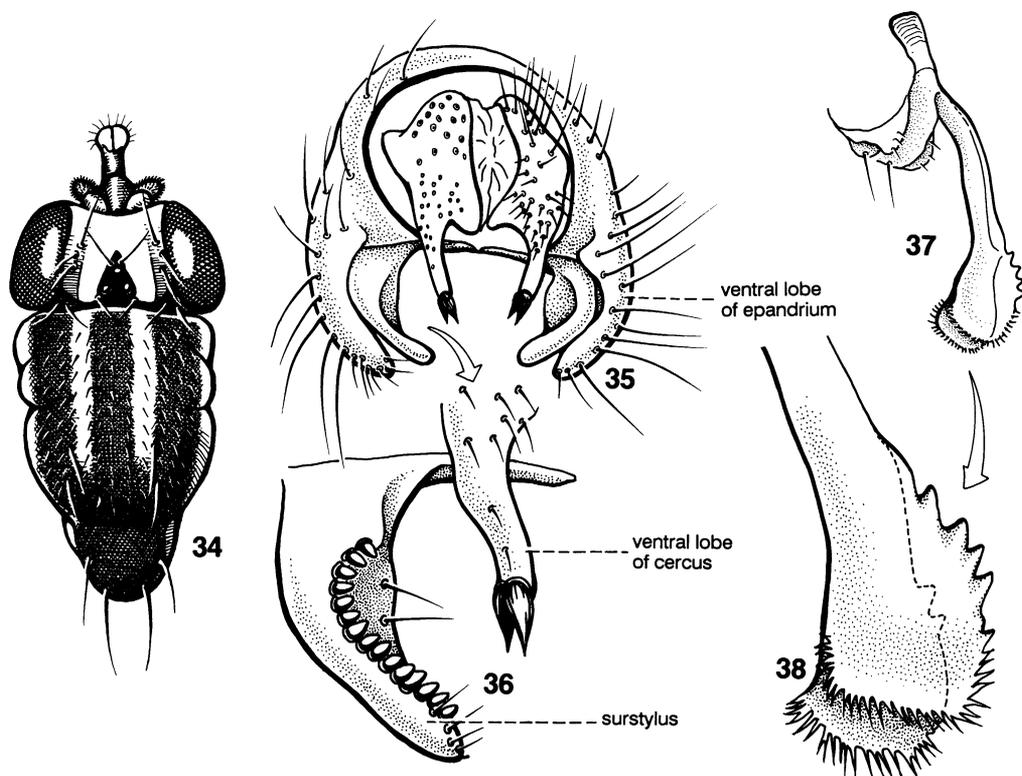
*Zygothrica britannia*, new species

Figures 29, 30, 40

**DIAGNOSIS:** Distinctive in that male has a pair of retrorse hooks on ventroapical surface of the distiphallus (otherwise, genitalia very similar to that of *Z. samoensis*). Externally, face and clypeus light-colored (latter usually black to dark brown); proboscis not entirely black-brown; proximal end ochre to light brown in males; palp extensively hirsute in males.

**DESCRIPTION:** Frontal orbital plates yellowish white. Frontal vittae dull brown, finely striate, twice the width of frontal orbital plate; converged for anterior half; with incomplete, faint, median vitta. Eyes red, bare. Ocellar triangle small, black between ocelli. Anterior reclinate nearly midway between proclinate and posterior reclinate. Posterior reclinate midway between inner vertical and anterior reclinate. Ocellar setae extended to bases of proclimates. Face, clypeus, and carina unicolorous ochre. Cheek light brown, extended to lateral oral margin. Pedicel ochre. Flagellomere 1 tan to light brown. Arista with 5–6 dorsal, 2 ventral, long branches. Proboscis with postmentum dark brown to black on distal half, light brown to ochre on anterior half in males. Palp brown, broad, but not as much so as in other *samoensis* gr. species; palp in males extensively covered on apical half and lateral margin with setae about equal in length to width of palp.

Scutellum and notal ground color unicolorous black-brown. Notopleural margin distinct. Acrostichals in 8 rows, with 2 pairs of large prescutellar ones. Pleura and legs entirely yellowish white. Male fore femora with 2 anteroventral, 3 postero-dorsolateral setae.



Figs. 34–38. Anterior dorsal habitus (fig. 34) and male terminalia (figs. 35–38) of *Z. paleovitta* n. sp. 35. Epandrium, posterior view. 36. Detail of ventral cercal lobe and surstylus. 37. Aedeagus. 38. Detail of distiphallus.

Subscutellum and postnotum light brown. Wing hyaline with light brown basal infuscation. Halter knob black-brown, base light.

Tergites black-brown. Oviscapt very similar to that of *samoensis* in shape, number, and distribution of ovisensilla pegs. Spermathecal capsule small, membranous. Hypo/epiproct, epandrium yellow. Surstylus small, lobate, with ca. 15 small and 3 larger, medial, surstylar prensisetae, plus 6 dorsal ones. Hypandrium with quadrate margin. Endophallus length only twice that of paraphyses. Distiphallus bulbous, with 2 ventroapical, retrorse hooks.

MEASUREMENTS: ♂: HD = 0.70 (0.64, 0.75); ED = 0.58 (0.51, 0.63); PL = 0.57 (0.49, 0.65); ThL = 1.26 (1.24, 1.29); WL = 2.23 (2.22, 2.24) (N = 2); ♀: HD = 0.73 (0.67–0.79); ED = 0.61 (0.57–0.67); PL = 0.67 (0.49–0.81); ThL = 1.27 (1.07–1.40); WL = 2.12 (1.74–2.30) (N = 6); ♂ + ♀: C.I. = 3.01 (2.43–3.99); 4-V = 2.01 (1.67–2.30).

HOLOTYPE: Male, New Hebrides: Malekula, N Lakatoro, 22–30/IX/67, J. & M. Sedlacek. Genitalia not dissected. In the BPBM. Measurements: HD = 0.65; ED = 0.54; PL = 0.49; ThL = 1.06; WL = 1.94; C.I. = 2.35; 4-V = 2.10.

ETYMOLOGY: “Of Britain,” referring to one of the two known localities, West New Britain, New Guinea, and also in honor of a singularly unique institution, the British Museum (Natural History). Among the 17 species of *Zygothrica* treated in this paper, 8 were found in the BM collections, and 3 of those are represented by specimens solely from that collection.

MATERIAL EXAMINED: Paratype series of 101 ♂ and ♀ from same collection time and site as holotype (in BPBM, 5 of each sex retained for AMNH). Also: Papua New Guinea: West New Britain, Kumbango, from rotted oil palm bunch, B2, VII/86, John Ismay (3♂, 1♀) (BMNH).

*Zygothrica flavofinira*

*Zygothrica flavofinira* Takada, 1976: 70; by original designation.

**DIAGNOSIS:** As selected from the description by Takada (1976): notum coffee-brown, with "2 longitudinal brownish stripes"; halteres brown; abdominal tergites yellow, t1-5 with large brown bands covering center of tergite; wing with a golden tint.

**HOLOTYPE:** Female, **Western Malaysia:** Gombak, near Kuala Lumpur, VII/3/72, H. Takada. Type not examined. In biological laboratory, Sapporo University, Hokkaido, Japan.

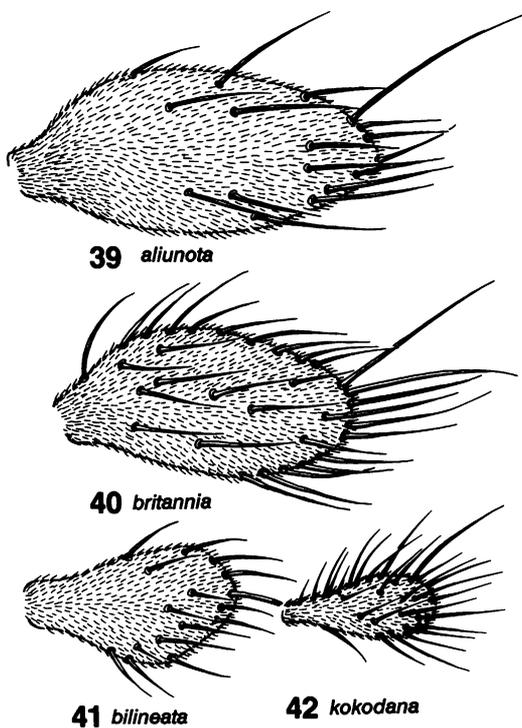
**DISCUSSION:** Given the cursory description, this species appears most similar to *Z. carsoni*, n. sp., because of the two notal vittae. The two species are most likely distinct, for there is no mention in Takada's description of the color pattern found in the *carsoni* wing, and the tergites of *carsoni* are entirely dark brown, without any yellow. Unfortunately, the species is only known from the holotype female, which Dr. Takada felt could not be loaned.

**SAMOAENSIS GROUP SPECIMENS,  
INCERTAE SEDIS**

Three females, each from a different collection locality and/or date than is represented by the above specimens, were dissected and examined for details of the oviscapt. Variation in oviscapt and spermathecal morphology fell within that of the species treated above; but since female features are rarely diagnostic, one can only speculate as to the species identity of these three specimens. It seems appropriate to treat the specimens, given the interesting localities from which they came and the small number of total specimens used in this revision.

Female 1 (fig. 43): **New Britain:** Rabaul, VIII/61, M. W. Wasserman (AMNH). Possesses 14 marginal and 5 lateral ovisensilla pegs; spermathecal capsule small and membranous. Location of specimens' origin, and arrangement of lateral ovisensilla suggests this is a specimen of *Z. samoensis*.

Female 2 (fig. 44): **Malaysia (peninsula):** Pahang, Fraser's Hill, 4000 ft, I/31/29, H. M. Pendelbury, F. M. S., BM(NH). Possesses 9



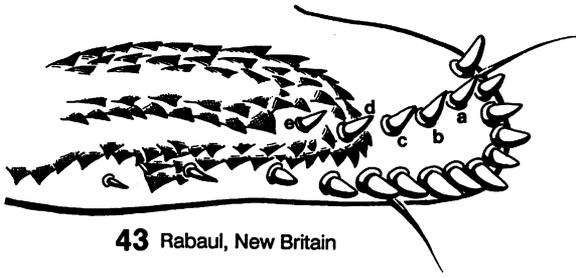
Figs. 39-42. Palps of selected *Zygothrica* species, lateral view.

marginal and 4 lateral ovisensilla pegs; spermatheca small and membranous. This is probably a specimen of *Z. aliunota*, n. sp., which has other, male records from Pahang. The low number of marginal ovisensilla (9-10) may be diagnostic for *Z. aliunota*; it is doubtful that the specimen is *Z. malaysiana*, also in this area, which has 12 marginal ovisensilla pegs; and it is certainly not *Z. orientalis*, also having a range extending to the Malay Peninsula, which has a distinctive arrangement of the lateral ovisensilla.

Female 3 (fig. 45): **Papua New Guinea:** Wau, X/61, H. L. Carson (AMNH). Possesses 15 marginal and 4 lateral ovisensilla pegs; spermathecal capsule small and membranous. Based on locality, the specimen could be either *samoensis*, *wau*, or *britannia*, but the specimen appears to have more marginal pegs than are found in these species.

**KEY TO INDO-PACIFIC ZYGOTHRICA  
SPECIES GROUPS**

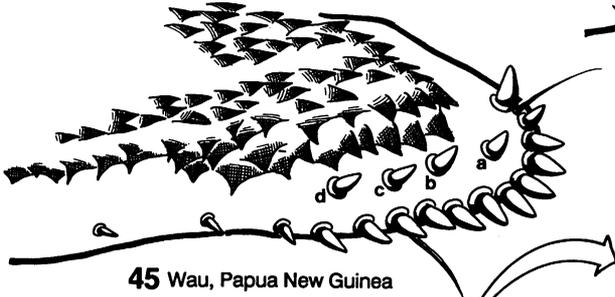
1. Body entirely yellow or nearly so; anterior reclinate orbital seta lying lateral to pro-



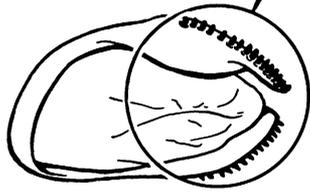
43 Rabaul, New Britain



44 Pahang, Malaysia

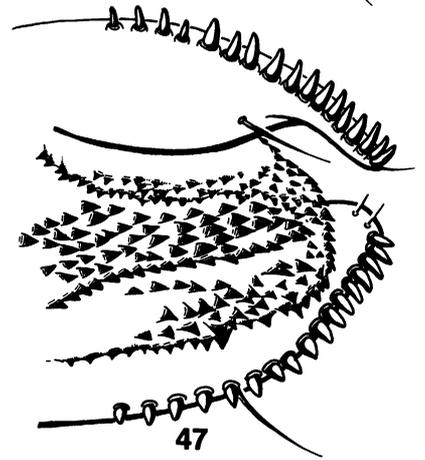


45 Wau, Papua New Guinea

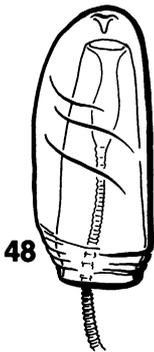


46

*paleovitta*

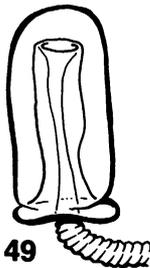


47



48

*bilineata*



49

*leptorostra*



50

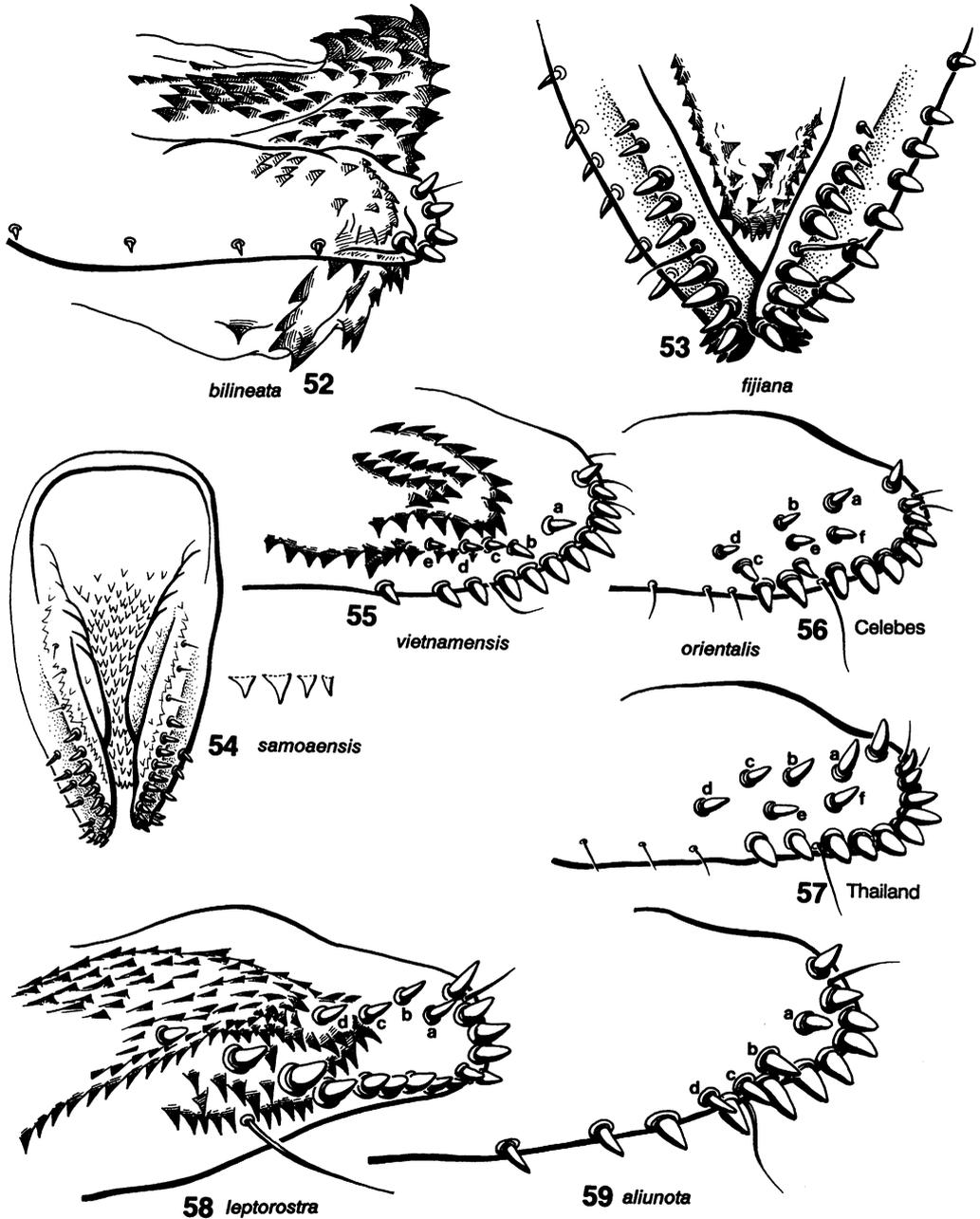
*malaysiana*



51

*paleovitta*

Figs. 43–51. Female genitalia. 43–45. Oviscaptus of unplaced *samoensis* group females. Lateral views of apex. 46, 47. Oviscaptus (46) and detail of apex (47) of *Z. paleovitta* n. sp. 48–51. Representative spermathecal capsules.



Figs. 52–59. Oviscapts of representative *Zygothrica* species. 52. *Z. bilineata* (Will.), lateral view, with oviprovectors partially everted. 53. *Z. fijiana* Takada, ventral view of apex. 54. Entire oviscapt, *Z. samoensis* Mall., ventral view, with detail of oviprovectors scale variation. 55. *Z. vietnamensis* n. sp. 56, 57. *Z. orientalis* n. sp. variation (56, Celebes; 57, Thailand), lateral view of apex. 58. *Z. leptorostra* n. sp., lateral view of apex. 59. *Z. aliunota* n. sp., lateral view of apex. Oviprovectors are not shown for figs. 56, 57, 59.

- clinate; flagellomere 1 with long sensilla  
*kokodana* sp. gr.
- 1a. Body with notum and scutellum dark brown, pleura light; anterior reclinate orbital seta posterior or posterolateral to proclinate; flagellomere 1 with short sensilla . . . . . 2
2. Proboscis, front, face, and palp yellow; palp not broad; oviscapt spatulate . . . . .  
. . . . . *paleovitta* sp. gr.
- 2a. Proboscis (except in *Z. leptorostra*), frontal vittae, and palps black-brown; palps broad; oviscapt not spatulate, but with 4–6 lateral ovisensilla pegs . . . . . *samoensis* sp. gr.
- tubercle; oviscapt with 6 lateral ovisensilla pegs (in *orientalis*) . . . . . 11
- 8a. Hypandrium shorter than width; aedeagus fusiform; distiphallus without protuberance; oviscapt with 4–5 lateral peg ovisensilla . . . . . 9
9. Distiphallus with apical knob; paraphyses not tapered to a point . . . . . *malaysiana* n. sp.
- 9a. Distiphallus simply tapered, no apical knob; paraphyses pointed . . . . . 10
10. Hypandrium short, entirely tapered; carina yellow, portions of face brown . . . . .  
. . . . . *samoensis* Malloch
- 10a. Hypandrium slightly shorter than wide, with constriction; face entirely brown . . . . .  
. . . . . *vietnamensis* n. sp.
11. Apex of distiphallus extended well beyond gonopods, aedeagal apodeme extended well beyond hypandrial margin; surstylus nearly circular . . . . . *prosopeiona* n. sp.
- 11a. Apices of distiphallus and aedeagal apodeme barely extended beyond margins mentioned above; surstylus small and crescentic . . . . . *orientalis* n. sp.

### KEY TO SPECIES OF THE SAMOAENSIS SPECIES GROUP

1. Proboscis long, projected, extremely thin, white . . . . . *leptorostra* n. sp.
- 1a. Proboscis projected, width about equal to that of palp, black . . . . . 2
2. Notum with pair of light, incomplete, paramedian vittae . . . . . 3
- 2a. Notum unicolorous black to black-brown 4
3. Wing with diffuse, small brown spots at apices of R<sub>2+3</sub>, R<sub>4+5</sub>, and M<sub>1</sub>; abdominal tergites entirely black-brown . . *carsoni* n. sp.
- 3a. Wing without such spots at apices of longitudinal veins; laterotergites yellow . . . . .  
. . . . . *flavofinira* Takada
4. Large species, thorax length approx. 1.50 mm, with medial part of oral margin deeply cleft . . . . . *fijiana* Takada
- 4a. Smaller species, thorax length generally 1.25 mm or less, without deep cleft on oral margin . . . . . 5
5. Males with large, dark apical wing spot . . . . .  
. . . . . *aliunota* n. sp.
- 5a. Males with most of wing completely hyaline . . . . . 6
- \*6. Aedeagus short, with pair of large, retrorse, dorsoapical spines on distiphallus . . . . .  
. . . . . *britannia* n. sp.
- 6a. Aedeagus otherwise, definitely without such spines on the distiphallus . . . . . 7
7. Aedeagus with slender, slightly arched endophallus; distiphallus tapered to small dorsoapical hook . . . . . *waii* n. sp.
- 7a. Aedeagus straight and short, endophallus fusiform . . . . . 8
8. Hypandrium long as wide; aedeagus tubular; distiphallus with small dorsoapical pro-

### KOKODANA SPECIES GROUP, NEW GROUP

#### CLADE 2.4 (SENSU GRIMALDI, 1987)

This new group is being erected, by original designation and monotypy, for the new species, *Z. kokodana*. Justification for doing so, including diagnostic features, is given below in the description.

#### *Zygothrica kokodana*, new species

Figures 31–33, 42

**DIAGNOSIS:** A very small, distinctive species, for its almost entirely yellow body; glabrous eyes; anterior reclinate orbital seta lying just lateral to the proclinate; proboscis projected and long; first flagellomere with long, dense sensilla; surstylus (male) distinctive, as described below. Female unknown.

**DESCRIPTION:** Frontal orbital plates yellow. Frontal vittae yellow, same color as frontal orbital plates; dull, but not velvety; with faint, median, light vitta. Eyes red, bare. Ocellar triangle small, brown between ocelli. Anterior reclinate small, ca.  $\frac{1}{3}$  thickness and length of proclinate and posterior reclinate; lies directly lateral to proclinate. Posterior reclinate closer to anterior reclinate than to inner vertical. Ocellar setae extended to slightly past

\* Beyond this point, specimens would require genitalic dissections for accurate identification.

bases of proclinate. Inner vertical seta in line with ipsilateral proclinate and anterior reclinate. Face light yellow, including antennal fossa. Carina prominent, complete, very light yellow. Oral margin with frontal cleft, but only slightly protuberant. Cheek yellow, with light brown spot beneath eye and above frontal genal suture. One pair vibrissae present, subtended by ca. 8 minute subvibrissal setulae. Flagellomere 1 yellow; long, extended to slightly past ventral level of carina; with dense covering of long sensilla, lengths ca.  $\frac{1}{3}$  width of flagellomere 1. Pedicel yellow. Arista with 3 dorsal and 1 ventral branch, plus large terminal fork. Clypeus yellow; narrow, length ca. equal to that of oral cavity. Proboscis yellow; protuberant; with long, projecting postmentum, labium heavily sclerotized; labella small, no wider than labium. Palpi yellow; small, length twice width,  $\frac{1}{3}$  that of postmentum length; with tuft of setulae on apical half, setula length ca.  $\frac{1}{2}$  that of palp.

Scutellum and notal ground color yellowish to ochre; notum with faint pair light parame-dian vittae, extended to anterior dorso-centrals. Acrostichals in 6 rows; no large prescutellar ones. Anterior dorsocentral  $\frac{2}{3}$  length of posterior dorsocentral. Pleura and legs entirely light yellowish to white. Subscutellum and postnotum light yellow. Halter entirely light yellow. Wing hyaline, no basal light infuscation. Male fore femur with 2 midventral setae, slightly longer than width of femur, and 1 dorsolateral preapical seta. Tergites light brown. Epandrium yellow; narrow dorsally, with long dorsolateral flanges; ventral margin projected, long, thin, but not lobelike; posterior margin with pair of long, straight, fine setae projected posteriad. Pair of small, setose hypoproct plates present. Surstylus distinct; with 6 fine, minute, setiform prensisetae on adaxial surface; outer surface with median groove along length, upper lip bearing 3 dentate spines, lower lip with 1 spine. Hypandrium reduced and short. Endophallus simple; with distiphallus largest and widest portion, having crenulate lateral flanges.

**HOLOTYPE:** Male, Papua New Guinea: Kokoda, 1200 ft, IV/33, L. E. Cheeseman, "on fungus," BM1933-427. Genitalia not dissected. In the BM(NH). Measurements: HD

= 0.47; ED = 0.35; PL = 0.43; ThL = 0.82; WL = 1.53; C.I. = 2.16; 4-V = 2.31.

**MATERIAL EXAMINED:** Male, with same collecting data as holotype (paratype, genitalia dissected [DAG], in BMNH). Measurements: HD = 0.48; ED = 0.36; PL = 0.41; ThL = 0.83; WL = 1.56; C.I. = 2.21; 4-V = 2.26 (N = 1).

**ETYMOLOGY:** Pertaining to Kokoda, Papua New Guinea, the type locality.

**DISCUSSION:** There is no doubt as to the plesiomorphic position of this species with regard to the *samoensis* group and other *Zygothrica* species. The lack of all the relevant color apomorphies alone excludes this species from the *samoensis* group, as well as the lack of genitalic features in common with this group. (Unfortunately, the female, which is diagnostically informative for the oviscapt and spermatheca in the *samoensis* group, is unknown for this species.) In fact, the flagellomere 1 setulae are not reduced in length in this species, unlike those in most *Zygothrica*; a closely related group of the genus, the subgenus *Hirtodrosophila* of *Drosophila*, possesses long antennal setulae. Nonetheless, there is no doubt that this species is in the genus *Zygothrica*, albeit a primitive member, because it has the diagnostic features of the carina and proboscis. The level to which this new group corresponds best with present *Zygothrica* groups is unclear, for lack of the female. For now, it may be best to regard it as an additional major clade, clade 6, of *Zygothrica*, in accordance with my present scheme of the genus (Grimaldi, 1987).

#### *PALEOVITTA* SPECIES GROUP, NEW GROUP

##### CLADE 2.5 (SENSU GRIMALDI, 1987)

Proposed for the new species *Zygothrica paleovitta*, in reference to its plesiomorphic position with respect to all the other Old World and Neotropical *Zygothrica*. A diagnosis can be found under the species description.

#### *Zygothrica paleovitta*, new species

Figures 34–38, 46–48

**DIAGNOSIS:** Front mostly yellow; face and proboscis yellow; notum dark brown, with

pair of light yellow paramedian vittae; wing hyaline; oviscapt spatulate; spermathecal capsule sclerotized, dome shaped. Male with pendulous ventral epandrial lobes, surstyli, and ventral pair of cercal lobes; aedeagus with bulbous distiphallus and apical fringes.

**DESCRIPTION:** Anterior half of frontal orbital plates very light yellow, same color as frontal vittae; posterior half dark brown. Frontal vittae pollinose. Eyes dull red-brown, with very sparse interfacetal setulae. Ocellar triangle extended anterior from anterior ocellus ca.  $3 \times$  ocellus diameter; dark brown to black. Anterior reclinate closer to proclinate than to posterior reclinate. Posterior reclinate closer to anterior reclinate than to inner vertical. Relative lengths of orbital setae: 1:2:2 (ant. reclinate : proclinate : post. reclinate). Frontal lunule ochre, dull. Inner vertical in line with ipsilateral reclinates (proclinate slightly medial to line). Face entirely light yellow. Carina prominent, narrow, but rounded on apical edge and bulbous; complete. Oral margin with dorsal indentation; cheeks not splayed. Brown spot between ventral margin of eye and frontogenal suture. Pedicel, flagellomere 1 yellow; latter with short sensilla. Arista with 4 dorsal and 2 ventral branches. One pair vibrissae, subtended by 6 minute subvibrissals. Palp yellow; flat, but not broad, with 1 large apical seta. Proboscis yellow; postmentum narrow, sclerotized, straight, projecting from oral margin. Labellum narrow, no wider than postmentum.

Notum and dorsal surface of scutellum dark brown. Pleura and legs entirely light yellow; notopleural margin indistinct. Notum with pair of incomplete light, paramedian vittae, extended to anterior dorsocentrals. Fore femur of male with ventral row of 6–7 long setae. Halter entirely yellow; wing hyaline. Acrostichals in 6 rows, without larger prescutellars.

Tergites dark brown; segments V + VI yellow. Oviscapt apically spatulate, with 17 marginal ovisensilla pegs per side. Oviprovector scales simple, triangular. Spermathecal capsule sclerotized, dome shaped, with deep introvert and slight basal annuli. Hypo/epiproct yellow. Epandrium and cerci (male) yellow. Epandrium with pair of long, pendulous ventral lobes, bearing sparse fan of 5–

6 long setae. Surstylus long, pendulous, with row of 15 stout prenisetae. Cercus with pair of pendulous, narrow, ventrolateral lobes, each bearing small setae and 2 large scali-form, apical setae. Cercus without apical-marginal rows of long, evenly spaced setae (as in *samoensis* group). Aedeagus with narrow endophallus; distiphallus bulbous and fringed on margins of paired apical lobes; dorsal surface of distiphallus with 2–4 irregular teeth on each lobe.

**HOLOTYPE:** Male, **Malaysia:** Pahang, King George V National Park, Gua 'Che Yatim, XII/16/58, L. W. Quate. Genitalia dissected (DAG). In the BPBM. Measurements: HD = 0.54; ED = 0.41; PL = 0.45; ThL = 0.93 (no wing measurements, specimen damaged).

**MATERIAL EXAMINED:** 1♂, 2♀, same data as the holotype (paratypes, in BPBM). Measurements: ♂: HD = 0.47; ED = 0.36; PL = 0.47; ThL = 0.83; WL = 1.56; ♀: HD = 0.56 (0.55, 0.57); ED = 0.43 (0.41, 0.44); PL = 0.42; ThL = 0.95 (0.93, 0.96); WL = 1.93 (N = 2); C.I. = 2.39; 4-V = 2.44.

**ETYMOLOGY:** *Paleo*, in reference to the Old World (tropics), and *vitta*, for the notal coloration.

**DISCUSSION:** There is little doubt as to the inclusion of this species within *Zygothrica*, and, in fact, there is some evidence pointing to its relationships within the genus. This species seems to have closer relationships with some groups of Neotropical *Zygothrica* than it certainly has with the *samoensis* group. In particular, the spatulate oviscapt and spermathecal capsule structure are like those of the *atriangulata* species group (sensu Grimaldi, 1987). However, the male genitalia belie no such obvious relationship. The long ventral cercal lobes, with a pair of apical scales on each, is not found in any Neotropical species. (Scalate setae are found on the surstyli in some species of the *atriangulata* group.) Likewise, the surstylus is distinctive for its single row of prenisetae, which are quite stout. The comb of long setae on each pendulous ventral epandrial lobe is also shared with some members of the *atriangulata* group, but I believe this to be a plesiomorphic trait at the level of the genus: it is shared with some *Hirtodrosophila* (loss of this would be apomorphic in *Zygothrica*).

I have examined a specimen of an unde-

scribed species of *Zygothrica* from Entabeni, North Transvaal, Africa, collected by Dr. Shane McEvey on fungi. This species is being described by Dr. Leonidas Tsacas in a paper on the South African drosophilids. It is a very interesting species, undoubtedly a primitive *Zygothrica* and obviously most closely related to *Z. paleovitta*. The species resembles *Zaprionus*, for the thin, silvery vittae bordered by dark brown, on the frontal vittae (unlike *Zaprionus*, it does not have such vittae on the notum); there is a lateral and ventral comb of long setae on the fore femur; and the arista has (autapomorphically) 1 ventral and 3 dorsal, short branches, with the base of the basal branch very close to the base of the arista. Otherwise, the species shares the following apomorphies with *Z. paleovitta*: ventral lobe of cercus elongate (but lying on the medial margin of the cercus in the African species, on the lateral surface in *paleovitta*); surstylus semicrescentic, with a single longitudinal row of stout, peglike prenisetae along most of the length; ventral lobe of epandrium large, with comb of 1–2 rows of long, evenly spaced setae; spermathecal capsule campanulate, with an annulated basal collar; oviscapt apically spatulate, flat, with an apical-lateral row of about 15 peg ovisensilla per side. The characteristics of the surstylus and ventral epandrial lobe may be considered to be primitive with respect to most species of *Zygothrica*, as they appear in *Hirtodrosophila* and in a few, only primitive, *Zygothrica*. Certainly, the short proboscis of the undescribed African species places it among the most plesiomorphic *Zygothrica*, for the labellum barely projects beyond the oral margin. Other plesiomorphic features of this species are the narrow (albeit, prominent) facial carina, and the short, dense eye pilosity, which are features also seen in *Z. bilineata*, as described below.

### BILINEATA SPECIES GROUP

#### CLADES 2.2 AND 2.3

**DIAGNOSIS:** Group (sensu Grimaldi, 1987) consists of two Neotropical species, each possessing a dark brown notum with a pair of incomplete, paramedian light vittae; palp broad and black; a dense patch of fine setulae

on the ventromedial surface of the cercus; and aedeagus being scoop shaped.

### *Zygothrica bilineata* (Clade 2.2)

Figures 41, 49, 52, 61, 65–67

*Drosophila bilineata* Williston, 1896: 409 (type in BM[NH]).

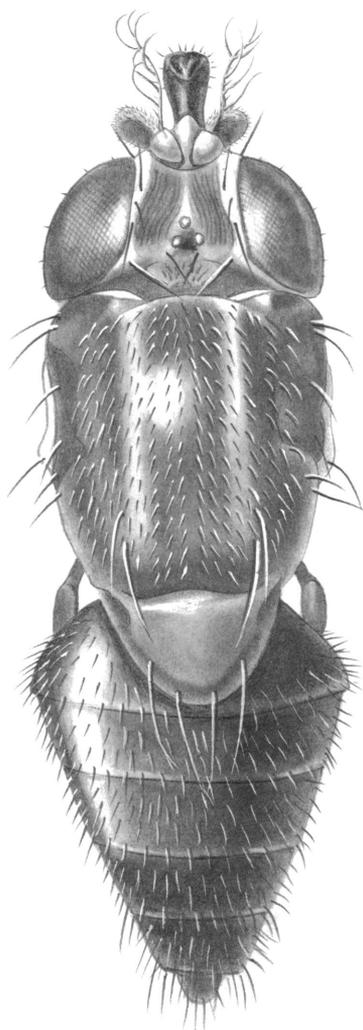
*Zygothrica gemma* Burla, 1956: 2249 (type in Zool. Mus. Univ. Zürich).

*Zygothrica bilineata*: Wheeler, 1981: 81 (proposed new comb.); Grimaldi, 1987: 133 (proposed new synonym).

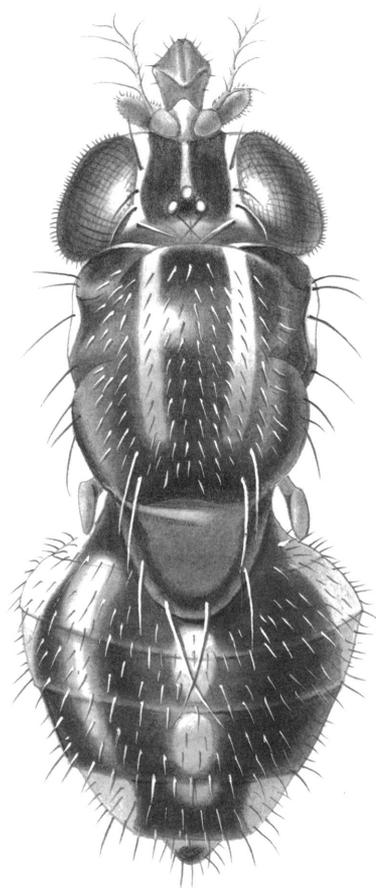
**DIAGNOSIS:** Frontal vittae velvety black-brown, with light median vitta; eyes with dense, short pilosity; carina very narrow; proboscis with yellow postmentum, brown labellum, dark brown palpi; notum dark brown with pair of incomplete, distinct, paramedian vittae (extended to anterior dorsocentrals); halter yellow; wing hyaline; tergites dark brown, with yellow median spot on t2 + 3, t4, and t5. Spermathecal capsule elongate, length ca.  $2\frac{1}{2} \times$  the width, with narrow, slightly annulated collar and long introvert; oviscapt with 4 apical-marginal peg ovisensilla, 1 lateral-apical ovisensilla; posteroventral margins of cerci (male) flat, broad, with row of ca. 15 fine setae on edge; aedeagus glabrous, tubular, with distinctive subapical constriction and apical knob.

**MEASUREMENTS:**  $\delta$ : HD = 0.63 (no range); ED = 0.51 (0.50–0.52); PL = 0.48 (0.46–0.48); ThL = 1.14 (1.03–1.24); WL = 1.87 (1.80–1.93) (N = 3);  $\text{♀}$ : HD = 0.57 (0.50–0.67); ED = 0.46 (0.39–0.54); PL = 0.46 (0.31–0.54); ThL = 0.94 (0.87–1.41); WL = 1.72 (1.51–1.93) (N = 7);  $\delta + \text{♀}$ : C.I. = 2.46 (1.96–2.81); 4-V = 1.71 (1.55–1.87).

**LECTOTYPE:** Sex unknown; with the following labels: "Windward side, St. Vincent, W.I., H. H. Smith/W. Indies, 1907–66." This specimen is in bad condition, having lost the abdomen, halteres, and hind pair of legs; the head, thorax, wings, and front two pairs of legs are intact. Fortunately, genitalia of *Z. bilineata* are not required to properly identify the species. Another specimen, the second of the three specimens mentioned by Williston (the third has not been recovered), was in extremely bad condition, being just a head and fragment of the right anterior half of the



60



61

Figs. 60, 61. Dorsal habitus of (60) *Zygothrica carsoni* n. sp. and (61) *Z. bilineata* (Will.). Drawn to the same scale.

thorax with 3 legs attached (all else having been lost), and lying loosely on a vertically mounted minuten. It was designated as paralectotype, but has subsequently been lost. Measurements: HD = 0.56; ED = 0.43; ThL = 0.90; WL = 1.61; C.I. = 2.15; 4-V = 1.89.

**MATERIAL EXAMINED: Bolivia:** Palos Blancos, Alto Beni, 11-15/I/76, 600 m, L. E. Pena

(1♂) (CNC). **Brazil:** Rondonia, Sao Carlos, Rio Madeira, 28-29/XI/75 "exp. Perm. Amaz." (1♀) (MZSP); Pará, Barreirinhas, Rio Tapajos, X-XI/70, "exp. Perm. Amaz." (4♂, 7♀) (MZSP); Rio de Janeiro, IV/52-III/53 (3♂, 3♀) (ZMUZ—as cited by Burla, 1957); Iguazu, 6/X/27, R. C. Shannon (1♂, 1♀) (NHSI); Mato Grosso, 12°50'S, 51°47'W, 15/II/68, O.

W. Richards, BM 1968-260, "gallery forest, white toadstool" (1♂) (BMNH); Rio Grande do Sol, Morungava, VII/58-I/59, A. R. Cordeiro (3♂) (AMNH). **British West Indies:** St. Vincent, VI-VIII/57, W. B. Heed (1♂) (AMNH). **Colombia:** El Recuerdo, Sierra Nevada de Sta. Marta, XII/56, W. B. Heed (1♂) (AMNH). **Costa Rica:** La Lola, VI-VIII/56, W. B. Heed, H. L. Carson, M. Wasserman (3♀, 1♂) (AMNH). **Cuba:** San Juan Mountains, I/27, C. T. Brues (1♂) (NHSI). **Dominica:** Clarke Hall, 21-31/I/65, Malaise trap, W. W. Wirth (1♂); 6/VI/66, G. Steyskal (1♀) (both in NHSI). **French West Indies:** Guadeloupe, VI-VIII/57, W. B. Heed (1♀) (AMNH); Martinique, VI-VIII/57, W. B. Heed (1♀) (AMNH). **Haiti:** Petionville, 1000 ft, VI-VII/59, W. B. Heed & H. L. Carson (2♂, 2♀) (AMNH). **Jamaica:** Hermitage Reservoir, VI/58, W. B. Heed & M. Wasserman (4♂) (AMNH); Runaway Bay, 1-8/III/70, W. W. Wirth (1♂), II/69, stream bed (1♀) (NHSI). **Panama:** Canal Zone: Barro Colorado Island, VII/16/23, R. C. Shannon (1♂) (NHSI); Chiriqui, David, 2200', 24/VI/64, light trap, A. Broce (1♀) (NHSI); Darien, David, Patino Point, 17/VIII/52, F. S. Blanton (1♂) (NHSI); Loma Borracha, VI/52, F. S. Blanton (1♀) (NHSI). **Peru:** Loreto, 12 km W Iquitos, 16/II/84, W. N. Mathis (1♀) (NHSI). **Puerto Rico:** Rio Piedras Agr. Exp. Sta., II/56, W. B. Heed (5♀, 2♂) (AMNH). **Trinidad:** Arima, Blanchisseuse Rd., 2000', 1-6/II/82, M. S. Adams (2♂, 1♀) (AMNH).

**DISTRIBUTION:** A very widespread species, occurring throughout the Caribbean islands (Greater and Lesser Antilles), in Central America from Costa Rica southward, and throughout northern South America down to Bolivia.

**DISCUSSION:** This species has several very interesting aspects. First, it never appears to have been common any place where it was collected. (No collecting series mentioned above has more than 11 specimens in it.) This is in contrast to such species as *Z. orbitalis* and *prodispar*, which are also very widespread Neotropical species (Grimaldi, 1987) that are among the most common individuals at any one collecting site. Where I have intensively collected mycophilous drosophilids in Costa Rica, Panama, Peru, and the Dominican Republic, not one specimen of this

species was obtained. Secondly, it has very little variation. Even among specimens from Brazil, Peru, and the Caribbean Islands, I could discern no consistent variation in color patterns or genitalic morphology. These two attributes seem rather incongruous with the widespread nature of the species. Presumably, being common at any one site may be attributable to, say, a polyphagous habit, which would, no doubt, be very influential in colonization and range expansion. *Zygothrica bilineata*, by not being a dominant component of the mycophilous drosophilid fauna, most likely has a rather narrow niche. If colonization and range expansion would indeed be limited in such a rare species, then how did it come to be widely distributed? If dispersal ability, as well, were relatively limited in this species, one would expect a large amount of geographic variation.

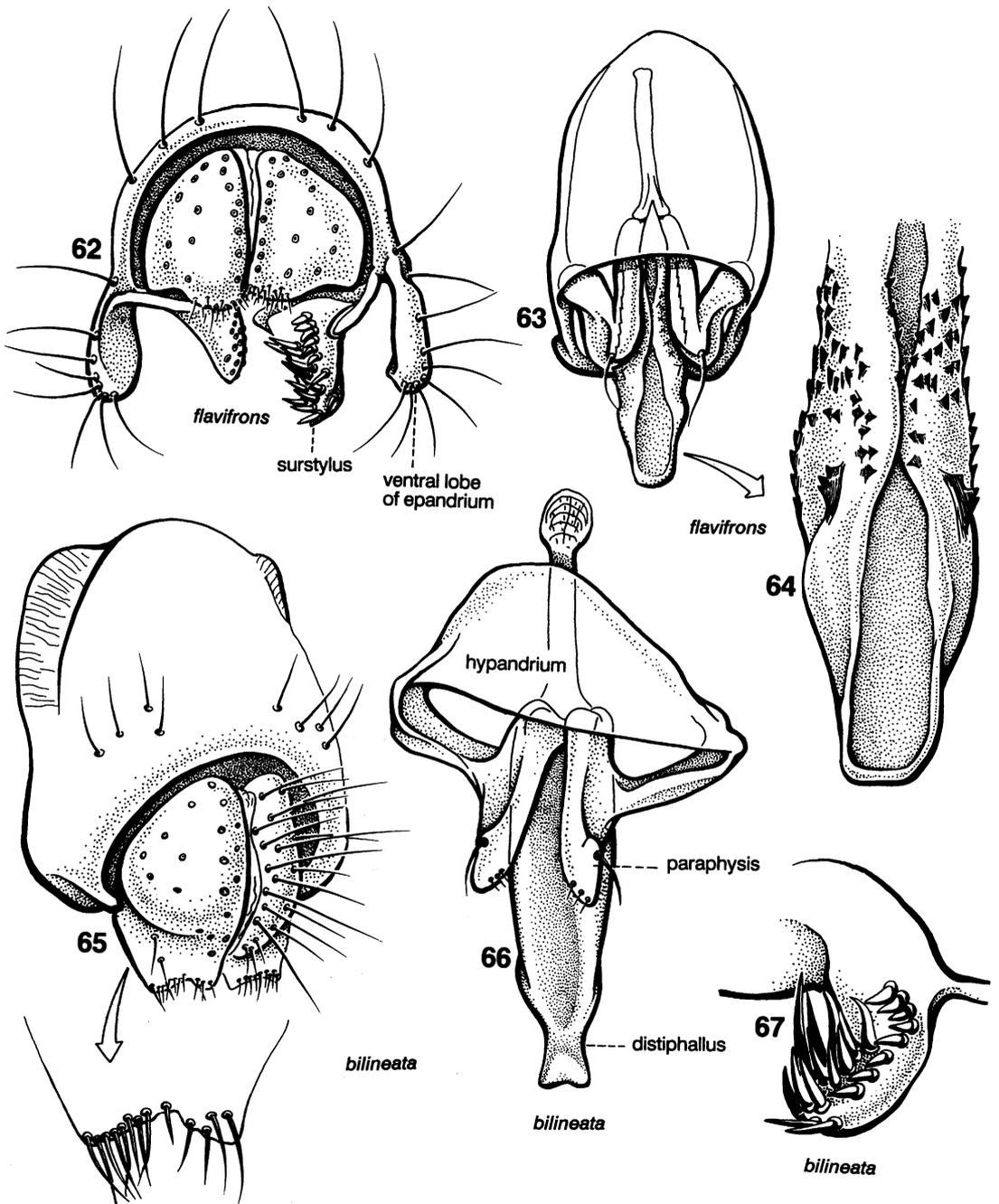
*Zygothrica flavifrons*, new species  
(Clade 2.3)

Figures 62-64

*Zygothrica* "flavifrons"; Grimaldi, 1987: 140, 148  
(placement of undescribed species).

**DIAGNOSIS:** Front of head entirely yellow; face yellow, without carina; eyes pilose; antennal sensilla short; proboscis yellow, stout, with sclerotized and projected postmentum; palpi stout, black; notum brown with light pair of paramedian vittae; halter light; wing hyaline; ventral epandrial lobes large and pendulous, with comb of 8 long marginal setae; aedeagus scoop shaped, and distiphallus adorned with retrorse scales. Female unknown.

**DESCRIPTION:** Frontal orbital plates light yellow, barely distinguishable from frontal vittae in color or texture. Eyes light red; with short dense pilosity. Ocellar triangle dark brown, margins lying just outside ocelli. Anterior reclinate orbital seta ca. ½ length and thickness of posterior reclinate; slightly closer to proclinate. Posterior reclinate closer to anterior reclinate than to inner vertical. Relative lengths of orbitals: 1:2:2.2 (ant. reclinate : post. reclinate : proclinate). Inner vertical in line with ipsilateral orbitals; anteromedial to outer vertical. Ocellar setae relatively short, extended to bases of proclimates. Face without carina (lost); yellow, with



Figs. 62–67. Male terminalia of *bilineata* group species. 62–64. *Z. flavifrons* n. sp., holotype. 62. Epandrium + cerci + surstyli, posterior view. 63. Aedeagus and hypandrium, ventral view. 64. Detail of distiphallus. 65–67. *Z. bilineata* (Will.). 65. Epandrium and cerci, with detail of ventral cercal margin. 66. Aedeagus and hypandrium. 67. Detail of surstylus.

small dark brown spot in lateral corner at base of vibrissa. Clypeus narrow, light brown. Cheek narrow; with dark brown coloration between ventral margin of eye, frontal genal suture, and lateral oral margin. Gena yellow, with 2 long setae on each side. Flagellomere 1 long, apices extended to slightly beyond dorsalmost part of oral margin; yellow, with tip light, diffuse brown; having short sensilla. Arista with 6 dorsal and 1 ventral branch. Proboscis protruding from oral margin ca.  $\frac{3}{4}$  length of face; stout, but with sclerotized, straight postmentum; yellow, but labellar lobes slightly sclerotized and light brown. Palpi dark brown, large, each with 1 long apical seta. Postociput dark brown.

Scutellum, notum ground color brown; with diffuse pair of light, paramedian vittae, extended to anterior dorsocentrals. Vittae separated by distance slightly wider than their width. Acrostichals in 6 rows, without pair of large prescutellars. Posterior dorsocentrals nearly twice the length of anteriors. Pleura, legs entirely light yellow to white. Notopleural margin coloration indistinct. Male fore femur with dorsolateral and ventrolateral row of 4 setae each. Halter knob light ochre, wing entirely hyaline.

Tergites brown, faded to yellow laterally; without light median spots. Epandrium yellow; with pair of distinct, lobate, pendulous ventral lobes, each with marginal comb of 8 long setae. Surstylus large, folded under ventral surface of cercus; with about 20 prensisetar pegs. Ventral surface of cercus with slight medial swelling, on which ca. 15 fine setulae lie. Hypandrium simple, oval. Endophallus almost twice length of aedeagal apodeme; straight; distiphallus with wide apical groove, and numerous retrorse scales.

**HOLOTYPE:** Male, **Trinidad:** Arima, Blanchisseuse Rd., 2000', II/1-6/82, Morton S. Adams. Genitalia dissected (DAG). In the AMHH. Measurements: HD = 0.60; ED = 0.51; PL = 0.36; ThL = 0.94; WL = 1.86; C.I. = 2.64; 4-V = 1.96.

**ETYMOLOGY:** Meaning "yellow frons," for the entirely yellow coloration of the front of the head.

**DISCUSSION:** The description is based on the holotype, and unique specimen for the species. Little can be said without a female; the oviscap and spermatheca, again, provide



Fig. 68. Distributions of *Zygothrica bilineata* and *flavifrons*.

useful information. It might appear as if this were a species of *D. (Hirtodrosophila)*, because of the lack of a facial carina and the pilose eyes, except for the fact that the first flagellomere definitely has short sensilla. The species is placed close to *Z. bilineata* because of the stout, black palps, the incomplete pair of paramedian notal vittae, and the simple, scoop-shaped aedeagus. The patches of small setae on the posteromedial surface of the cerci are no doubt homologous to those in *bilineata*; in the latter, this surface has been modified into a flat flange.

#### NOMENCLATURAL CHANGES

Although not mentioned in my monograph, the first part of the *Zygothrica* revision (Grimaldi, 1987), there are two nomina nuda published by Lin et al. (1977) that should be dismissed. They are *meishouea* Lin and Wheeler, and *monodorsocentralis* Lin and Wheeler. The paper in which these and many other Taiwan drosophilid names are published have no diagnoses associated with them, even though specimens (including holotypes) are designated; thus, the names are

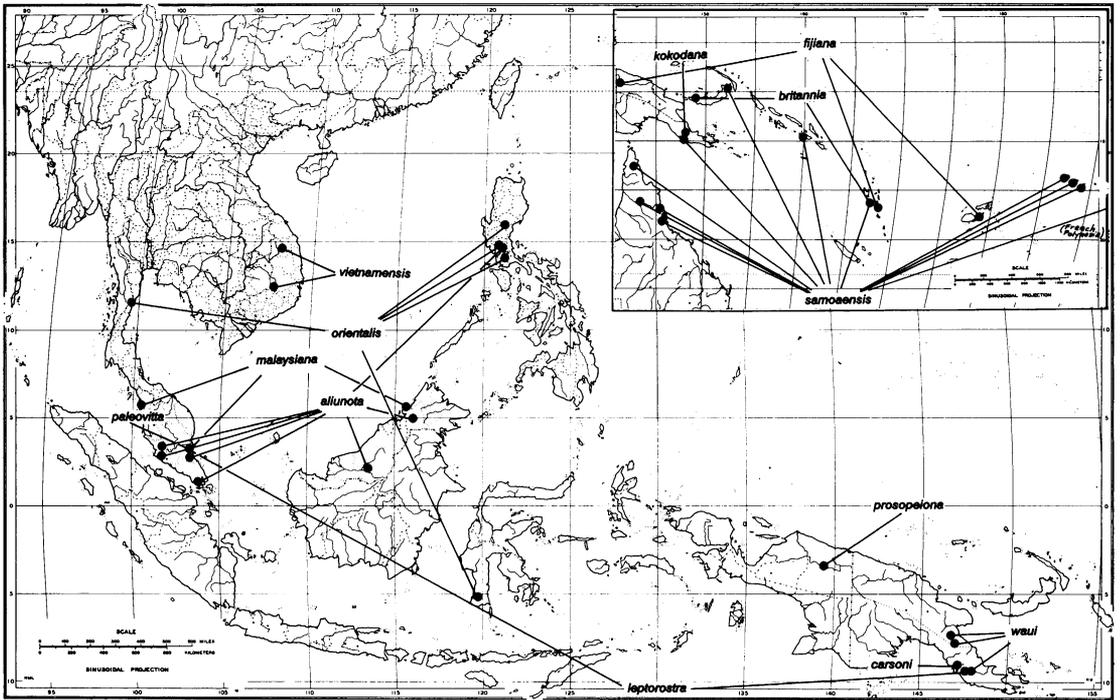


Fig. 69. Distributions of *Zygothrica* species in the *samoensis* group.

invalid. Specimens of the above two species, placed in the University of Texas collection (now at the AMNH), do not even belong in the genus *Zygothrica*. In addition, Lin et al. had synonymized the species *Mulgravea asiatica* (Okada), originally described in *Lissocephala*, as a *Zygothrica*. Nothing could be farther from accuracy. Based on a conversation with Marshall Wheeler, it is indeed unfortunate that Lin had created all of these nomen nuda, and especially that Dr. Wheeler's name had been attached to them without his notice or even permission. An additional name removed from the list of *Zygothrica* species is given below.

*Drosophila (Dudaica) malayana*,  
new combination

*Zygothrica malayana* Takada, 1976: 68 (type in biological laboratory, Sapporo University, Japan).

I have not seen Takada's specimens of this species, but based on his descriptions there

is no doubt that it is not a *Zygothrica*, and indeed it belongs to the subgenus *Dudaica* of *Drosophila*. The following are features given in Takada's description that indicate the species is distinctively *Dudaica* (using his terminology): antenna, front, carina, cheeks, palpi, mesonotum, humeral calli (upper half), scutellum, and halteres milky white. Proboscis, pleura, legs, and tergites brown. The male genitalia, as figured in Takada (1976), also agree with placement in the subgenus *Dudaica*.

According to Wheeler (1981), the only species in the subgenus, *Drosophila (Dudaica) senilis* (Duda), ranges from the Philippines to Java and Sumatra (the last being the type locality). I have not dissected *Dudaica* specimens from these localities, but have dissected specimens of a species from New Guinea, in the AMNH collection, whose male genitalia are distinct from those figured by Takada. This species also has large palpi, unlike the species from West Malaysia discussed by Takada. Thus, at least two species of *Dudaica* exist.

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