

NEW SPECIES AND RECORDS OF INDO-AUSTRALASIAN DACINI (DIPTERA: TEPHRITIDAE)

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ABSTRACT. - Twenty four new species of Dacini are described from the Oriental and Australasian Regions, viz: *B. (Asiadacus) atypica* White & Evenhuis, new species, *B. (B.) fuscohumeralis* White & Evenhuis, new species, *B. (B.) grandifasciata* White & Evenhuis, new species, *B. (B.) heppneri* White, new species, *B. (B.) lacerata* White & Evenhuis, new species, *B. (B.) nigroscutata* White & Evenhuis, new species, *B. (B.) pseudocucurbitae* White, new species, *B. (B.) tortuosa* White & Evenhuis, new species, *B. (Bulladacus) aceraglans* White & Evenhuis, new species, *Bactrocera (Bulladacus) aceromata* White & Evenhuis, new species, *Bactrocera (Bulladacus) obrullata* White & Evenhuis, new species, *Bactrocera (Bulladacus) warisensis* White & Evenhuis, new species, *Bactrocera (Papuodacus) complicata* White, new species, *B. (Paradacus) magnicauda* White & Evenhuis, new species, *B. (P.) urens* White, new species, *B. (Paratridacus) banneri* White, new species, *B. (Zeugodacus) assamensis* White, new species, *B. (Z.) buruensis* White, new species, *B. (Z.) freidbergi* White, new species, *B. (Z.) fulvoabdominalis* White & Evenhuis, new species, *B. (Z.) hoedi* White, new species, *B. (Z.) neoelegantula* White, new species, *B. (Z.) pura* White, new species, *Dacus (Callantra) axanthinus* White & Evenhuis, new species. *B. (B.) maculigera* Doleschall is removed from synonymy with *Dasyneura zonatus* Saunders (= *B. zonata*). Diagnostic notes are presented on 10 other species, most apparently new but not formally described due to a lack of adequate specimens, viz: species near *B. (B.) exscoliata* (Hering), *B. (B.) musae* (Tryon), *B. (B.) pernigra* Ito, *B. (Bulladacus) aceraglans* White & Evenhuis, new species, *Bactrocera (Hemizeugodacus) arisanica* (Shiraki), *B. (Tetradacus) pagdeni* (Malloch), *B. (Zeugodacus) connexa* (Hardy), *B. (Z.) diaphora* (Hendel), *B. (Z.) emitens* (Walker), *B. (Z.) vultus* (Hardy). There is also some discussion of *B. (B.) abdonigella* (Drew), including a note on the likely identity of *Dacus maculosus* Walker, nomen nudum, *B. (Paratridacus) unichromata* Drew, and *B. (Z.) yoshimotoi* (Hardy). New distribution data is provided for a further 15 species.

KEY WORDS. - Tephritidae, Bactrocera, New Taxa, Distribution, Oriental, Australasian

INTRODUCTION

A computerised multiple-entry key to the Indo-Australasian species of Dacini was recently compiled using the CABIKEY software and issued on CD-ROM (White & Hancock, 1997). Those authors recognised 507 previously described and valid species. Their work, in combination with the extensive surveys recently carried out in several Asian and Pacific areas by R.A.I. Drew and colleagues, has led to the discovery of well over 100 undescribed species. None of those was included by White & Hancock (1997) due to the lack of general acceptance of electronic media for satisfying the criteria for publication of new species. However, a multiple-entry key is being produced specifically for the Dacini of Malesia (Thailand to the Solomon Islands, plus Laos, Cambodia, Vietnam, the Philippines, New Caledonia and Vanuatu) and that will include some species that have not been formally named. Those species are cross-referenced here by the number they will receive in this *Fauna Malesiana* CD-ROM multiple-entry key.

The primary purpose of this paper is to describe and formally name some of the "new" species covered by the *Fauna Malesiana* account, plus some other Asian species. New species resulting from major surveys will be published elsewhere and papers are being prepared to describe several new *Bactrocera* spp. from Sri Lanka (K. Tsuruta & White), and to revise the *B. (Zeugodacus) tau* (Walker) species group (Drew & Hancock). The latter will form part of a major series of papers revising Asian Dacini, three of which have been completed so far (Drew & Hancock, 1994a; 1994b; Drew, Hancock & White, 1998). New species belonging to the Oriental fruit fly, *B. dorsalis* (Hendel), species group that have been discovered since the recent revision (Drew & Hancock, 1994a) will also be published elsewhere. Other publications that have appeared since the completion of the Indo-Australasian CD-ROM by White & Hancock (1997) include a check list of Malaysian Dacini (Chua, 1998), a host list for Sri Lanka (Tsuruta et al., 1997), a host list for south-east Asia (Allwood et al., in press), a review of Dacini morphology (White, in press), and description of new Australian species (Drew et al., 1999).

Many of the species described here have only been found once, in many cases a long time ago. Those species are mostly from areas where modern methods of using male lures have not yet been applied, and many of them may prove common as commercial fruit growing expands to new regions. Furthermore, many of the species described here are difficult to place in the current subgeneric classification as they have unusual permutations of character states that will be of value in a future revision of the subgeneric classification. This paper also reports on several specimens that appear to represent distinct species but further collecting will be needed before they can be described formally.

MATERIALS AND METHODS

The largest collection of unidentified specimens examined for this study comprised 911 specimens from Papua New Guinea and Indonesia, belonging to Bernice P. Bishop Museum, Honolulu, Hawaii, USA (BPBM). Specimens were also examined from the following collections: American Museum of Natural History, New York, USA (AMNH); The Natural History Museum, London, UK (BMNH); Florida State Collection of Arthropods, Gainesville, Florida, USA (FSCA); Instituut voor Taxonomische Zoologie, Amsterdam, Netherlands (ITZ); Museum Bogoriense, Bogor, Java, Indonesia (MBB); National Museum of Wales, Cardiff, UK (NMWC); Naturhistoriska Riksmuseet, Stockholm, Sweden (NRS); Queensland

Museum, Brisbane, Australia (QMB); Natuurhistorisch Museum, Leiden, Leiden, Netherlands (RMHL); Tel Aviv University, Israel (TAU); National Museum of Natural History (Smithsonian Inst.), Washington DC, USA (USNM); and Museum für Naturkunde, Humboldt Universität, Berlin, Germany (ZMHB).

The descriptions given here closely follow the ordering and naming of characters used by White & Hancock (1997). Each species was initially added to the matrix of data compiled by those authors, and the CABIKEY software was used to draft the description, determine key diagnostic features and determine which species are similar. Species have been assigned authorship in this paper (i.e. White, or White & Evenhuis) according to which species each author(s) examined and described.

Geographic details closely follow the label data. However, many of the BPBM specimens were labelled "West New Guinea" or "New Guinea". Town or village data for these was checked in a gazetteer and, if found, the latitude and longitude noted as confirmation that the specimens were apparently from Irian Jaya or Papua New Guinea respectively.

Diagrams of body patterning were prepared using a computerised technique designed to be comparable with the drawing style of Drew (1989) and other works by that author. Most were based on a "standard outline" (derived from a figure of *B. dorsalis* by Meridith Romig; Drew & Hancock, 1994a); the exceptions being species with distinctive abdomen shapes (e.g. fig. 1). Only *Dacus (Callantra) axanthinus*, White & Evenhuis, new species, is entirely original (fig. 26). In most species the abdomen shape is very similar and variation with development (from slender teneral individuals to bloated gravid females) is greater than inter-specific differences. Other body parts are also sufficiently invariant in shape as to allow use of a standard outline for most species. The boundary of each area of colour pattern, and the chaetotaxy, for each species was drawn onto an outline which was then scanned into a computer paint program. The paint program was then used to add grey tones to each area that was not bright yellow. Finally, the colour-depth of the image was reduced to two colours, i.e. black and white, which had the effect of replacing grey tones with stipple patterns.

SYSTEMATICS

SUBFAMILY DACINAE

Tribe Dacini

Genus *Bactrocera* Macquart

Subgenus *Bactrocera (Asiadacus)* Hardy

This subgenus shares the same male terminalia features as *B. (Zeugodacus)* spp., i.e. long posterior lobe of surstyli, shallow posterior margin to sternite V, plus the presence of a pecten, but differs in the absence of prescutellar acrostichal setae and basal scutellar setae, and usually anterior supra-alar setae. White (in press) noted that subgenera defined merely by the presence or absence of such setae were unlikely to constitute natural groups and a future revision of subgeneric limits is likely to conclude that most species currently assigned to this subgenus would be better placed in *B. (Zeugodacus)*. The following species may be an exception for reasons noted below.

***Bactrocera (Asiadacus) atypica* White & Evenhuis, new species**
(Fig. 1)

Bactrocera (Asiadacus) sp. 1, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - male (BPBM), INDONESIA: Irian Jaya [as "New Guinea (NW)"], Wisselmeren [$3^{\circ}55'S$ $136^{\circ}15'E$], Moanemani, Kamo V[alley], 1500m, 13 Aug. 1962, coll. J. Sedlacek [#33 on N.L. Evenhuis det. label, BPBM holotype 16001]

Description. - male.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face without a dark spot in each antennal furrow; face without other markings. Frons, 3 pairs frontal setae; 1 pair orbital setae; without spots at seta bases. No dark mark between eye and antenna base.

Thorax - Predominant colour of scutum orange-brown. Postpronotal lobe orange-brown (same as ground colour). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow vittae. Notopleural lobe orange-brown, same colour as scutum. Notopleural suture without isolated wedge shaped mark. Scutum without lateral postsutural vittae. Scutum without a medial vitta. No yellow mark around or across prescutellar area. Scutellum not extensively marked (patterned); with a deep basal band; yellow (not concolorous with scutum); not bilobed. Anepisternum with a yellow stripe from notopleuron almost to katepisternum; stripe (dorsally) to level with anterior notopleural seta; not an inverted L-shape. Katepisternum without a yellow mark. Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Notopleuron with anterior seta. Scutum without anterior supra-alar setae; without prescutellar acrostichal setae. Scutellum without basal setae.

Wing - Length, approx. 5mm [slightly folded]. Vein R_{2+3} not sinuate near end R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. Wing with costal band reduced to a trace of colour in cell R_1 . Without an anal streak. Cells bc and c hyaline. Wing not overall fumose; not patterned (other than costal band).

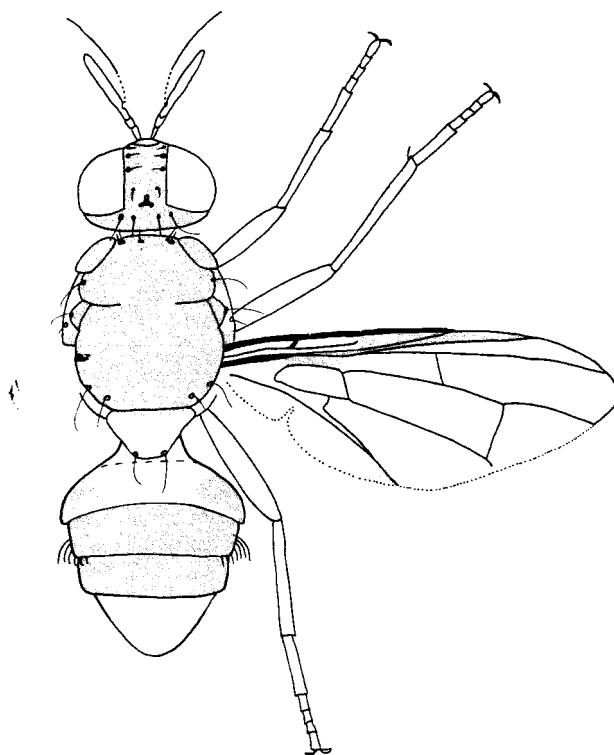
Leg - Fore femur without stout ventral spines. Legs entirely yellow except hind tibia slightly darker.

Abdomen - Predominant colour orange-brown. Tergites not fused. Abdomen not wasp waisted. Tergite V without a dorsal hump. Lacking distinct pattern. Ceromata apparently absent.

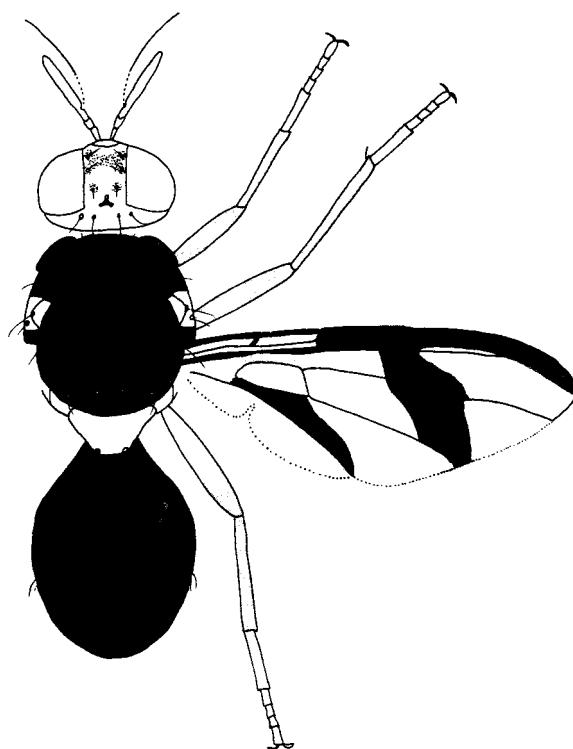
Terminalia and secondary sexual characters - Wing without a bulla. Tergite III with a pecten (setal comb) on each side. IVth and Vth sternites of normal width, not very broad. Sternite IV posterior margin shallow, not V-shaped. Surstylus apparently with a long posterior lobe (folded under but with care can be seen). Wing without a deep indent in posterior margin (wing folded badly but appears to lack supernumerary lobe). Wing with microtrichia area around apex of vein A_1+CuA_2 . Hind tibia with a preapical pad.

Etymology. - Named for its very unusual (atypical) combination of features.

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2



Figs. 1-2. *Bactrocera*. 1, *B. (Asiadacus) atypica* White & Evenhuis, new species, male; 2, *B. (B.) fuscohumeralis* White & Evenhuis, new species, male, using standard outline.

Remarks. - This species has been assigned to *B. (Asiadacus)* simply because it shares the diagnostic features of that subgenus as presently defined. However, its surstyli lobes were very difficult to observe; careful examination indicated that they appeared to be long, thus placing this species in the *B. (Zeugodacus)* groups of subgenera as defined by Drew (1989). Furthermore, this species appears to lack ceromata (wax glands on tergite V), a feature of *B. (Bulladacus)* spp., although this species lacks the short extension of cell cup and short antennae typical of that subgenus.

Subgenus *Bactrocera* sensu stricto

***Bactrocera (Bactrocera) abdonigella* (Drew)**

? *Dacus maculosus* Walker, 1866, nomen nudum

Dacus (Strumeta) abdonigella Drew, 1971: 52

This species is newly recorded from Indonesia; previously only recorded from Papua New Guinea; one male (BPBM), Irian Jaya ("Vogelkop" [Doberai, Jazirah], Manokwari area, Soawi, 75m., 20 Jul.1957, coll. D.E. Hardy. However, White & Hancock (1997) did note that *Dacus maculosus* Walker, 1866, nomen nudum, could be this species. *Dacus maculosus* is a nomen nudum because Walker (1866: 26) did not describe it, he merely listed it in a distribution table as being in "Bachian" [Bacan Island, Maluku] and "New Guinea". A male from (Moluccas, Bachan, W.W. Saunders, BM 1868-4) in the BMNH collection used to stand above a typed label reading "maculosus Walker" and although it does not bear any name label in Walker's handwriting, it is probably the specimen Walker examined. It appears to be a rather dark specimen of *B. abdonigella*. *Dacus maculosus* was omitted from the recent regional catalogue (Hardy & Foote, 1989).

***Bactrocera (Bactrocera) sp. near B. expoliata* (Hering)**

Near *Strumeta expoliata* Hering, 1941: 54

A single male, from Danum Valley, Sabah, Malaysia (coll. A.H. Kirk-Spriggs, 19-23 Aug.1987, NMWC) is similar to *B. expoliata*, a species known only from its holotype, a male collected in Papua New Guinea. *Bactrocera expoliata* has all femora dark (fuscous/black); the Sabah specimen has the fore and mid femora fuscous and the hind pale fulvous. The Sabah specimen also has a slightly narrower anepisternal stripe. Although these are unlikely to be conspecific this difference is insufficient grounds for formal description until further material becomes available.

***Bactrocera (Bactrocera) fuscohumeralis* White & Evenhuis, new species**
(Fig. 2)

Bactrocera (Bactrocera) sp. 7, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - male (BPBM), INDONESIA: Irian Jaya, [presumably Biak 1°10'S 136°06'E], Kampong Landbouw, 30km n.e. of air strip, 40m, 16 Jul.1957, coll. D.E. Hardy [location inferred by *Bactrocera (B.) nigroscutata* data] [#17 on N.L. Evenhuis det. label, BPBM holotype 16002]

Description. - male.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face with a dark spot in each antennal furrow; spot round/elongate; large; without other markings. Frons, 2 pairs frontal setae; 1 pair orbital setae. No dark mark between eye and antenna base.

Thorax - Predominant colour of scutum black. Postpronotal lobe fuscous. No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vittae. Notopleural lobe yellow. Notopleural suture without isolated wedge shaped mark. Scutum without lateral postsutural vittae; without a medial vitta. No yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to, or almost to, katepisternum; anepisternal stripe (dorsally) not reaching anterior notopleural seta; not an inverted L-shape. Katepisternum unmarked. Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Notopleuron with anterior seta. Scutum with anterior supra-alar setae and prescutellar acrostichal setae. Scutellum without basal setae.

Wing - length, 6.7mm. Vein R_{2+3} not sinuate near end R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cell bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. Wing with a complete costal band; band depth, to below R_{2+3} , almost to R_{4+5} ; band not expanded into a spot at apex; band not abruptly darkened at apex. Wing with an anal streak. Cells bc and c hyaline. Wing not overall fumose. Wing patterned (other than costal band and anal streak); with a transverse and slightly sinuate crossband covering both crossveins $r-m$ and $dm-cu$.

Leg - Fore femur without stout ventral spines. Fore and mid-femora fulvous; hind femur pale basally, fulvous apically. Tibiae pale fulvous.

Abdomen - Predominant colour black. Tergites not fused. Abdomen not wasp waisted. Tergite V without a dorsal hump. Tergite II fuscous; III and IV black. Ceromata round/ovoid.

Terminalia and secondary sexual characters - Wing without a bulla. Tergite III with a pecten (setal comb) on each side. IVth and Vth sternites of normal width, not very broad. Sternite V posterior margin V-shaped. Surstyli without a long posterior lobe. Wing with a deep indent in posterior margin (forming supernumerary lobe); with microtrichia area around apex of vein A_1+CuA_2 . Hind tibia with a preapical pad.

Etymology. - Named for its fuscous postpronotal (= humeral) lobes.

Remarks. - This species can be separated from all other species with dark postpronotal lobes by its absence of postsutural vittae, crossband over both $r-m$ and $dm-cu$ crossveins, and black tergites III and IV.

***Bactrocera (Bactrocera) grandifasciata* White & Evenhuis, new species**
(Fig. 3)

Bactrocera (Bactrocera) sp. 9, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - female (BPBM), INDONESIA: Irian Jaya, Hittikima, 100m, 19 Feb.1960, coll. T.C. Maa [locality not traced] [BPBM holotype 16003].

Paratypes - 1 female (BPBM), same data as holotype (preserved in gelatine capsule on same pin as holotype); 1 female (BPBM), Irian Jaya, Wamena[4°04'S 138°57'E or 3°55'S 138°44'E ?], 1700m, 10-25 Feb.1960, coll. T.C. Maa [#5 on N.L. Evenhuis det. label; head in capsule].

Description. - female.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face with a dark spot in each antennal furrow; spot elongate vertically; very large. Face without other markings. Frons, 2 pairs frontal setae; 1 pair orbital setae; with spots at seta bases. No dark mark between eye and antenna base.

Thorax - Predominant colour of scutum fuscous. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vittae. Notopleural lobe yellow. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vittae (yellow); lateral vittae not extended anterior to suture; vittae somewhat tapered; ending before intra-alar seta. Scutum without a medial vitta. No yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); without a deep basal band; yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum; stripe (dorsally) not reaching anterior notopleural seta; not an inverted L-shape. Katepisternal mark slightly broader than anepisternal stripe (at katepisternum-anepisternum suture). Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Notopleuron with anterior seta. Scutum with anterior supra-alar setae; prescutellar acrostichal setae present (paratype) or absent (holotype). Scutellum without basal setae.

Wing - Length, 6.2-6.5mm. Vein R_{2+3} not sinuate near end R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cell bc , cell c and cell br (narrowed part) with extensive covering of microtrichia. Wing with a complete costal band; deep, extending below R_{4+5} ; not expanded into a spot at apex; not abruptly darkened at apex. Wing with an anal streak. Cell bc coloured, but not quite as dark as costal band. Cell c coloured as costal band. Wing not patterned (other than costal band and anal streak).

Leg - Fore femur without stout ventral spines. Fore and mid femora fuscous. All tibiae fulvous. Hind femur pale basally, fulvous apically.

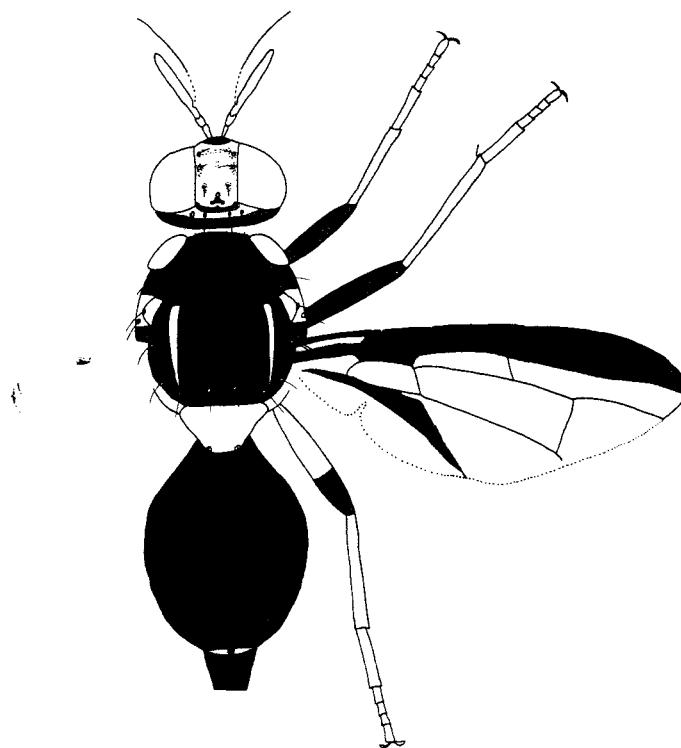
Abdomen - Predominant colour black. Tergites not fused. Abdomen not wasp waisted. Tergite V without a dorsal hump. Tergites III and IV black. Ceromata round/ovoid.

Terminalia and secondary sexual characters - Aculeus apex pointed (observed with low power microscope only).

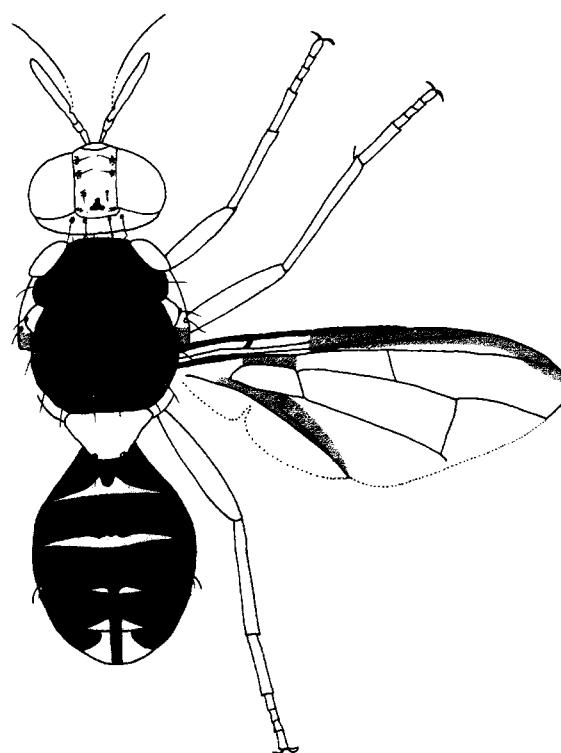
Etymology. - Named for its very deep (grand) costal band (fascia).

Remarks. - Separated from all other species that have lateral postsutural vittae, anterior supra-alar setae and a very deep costal band, by the absence of more extensive wing patterning and the presence of an extensive covering of microtrichia in cell bc . The presence or absence of prescutellar acrostichal setae appears to be variable. They are clearly present in the paratypes but appear to be absent in the holotype. However, the holotype has its pin placed near the prescutellar area and very close to the setal positions, although careful examination suggests that the setae are absent.

3



4



Figs. 3-4. *Bactrocera*, using standard outline. 3, *B. (B.) grandifasciata* White & Evenhuis, new species, female; 4, *B. (B.) heppneri* White, new species, male.

***Bactrocera (Bactrocera) heppneri* White, new species**
(Fig. 4)

Material examined. - Holotype - male (FSCA), TAIWAN: Pingtung Co., Kenting Park, 31 Oct.-1 Nov. 1984. coll. J.B. Heppner & H. Wang.

Paratypes - 2 females (FSCA), data as holotype.

Description. - male.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face with a dark spot in each antennal furrow; spots round/elongate, medium size; without other markings. Frons - 2 pairs frontal setae; 1 pair orbital setae; with spots at seta bases. Without dark mark between eye and antenna base.

Thorax - Predominant colour of scutum black. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vitta. Notopleuron pale coloured. Notopleural suture without isolated wedge shaped mark. Scutum without lateral postsutural vittae. Scutum without a medial vitta. Without yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); basal band narrow; scutellum yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum; stripe (dorsally) extended to in-line with anterior notopleural seta; stripe not an inverted L-shape. Katepisternal mark slightly broader than anepisternal stripe (at katepisternum-anepisternum suture). Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Anterior notopleural seta, anterior supra-alar seta and prescutellar acrostichal setae present. Scutellum without basal setae.

Wing - Length 6.0-6.5mm. Vein R_{2+3} not sinuate near end of vein R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. Wing with a complete costal band; band extended below R_{2+3} but not to R_{4+5} ; band not abruptly darkened at apex. Wing with an anal streak. Cells bc and c hyaline. Wing not overall fumose. Wing not patterned (other than costal band and anal streak).

Leg - Fore femur without stout ventral spines. Fore and mid femora, yellow, or yellow with dark preapical spot. Fore tibia yellow. Mid and hind tibiae fuscous. Hind femur yellow.

Abdomen - Predominant colour of abdomen black. Tergites not fused. Abdomen not wasp-waisted. Tergite V without a dorsal hump. Pattern on abdomen diffuse or distinct. Tergite III pale centrally only. Tergite IV pale centrally only. Medial longitudinal stripe on tergite IV. Ceromata round/ovoid.

Terminalia and secondary sexual characters - Wing without a bulla. Tergite III with a pecten (setal comb) on each side. IVth and Vth sternites of normal width, not very broad; sternite V posterior margin V-shaped. Surstyli without a long posterior lobe. Wing with a deep indent in posterior margin; with microtrichia area around apex of vein A_1+CuA_2 . Hind tibia with a preapical pad.

Description. - female - Aculeus apex pointed (observed with low power microscope only). Other characters as male except, tergite III without a pecten; sternite V posterior margin

shallow, not V-shaped; wing without a deep indent in posterior margin; without microtrichia area around apex of vein A_1+CuA_2 ; hind tibia without a preapical pad.

Etymology. - Named after the collector, J.B. Heppner.

Remarks. - Part of a group within subgenus *B. (Bactrocera)* that lacks postsutural vittae, have facial spots, a black scutum, the costal band extended below vein R_{2+3} , and all femora pale. This group also includes *B. allwoodi* (Drew), from the Australian Northern Territory, and *B. obscura* (Malloch), from Samoa, Niue and Tonga. *Bactrocera heppneri* differs from both of these species in its very extensively black abdomen.

Bactrocera (Bactrocera) lacerata White & Evenhuis, new species
(Fig. 5)

Bactrocera (Bactrocera) sp. 8, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - female (BPBM), INDONESIA: Timor Island, Balical, 200-300m, 14-24 Dec. 1963, coll. J. Sedlacek [#10 on N.L. Evenhuis det. label, BPBM holotype 16004]

Description. - female.

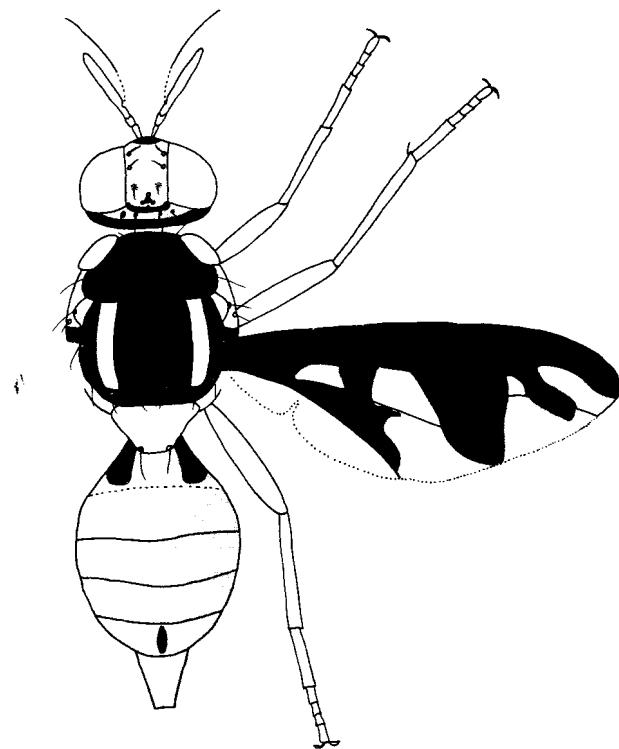
Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face with a dark spot in each antennal furrow; spots slightly transverse elliptical; spots medium size. Face without other markings. Frons, 2 pairs frontal setae; 1 pair orbital setae; without spots at seta bases. No dark mark between eye and antenna base.

Thorax - Predominant colour of scutum black; covered in golden-yellow microtrichia. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vittae. Notopleural lobe yellow. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vittae (yellow; lateral postsutural vittae not very narrow; not extended anterior to suture; not tapered; extended to intra-alar seta. Scutum without a medial vitta. No yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); without a deep basal band; yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum; stripe (dorsally) extended to postpronotal lobe; stripe not an inverted L-shape. Katepisternal mark as broad as anepisternal stripe (at katepisternum-anepisternum suture). Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Notopleuron with anterior seta. Scutum with anterior supra-alar setae and prescutellar acrostichal setae. Scutellum without basal setae.

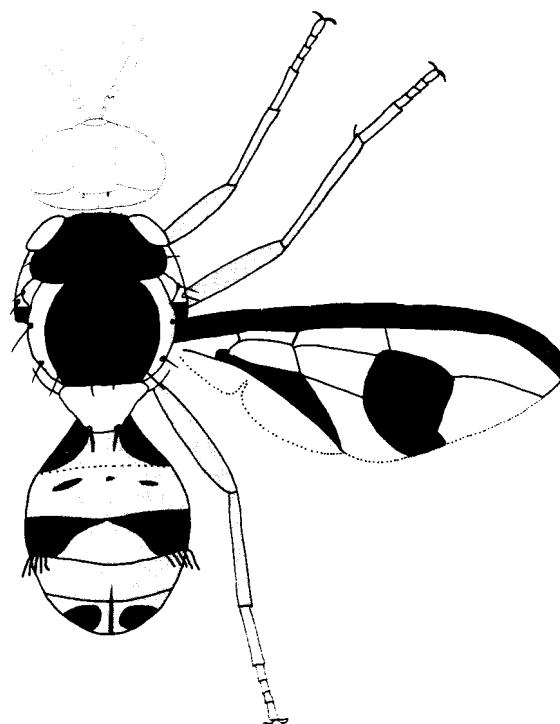
Wing - Length, 6.7mm. Vein R_{2+3} not sinuate near end R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. Wing with a complete costal band; band depth to below R_{4+5} ; band not abruptly darkened at apex. Wing with an anal streak. Cells bc and c coloured as deeply as costal band. Wing not overall fumose. Wing patterned (other than costal band and anal streak); transverse mark along crossvein $bm-cu$; transverse mark covering both crossveins $r-m$ and $dm-cu$; diagonal mark along/across distal vein M .

Legs - All femora and tibiae pale, yellowish.

5



6



Figs. 5-6. *Bactrocera*, using standard outline. 5, *B. (B.) lacerata* White & Evenhuis, new species, female; 6, *B. (B.) maculigera* Doleschall, male (head missing).

Abdomen - Predominant colour red-brown (holotype badly stained). Tergites not fused. Abdomen not wasp waisted. Tergite V without a dorsal hump. Ceromata round/ovoid.

Etymology. - Named for the torn (lacerated) appearance of the wing pattern.

Remarks. - The only species *B. lacerata* is likely to be confused with is *B. umbrosa* (Fabricius) which has a narrower costal band (not below R_{4+5}). Examination of a long series of *B. umbrosa* (in BMNH) failed to reveal any specimens with a deeper costal band, indicating that the holotype of *B. lacerata* is very unlikely to be a mere variant of *B. umbrosa*.

***Bactrocera* (*Bactrocera*) *maculigera* Doleschall, revised status**
(Fig. 6)

Bactrocera maculigera Doleschall, 1859: 122

This species has been listed in catalogues (Hardy, 1977; Hardy & Foote, 1989) and identification works (e.g. White & Elson-Harris, 1994) as a synonym of *B. zonata* (Saunders) (originally *Dasyneura zonatus* Saunders). However, the type of *B. maculigera* (headless male, Indonesia, Ambon, ZMHB) is clearly a distinct species. *Bactrocera maculigera* can be differentiated from all other known *Bactrocera* spp. by the presence of a broad isolated mark across the apical half of cells dm and cu₁. In addition it has a very broad anepisternal stripe (joins postpronotal lobe), a deep costal band (reaches R_{4+5}), and an extensive covering of microtrichia in cell c. The type is also discoloured but postsutural vittae are just discernible.

***Bactrocera* (*Bactrocera*) spp. near *B. musae* (Tryon)**

Near *Chaetodacus musae* Tryon, 1927: 197

The true *B. musae* is only known from Papua New Guinea, Queensland (Australia) and the Solomon Islands, and the males are attracted to methyl eugenol. Hardy (1982) reported a species close to *B. musae* from Sulawesi, Indonesia, whose males were attracted to cue lure. Further specimens similar to *B. musae* have been found in Flores, Indonesia (leg. J. Turner, MBB) and these appear to represent two species, one of which is attracted to cue lure and the other to methyl eugenol. Clearly the *B. musae* species complex (sensu Drew, 1989) is represented in Indonesia by at least two species, neither of which is likely to be *B. musae*. As the specimens to hand are too few to allow a proper study of this difficult group they are not considered further here.

***Bactrocera* (*Bactrocera*) *nigroscutata* White & Evenhuis, new species**
(Fig. 7)

Bactrocera (*Bactrocera*) sp. 5, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - male (BPBM), INDONESIA: Irian Jaya, Biak [1°10'S 136°06'E], Kampong Landbouw, 30km n.e. of air strip, 40m, 16 Jul. 1957, coll. D.E. Hardy [#7 on N.L. Evenhuis det. label, BPBM holotype 16005]

Description. - male

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face with a dark spot in each antennal furrow; spot round/elongate; spot large; without other markings. Frons, 2 pairs frontal setae; 1 pair orbital setae; with spots at seta bases. No dark mark between eye and antenna base.

Thorax - Predominant colour of scutum black. Postpronotal lobe fuscous (but distinctly paler than scutum). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vittae. Notopleural lobe yellow. Notopleural suture without isolated wedge shaped mark. Scutum without lateral postsutural vittae. Scutum without a medial vitta. No yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); basal band narrow; scutellum yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to, or almost to, katepisternum; stripe (dorsally) not reaching anterior notopleural seta; stripe not an inverted L-shape. Katepisternal mark reduced to a trace. Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Notopleuron with anterior seta. Scutum with anterior supra-alar setae and prescutellar acrostichal setae. Scutellum without basal setae.

Wing - Length, 6.3mm. Vein R_{2+3} not sinuate near end R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. Wing with a complete costal band; reaching R_{4+5} ; not expanded into a spot at apex; not abruptly darkened at apex. Wing with an anal streak. Cells bc and c hyaline. Most of wing slightly fumose. Wing not patterned (other than costal band and anal streak).

Leg - Fore femur without stout ventral spines; yellow, with dark outer-apical spot. Fore tibia fulvous. Mid femur fuscous. Mid tibia yellow. Hind femur yellow basally, fuscous apically. Hind tibia fulvous.

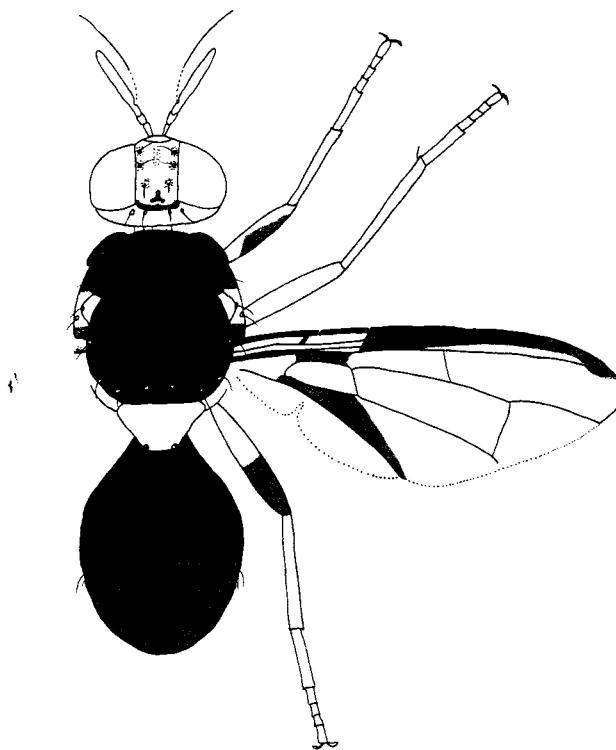
Abdomen - Predominant colour of abdomen dark red-brown. Tergites not fused. Abdomen not wasp waisted. Tergite V without a dorsal hump. Pattern on abdomen diffuse [stained in holotype]; tergite III [apparently] with a dark transverse basal band; tergite IV [apparently] unmarked except for a medial longitudinal stripe. Ceromata round/ovoid.

Terminalia and secondary sexual characters - Wing without a bulla. Tergite III with a pecten (setal comb) on each side. IVth and Vth sternites of normal width, not very broad; sternite V posterior margin V-shaped. Surstyli without a long posterior lobe. Wing with a deep indent in posterior margin (forming supernumerary lobe). Wing with microtrichia area around apex of vein A_1+CuA_2 . Hind tibia with a preapical pad.

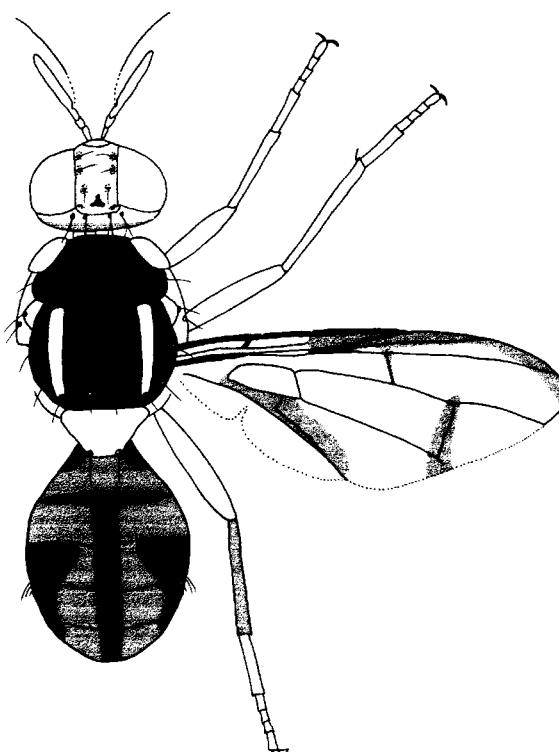
Etymology. - Named for its black scutum.

Remarks. - *Bactrocera nigroscutata* may be differentiated from all other *Bactrocera* spp. by the dark postpronotal lobes, yellow scutellum, lack of postsutural vittae, lack of wing pattern (other than costal band and anal streak), and the presence of anterior supra-alar setae and facial spots.

7



8



Figs. 7-8. *Bactrocera*, using standard outline. 7, *B. (B.) nigroscutata* White & Evenhuis, new species, male; 8, *B. (B.) pseudocucurbitae* White, new species, male.

***Bactrocera (Bactrocera) sp. near B. pernigra* Ito**

Near *Bactrocera pernigra* Ito, 1983: 23

Three males collected in a methyl eugenol trap in Hong Kong, China (22 Apr. 1981, R. Winney, BMNH) have the fore femora entirely black along the upper, outer and lower surfaces, leaving only a trace of paler colour (dark fulvous) along the inner side. *Bactrocera pernigra* (Ito) was described from Japan, and White & Hancock (1997) also recorded it from Taiwan (on the basis of considering *Dacus tenuivittatus* Tseng, Chen & Chu to be an unconfirmed synonym). The Hong Kong specimens probably represent a darker form of the same species but insufficient material of *B. pernigra* is available to permit proper comparison.

***Bactrocera (Bactrocera) pseudocucurbitae* White, new species**
(Fig. 8)

Bactrocera (Bactrocera) sp. 2, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - male (NMWC), MALAYSIA: Sabah, Danum Valley, 5°01'N 117°47'E, lowland mixed dipterocarp forest, grid WON3, 19-24 Sep. 1987, in cue lure trap, coll. A.H. Kirk-Spriggs.

Description. - male.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face with a dark spot in each antennal furrow; spot round/elongate; spot medium size; without other markings. Frons - 2 pairs frontal setae; 1 pair orbital setae; with spots at seta bases. Without dark mark between eye and antenna base.

Thorax - Predominant colour of scutum black. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vitta. Notopleuron pale coloured. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vitta (yellow); vitta broad; not extended anterior to suture; not tapered; extended to intra-alar seta. Scutum without a medial vitta. Without yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); basal band narrow; scutellum yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum; stripe (dorsally) extended to postpronotal lobe; not an inverted L-shape. Katepisternal mark as broad as lower part of anepisternal stripe. Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Anterior notopleural seta, anterior supra-alar seta and prescutellar acrostichal setae present. Scutellum without basal setae.

Wing - Length 6.0mm. Vein R_{2+3} not sinuate near end of vein R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. With a complete costal band; band extended below R_{2+3} but not to R_{4+5} ; not expanded into a spot at apex; not abruptly darkened at apex. Wing with an anal streak. Cells bc and c hyaline. Wing not overall fumose. Wing patterned (other than costal band and anal streak); transverse mark over crossvein $r-m$ (not direct to any on $dm-cu$) present; mark over $r-m$ joined to costal band; not continued across cell dm to CuA_1 . Transverse mark over crossvein $dm-cu$ (not direct to any on $r-m$) present; mark over $dm-cu$ not continued across r_{4+5} to R_{4+5} ; not recurved back along CuA_1 . Crossbands over $r-m$ and $dm-cu$ not linked behind CuA_1 .

Leg - Fore femur without stout ventral spines. All femora yellow. All tibiae fuscous.

Abdomen - Predominant colour of abdomen red-brown. Tergites not fused. Abdomen not wasp-waisted. Tergite V without a dorsal hump. Pattern on abdomen diffuse or distinct; tergites III and IV dark laterally; medial longitudinal stripe on tergite IV. Ceromata round/ovoid.

Terminalia and secondary sexual characters - Wing without a bulla. Tergite III with a pecten (setal comb) on each side. IVth and Vth sternites not very broad; sternite V posterior margin V-shaped. Surstylus without a long posterior lobe. Wing with a deep indent in posterior margin. Wing with microtrichia area around apex of vein A_1+CuA_2 . Hind tibia with a preapical pad.

Etymology. - Named for the resemblance of its wing pattern to that of the well known pest species, *B. cucurbitae* (Coquillett), the melon fly.

Remarks. - This, and the following species, are the only members of subgenus *Bactrocera* that have marks across both crossveins r-m and dm-cu which are neither very pale, e.g. *B. melanota* (Coquillett) from the Pacific, nor form part of a more complex pattern, e.g. members of the *B. recurrens* (Hering) species complex from Australasia, as defined by Drew (1989).

***Bactrocera (Bactrocera) tortuosa* White & Evenhuis, new species**
(Fig. 9)

Bactrocera (Bactrocera) sp. 6, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - female (BPBM), [INDONESIA: Irian Jaya as] "West New Guinea", Star M[oun]t[ain]s, Sibil Val[ley] [around 5°S 141°E], 1245m, 18 Oct.-8 Nov.1961, coll. S. & L. Quate, malaise trap" [#35 on N.L. Evenhuis det. label, BPBM holotype 16006]

Description. - female.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face with a dark spot in each antennal furrow; spot round/elongate; spot small; without other markings. Frons, 2 pairs frontal setae; 1 pair orbital setae; with spots at seta bases. No dark mark between eye and antenna base.

Thorax - Predominant colour of scutum black. Postpronotal (=humeral) lobe colour entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vittae. Notopleural lobe yellow/orange. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vittae (yellow), which are very narrow; not extended anterior to suture; very short, ending before posterior supra-alar seta. Scutum without a medial vitta. No yellow/orange mark around or across prescutellar area. Scutellum not patterned; without a deep basal band; yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum; stripe (dorsally) not reaching anterior notopleural seta; not an inverted L-shape. Katepisternum with only a trace of yellow marking. Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Notopleuron with anterior seta. Scutum with anterior supra-alar setae and prescutellar acrostichal setae. Scutellum without basal setae.

Wing - length approx. 5mm (estimate - wings folded). Vein R_{2+3} not sinuate near end R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cell bc without extensive covering of microtrichia. Cell c with extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. Wing with a complete costal band; depth not below R_{2+3} except at apex; not very narrow in cell r_{2+3} ; not continued to vein M ; not expanded into a spot at apex; not abruptly darkened at apex. Wing with an anal streak. Cells bc and c hyaline. Wing not overall fumose. Wing patterned (other than costal band and anal streak); sinuate mark covering both crossveins $r-m$ and $dm-cu$ but very pale beyond $r-m$.

Leg - Fore femur without stout ventral spines. All femora pale basally, fulvous apically; tibiae fulvous.

Abdomen - Predominant colour of abdomen fuscous. Tergites not fused. Abdomen not wasp waisted. Tergite V without a dorsal hump. Abdomen without any distinct dark markings. Ceromata round/ovoid.

Etymology. - Named for its sinuate (tortuous curved) crossband.

Remarks. - The strongly sinuate crossband over crossveins $r-m$ and $dm-cu$ separates this species from all others that have very short lateral postsutural vittae, no medial vitta and a narrow costal band.

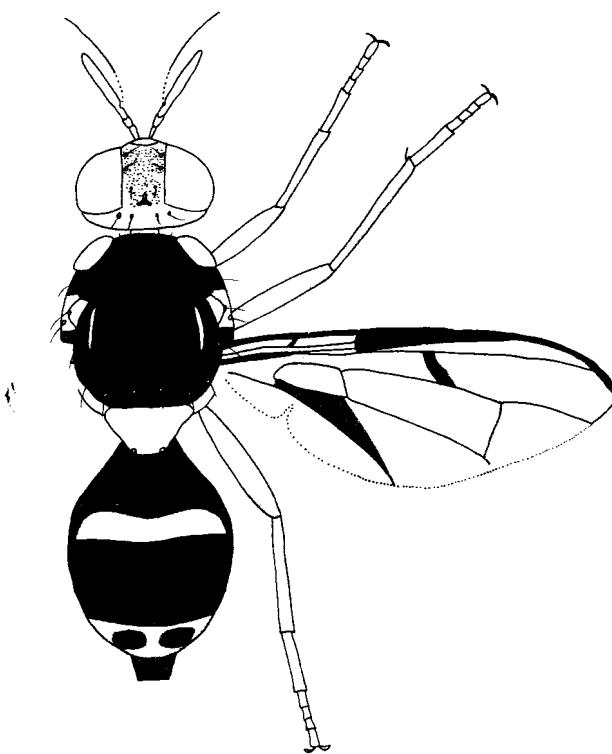
Subgenus *Bulladacus* Drew & Hancock

This subgenus was described by Drew & Hancock (1995) to take those species of *Bactrocera* that have the male terminalia and chaetotaxy typical of subgenus *B.* (*Bactrocera*) s.str., combined with the presence of a bulla in the male, and the lack of ceromata (wax glands on tergite V). Most *B.* (*Bulladacus*) spp. also have a rather angulate abdomen shape and unusually short antennae. All other *Bactrocera* and *Dacus* spp. that have been studied have ceromata (White & Hancock, 1997; White, in press). *Bactrocera neotigrina* Drew & Hancock from Queensland, Australia, which lacks all but a trace of the bulla but has other features typical of subgenus *Ba.* (*Bulladacus*), including the absence of ceromata (Drew *et al.*, 1999). The present authors have now found four more species in which ceromata cannot be detected and these are described here as *Ba.* (*Bu.*) *aceraglans*, new species, *Ba.* (*Bu.*) *aceromata*, new species, *Ba.* (*Bu.*) sp. and *Ba.* (*Asiadacus*) *atypica*, new species. Furthermore, they all have the unusual abdomen shape typical of *Ba.* (*Bulladacus*) spp. The first three of these species are tentatively placed in subgenus *Ba.* (*Bulladacus*), although those known from males lack a pecten and might therefore equally well be placed in subgenus *Ba.* (*Gymnodacus*).

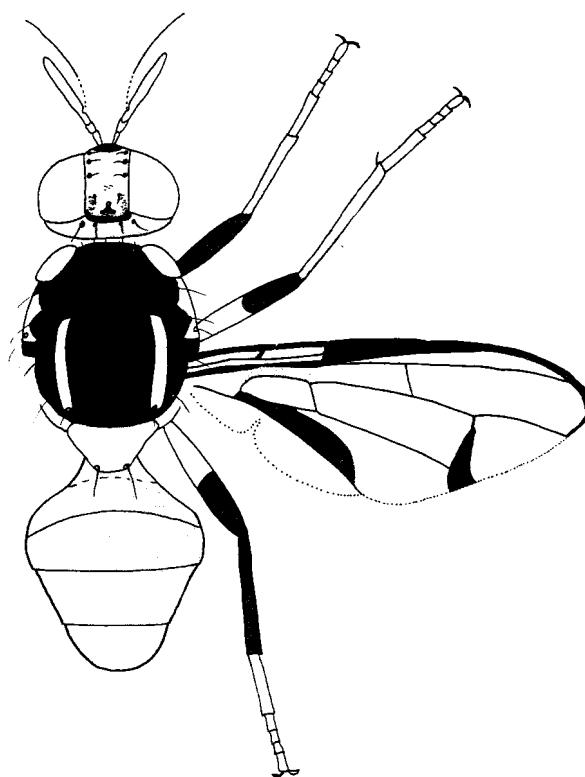
The type species of *Ba.* (*Gymnodacus*) (*Dacus mesomelas* Bezzi) has a long extension to cell cup, of the form observed in the vast majority of *Bactrocera* spp. However, most Asian species assigned to *Ba.* (*Gymnodacus*)¹ have the very unusual feature of a very short cup extension, which is narrower at its base than in the middle (or apparently so due to a sinuation in vein CuA_2 , i.e. it is almost *Ceratitis*-like in shape. Females of true *Ba.* (*Bulladacus*) spp.

1 Species confirmed as having a short cell cup extension are: *B. absona* (Hering) in NRS; *B. calophylli* (Perkins & May) in BMNH; *B. continua* (Bezzi) in BPBM; *B. hastigerina* (Hardy) in BPBM; *B. tillyardi* (Perkins) in BMNH; *B. unipunctata* (Malloch) in BMNH. *B. petila* Drew, in QMB, is a clear exception as it has a long cup extension.

9



10



Figs. 9-10. *Bactrocera*. 9, *B. (B.) tortuosa* White & Evenhuis, new species, female, using standard outline; 10, *B. (Bulladacus) aceraglans* White & Evenhuis, male.

(i.e. those whose males have a bulla) also have this short cup extension (it is obscured by the bulla in the males), as do the new species here placed in *Ba. (Bulladacus)*. The discovery of some species that lack ceromata (as in sg. *Bulladacus*), lack a pecten [where males known] (as in sg. *Gymnodacus*) and have a short cup extension (as in both sg. *Bulladacus* and Asian species of sg. "Gymnodacus") suggests that most Asian species presently assigned to *Ba. (Gymnodacus)*, together with the new species described here, and *Ba. (Bulladacus)* spp., may all belong to a single natural group defined by cell cup shape. Most of these species also have a short first flagellomere. However, that character has yet to be confirmed for all species and will have to be quantified, perhaps as a ratio to face height, before changes in subgeneric placement are made formally. Furthermore, a short cup extension is also a feature of subgenus *Ba. (Melanodacus)* spp. and of *Ba. (Queenslandacus) exigua* (May), although the extension shape appears different in those species and they do not have abnormally short antennae. The status of *Ba. (Asiadacus) atypica*, new species, was discussed earlier in this paper.

***Bactrocera (Bulladacus) aceraglans* White & Evenhuis, new species**
(Fig. 10)

Bactrocera (Bulladacus) sp. 3, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - male (BPBM), PAPUA NEW GUINEA: Minj [5°54'S 144°41'E], W. Highlands, 8-13 Sep.1959, sweeping, coll. T.C. Maa [#38 on N.L. Evenhuis det. label, BPBM holotype 16007]

Description. - male.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face without a dark spot in each antennal furrow; without other markings. Frons, 3 pairs frontal setae; 1 pair orbital setae; no spots at seta bases. No dark mark between eye and antenna base.

Thorax - Predominant colour of scutum black. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vittae. Notopleural lobe fuscous, except for a trace of yellow posteriorly; Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vittae (yellow); vittae not very narrow; not extended anterior to suture; not tapered; length, to intra-alar seta. Scutum without a medial vitta. No yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); yellow/orange; not bilobed. Anepisternum with a yellow stripe from notopleuron almost to katepisternum; stripe (dorsally) extended to postpronotal lobe; not an inverted L-shape. Katepisternum unmarked. Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Notopleuron with anterior seta. Scutum with anterior supra-alar setae and prescutellar acrostichal setae. Scutellum without basal setae.

Wing - Length, 4.8mm. Vein R_{2+3} not sinuate near end R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. Wing with a complete costal band; band not below R_{2+3} ; not expanded into a spot at apex; not abruptly darkened at apex. Wing with an anal streak. Cells bc and c hyaline. Wing not overall fumose. Wing patterned (other than costal band and anal streak); transverse mark over crossvein $dm-cu$.

Leg - Fore femur without stout ventral spines. Fore femur fuscous. Fore and mid tibiae pale apically, slightly darkened basally. Mid and hind femora pale basally, fuscous apically. Hind tibia fuscous.

Abdomen - Predominant colour red-brown. Tergites not fused. Abdomen not wasp waisted. Tergite V without a dorsal hump. Abdomen not patterned. Ceromata absent.

Terminalia and secondary sexual characters - Wing without a bulla; with dense patch of long microtrichia in the area where other species have a bulla. Tergite III without a pecten (setal comb) on each side. IVth and Vth sternites of normal width, not very broad. sternite IV posterior margin V-shaped. Surstylus without a long posterior lobe. Wing without microtrichia area around apex of vein A_1+CuA_2 . Hind tibia without a preapical pad.

Etymology. - Named for its lack of ceromata (wax glands) (cera=wax).

Remarks. - The lack of ceromata and short extension of cell cup will help differentiate even females of this unusual species. Discounting those features, and the lack of the male bulla and pecten, this species may be differentiated from all other known *Bactrocera* spp. by its combination of all yellow face, broad anepisternal stripe (joins postpronotal lobe), lateral vittae that do not extend anterior to suture, uniformly pale abdomen and marking on crossvein dm-cu.

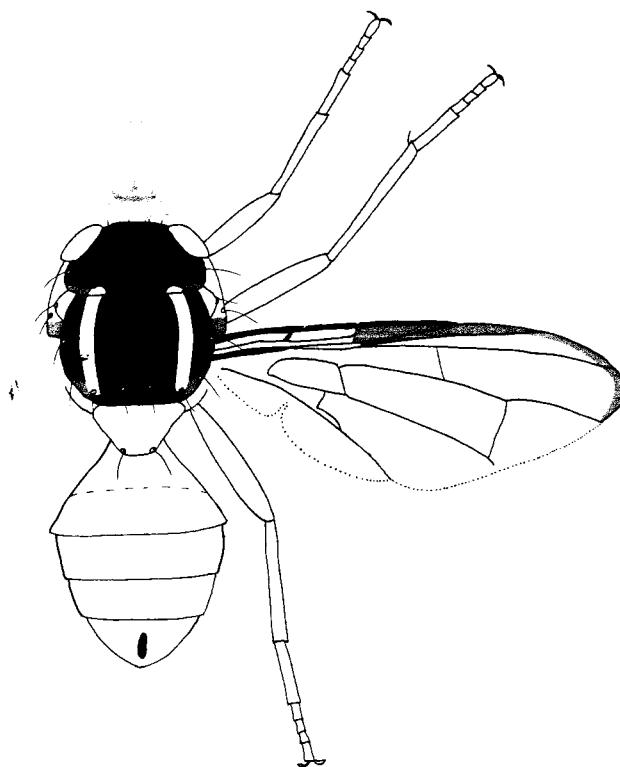
Although this species lacks a bulla, it does have unusually long microtrichia in the position where other species have a bulla, and it is possible that they are the evolutionary precursor to bulla development. *Bactrocera (Sinodacus) paulula* Drew (from Papua New Guinea; male examined, BPBM coll.) has similar long microtrichia and when the wing of that species is viewed obliquely it is apparent that the microtrichia are formed into a "bulge" similar in shape to a bulla (they are not arched in this manner in *B. aceraglans*). However, that species has well developed ceromata and its male terminalia structures clearly place it in the *B. (Zeugodacus)* group of subgenera; *B. (Bulladacus)* spp. belong in the *B. (Bactrocera)* group of subgenera as defined by Drew (1989). If these microtrichia do represent an incipient bulla, then that structure must have evolved at least twice. When cladistic analyses are applied to the genus, it must be considered possible that even the fully formed bulla may have evolved in more than a single lineage. A comprehensive survey of this character across all species has not been carried out.

***Bactrocera (Bulladacus)* sp. near *B. aceraglans* White & Evenhuis, new species**
(Fig. 11)

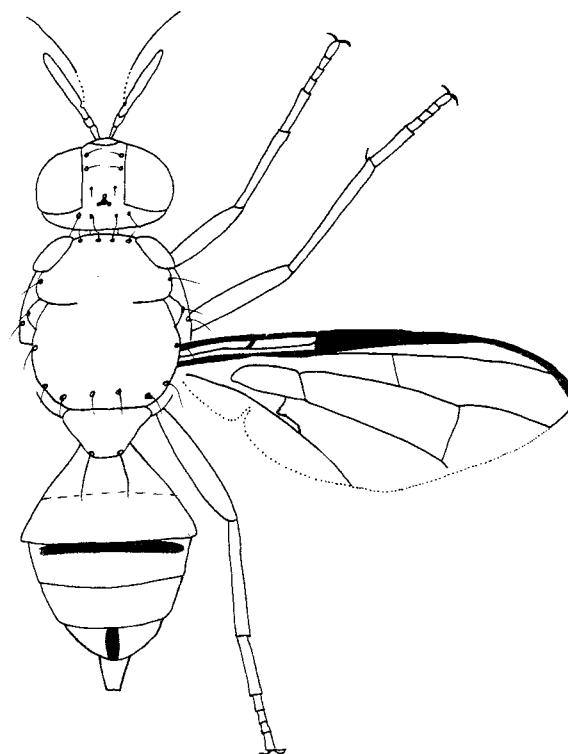
Near *Bactrocera (Bulladacus)* sp. 5, Fauna Malesiana (in prep, CD-ROM)

A single male from Papua New Guinea (Madang District, Wanuma [4°54'S 145°19'E], 600-720m, Aug. 1968, coll. N.L.H. Krauss, BPBM) represents a new species but is not formally described here due to its damaged state (missing head). It is quite distinct from all previously described species and is best compared to *Ba. (Bu.) aceraglans*, because of their shared features of dark scutum, broad anepisternal stripe, (dorsally extended forwards to postpronotal lobe), costal band reaching vein M, absence of ceromata (wax glands on tergite V) and absence of pecten. This species differs from *Ba. (Bu.) aceraglans* as follows: lack of marking over dm-cu crossvein; uniformly pale legs; lateral vittae apparently extended anterior to

11



12



Figs. 11-12. *Bactrocera*. 11, sp. near *B. (Bulladacus) aceraglans* White & Evenhuis, new species, male (head missing); 12, *Bactrocera (Bulladacus) aceromata* White & Evenhuis, new species, female.

suture (diffuse and may be wrongly interpreted); absence of a yellow marking (extension of anepisternal stripe) on the katepisternum; lack of long microtrichia adjacent to cell r_1 .

***Bactrocera (Bulladacus) aceromata* White & Evenhuis, new species**
(Fig. 12)

Bactrocera (Bulladacus) sp. 4, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - female (BPBM), PAPUA NEW GUINEA: Tapini [8°22'S 146°59'E], 17-19 May 1961, light trap, coll. J.L. Gressitt [#13 on N.L. Evenhuis det. label, BPBM holotype 16008].

Description. - female.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face without a dark spot in each antennal furrow; without other markings. Frons, 2 pairs frontal setae; 1 pair orbital setae; without spots at seta bases. No dark mark between eye and antenna base.

Thorax - Predominant colour of scutum fulvous. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum with lateral yellow/orange vittae; vittae not in line with postsutural lateral vittae (more lateral in position). Notopleural lobe yellow. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vittae (yellow); vittae not very narrow; not tapered; length, to intra-alar seta. Scutum without a medial vitta. No yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); without a deep basal band; yellow (not concolorous with scutum); not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum; stripe (dorsally) extended to postpronotal lobe; not an inverted L-shape. Katepisternal mark slightly broader than anepisternal stripe (at katepisternum-anepisternum suture). Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Notopleuron with anterior seta. Scutum with anterior supraalar setae and prescutellar acrostichal setae. Scutellum without basal setae.

Wing - Length 4.2mm. Vein R_{2+3} not sinuate near end R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cell bc without extensive covering of microtrichia. Cell c with extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. Wing with a complete costal band; band not below R_{2+3} (except at apex); band not very narrow in cell r_{2+3} ; not extended to vein M ; band not expanded into a spot at apex; not abruptly darkened at apex. Wing with an anal streak. Cells bc and c hyaline. Wing not overall fumose. Wing not patterned (other than costal band and anal streak).

Leg - Fore femur without stout ventral spines. All femora pale (yellowish). Fore and mid tibiae pale. Hind tibia fulvous.

Abdomen - Predominant colour fulvous. Tergites not fused. Abdomen not wasp waisted. Tergite V without a dorsal hump. Not distinct pattern on abdomen; diffuse basal band on tergite III. Ceromata absent.

Terminalia and secondary sexual characters - Aculeus apex pointed (observed with low power microscope only).

Etymology. - Named for its lack of ceromata (wax glands on tergite V).

Remarks. - Like *B. aceraglans*, which also lacks ceromata, this species may be differentiated from most other known *Bactrocera* spp. by its combination of all yellow face and broad anepisternal stripe. However, it differs from *B. aceraglans* in its lack of wing pattern (other than costal band and anal streak) and it differs from most species in having presutural lateral vittae. *Bactrocera (Gymnodacus) continua* (Bezzi), from the Philippines, has these vittae but differs from *B. aceroglypta* in having very short tapered lateral postsutural vittae, no anterior supra-alar setae and the costal band extended to vein M.

***Bactrocera (Bulladacus) obtrullata* White & Evenhuis, new species**
(Fig. 13)

Bactrocera (Bulladacus) sp. 1, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - male (ITZ), INDONESIA: Irian Jaya, Dojo, Apr.[19]58, coll. G. den Hoed.

Paratype - 1 male (BPBM), [INDONESIA: Irian Jaya as] "West New Guinea", Star M[oun]t[ain]s, Sibil Val[ley] [around 5°S 141°E], 1245m, 18 Oct.-8 Nov.1961, coll. S. & L. Quate"

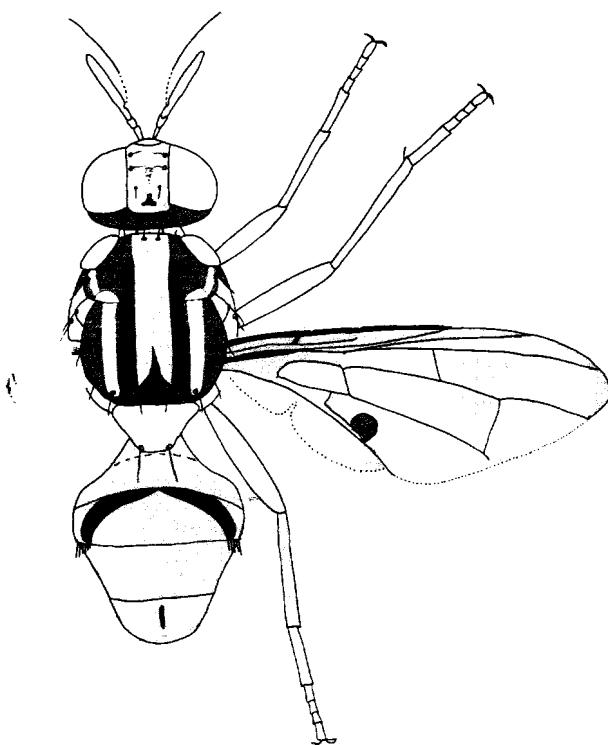
Description. - male.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face without a dark spot in each antennal furrow; without other markings. Frons - 2 pairs frontal setae; 1 pair orbital setae; without spots at seta bases. Without dark mark between eye and antenna base.

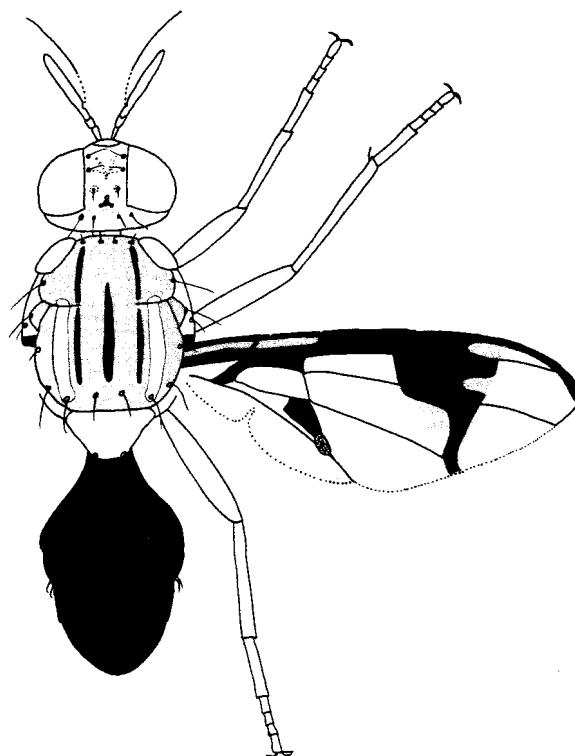
Thorax - Predominant colour of scutum fulvous. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum with lateral yellow vitta; vitta not in line with postsutural lateral vitta. Notopleuron pale coloured. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vitta; broad; extended anterior to suture; not tapered; vitta extended to intra-alar seta. Scutum without a medial vitta. Without yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned) [but see note below about paratype]; basal band narrow; scutellum yellow; not bilobed. Anepisternum with a yellow stripe from the notopleuron to katepisternum; stripe (dorsally) extended to in-line with anterior notopleural seta; stripe not an inverted L-shape. Katepisternal mark slightly broader than anepisternal stripe (at katepisternum-anepisternum suture). Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Anterior notopleural seta present, anterior supra-alar seta and prescutellar acrostichal setae present. Scutellum without basal setae.

Wing - Length 5.2mm. Vein R_{2+3} not sinuate near end of vein R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cell c with extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. With a complete costal band; band either not extended below R_{2+3} or below R_{2+3} , but not to R_{4+5} ; band not very narrow in cell r_{2+3} ; not abruptly darkened at apex. Wing with an anal streak.

13



14



Figs. 13-14. *Bactrocera*. 13, *Bactrocera (Bulladacus) obtrullata* White & Evenhuis, new species, male; 14, *Bactrocera (Bulladacus) warisensis* White & Evenhuis, new species, male.

Cell bc coloured but not as dark as costal band. Cell c coloured same as costal band. Wing not overall fumose. Wing patterned (other than costal band and anal streak) with an ill-defined isolated mark across M, between r-m and dm-cu.

Leg - Fore femur without stout ventral spines. All femora yellow. Fore and mid tibiae yellow. Hind tibia fuscous.

Abdomen - Predominant colour of abdomen orange-brown. Tergites not fused. Abdomen not wasp-waisted. Tergite V without a dorsal hump. Pattern on abdomen distinct. Tergite III with a transverse dark basal band that does not extend to the lateral margins. Tergite IV unmarked. No medial longitudinal stripe on tergite IV. Ceromata absent.

Terminalia and secondary sexual characters - Wing with a bulla. Tergite III with a pecten (setal comb) on each side. IVth and Vth sternites of normal width, not very broad; sternite V posterior margin V-shaped. Surstylus without a long posterior lobe. Wing with a deep indent in posterior margin. Wing with microtrichia area around apex of vein A₁+CuA₂. Hind tibia with a preapical pad.

Etymology. - Named for its abdomen shape (characteristic of several s.g. *Bulladacus* spp.) which is an inverted egg shape (*obovate*), which is angled; *obtrullate* meaning angulate *obovate*.

Remarks. - In common with *B. peterseni* (Hardy) (Philippines), this is a member of subgenus *B. (Bulladacus)* which has lateral presutural vittae. However, it differs from *Bactrocera peterseni* in its paler scutum, the fuscous area in the centre of the wing, and the lack of dark markings on the mid femur. The paratype male differs slightly from the holotype, as follows: the black sub-medial lines on the scutum extend onto the anterior fifth of the scutellum, so that the scutellum base has two basal black markings; tergite IV has an isolated medial black stripe in its posterior two-thirds, not quite connected to the stripe on tergite V.

***Bactrocera (Bulladacus) warisensis* White & Evenhuis, new species**
(Fig. 14)

Bactrocera (Bulladacus) sp. 2, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - male (BPBM), INDONESIA: Irian Jaya, Waris [3°07'S 140°53'E], S. of Hollandia [now Jayapura 2°32'S 140°42'E], 450-500m, 24-31 Aug. 1959, coll. T.C. Maa. [#14 on N.L. Evenhuis det. label, BPBM holotype 16009]

Description. - male.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face without a dark spot in each antennal furrow; without other markings. Frons, 2 pairs frontal setae; 1 pair orbital setae; with spots at seta bases. No dark mark between eye and antenna base.

Thorax - Predominant colour of scutum red-brown. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vittae. Notopleural lobe same colour as scutum. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vittae; vittae not very narrow; extended anterior to

suture; not tapered; length, to intra-alar seta. Scutum without a medial vitta. No yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); without a deep basal band; yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum; extends (dorsally) to postpronotal lobe; not an inverted L-shape. Katepisternal mark broader than anepisternal stripe (at katepisternum-anepisternum suture). Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Notopleuron with anterior seta. Scutum with anterior supralar setae and prescutellar acrostichal setae. Scutellum without basal setae.

Wing - Length, 5.7mm. Vein R_{2+3} not sinuate near end R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cell bc with microtrichia in apical half. Cell c with extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. Wing with a complete costal band; band not expanded into a spot at apex; band not abruptly darkened at apex. Wing with an anal streak but not coloured in cell cup . Cells bc and c very pale coloured. Wing not overall fumose. Wing patterned (other than costal band and anal streak); transverse mark covering both crossveins $r-m$ and $dm-cu$.

Leg - Fore femur without stout ventral spines. Legs pale, yellowish.

Abdomen - Predominant colour fuscous. Tergites not fused. Abdomen not wasp waisted. Tergite V without a dorsal hump. No pattern on abdomen (apparently, as holotype badly stained). Ceromata absent.

Terminalia and secondary sexual characters - Wing with a bulla. Tergite III with a pecten (setal comb) on each side. IVth and Vth sternites of normal width, not very broad. Sternite V posterior margin V-shaped. Surstyli without a long posterior lobe. Wing with a deep indent in posterior margin (forming supernumerary lobe). Wing with microtrichia area around apex of vein A_1+CuA_2 . Hind tibia with a preapical pad.

Etymology. - Named for its type locality, Waris.

Remarks. - This is the only known species that lacks ceromata, has a crossband covering both $r-m$ and $dm-cu$ crossveins, and lacks presutural lateral vittae. Discounting the lack of ceromata (a difficult character to observe), it is also the only known species to have an unmarked yellow face, combined with a broad anepisternal stripe (reaches postpronotal lobe) and the crossband over both $r-m$ and $dm-cu$.

Subgenus *Bactrocera* (*Hemizeugodacus*) Hardy

Bactrocera sp. similar to *B. (Hemizeugodacus) arisanica* (Shiraki)

? *Zeugodacus arisanicus* Shiraki, 1933: 81

A female from Shillong Botanical Gardens, Meghalaya [Assam], India (23 Apr. 1980, coll. A. Freidberg, TAU) runs to *B. arisanica* (Shiraki) using White & Hancock (1997). However, those authors knew only that Taiwanese species from its published description. They also regarded *Dacus parvifoliaceus* Tseng, Chen & Chu as an unconfirmed synonym and on the basis of details given by Tseng et al. (1992), placed *B. arisanica* in subgenus *B. (Hemizeugodacus)*. While it is possible that this Indian specimen is identical to a species

so far only known from Taiwan, the identification appears at first sight unlikely, and as the specimen is female it is not even possible to confirm its subgeneric placement. This Indian specimen is remarkable for the structure of its aculeus tip, which when seen in profile has a sharp angle in its dorsal surface that then curves slightly down, before curving back to the horizontal at the apex.

Subgenus *Bactrocera* (*Papuodacus*) Drew

***Bactrocera* (*Papuodacus*) *complicata* White, new species**
(Fig. 15)

Bactrocera (*Papuodacus*) sp. 1, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - male (RMHL), INDONESIA: "Timor 12".

Description. - male.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face with a dark spot in each antennal furrow; spots roughly round; medium size; without other markings. Frons - 2 pairs frontal setae; 1 pair orbital setae; without spots at seta bases. Without dark mark between eye and antenna base.

Thorax - Predominant colour of scutum black. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vitta. Notopleuron pale coloured. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vitta (yellow); vitta very narrow; extended anterior to suture; tapered; ending before posterior supra-alar seta. Scutum with a medial vitta (yellow); not extended anterior to suture; broadest near posterior. Without yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); basal band narrow; scutellum yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum; stripe (dorsally) extended to in-line with anterior notopleural seta; stripe not an inverted L-shape. Katepisternal mark broader than anepisternal stripe(at katepisternum-anepisternum suture). Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Anterior notopleural seta present. Anterior supra-alar seta absent. Prescutellar acrostichal seta present. Scutellum with reduced basal plus apical setae; both basal setae are broken at the base and lay prostrate; the left seta is thin and black while the right is thin, short and pale (hardly visible); it is likely that this species is variable in the presence/absence of basal scutellar setae.

Wing - Length 7.4mm. Vein R_{2+3} not sinuate near end of vein R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. With a complete costal band; depth reaching R_{4+5} ; expanded into a spot at apex; spot nearly to M ; band not abruptly darkened at apex. Wing with an anal streak. Cell bc hyaline. Cell c very pale coloured. Wing not overall fumose. Wing patterned (other than costal band and anal streak). Transverse mark over crossvein $r-m$ (not direct to any on $dm-cu$) present; mark over $r-m$ joined to costal band; not continued across cell dm to CuA_1 . Transverse mark over crossvein $dm-cu$ (not direct to any on $r-m$) present; mark over $dm-cu$ not continued across r_{4+5} to R_{4+5} ; not recurved back along CuA_1 .

Leg - Fore femur without stout ventral spines. Legs yellow.

Abdomen - Predominant colour of abdomen orange-brown. Tergites not fused. Abdomen not wasp-waisted. Tergite V without a dorsal hump. Pattern on abdomen distinct. Tergites III and IV dark laterally. No medial longitudinal stripe on tergite IV. Ceromata round/ovoid.

Terminalia and secondary sexual characters - Wing without a bulla. Tergite III with a pecten (setal comb) on each side. IVth and Vth sternites of normal width, not very broad; sternite V posterior margin shallow, not V-shaped. Surstylus with a long posterior lobe. Hind tibia with a preapical pad.

Etymology. - Named for its complex wing pattern.

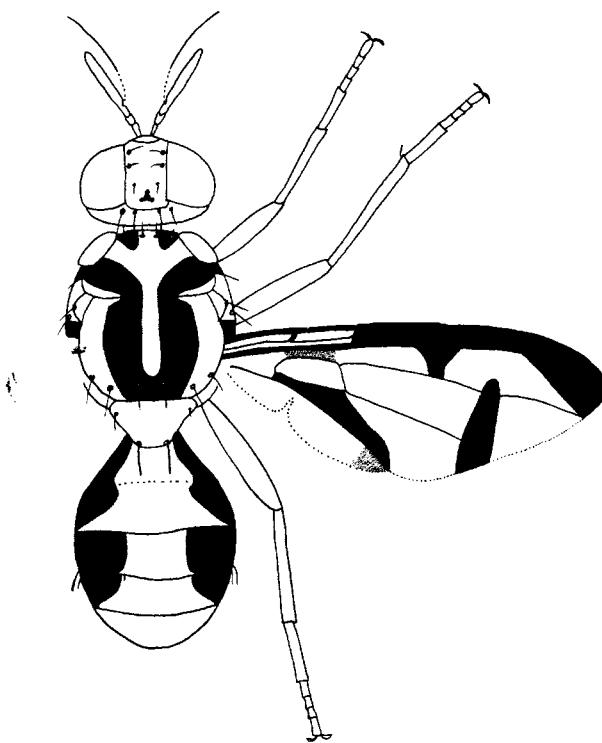
Remarks. - This specimen was originally identified as *B. emittens* (Walker) by D.E. Hardy (see notes below on that species). This species has been placed in subgenus *B. (Papuodacus)* because of its lack of anterior supra-alar setae. However, it is far more likely to be an aberrant member of subgenus *B. (Zeugodacus)*. It differs from the only other species of *B. (Papuodacus)*, *B. (P.) neopallascentis* Drew, from Papua New Guinea, in having an extensive wing pattern. The known *B. (Zeugodacus)* spp. with facial spots, black scutum, medial vitta and separate marks on crossveins r-m and dm-cu, are *B. ishigakiensis* (Shiraki) and *B. synnephes* (Hendel), both of which have longer and broader lateral vittae than *B. complicata*, and also differ in wing pattern.

Subgenus *Bactrocera (Paradacus)* Perkins

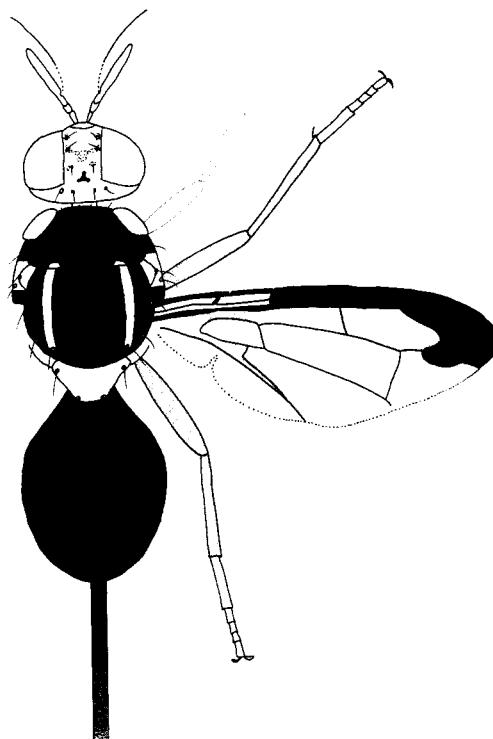
According to Drew (1989) species of this subgenus only differ from *B. (Zeugodacus)* spp. in the absence of prescutellar acrostichal setae. White & Hancock (1997) allocated 11 species to this subgenus but some of those would have been placed in *B. (Sinodacus)* by Drew (1989) due to their lack of basal scutellar setae. These changes to subgeneric placement will be described in a future work on *B. (Zeugodacus)* and allied subgenera (Drew & Hancock, in prep.). Both of the new species described here have the unusual feature of a remarkable long tubular (parallel sided) oviscape. Hardy (1974) included a drawing of an optical section through the abdomen of the type species of *B. (Paradacus)*, namely *B. fulvipes*, showing that its aculeus is only about half as long as the oviscape (IMW has examined the slide, in BPBM). This is very unusual as the aculeus is normally similar in length to the oviscape. A long tubular oviscape is unknown outside of this subgenus and two other species also have this feature: *B. areolata* (Walker) and *B. longicaudata* (Perkins)². However, the following species presently allocated to the subgenus have a shorter oviscape: *B. decipiens* (Drew), *B. mindanaus* (Bezzi), *B. minima* (Hering) and *B. perplexa* (Walker). The following are only known from males: *B. abdopallescens* (Drew), *B. angustifinis* (Hardy), *B. aurantiventer* Drew and *B. citroides* Drew.

² White & Hancock (1997) noted that *Dacus vinnulus* Hardy, 1973, and *D. drewi* Hardy, 1983, could not be separated from *B. longicaudata* (Perkins). However, there may also be confusion between these species and *B. fulvipes* (Perkins), the types of which were not examined by those authors. Consequently, formal synonymy should await further study.

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16



Figs. 15-16. *Bactrocera*, using standard outline. 15, *B. (Papuodacus) complicata* White, new species, male; 16, *B. (Paradacus) magnicauda* White & Evenhuis, new species, female (fore legs missing).

***Bactrocera (Paradacus) magnicauda* White & Evenhuis, new species**
(Fig. 16)

Bactrocera (Paradacus) sp. 2, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - female (BPBM), [INDONESIA: Irian Jaya as] "West New Guinea:", Nabire [3°22'S 135°29'E or what is now Nabi 2°56'S 134°14'E ?], 5-50m, 25 Aug.-2 Sep. 1962, coll. J. Sedlacek. [#16 on N.L. Evenhuis det. label, BPBM holotype 16010]

Description. - female.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face without a dark spot in each antennal furrow; without other markings. Frons, 2 pairs frontal setae; 1 pair orbital setae; with spots at seta bases. Without dark mark between eye and antenna base.

Thorax - Predominant colour of scutum black. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vittae. Notopleural lobe yellow. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vittae (yellow); vittae not very narrow; vittae extended anterior to suture; vittae not tapered; vittae length, to intra-alar seta. Scutum without a medial vitta. No yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); with a deep basal band; yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum; stripe narrow, (dorsally) not reaching anterior notopleural seta; not an inverted L-shape. Katepisternal mark slightly broader than anepisternal stripe (at katepisternum-anepisternum suture). Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Notopleuron with anterior seta. Scutum with anterior supra-alar setae; without prescutellar acrostichal setae. Scutellum with basal as well as apical setae.

Wing - Length, 6.0mm. Vein R_{2+3} not sinuate near end R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. Wing with a complete costal band; depth, to R_{4+5} , and trace below R_{4+5} ; band expanded into a spot at apex; spot large, to below vein M ; band not abruptly darkened at apex. Wing with an anal streak. Cell bc clear. Cell c very pale coloured. Pale marking over $r-m$ crossvein.

Leg - [Fore leg missing]. Mid and hind legs fulvous.

Abdomen - Predominant colour fulvous. Tergites not fused. Abdomen not wasp waisted. Tergite V without a dorsal hump. Abdomen without any distinct pattern. Ceromata round/ovoid.

Etymology. - Named for its very long ovipositor (cauda).

Remarks. - The characteristic wing pattern of this species easily separates it from others that have basal scutellar setae and anterior supra-alar setae, combined with the lack of prescutellar acrostichal setae and a medial vitta. Only *B. (P.) areolata* (Walker) shares a similar wing pattern but in that species there is also a marking across the apical half of cell dm , linking the anal streak and costal band.

***Bactrocera (Paradacus) urens* White, new species**
(Fig. 17)

Bactrocera (Paradacus) sp. 1, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - female (ITZ), INDONESIA: Buru, Station, 1921, coll. L.J. Toxopeus.

Description. - female.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face without a dark spot in each antennal furrow; without other markings. Frons - 2 pairs frontal setae; 1 pair orbital setae, with spots at seta bases. Without dark mark between eye and antenna base.

Thorax - Predominant colour of scutum fuscous. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vitta. Notopleuron pale coloured. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vitta (yellow); broad; extended anterior to suture; not tapered; extended to intra-alar seta. Scutum without a medial vitta. Without yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum; stripe (dorsally) broader than notopleural callus but not reaching anterior notopleural seta; stripe not an inverted L-shape. Katepisternal mark slightly broader than anepisternal stripe (at katepisternum-anepisternum suture). Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Anterior notopleural seta and anterior supralar setae present. Prescutellar acrostichal seta absent. Scutellum with basal and apical setae.

Wing - Length 4.8mm. Vein R_{2+3} not sinuate near end of vein R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. Wing with a complete (but pale) costal band; band reaching R_{4+5} ; expanded into a spot at apex; spot extended half way to M ; band not abruptly darkened at apex. Wing without an anal streak. Cells bc and c hyaline. Wing not overall fumose. Wing not patterned (other than costal band).

Leg - Fore femur without stout ventral spines; yellow, or pale with dark preapical spot. All tibiae fuscous. Mid and hind femora pale basally, fulvous apically.

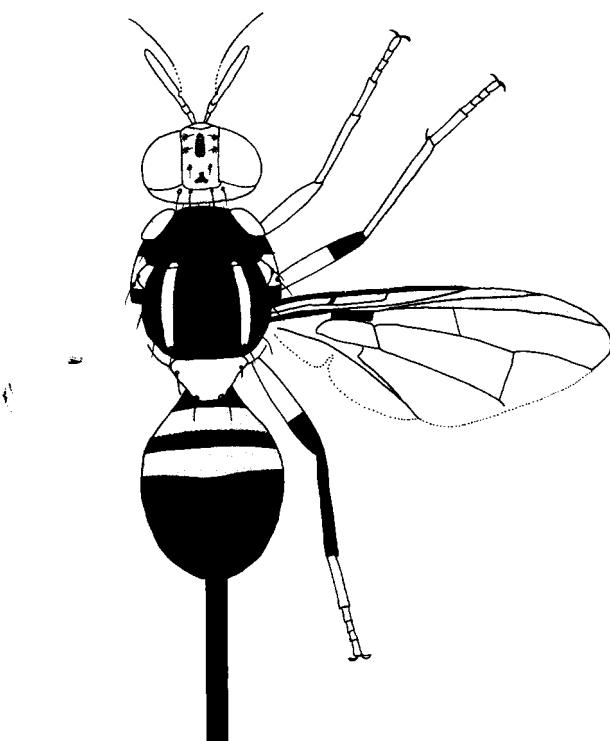
Abdomen - Predominant colour of abdomen orange-brown. Tergites not fused. Abdomen not wasp-waisted. Tergite V without a dorsal hump. Abdomen without pattern. Ceromata round/ovoid.

Terminalia and secondary sexual characters - Oviscape very long.

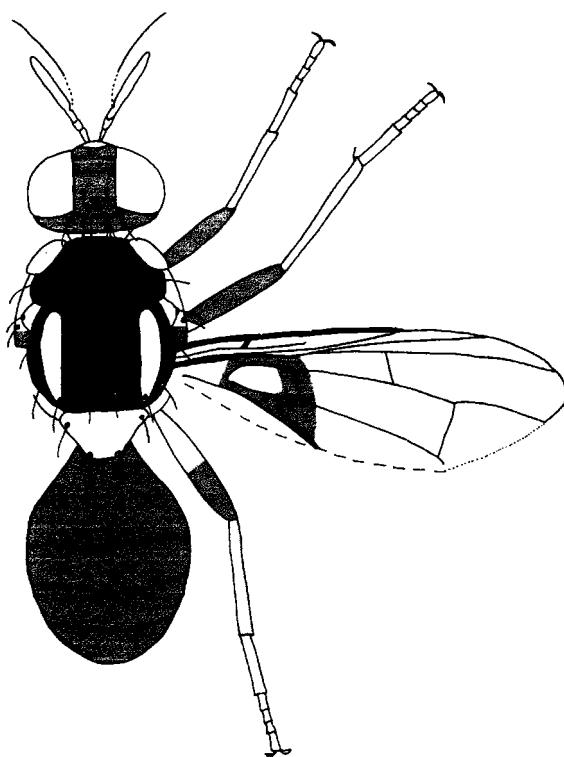
Etymology. - Named for its long ovipositor, or sting; *urens* meaning stinging.

Remarks. - This species has the chaetotaxy typical of subgenus *B. (Paradacus)*, although a male specimen will be needed to confirm its allocation to this group. Of the species with a long tubular oviscape, *B. longicaudata* differs from other members of the subgenus in that it lacks basal scutellar setae. *Bactrocera urens* differs from *B. areolata* and *B. fulvipes* in

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18



Figs. 17-18. *Bactrocera*, using standard outline. 17, *B. (P.) urens* White, new species, female; 18, *B. (Paratridacus) banneri* White, new species, male (hind margin of wing damaged).

its lack of an extensive wing pattern and small size (wing 4.8mm long, compared to the other species at 5.8 and 6.1mm respectively).

Subgenus *Bactrocera* (*Paratridacus*) Shiraki

***Bactrocera* (*Paratridacus*) *banneri* White, new species**
(Fig. 18)

Bactrocera (*Paratridacus*) sp. 1, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - male (AMNH), INDONESIA: Moluccas, Morotai, Mar.1945, coll. G. Banner.

Description. - male.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face without a dark spot in each antennal furrow; without other markings. Frons - 2 pairs frontal setae; 1 pair orbital setae. Frons - without spots at seta bases. Without dark mark between eye and antenna base.

Thorax - Predominant colour of scutum black. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vitta. Notopleuron pale coloured. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vitta (yellow); broad; not extended anterior to suture; not tapered; extended to intra-alar seta. Scutum without a medial vitta. Without yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); basal band narrow; scutellum yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum; stripe (dorsally) extended to postpronotal lobe; stripe not an inverted L-shape. Katepisternal mark reduced and hardly visible. Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Anterior notopleural seta, anterior supra-alar seta and prescutellar acrostichal setae present. Scutellum with basal and apical setae.

Wing - [Damaged - hind margin folded] - Wing length 3.7mm. Vein R_{2+3} not sinuate near end of vein R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. Without a complete costal band, at most cell sc coloured. Wing with an anal streak. Cells bc and c hyaline. Wing not overall fumose. Wing patterned (other than partial costal band and anal streak); transverse mark along crossvein $bm-cu$ present; transverse mark over crossvein $r-m$ (not direct to any on $dm-cu$) present.

Leg - Fore femur without stout ventral spines. Fore and mid femora fulvous to fuscous. Fore and mid tibiae yellow. Hind femur pale basally, fulvous to black apically. Hind tibia fuscous.

Abdomen - Predominant colour of abdomen black. Tergites not fused. Abdomen not wasp-waisted. Tergite V without a dorsal hump. Abdomen without pattern. Ceromata round/ovoid.

Terminalia and secondary sexual characters - Wing without a bulla. Tergite III without a pecten (setal comb) on each side. IVth and Vth sternites of normal width, not very broad. Sternite V posterior margin shallow, not V-shaped. Surstyli with a long posterior lobe.

Hind tibia without a preapical pad.

Etymology. - Named for its collector, Gilbert Banner.

Remarks. - One of only two species in subgenus *B. (Paratridacus)* that lack a medial vitta and have an extensive wing pattern, the other being *B. coracina* (Drew) from Papua New Guinea. However, *B. coracina* has a crossband across crossveins r-m and dm-cu, while this species has the very unusual feature of a crossband over crossvein bm-cu. All other Indo-Australasian Dacini (probably all African Dacini too) that have a mark along crossvein bm-cu have it as part of a more extensive pattern, e.g. *B. umbrosa* (Fabricius).

■
***Bactrocera (Paratridacus) unichromata* (Perkins)**

Bactrocera (Paratridacus) unichromata Drew, 1989: 200

Material examined. - Irian Jaya: 1 male (BPBM), Central Mountains, Mulik R., 10km east of Archibald Lake, 1050m, 25 Nov.-5 Dec. 1961, coll. S. & L. Quate; 1 female (BPBM), Waris, S. of Hollandia, 450-500m, 24-31 Jul. 1959, coll. T.C. Maa.

This species is newly recorded from Indonesia (Irian Jaya); previously only known from Papua New Guinea. The specimens examined all keyed to *B. unichromata* using the key provided by Drew (1989), who separated that species from *B. atrisetosa* (Perkins) on the basis of the latter having a deeper costal band (overlapping R_{2+3})³ and some dark thoracic and abdominal markings. However, the two female syntypes of *Z. atrisetosa* (BMNH, examined by IMW) both have the narrow costal band said to be diagnostic of *B. unichromata*, and one of them is totally devoid of dark thoracic and abdominal markings. That would suggest that these two nominal species may be conspecific. However, D.L. Hancock (*pers. comm.*) has noted that *B. unichromata* is found at a lower altitude than specimens fitting the Drew (1989) description of *B. atrisetosa* (1200-1650m). Furthermore, Drew (1989) only recorded *B. unichromata* at male lure (methyl eugenol) suggesting that the high altitude population does not respond to lure (although that would require proper investigation). These data suggest that two biologically distinct species may be involved and their nomenclatural status should be considered as part of a proper revision.

Subgenus *Bactrocera (Tetradacus)* Miyake

***Bactrocera (Tetradacus)* sp. near *B. pagdeni* (Malloch)**

Near *Dacus pagdeni* Malloch, 1939: 243

A male from "New Guinea" (coll. A.R. Wallace, BMNH) is clearly an undescribed species. However, the pin has been passed through the middle of the scutum, so it is not possible to determine if it has a medial vitta. The costal band is deeper than that of *B. pagdeni* (reaches to half depth of cell R_{4+5}), and the scutum and abdomen have extensive areas of red-brown. *B. pagdeni* is only known from the holotype female (BMNH) from the Solomon Islands.

3 Drew (1989: 227, couplet 89) says R_{2+3} but in his text (Drew, 1989: 201) he says R_{4+5} ; the latter appears to be an error.

Subgenus *Bactrocera* (*Zeugodacus*) Hendel

***Bactrocera* (*Zeugodacus*) *assamensis* White, new species**
(Fig. 19)

Material examined. - Holotype - female (BMNH), INDIA: [Assam as "Burma"], Mishmi Hills, Lohit River, 17 Mar. 1935, coll. M. Steele.

Description. - female.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face with a dark spot in each antennal furrow; spot round/elongate; spot large; without other markings. Frons - 3 pairs frontal setae; 1 pair orbital setae; with spots at seta bases. Without dark mark between eye and antenna base.

Thorax - Predominant colour of scutum black. Postpronotal lobe partly fuscous / black. No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vitta. Notopleuron not coloured. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vitta (yellow); very narrow; not extended anterior to suture; not tapered; ending before intra-alar seta. Scutum with a medial vitta; not extended anterior to suture; parallel sided. Without yellow/orange mark around or across prescutellar area. Scutellum black, except for pale sides; not bilobed. Anepisternum yellow stripe from notopleuron to above katepisternum; stripe (dorsally) broader than notopleural callus but not reaching anterior notopleural seta; stripe not an inverted L-shape. Katepisternal mark absent. Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Anterior notopleural seta, anterior supra-alar seta and prescutellar acrostichal setae present. Scutellum without basal setae.

Wing - Length 7.3mm. Vein R_{2+3} not sinuate near end of vein R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. With a complete costal band; band not extending below R_{2+3} ; not extended narrowly all the way to vein M ; expanded into a small spot at apex; band not abruptly darkened at apex. Wing with an anal streak. Cells bc and c hyaline. Wing not overall fumose. Wing not patterned (other than costal band and anal streak).

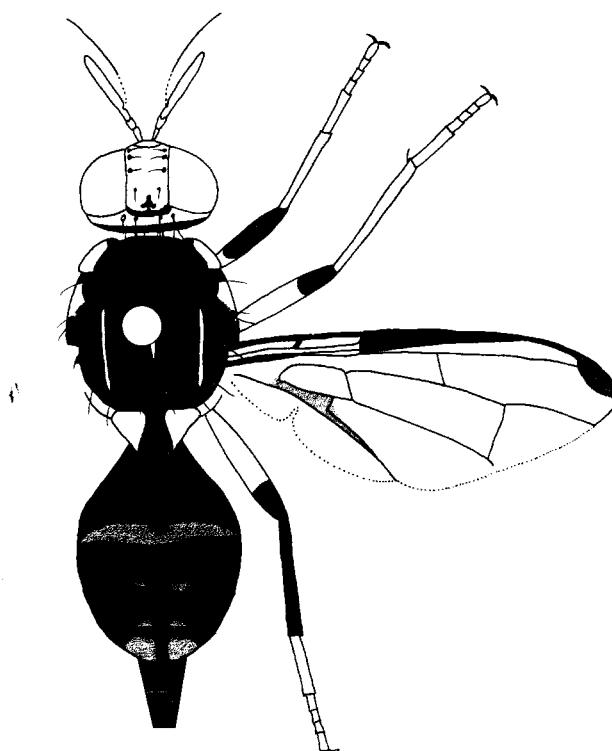
Leg - Fore femur without stout ventral spines. All femora, pale basally, fulvous to black apically. All tibiae fuscous.

Abdomen - Predominant colour of abdomen black. Tergites not fused. Abdomen not wasp-waisted. Tergite V without a dorsal hump. Pattern on abdomen somewhat diffuse. Tergites III and IV pale centrally only. Medial longitudinal stripe on tergite IV. Ceromata round/ovoid.

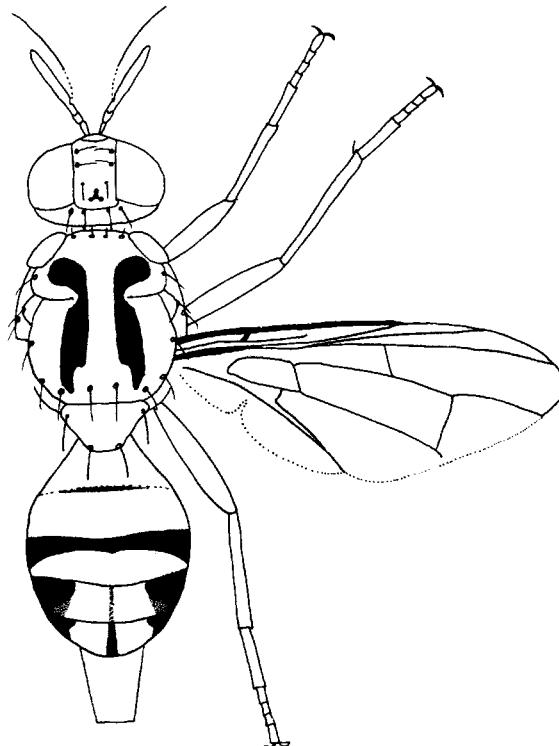
Etymology. - Named after Assam.

Remarks. - Part of a group within subgenus *B.* (*Zeugodacus*) that also includes *B. biguttata* (Bezzi), from north India-south China, and *B. tappanus* (Shiraki), from Taiwan; defined by facial spots, lateral and medial postsutural vittae, scutellum with a black mark extending to apex, no basal scutellar setae, no extensive wing pattern. *Bactrocera assamensis* differs from

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20



Figs. 19-20. *Bactrocera*, using standard outline. 19, *B. (Zeugodacus) assamensis* White, new species, female (pin obscures medial vitta); 20, *B. (Z.) buruensis* White, new species, female.

B. biguttata by having microtrichia in the narrow part of cell br, an anal streak and some abdominal patterning. The differences from *B. tappanus* include the notopleuron being dark coloured, narrower lateral vittae, the dark areas of the fore femora are more extensive, and the abdomen also has more extensive dark markings in *B. assamensis*.

***Bactrocera (Zeugodacus) buruensis* White, new species**
(Fig. 20)

Bactrocera (Zeugodacus) sp. 1, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - female (ITZ), INDONESIA: Buru, Station, 1921, coll. L.J. Toxopeus.

Paratypes - 4 females (ITZ), same data as holotype.

Description. - female.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face with a dark spot in each antennal furrow; spot round/elongate; medium size; face without other markings. Frons - 2-3 pairs frontal setae; 1 pair orbital setae. Without dark mark between eye and antenna base.

Thorax - Predominant colour of scutum red-brown. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vitta. Notopleuron pale coloured. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vitta (yellow); broad; extended anterior to suture; tapered; extended to intra-alar seta. Scutum with a medial vitta (yellow); not extended anterior to suture; broadest near posterior. Without yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); basal band narrow; scutellum yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum; stripe (dorsally) broader than notopleural callus but not reaching anterior notopleural seta; stripe not an inverted L-shape. Katepisternal mark broader than lower part of anepisternal stripe (at katepisternum-anepisternum suture). Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Anterior notopleural seta, anterior supra-alar seta and prescutellar acrostichal setae present. Scutellum with basal and apical setae.

Wing - Length 6.4-7.6mm. Vein R_{2+3} not sinuate near end of vein R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. With indistinct costal band; band either not to R_{4+5} or to R_{4+5} ; band expanded into a spot at apex; spot to M; band abruptly darkened at apex (possibly slightly teneral). Cells bc and c very pale coloured. Wing sometimes slightly fumose. Wing patterned (other than costal band and anal streak); transverse mark over crossvein dm-cu (not direct to any on r-m) present; continued across r_{4+5} to R_{4+5} ; not recurved back along CuA_1 .

Leg - Fore femur without stout ventral spines. Legs yellow.

Abdomen - Predominant colour of abdomen orange-brown. Tergites not fused. Abdomen not wasp-waisted. Tergite V without a dorsal hump. Pattern on abdomen distinct. Tergite III with a transverse dark band. Tergite IV either with anteri-lateral rectangular marks or dark laterally. Medial longitudinal stripe on tergite IV. Ceromata round/ovoid.

Terminalia and secondary sexual characters - Aculeus apex pointed (observed with low power microscope only).

Etymology. - Named after Buru Island, Indonesia.

Remarks. - Although no males are available for examination there is little doubt that this belongs to subgenus *B. (Zeugodacus)*. It can be separated from all other known species by the following combination of character states: facial spots, lateral and medial vittae, scutellum with basal setae, wing with short crossband over dm-cu but not r-m crossvein, and costal band with an apical spot reaching vein M but not connected to mark on dm-cu.

Bactrocera (Zeugodacus) sp. near B. connexa (Hardy)

Near *Dacus connexus* Hardy, 1982: 203

A male from Jikolomo, Jailolo District, Halmahera, Indonesia (4-5 Jun. 1981, coll. A.C. Messer, USNM) has the unusual feature of lateral presutural vittae, in common with *B. connexa*, a species only known from Sulawesi, Indonesia. This specimen differs in lacking a transverse band on tergite III, having just lateral marks instead. The wings are both crumpled but there is clearly a marking along vein dm-cu (unlike *B. connexa*), confirming that this is a distinct species, although the specimen is unfit for full description.

Bactrocera (Zeugodacus) sp. near B. diaphora (Hendel)

Near *Chaetodacus diaphorus* Hendel, 1915: 425

Two males and a female from Shillong Botanical Gardens, Meghalaya [Assam], India (6-23 Apr. 1980, coll. W. Mathis & A. Freidberg, TAU) belong to a group within subgenus *Zeugodacus* that have unusually broad sternites in the male. Species known to have this feature are *B. atrifacies* (Perkins) (s.e. Asia), *B. caudata* (Fabricius) (s.e. Asia), *B. diaphora* (Hendel) (s.e. Asia), *B. diaphoropsis* (Hering) (Borneo) and *B. munda* (Bezzi) (Philippines). All of these species also have unusual facial markings, either a line across (*B. caudata*, *B. diaphora*), a black face (*B. atrifacies*), an unmarked face (*B. munda*) or transverse spots that almost form a line (*B. diaphoropsis*). The Shillong specimens have a line across the face and are very similar to *B. diaphora* but differ in the basal parts of the fore femora being pale, rather than having entirely dark fore femora. This is a trivial difference and this may simply represent variation in *B. diaphora*.

Bactrocera (Zeugodacus) sp. near B. emittens (Walker)

Near *Dacus emittens* Walker, 1860: 152

A male (Indonesia, Misool, BMNH) is labelled "emittens" in what appears to be Walker's handwriting. The specimen is badly damaged (wing broken but preserved) and unfit for formal description. This specimen differs from *B. emittens*, from Sulawesi, in having a crossband over r-m, no complete basal band on tergite III, a slightly broader anepisternal stripe and no seta on the postpronotal lobe (but note that some specimens that appear to be true *B. emittens* from the type locality also lack this).

The *B. emittens* species group requires proper revision if and when adequate modern material is available and there may even be more than a single species in Sulawesi, as Walker (1860) in his original description recognised several forms (although it is not clearly stated that they were all from the same locality, it is inferred as such); as follows: variety *beta* (abdomen with two black bands), *gamma* (discal transverse vein not clouded with brown), *delta* (praebrachial transverse vein clouded with brown), *epsilon* (disk of thorax blackish grey, wings vitreous, excepting a slight brown line along the costa, and another along the subanal vein), and *zeta* (abdomen with a black interrupted subapical band). *Dacus chrysotoxus* Hendel, from Kai, is regarded as a synonym but its status requires confirmation. A male and female from Sunda ("Dompoe, O. Soembawa" [probably Dompu, Sumbawa]) is rather smaller than Walker's Sulawesi series (BMNH) but appears to represent the same species. The specimens identified from Sulawesi as *D. abdoangustus* Drew (originally described from Bougainville Island, Papua New Guinea), by Hardy (1982), also appear to be part of this species group, and may be misidentified *B. emittens*.

Aculeus apex shape also varies within the group but information is very fragmentary. The true *B. emittens* appears to have a trilobed aculeus apex (as figured by Drew, 1973: 30 from a presumed syntype of Walker's in National Museum of Victoria, Melbourne). However, a superficially similar female from Ambon (slide of aculeus in BPBM) has a rounded aculeus apex and must therefore represent another species.

***Bactrocera (Zeugodacus) freidbergi* White, new species**
(Fig. 21)

Material examined. - Holotype - male (TAU), INDIA: [Assam], Meghalaya, Shillong, Bot. Gard., 23 Apr. 1980, coll. A. Freidberg.

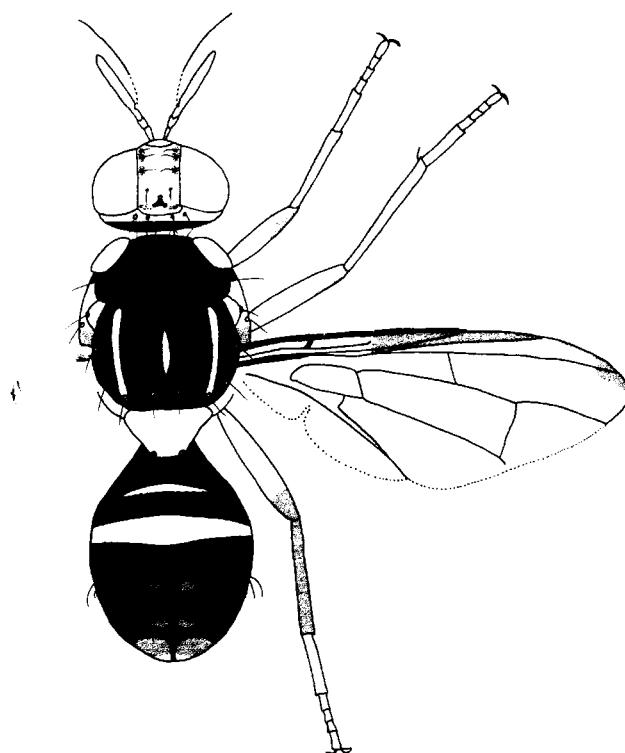
Paratypes - 1 male, 2 females (TAU), same data as holotype.

Description. - male.

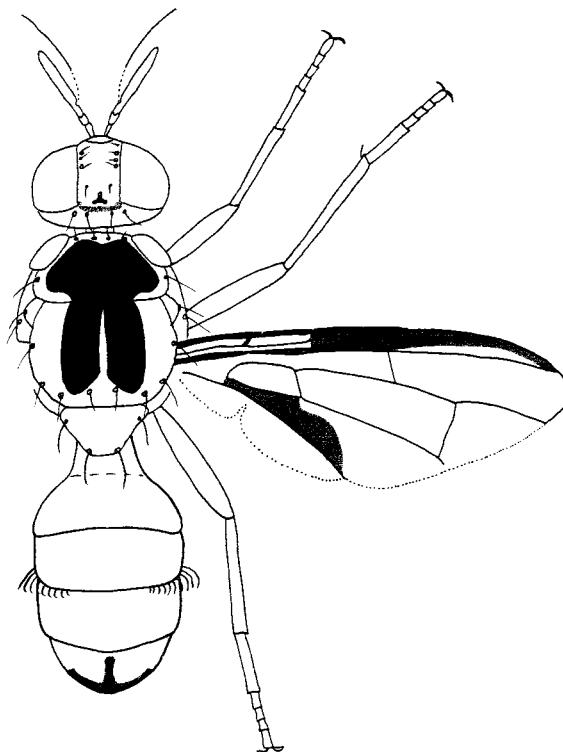
Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face with a dark spot in each antennal furrow; spot roughly round; spot medium size; face without other markings. Frons - 3 pairs frontal setae; 1 pair orbital setae; with spots at seta bases. Without dark mark between eye and antenna base.

Thorax - Predominant colour of scutum black. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vitta. Notopleuron pale coloured. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vitta (yellow); vitta sometimes slightly extended anterior to suture; not tapered; extended to intra-alar seta. Scutum with a medial vitta (yellow); not extended anterior to suture; parallel sided. Without yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); basal band narrow; scutellum yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum or to above katepisternum; stripe (dorsally) extended to in-line with anterior notopleural seta; stripe not an inverted L-shape. Katepisternal mark absent or as broad as anepisternal stripe (at katepisternum-anepisternum suture). Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Anterior notopleural seta, anterior supra-alar seta and prescutellar acrostichal setae present. Scutellum without basal setae.

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22



Figs. 21-22. *Bactrocera*. 21, *B. (Z.) freidbergi* White, new species, male, using standard outline; 22, *B. (Z.) fulvoabdominalis* White & Evenhuis, new species, male.

Wing - Length 6.0-7.0mm. Vein R_{2+3} not sinuate near end of vein R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c without extensive covering of microtrichia. Cell br (narrowed part) with microtrichia confined to anterior half of area. Wing with indistinct costal band; band not extending below R_{2+3} , except at apex; band very narrow in cell r_{2+3} ; not extended narrowly all the way to vein M ; expanded into a spot at apex; apical spot about half way to M ; band not abruptly darkened at apex. Wing with reduced anal streak (at most trace outside cup). Cells bc and c hyaline. Wing not overall fumose. Wing not patterned (other than costal band and trace of anal streak).

Leg - Fore femur without stout ventral spines; yellow with dark preapical spot or yellow basally, fulvous to black apically. Fore and mid tibiae yellow. Mid and hind femora yellow basally, fulvous to black apically. Hind tibia fuscous.

Abdomen - Predominant colour of abdomen fuscous. Tergites not fused. Abdomen not wasp-waisted. Tergite V without a dorsal hump. Pattern on abdomen sometimes diffuse. Tergites III and IV unmarked or pale centrally only. Medial longitudinal stripe on tergite IV present if not entirely dark. Ceromata round/ovoid.

Terminalia and secondary sexual characters - Wing without a bulla. Tergite III with a pecten (setal comb) on each side. IV th and V th sternites of normal width, not very broad; sternite V posterior margin shallow, not V-shaped. Surstylus with a long posterior lobe. Wing with a deep indent in posterior margin. Wing with microtrichia area around apex of vein A_1+CuA_2 . Hind tibia with a preapical pad.

Description. - female - As male except, tergite III without a pecten; sternite V posterior margin shallow, not V-shaped; wing without a deep indent in posterior margin; without microtrichia area around apex of vein A_1+CuA_2 ; hind tibia without a preapical pad.

Etymology. - Named for the collector, Amnon Freidberg.

Remarks. - This species can be separated from all others in subgenus *Zeugodacus* by its lack of basal scutellar setae, lack of scutellar pattern and lack of microtrichia in the narrow part of cell br . A male (BMNH) from Bhutan may also be this species but the scutellum has a trace of a black apical mark and the fore femur is almost entirely black.

***Bactrocera (Zeugodacus) fulvoabdominalis* White & Evenhuis, new species**
(Fig. 22)

Bactrocera (Zeugodacus) sp. 9, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - male (BPBM), INDONESIA: Irian Jaya, Waris [3°07'S 140°53'E], S. of Hollandia [now Jayapura 2°32'S 140°42'E], 450-500m, 16-23 Aug. 1959, coll. T.C. Maa. [#22 on N.L. Evenhuis det. label, BPBM holotype 16011]

Description. - male.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face with a dark spot in each antennal furrow; spot small, elongate vertically; face without other markings. Frons, 3-4 pairs frontal setae; 1 pair orbital setae. No dark mark between eye and antenna base.

Thorax - Predominant colour of scutum black. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vittae. Notopleural lobe yellow/orange. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vittae (yellow); vittae not very narrow; vittae extended anterior to suture; not tapered; length, to intra-alar seta. Scutum with a medial vitta (yellow); broadest posteriorly. No yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); without a deep basal band; yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum; stripe (dorsally) not reaching anterior notopleural seta; not an inverted L-shape. Katepisternal mark broader than anepisternal stripe (at katepisternum-anepisternum suture). Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Notopleuron with anterior seta. Scutum with anterior supra-alar setae and prescutellar acrostichal setae. Scutellum with basal as well as apical setae.

Wing - Length, 8.1mm. Vein R_{2+3} not sinuate near end R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. Wing with a complete costal band; band extended below R_{2+3} , to about midway between R_{2+3} and R_{4+5} , then pale to R_{4+5} ; band not expanded into a spot at apex; band not abruptly darkened at apex. Wing with an anal streak. Cells bc and c hyaline. Wing not overall fumose. Wing not patterned (other than costal band and anal streak).

Leg - Fore femur without stout ventral spines. All femora yellow to fulvous; tibiae fulvous.

Abdomen - Predominant colour fulvous. Tergites not fused. Abdomen not wasp waisted. Tergite V without a dorsal hump. Abdomen without any distinct pattern. Ceromata round/ovoid.

Terminalia and secondary sexual characters - Wing without a bulla. Tergite III with a pecten (setal comb) on each side. IVth and Vth sternites of normal width, not very broad. Sternite V posterior margin shallow, not V-shaped. Surstylus with a long posterior lobe. Wing with a deep indent in posterior margin (forming supernumerary lobe). Wing with microtrichia area around apex of vein A_1+CuA_2 . Hind tibia with a preapical pad.

Etymology. - Named for its uniformly fulvous abdomen.

Remarks. - The uniformly pale and almost parallel sided abdomen of this species, combined with its largely black scutum and otherwise typical features of subgenus *B.* (*Zeugodacus*), differentiate it from all other known species.

***Bactrocera (Zeugodacus) hoedi* White, new species**
(Fig. 23)

Bactrocera (Zeugodacus) sp. 2, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - female (ITZ), INDONESIA: "H'dia" [presumably Hollandia, now Jayapura, Irian Jaya], Nov.[19]57, coll. G. den Hoed.

Description. - female.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face without a dark spot in each antennal furrow; without other markings. Frons - 2 pairs frontal setae; 1 pair orbital setae; without spots at seta bases. Without dark mark between eye and antenna base.

Thorax - Predominant colour of scutum red-brown. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vitta. Notopleuron pale coloured. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vitta (yellow); broad; extended anterior to suture; not tapered; ending before intra-alar seta. Scutum without a medial vitta. Without yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); basal band narrow; scutellum yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum; stripe (dorsally) extended to in-line with anterior notopleural seta; stripe not an inverted L-shape. Katepisternal mark slightly broader than anepisternal stripe (at katepisternum-anepisternum suture). Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Anterior notopleural seta, anterior supra-alar seta and prescutellar acrostichal setae present. Scutellum without basal setae.

Wing - Length 6.1mm. Vein R_{2+3} not sinuate near end of vein R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cell bc without extensive covering of microtrichia. Cell c with extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. With a complete costal band; band not extending below R_{2+3} ; not very narrow in cell r_{2+3} ; not extended narrowly all the way to vein M ; not expanded into a spot at apex; not abruptly darkened at apex. Wing with an anal streak. Cell bc coloured, almost as dark as costal band. Cell c pale coloured. Wing not overall fumose. Wing not patterned (other than costal band and anal streak).

Leg - Fore femur without stout ventral spines. Legs yellow, except hind tibia fuscous.

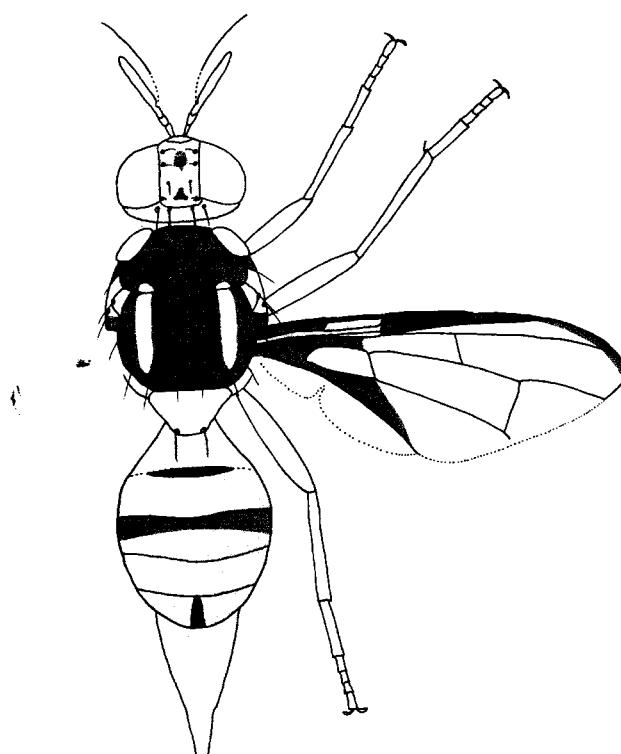
Abdomen - Predominant colour of abdomen red-brown. Tergites not fused. Abdomen not wasp-waisted. Tergite V without a dorsal hump. Pattern on abdomen absent or diffuse. No medial longitudinal stripe on tergite IV. Ceromata round/ovoid.

Terminalia and secondary sexual characters - Aculeus apex pointed (observed with low power microscope only).

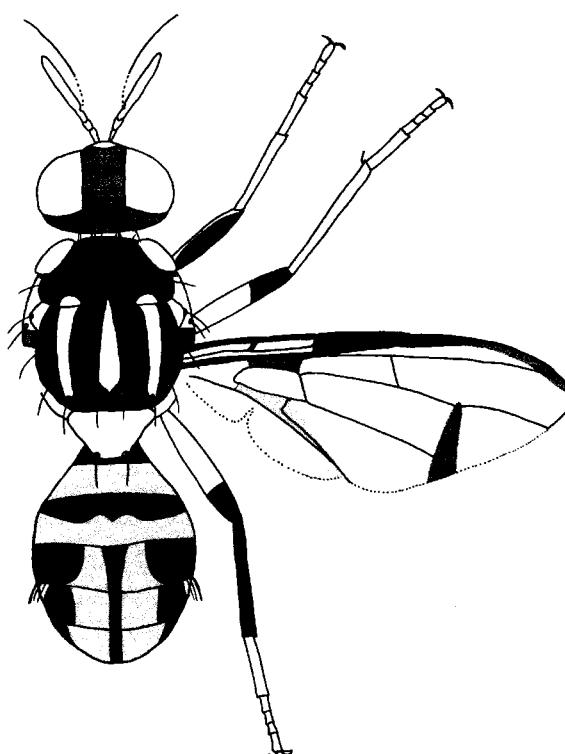
Etymology. - Named for its collector, G. den Hoed.

Remarks. - This species is tentatively assigned to subgenus *B. (Zeugodacus)* as the chaetotaxy is typical of that subgenus (except for the lack of basal scutellar setae), and the lateral vittae extend anterior to the notopleural suture, a feature rare outside of the *B. (Zeugodacus)* group of subgenera. However, unlike most *B. (Zeugodacus)* spp. it lacks a medial vitta. This species also lacks facial spots, has a red-brown scutum and microtrichia across most of cell c , unlike any other species in the subgenus.

23



24



Figs. 23-24. *Bactrocera*, using standard outline. 23, *B. (Z.) hoedi* White, new species, female; 24, *B. (Z.) neoelegantula* White, new species, male.

***Bactrocera (Zeugodacus) neoelegantula* White, new species**
(Fig. 24)

Bactrocera (Zeugodacus) sp. 4, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - male (ITZ), INDONESIA: Sumatra, Fort de Kock, 920m, 1925, coll. E. Jacobson.

Description. - male.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face with a dark spot in each antennal furrow; spot round/elongate; spot very large; without other markings. Frons - 3 pairs frontal setae; 1 pair orbital setae; without spots at seta bases. Without dark mark between eye and antenna base.

Thorax - Predominant colour of scutum black. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vitta. Notopleuron pale coloured. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vitta (yellow); broad; extended anterior to suture; not tapered; extended to intra-alar seta. Scutum with a medial vitta (yellow). Without yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); with a deep basal band; yellow; not bilobed. Anepisternum with a yellow stripe from notopleuron to katepisternum; stripe (dorsally) almost to postpronotal lobe; stripe not an inverted L-shape. Katepisternal mark broader than anepisternal stripe (at katepisternum-anepisternum suture). Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Anterior notopleural seta, anterior supra-alar seta and prescutellar acrostichal setae present. Scutellum without basal setae.

Wing - Length 7.9mm. Vein R_{2+3} not sinuate near end of vein R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. With a complete costal band; band barely traceable below R_{2+3} ; band not very narrow in cell r_{2+3} ; band not extended narrowly all the way to vein M ; not abruptly darkened at apex. Wing with an anal streak. Cells bc and c hyaline. Wing not overall fumose. Wing patterned (other than costal band and anal streak); transverse mark over crossvein $dm-cu$ (not direct to any on $r-m$) present; not continued across r_{4+5} to R_{4+5} ; not recurved back along CuA_1 ; a trace of infuscation between CuA_1 and CuA_2 along margin.

Leg - Fore femur without stout ventral spines; fulvous to fuscous / black. Fore tibia fulvous. Mid tibia yellow. Hind femur pale basally, fulvous to black apically. Hind tibia fuscous.

Abdomen - Predominant colour of abdomen orange-brown. Tergites not fused. Abdomen not wasp-waisted. Tergite V without a dorsal hump. Pattern on abdomen distinct. Tergites III and IV dark laterally. Medial longitudinal stripe on tergite IV. Ceromata round/ovoid.

Terminalia and secondary sexual characters - Wing without a bulla. Tergite III with a pecten (setal comb) on each side. IVth and Vth sternites of normal width, not very broad; sternite V posterior margin V-shaped. Surstyli with a long posterior lobe. Wing with a deep indent in posterior margin. Wing with microtrichia area around apex of vein A_1+CuA_2 . Hind tibia with a preapical pad.

Etymology. - Named for its similarity to *B. elegantula* (Hardy).

Remarks. - Although assigned to subgenus *B. (Zeugodacus)* because of its chaetotaxy and long male surstyli, this species, and *B. elegantula* (from the Philippines), differ from all other members of that subgenus whose males have been examined in that sternite V has a deep V-shaped posterior margin. The only other species known to have a long posterior lobe to the surstylus, combined with that form of sternite V, is *B. (Queenslandacus) exigua* (May). However, *B. exigua* lacks a pecten, anterior supra-alar setae, and prescutellar acrostichal setae, while the presence of the pecten in *B. elegantula* and *B. neoelegantula* indicates that they should not be placed in *B. (Queenslandacus)*. Although in the present classification these two species deserve a new subgenus, White (in press) has indicated that the present classification is too heavily divided into subgenera already, and that a revision bringing about a substantial "lumping" of the subgenera is needed. *Bactrocera elegantula* differs from *B. neoelegantula* in having tapered lateral postsutural vittae, a narrower anepisternal stripe, a distinct costal band apical spot, entirely pale femora and a more extensive dark area on tergite III.

***Bactrocera (Zeugodacus) pura* White, new species**
(Fig. 25)

Bactrocera (Zeugodacus) sp. 10, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - female (ITZ), INDONESIA: Irian Jaya, Dojo, Apr.[19]58, coll. G. den Hoed.

Description. - female.

Head - Pedicel+first flagellomere not longer than ptilinal suture. Arista not plumose. Face without a dark spot in each antennal furrow; without other markings. Frons - 2 pairs frontal setae; 1 pair orbital setae; with spots at seta bases.

Thorax - Predominant colour of scutum fuscous. Postpronotal lobe entirely pale (yellow). No yellow spot laterad of postpronotal lobe. Prescutum without lateral yellow/orange vitta. Notopleuron not coloured differently to most of scutum. Notopleural suture without isolated wedge shaped mark. Scutum with lateral postsutural vitta (yellow); vitta broad; vitta extended anterior to suture; not tapered; vitta extended to intra-alar seta. Scutum without a medial vitta. Without yellow/orange mark around or across prescutellar area. Scutellum not extensively marked (patterned); basal band narrow; scutellum yellow. Anepisternum with a yellow stripe from the notopleuron to katepisternum; stripe (dorsally) extended to postpronotal lobe; stripe not an inverted L-shape. Katepisternal mark broader than anepisternal stripe (at katepisternum-anepisternum suture). Yellow marking on hypopleural calli across both anatergite and katatergite. Postpronotal lobe without a seta. Anterior notopleural seta, anterior supra-alar seta and prescutellar acrostichal setae present. Scutellum without basal setae.

Wing - Length 7.7mm. Vein R_{2+3} not sinuate near end of vein R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cell bc and c without extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. With a complete costal band; band not extending below R_{2+3} ; band not very narrow in cell r_{2+3} ; band not extended narrowly all the way to vein M ; not expanded into a spot at apex;

not abruptly darkened at apex. Wing with an anal streak. Cell bc coloured the same as costal band. Cell c very pale coloured. Wing not overall fumose. Wing patterned (other than costal band and anal streak). Transverse mark over crossvein $r-m$ (not direct to any on $dm-cu$) present; mark over $r-m$ not joined to costal band; not continued across cell dm to CuA_1 . Transverse mark over crossvein $dm-cu$ (not direct to any on $r-m$) present; mark over $dm-cu$ not continued across r_{4+5} to R_{4+5} ; not recurved back along CuA_1 .

Leg - Fore femur without stout ventral spines. Legs yellow.

Abdomen - Predominant colour of abdomen orange-brown. Tergites not fused. Abdomen not wasp-waisted. Tergite V without a dorsal hump. Abdomen without pattern. Ceromata round/ovoid.

Terminalia and secondary sexual characters - Aculeus apex pointed (observed with low power microscope only).

Etymology. - Named for its pure white facial furrows and lack of facial spots.

Remarks. - This is tentatively assigned to subgenus *B. (Zeugodacus)* (unconfirmed in absence of a male) because of its chaetotaxy typical of that subgenus combined with the lateral vittae extending anterior to the suture. However, the same combination of character states also occurs in some species assigned to other subgenera, including *B. (Bactrocera)*, *B. (Bulladacus)*, *Bactrocera (Nesodacus)*, and *B. (Paradacus)*, and this species may in reality belong in one of these, as presently defined. Its lack of facial spots, combined with the other characters just mentioned, eliminates all other species from comparison except for *B. (Bulladacus) bullifera* (Hardy) (Thailand), *Bactrocera (Zeugodacus) cilifera* (Hendel) (S.E. Asia) and *B. (Z.) hoedi*, new species (Irian Jaya). *Bactrocera pura* differs from all these species in having an extensive wing pattern, a dark notopleural callus, and a very broad anepisternal stripe (which reaches postpronotal lobe).

*Bactrocera (Zeugodacus) sp. near *B. vultus* (Hardy)*

Near *Dacus vultus* Hardy, 1973: 74

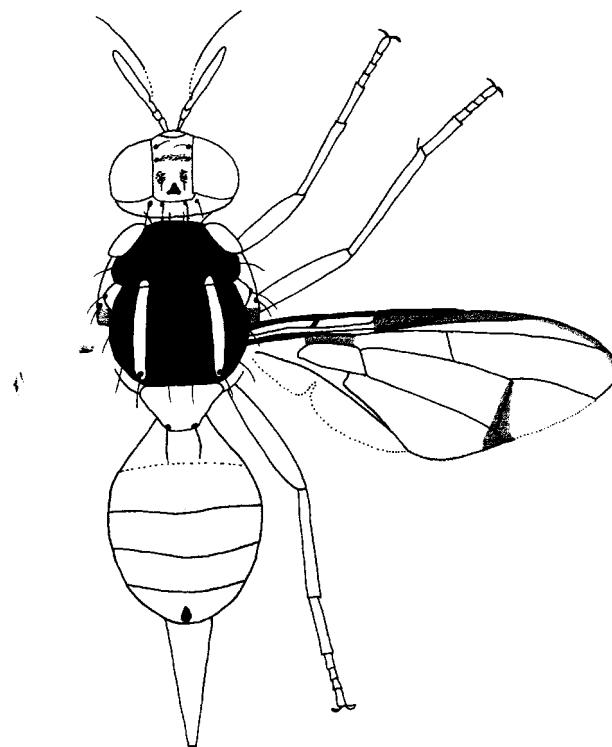
A male from Ulu Gombak, Selangor, Malaysia, collected at cue lure (25 Mar. 1988, coll. I.M. White & C.S. Ooi, BMNH) is similar to *B. vultus* (Hardy), known from Java (Indonesia) and Thailand. However, it has a much darker and more diffuse abdomen pattern than is typical of that species. This specimen has an almost completely fuscous tergite III and tergite IV has very broad fuscous margins, leaving only narrow pale areas either side of the dark mid-line. Without more material this appears to be a trivial difference upon which to base a new species description.

Bactrocera (Zeugodacus) yoshimotoi (Hardy)

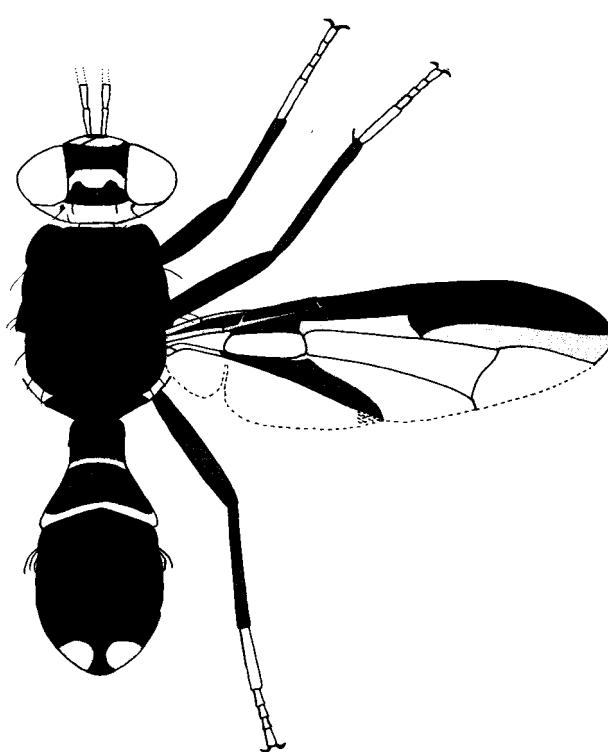
Dacus yoshimotoi Hardy, 1973: 53

A series of 17 males from Bhutan (BMNH, several localities, at "cue lure" [some evidence of methyl eugenol contamination]) appear to be this species and are diagnosed as follows:

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Figs. 25-26. *Bactrocera* and *Dacus*. 25, *B. (Z.) pura* White, new species, female, using standard outline; 26, *D. (Callantra) axanthinus* White & Evenhuis, new species, male (first flagellomere missing).

scutum black, medial vitta present, no pattern on scutellum, no basal scutellar setae, narrow costal band, fore femur entirely pale and the male sternites of normal width. They differ from the type of *B. yoshimotoi* (from Vietnam, BPBM) in the lateral postsutural vittae not being tapered and having a more prominent apical expansion of the costal band. A male from Nongph Forest, Meghalaya, Assam, India (25-28 Apr. 1980, coll. A. Freidberg, TAU) also appears to be this species but has a more parallel sided medial vitta and a pre-apical dark marking on the hind femur.

Genus *Dacus* Fabricius

Subgenus *Dacus (Callantra)* Walker

***Dacus (Callantra) axanthinus* White & Evenhuis, new species**
(Fig. 26)

Dacus (Callantra) sp. 1, Fauna Malesiana (in prep, CD-ROM)

Material examined. - Holotype - male (BPBM), PAPUA NEW GUINEA: Maprik [3°38'S 143°03'E], 160m, 14 Oct. 1957, coll. J.L. Gressitt. [#2 on N.L. Evenhuis det. label, BPBM holotype 16012]

Description. - male.

Head - [First flagellomere broken]. Face with a dark spot in each antennal furrow; spot very large; spot elongate vertically; face without other markings. Frons, 2 pairs frontal setae; 1 pair orbital setae. No dark mark between eye and antenna base.

Thorax - Scutum dark fuscous to black. Postpronotal lobes, dark fuscous. No yellow markings on thorax. Scutellum fuscous; not bilobed. Postpronotal lobe without a seta. Notopleuron with anterior seta. Scutum with anterior supra-alar setae; without prescutellar acrostichal setae. Scutellum without basal setae.

Wing - Length, 9.0mm. Vein R_{2+3} not sinuate near end R_1 . Vein R_{4+5} not setulose. Cell bm not tapered to base. Cell dm not expanded apically. Cells bc and c with extensive covering of microtrichia. Cell br (narrowed part) with extensive covering of microtrichia. Wing with a complete costal band; depth, to vein M ; band not expanded into a spot at apex; band not abruptly darkened at apex but pale in apical two-thirds of cell br and lower half of cell R_{4+5} . Wing with an anal streak. Cell bc coloured but not dark as costal band; cell c coloured as deeply as costal band. Wing not patterned (other than costal band and anal streak).

Leg - Fore femur without stout ventral spines. All femora red-brown; fore and mid tibiae fulvous; hind tibia fuscous.

Abdomen - Predominant colour fuscous. Tergites fused. Abdomen wasp waisted; tergite I not much longer than broad. Abdomen without any distinct pattern; indistinct paler areas along hind margins of tergites I and II. Long yellow pubescence on posterior margin of tergite IV and around ceromata. Ceromata round/ovoid.

Terminalia and secondary sexual characters - Wing without a bulla. Tergite III with a pecten (setal comb) on each side. IVth and Vth sternites not very broad. Sternite V posterior margin shallow, not V-shaped. Wing without a deep indent in posterior margin. Wing with

microtrichia area around apex of vein A_1+CuA_2 . Hind tibia with a preapical pad.

Etymology. - Named for its total lack of the yellow thoracic markings which Munro (1984) termed "xanthines".

Remarks. - Differentiated from all other known *D. (Callantra)* spp. by its total lack of yellow or orange markings. Although the holotype lacks its first flagellomere, it is clear from the length of the scape and pedicel that this species belongs to *D. (Callantra)*.

NEW DISTRIBUTION RECORDS

Over 900 unidentified specimens of Dacini from the BPBM collections were examined, mostly from Papua New Guinea and Irian Jaya (Indonesia). White & Hancock (1997) recognised 174 species from Papua New Guinea but only 25 from eastern Indonesia (east of Weber's Line, primarily from Irian Jaya) and those distribution data were largely derived from Drew (1989). Clearly, eastern Indonesia is seriously under-surveyed in comparison to Papua New Guinea, and even there, many new species must remain to be discovered. The following list, together with the notes and descriptions given above, increases the known Dacini from Irian Jaya to 56 species. All specimens in BPBM.

Indonesia

Bactrocera (Afrodacus) jarvisi (Tryon) [NEW TO MALESIA]

1 male, Irian Jaya, Eramboe, 80km ex Merauke, 29 Jan.1960, coll. T.C. Maa. Previously known from Australia.

Bactrocera (Bactrocera) anfracta Drew

1 male, Irian Jaya, "Hollandia" [Jayapura] area, Hamadi, 50m, 13 Jul.1957, coll. D.E. Hardy; 4 males, Irian Jaya, "Vogelkop" [Doberai, Jazirah], Manokwari area, Soawi, 75m, 20 Jul.1957, coll. D.E. Hardy; 1 male, Irian Jaya, "Hollandia" area, Ginnakan, 50m, 13 Jul.1957, coll. D.E. Hardy. Previously known from Papua New Guinea and Australia (Torres Straits Islands).

Bactrocera (Bactrocera) brevistriata (Drew)

1 female, Irian Jaya, "Vogelkop" [Doberai, Jazirah], Bomberi, 700-900m, 5 Jun.1959, coll. J.L. Gressitt. Previously known from Papua New Guinea.

Bactrocera (Bactrocera) frauendorfii (Schiner)

1 male, Irian Jaya, "Vogelkop" [Doberai, Jazirah], Jef Lio I., Sele Straits, 1-5m, 15 Aug.1957, coll. D.E. Hardy. Previously known from Australia (Queensland), Belau, Kiribati, Kosrae, Micronesia, Nauru, Palau, Papua New Guinea, Solomon Islands.

Bactrocera (Bactrocera) fulvicauda (Perkins)

1 male, Irian Jaya, "Vogelkop" [Doberai, Jazirah], Bomberi, 700-900m, 10 Jun.1959, coll. T.C. Maa. Previously known from Papua New Guinea.

Bactrocera (Bactrocera) lineata (Perkins)

2 male, Irian Jaya, "Hollandia" [Jayapura]-Binnen, 50m, 17 Aug.1957, coll. D.E. Hardy; 1 male, Irian Jaya, Kulima, 1400m, 19-22 Feb.1960, coll. T.C. Maa; 1 male, Waris, S. of "Hollandia", 450-500m, 24-31 Aug.1959, coll. T.C. Maa; 1 male, Irian Jaya, "Hollandia" area, Hamadi, 50m, 13 Jul.1957, coll. D.E. Hardy; 1 male, Irian Jaya, "Hollandia" area, Ginnakan, 50m, 13 Jul.1957, coll. D.E. Hardy. Previously known from Papua New Guinea.

Bactrocera (Bactrocera) nigrovittata Drew

1 male, Irian Jaya, Kulima, 1400m, 19-22 Feb.1960, coll. T.C. Maa. Previously known from Papua New Guinea.

Bactrocera (Bactrocera) paramusae Drew

1 male, Irian Jaya, "Vogelkop" [Doberai, Jazirah], Manokwari, 75m., 19 Jul.1957, coll. D.E. Hardy. Previously known from Papua New Guinea.

Bactrocera (Bactrocera) recurrens (Hering)

1 male, Irian Jaya, "Vogelkop" [Doberai, Jazirah], Manokwari area, Soawi, 75m., 20 Jul.1957, coll. D.E. Hardy. Previously known from Papua New Guinea.

Bactrocera (Hemizeugodacus) aglaiae (Hardy) [NEW TO MALESIA]

1 female, Irian Jaya, Wamena, 1700m., 10-25 Feb.1960, coll. T.C. Maa. Previously known from Australia (Queensland).

Bactrocera (Paradacus) abdopallescens (Drew)

1 male, Irian Jaya, Central Mountains, Archibald Lake, 760m, 26 Nov.-3 Dec.1961, coll. S. & L. Quate. Previously known from Papua New Guinea.

Bactrocera (Paradacus) areolata (Walker)

1 female, Moluku, Seram, Piroc, Jan.1909, coll. F. Muir. Previously known from Indonesia (Moluku, Bacan, coll. A.R. Wallace). Only second record of this species although not new to region.

Bactrocera (Sinodacus) strigifinis (Walker)

1 female, Irian Jaya, Biak I., Kampong Landbouw, 50-100m, 28 May.1959, coll J.L. Gressitt. Previously known from Papua New Guinea, Indonesia (Maluku), Australia (Queensland).

Papua New Guinea

Bactrocera (Gymnodacus) calophylli (Perkins & May)

1 male, nr. Port Moresby, Brown R., 17 Jun.1957, coll. D.E. Hardy; 1 male, Port Moresby area, 16 Jun.1957, coll. D.E. Hardy; 1 female, Popondetta, 60m, 2 Sep.1963, coll. J. Sedlacek. Previously known from Australia (Christmas Island; Queensland), Belau, Japan (Ryukyu Is.), Malaysia, Philippines (Balabac I.), Singapore and Thailand.

Bactrocera (Queenslandacus) exigua (May) [NEW TO MALESIA]

1 female, Wau, 1100-1200m, May.1968, coll. N.L.H. Krauss. Previously known from Australia (Queensland).

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