NEW SPECIES AND A NEW RECORD OF *ECNOMUS* MCLACHLAN (TRICHOPTERA: ECNOMIDAE) FROM PAPUA NEW GUINEA AND IRIAN JAYA

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Abstract

Cartwright, D.I., 1998. New species and a new record of *Ecnomus* McLachlan (Trichoptera: Ecnomidae) from Papua New Guinea and Irian Jaya. *Memoirs of the Museum of Victoria* 57: 73–87.

Descriptions, keys and a checklist are provided for males of twenty-one species of *Ecnomus* including seventeen new species from Papua New Guinea and Irian Jaya. The northern Australian species *Ecnomus tarakia* Cartwright, 1990 is recorded from Papua New Guinea for the first time.

Introduction

Three species of *Ecnomus* have been described previously from Papua New Guinea (PNG) and Irian Jaya (*E. cyclopicus* Kimmins, 1962; *E. addi* Malicky, 1993; *E. papuanus* Ulmer, 1938). E. cyclopicus and *E. papuanus* are here redrawn from the original figures. No type or new material of these two species has been seen. Kumanski (1979) recorded two male specimens from PNG, which he identified as *E. cyclopicus* Kimmins.

Most of the material available for study was collected during the 1960s and deposited as dried pinned specimens in the B. P. Bishop Museum, Honolulu, Hawaii (BPBM).

A total of 67 males were examined during this study, which were placed in 18 species of which 17 were new to science. Almost half the specimens are referred to two species (*Ecnomus skruim* sp. nov. and *E. milnensis* sp. nov.), the remaining 37 specimens representing 16 species.

The Papua New Guinea- Irian Jaya total of 21 species compares with the Australian total of 40 species (Cartwright, 1990) and western Indonesian total also of 21 species (Cartwright, 1994).

The objectives of this study were to provide a key and descriptions for the males of *Ecnomus* species from Papua New Guinea and Irian Jaya.

Both males and females of *Ecnomus* species are best identified by differences in genitalia, which usually requires clearing the abdomen in potassium hydroxide. Males and females can seldom be associated positively unless collected in copula or bred through from larvae. Females have not been described in this paper because of the problem of positive association, which is increased when more than one species is collected from a site.

Depositories for specimens are abbreviated as follows: The Natural History Museum, London (BMNH); B. P. Bishop Museum, Honolulu, Hawaii (BPBM); National Natural History Museum, Sofia, Hungary (NHMS); Museum of Victoria, Melbourne (NMV); National Museum of Natural History, Lieden (RMNH); Zoölogisch Museum, Universiteit van Amsterdam (ZMA); Zoologisches Museum, University of Copenhagen, Copenhagen (ZMUC).

Figured specimens are identified by the author's notebook number, prefix CT-; occasional PT- numbers refer to the notebook used by Dr A. Neboiss (NMV). Abbreviations for genitalic parts are as shown in Figs 1 and 2.

Ecnomus McLachlan

Ecnomus McLachlan, 1864: 30.—Cartwright, 1994: 447.

Type species. *Philopotamus tenellus* Rambur, 1842 (by original designation).

Remarks. A revised diagnosis was provided by Cartwright (1994).

Key to males of Papua New Guinean and Irian Jayan species of *Ecnomus*

1. Superior appendages with large process present on ventral margin (Fig. 1)..... ..... *E. spia* sp. nov.
— Superior appendages without large process on ventral margin (Figs 3, 5).....2
2(1). Basal plate of inferior appendages with a pointed dorsal lobe (Figs 3, 5).....3
— Basal plate of inferior appendages without a pointed dorsal lobe (Figs 7, 9)..4

3(2). Inferior appendages in ventral view dilated, with strongly bifid apices (Fig. 4).....*E. masalai* sp. nov.

— Inferior appendages in ventral view with weakly bifid apices (Fig. 6).....*E. cyclopicus* Kimmins

4(2). Superior appendages in lateral view with apical finger-like projection (Fig. 7).....*E. digitulus* sp. nov.

— Superior appendages in lateral view without apical finger-like projection (Fig. 9).....5

5(4). Superior appendages in lateral view short and broadbased, length about 2 × width (Fig. 9).....*E. larakia* Cartwright

— Superior appendages in lateral view long and robust, length > 2.5 × width (Figs 11, 13).....6

6(5). Inferior appendages in lateral view deeply incised (Figs 11, 13, 15).....7

— Inferior appendages in lateral view not deeply incised (Figs 17, 19).....9

7(6). Superior appendages very long and slender, length > 6 × width (Fig. 11).....*E. addi* Malicky

— Superior appendages more robust, length < 5 × width (Figs 13, 15).....8

8(7). Inferior appendages in ventral with dorsomesal process (Fig. 14).....*E. oriomo* sp nov.

— Inferior appendages in ventral without process (Fig. 16)....*E. cavatus* sp. nov.

9(6). Inferior appendages in ventral view with mesal digitiform process (Fig. 18), in lateral view with greatly enlarged basal segment of inferior appendages (Fig. 17).....*E. illugi* sp. nov.

— Inferior appendages in ventral view without process (Fig. 20), basal segment of inferior appendages not enlarged (Fig. 19).....10

10(9). Parameres branched (Fig. 19).....*E. skruim* sp. nov.

— Parameres not branched (Figs 21, 23, 41).....11

11(10). Superior appendages in lateral view dilated strongly apically (Figs 21, 23).....12

— Superior appendages in lateral view not obviously dilated or weakly dilated apically (Figs 25, 27).....13

12(11). Inferior appendages in ventral view slender and fairly straight (Fig. 22).....*E. masong* sp. nov.

— Inferior appendages in ventral view robust and strongly bent (Fig. 24).....*E. tamiok* sp. nov.

13(11). Parameres in lateral view downturned apically (Figs 25, 27).....14

— Parameres in lateral view not downturned apically (Figs 35, 37, 41).....18

14(13). Inferior appendages in ventral view, tapered in apical half (Figs 26, 28).....15

— Inferior appendages in ventral view, not tapered in apical half (Figs 30, 32).....16

15(14). Superior appendages with a swelling on dorsobasal margin (Fig. 25).....*E. bullatus* sp. nov.

— Superior appendages without a swelling on dorsobasal margin (Fig. 27).....*E. aliceae* sp. nov.

16(14). Inferior appendages in ventral view, tapered strongly to narrow rounded apices (Fig. 30).....*E. laensis* sp. nov.

— Inferior appendages in ventral view, not tapered strongly, with short pointed apices (Figs 32, 34).....17

17(16). Inferior appendages in lateral view, tapered in apical half, with pointed apices (Fig. 31).....*E. ulap* sp. nov.

— Inferior appendages in lateral view, not tapered in apical half, with rounded apices (Fig. 33).....*E. wamena* sp. nov.

18(13). Superior appendages in lateral view with a small mesally directed digitiform projection on ventrobasal margin (Fig. 35).....*E. milnensis* sp. nov.

— Superior appendages in lateral view without digitiform projection (Fig. 37).....19

19(18). Superior appendages very long and slender, length > 6 × width (Fig. 37).... .....*E. dadi* sp. nov.
— Superior appendages more robust, length < 5 × width (Figs 39, 41).....20
20(19). Superior appendages tapered slightly distally, parameres simple and slender (Fig. 39).....*E. iomari* sp. nov.
— Superior appendages not tapered distally, parameres complex (Fig. 41)..... .....*E. papuanus* Ulmer

Ecnomus spia sp. nov.

Figures 1, 2

Type material. Holotype male, Papua New Guinea, Mamai Plantation, E of Port Glasgow, 150 m, light trap, 27 Feb 1965, R. Straatman (genitalia prep. CT-142 figured, BP-8324, BPBM).

Description. Male. Wings fawn. Ventrolateral processes of segment 10 reduced to inconspicuous rounded swellings each with 3 small setae apically. Superior appendages in lateral view long with a large ventrally directed, digitiform process mesally on ventral margin (Fig. 1), in ventral view with a field of mesally directed spiny setae apically; inferior appendages in ventral and lateral views with a subapical dorsally directed digitiform projection (Figs 1, 2); parameres straight and robust in lateral view; phallus acute apically (Fig. 1).

Female unknown.

Length of forewing: male 3.4 mm.

Etymology. Papua New Guinean word for spear, referring to the projection on the superior appendages, noun in apposition.

Distribution. Southeast Papua New Guinea (known only from type locality).

Remarks. The single male specimen is very distinctive and distinguished readily from all other known *Ecnomus* species by the very large process on each superior appendage.

Ecnomus masalai sp. nov.

Figures 3, 4

Type material. Holotype male, Papua New Guinea,Wau, 1150–1300 m, Malaise trap, 29 Dec 1965, J. Sedlacek (genitalia prep. CT-148, BP-8324, BPBM).

Paratypes: 1 male, Papua New Guinea, Kassam, 48 km E Kainantu, 1350 m, 7 Nov 1959, T.C. Maa (genitalia prep. PT-1608, BPBM); 1 male, Papua New Guinea, Morobe District, Mt Missim, 1300 m, 7°13'S, 146°20'E, 15-21 Dec 1966, G.A. Samuelson (genitalia prep. CT-122, BPBM); 1 male, Papua New Guinea, Wau, Morobe District, 1200 m, Malaise trap, 26 Oct 1961, J. Sedlacek (genitalia prep. CT-147, BPBM); 1 male, Papua New Guinea, Umboi Island, 1 km N Awelkom, 600 m, light trap, 21–28 Feb 1967, G.A. Samuelson (genitalia prep. PT-1281 figured, BPBM).

Description. Male. Wings fawn, venation characteristic of genus. Ventrolateral processes of segment 10 short, broad based, with 3 short setae apically. Superior appendages in lateral view long, length about 5 × width (Fig. 3), in ventral view with field of mesally directed spiny setae apically; inferior appendages in ventral view, length about 2.5 × width, apices dilated, shallowly bifid (Fig. 4), in lateral view robust, length about 2 × width; basal plate of the inferior appendages with a large pointed dorsal lobe; parameres in lateral view robust, dilated and slightly down turned apically; phallus with apex extended into a short projection (Fig. 3).

Female unknown.

Length of forewing: male 4.4–5.7 mm.

Etymology. Papua New Guinean word for spirit of the waterways, noun in apposition.

Distribution. Northeast Papua New Guinea.

Remarks. Ecnomus masalai groups with *E. cyclopicus* Kimmins on the basis of the pointed dorsal lobe on the basal plate of the inferior appendages, and can be distinguished by the dilated, bifid apices on the inferior appendages, which are similar in appearance to the Australian species *E. turrbal* Cartwright.

Ecnomus cyclopicus Kimmins

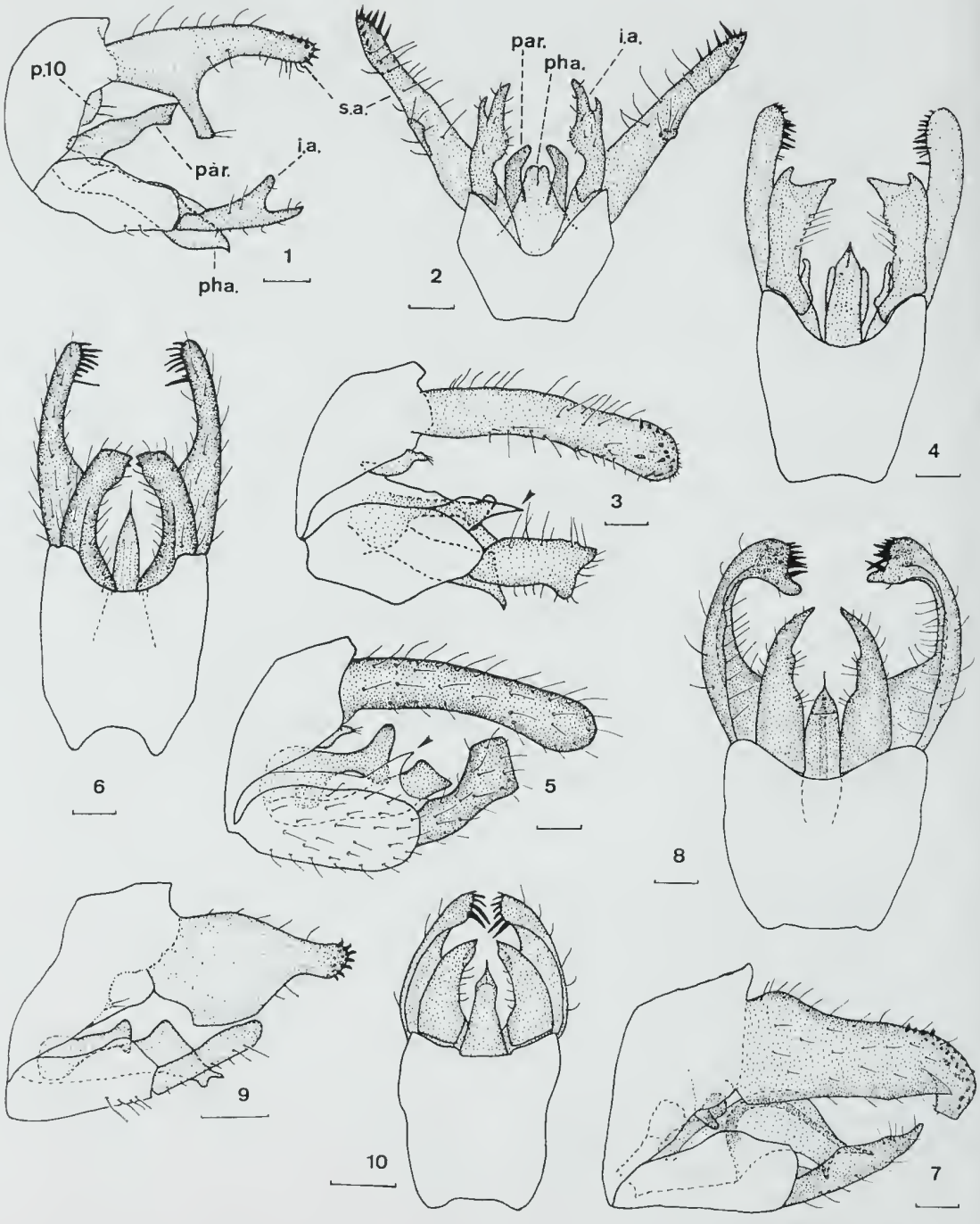
Figures 5, 6

Ecnomus cyclopicus Kimmins, 1962: 134, figs 35A–C.

Type material. Holotype male, Irian Jaya (Indonesia), Mt Cyclops, 3500 ft, Mar 1936, L.E. Cheesman (BMNH).

Paratype male, Irian Jaya (Indonesia), Cyclops Mts, Sabron, camp 2, 2000 ft, Jul 1936, (L.E. Cheesman) (BMNH). Types not seen, although Dr P. Barnard of the BMNH states that my reproduction of Kimmins lateral view drawing matches the holotype specimen prepared on a slide .

Other material. 2 males, Papua New Guinea, Telefomin, West Sepic Province, c. 1600 m, 25 Jul?–3 Aug 1975, P. Beron and/or P. Chapman (NHMS). Material not seen.



Figures 1–10. *Ecnomus* spp. Male genitalia in lateral and ventral views. 1, 2: *E. spia* sp. nov. 3, 4: *E. masalai* sp. nov. 5, 6: *E. cyclopicus* Kimmins (copied from Kimmins, 1962, Figs 35A–C). 7, 8: *E. digitulus* sp. nov. 9, 10: *E. larakia* Cartwright.

Abbreviations: i.a., inferior appendages; par, parameres; pha, phallus; p10, ventrolateral processes of segment 10; s.a., superior appendages. All scale lines 0.1 mm.

Description (revised after Kimmins, 1962). Male. Wings, forewing with sparse golden pubescence, brownish membrane with hyaline spots. Ventrolateral processes of segment 10 short, digitate, with several small setae apically. Superior appendages in lateral view long, length about 4 × width (Fig. 5), in ventral view with field of mesally directed spiny setae apically; inferior appendages in ventral view, robust, slightly incurved (Fig. 6), weakly bifid in dorsal view (Kimmins, 1962, Fig. 35B), in lateral view robust, narrowed slightly in middle, apices slightly dilated and truncated; basal plate of the inferior appendages with a large pointed dorsal lobe; parameres in lateral view robust, dilated and down turned apically; phallus slightly dilated subapically with acute apex (Fig. 5).

Female unknown.

Length of forewing: male 5 mm.

Distribution. Irian Jaya (Indonesia) and western Papua New Guinea.

Remarks. Ecnomus cyclopicus groups with *E. masalai* on the basis of having a pointed dorsal lobe on the basal plate of the inferior appendages The two species can be separated by the form of the inferior appendages, which are truncated and weakly bifid apically in *E. cyclopicus*. Kimmins (1962) figures are reproduced to allow direct comparisons and to accompany the description that is revised in light of new interpretations of *Ecnomus* genitalic structures.

Ecnomus digitulus sp. nov.

Figures 7, 8

Type material. Holotype male, Papua New Guinea, Muller Plateau (Duna Sands, Atem Karanda?), 5 Aug 1978, G.S. (genitalia prep. CT-260 figured, RMNH).

Description. Male. Wings pale fawn, venation characteristic of genus. Ventrolateral processes of segment 10 short. Superior appendages in lateral view long, broad-based, length about 2 × width, constricted and down turned subapically, with a finger-like projection apically (Figs 7, 8), in ventral view with field of mesally directed spiny setae apically; inferior appendages in ventral view, length about 3 × width, tapered to pointed apices (Fig. 8); in lateral view, length about 4 × width, tapered to pointed apices; parameres in lateral view short, straight, dilated apically; phallus robust, with ventral subapical projection, acute apex and embedded slender, elongated, down turned process (Fig. 7).

Female unknown.

Length of forewing: male 6.6 mm.

Etymology. Latin, a little finger, referring to the projection on the superior appendages.

Distribution. Central-west Papua New Guinea.

Remarks. Ecnomus digitulus can be separated from all other *Ecnomus* species by the distinctive apices on the superior appendages which are downturned, constricted and have a finger-like projection. The phallus has an unusual embedded process.

Ecnomus larakia Cartwright

Figures 9, 10

Ecnomus larakia Cartwright, 1990: 25, figs 77–78.

Type material. Holotype male, Australia, Northern Territory, Howard Springs, 9 Sep 1980, D. King (NMV).

Other material. 1 male, Papua New Guinea, Morobe Province, Wau Ecology Institute, 24 May 1986, A. Wells (genitalia prep. CT-242 figured, NMV).

Description. (revised after Cartwright, 1990). Male. Wings pale fawn, venation characteristic of genus. Ventrolateral processes of segment 10 very short, with 3 small setae apically. Superior appendages in lateral view short, broad based, tapered strongly distally, length about 2 × width (Fig. 9), in ventral view with field of mesally directed spiny setae apically; inferior appendages in ventral view, length about 3 × width, slightly constricted medially, dilated subapically, tapered to pointed apices (Fig. 10), in lateral view robust, straight, apices rounded; parameres in lateral view robust, dilated and down turned slightly apically; phallus slightly dilated subapically with acute apex (Fig. 9).

Female unknown.

Length of forewing: male 2.9–3.5 mm.

Distribution. Northern Australia and northeast Papua New Guinea.

Remarks. Ecnomus larakia can be distinguished from all other PNG and Irian Jaya species by the short and broad-based superior appendages.

Ecnomus addi Malicky

Figures 11, 12

Ecnomus addi Malicky, 1993: 1120, pl 8, 3 figs.

Type material. Holotype male, Papua New Guinea, Bismarck Island, date unknown, Noona Dan Expedition, (ZMK).

Paratypes. 8 males, 3 females, same data as holotype (ZMK). One male paratype seen and figured (now lodged in the NMV).

Description. (revised after Malicky, 1993). Male. Wings fawn. Ventrolateral processes of segment 10 long, broad based, with 3 small setae apically. Superior appendages in lateral view very long, slender, length about 6 × width (Fig. 11), in ventral view with field of mesally directed spiny setae apically; inferior appendages in ventral view, length about 3 × width, tapered to inflexed, pointed apices (Fig. 12), in lateral view robust, incised in distal half, apices upturned and pointed; parameres in lateral view robust, straight; phallus slightly dilated subapically with acute apex (Fig. 11).

Female known (but not described by Malicky, 1993).

Length of forewing: male 4 mm, female 5 mm.

Distribution. Northeast Papua New Guinea (type locality only).

Remarks. Ecnomus addi can be distinguished from all other PNG and Irian Jaya species by the very long and slender superior appendages combined with the incised inferior appendages, in lateral view. Malicky's (1993) figures are redrawn to allow direct comparisons and to accompany the description that is revised in light of new interpretations of *Ecnomus* genitalic structures.

Ecnomus oriomo sp. nov.

Figures 13, 14

Type material. Holotype male, Papua New Guinea, Western District, Oriomo River, 3 m, 8°50'S, 143°11'E, light trap, 4 Aug 1964, H. Clissold (genitalia prep. CT-121 figured, BP-8324, BPBM).

Paratype male, same data as holotype, 1 Aug 1964 (genitalia prep. CT-131, BPBM).

Description. Male. Wings fawn. Ventrolateral processes of segment 10 short, broad based, with 3 small setae apically. Superior appendages in lateral view long, length about 4 × width (Fig. 13), in ventral view with field of mesally directed spiny setae apically; inferior appendages robust, length about 2.5 × width, with small truncate, dorsomesal projection near middle, incised distally, tapered to pointed apices (Figs 13, 14); parameres in lateral view slender, down turned apically; phallus slightly dilated subapically with acute apex (Fig. 13).

Female unknown.

Length of forewing: male 3.8 mm.

Etymology. Named after type locality (Oriomo River), noun in apposition.

Distribution. Southeast Papua New Guinea.

Remarks. Ecnomus oriomo groups with *E. addi* and *E. cavatus* sp. nov. on the basis of the incised form of the inferior appendages, but can be distinguished by the small, truncate dorsomesal projection on the inferior appendages and the slender, downturned parameres.

Ecnomus cavatus sp. nov.

Figures 15, 16

Type material. Holotype male, Papua New Guinea, Wau, Morobe District, 1050 m, Malaise trap, 4 Nov 1961, J. Sedlacek (genitalia prep. CT-149 figured, BP-8324, BPBM).

Description. Male. Wings fawn. Ventrolateral processes of segment 10 long, with 3 small setae apically. Superior appendages in lateral view long, length about 3.5 × width, tapered slightly distally (Fig.15), in ventral view with field of mesally directed spiny setae apically; inferior appendages in ventral view robust, length about 2.5 × width, tapered to pointed apices (Fig. 16), in lateral view incised sub-apically with upturned apices; parameres in lateral view robust, dilated and down turned apically; phallus with acute apex extended into a short projection (Fig. 15).

Female unknown.

Length of forewing: male 5.2 mm.

Etymology. Latin, hollowed out, referring to appearance of inferior appendages.

Distribution. Northeast Papua New Guinea (type locality only).

Remarks. Ecnomus cavatus groups with *E. addi* and *E. oriomo* on the basis of incised inferior appendages, but can be distinguished by the absence of a mesal projection on the inferior appendages and the robust, downturned parameres.

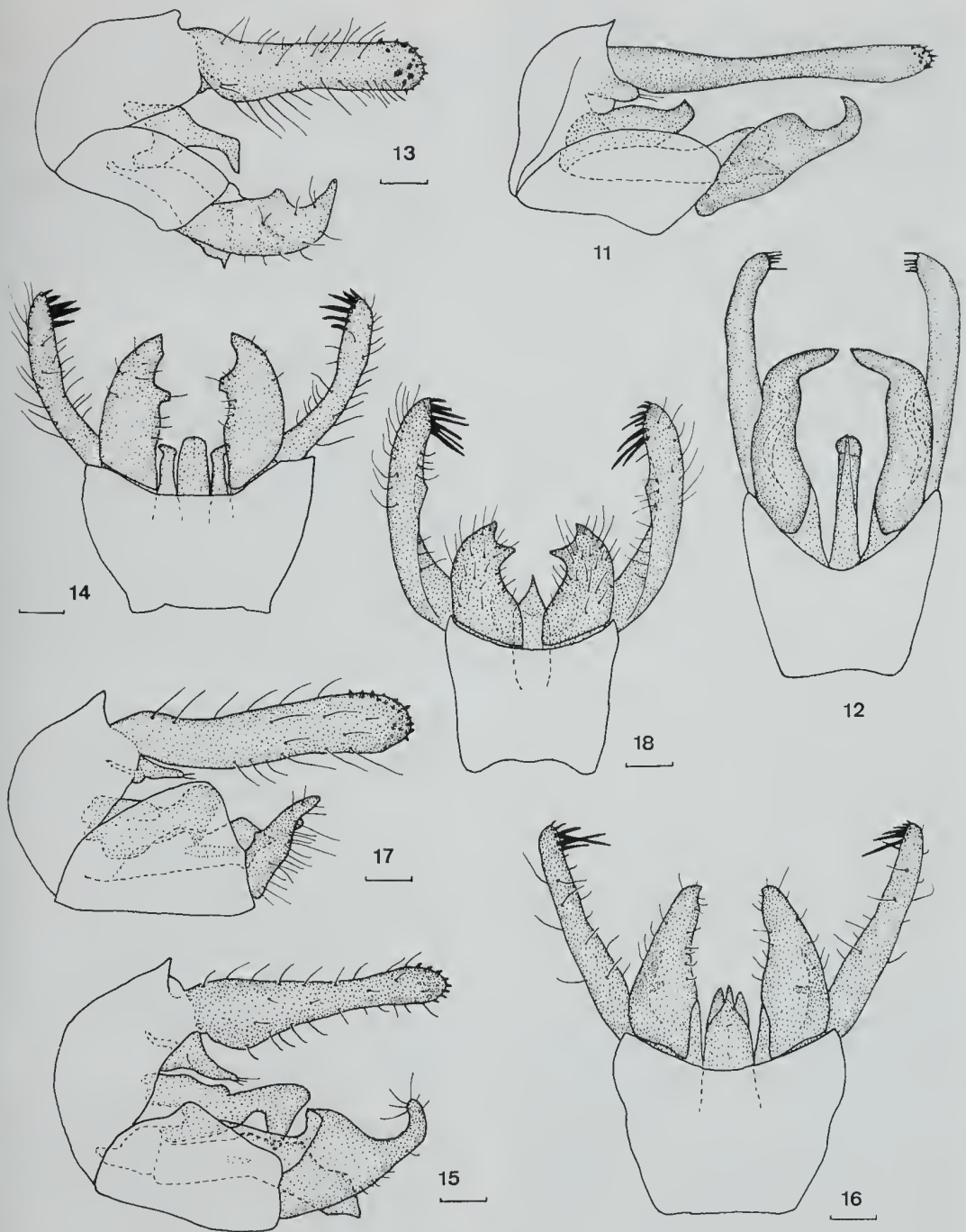
Ecnomus illngi sp. nov.

Figures 17, 18

Type material. Holotype male, Papua New Guinea, New Britain, Gazelle Peninsula, Upper Warangoi, Illugi, 220 m, Malaise trap, 15 Dec 1962, J. Sedlacek (genitalia prep. CT-132 figured, BP-8324, BPBM).

Paratype male, same data as holotype (genitalia prep. CT-136, BPBM).

Description. Male. Wings fawn. Ventrolateral processes of segment 10 long, with 3 small setae apically. Superior appendages in lateral view long, length about 5 × width (Fig. 17), in ventral view with field of mesally directed spiny setae apically; inferior appendages in ventral view



Figures 11–18. *Ecnomus* spp. Male genitalia in lateral and ventral views. 11, 12: *E. addi* Malicky (reproduced from Malicky, 1993, pl. 8, 3 figs). 13, 14: *E. oriomo* sp. nov. 15, 16: *E. cavatus* sp. nov. 17, 18: *E. illugi* sp. nov. All scale lines 0.1 mm.

robust, length about 1.5 × width, with mesal digitiform projection subapically, tapered to pointed apices (Fig. 18), in lateral view slender, tapered slightly to pointed apices, basal section of inferior appendages greatly enlarged, concealing parameres and phallus; parameres in lateral view robust, dilated and down turned apically; phallus with acute apex extended into a short projection (Fig. 17).

Female unknown.

Length of forewing: male 4.4 mm.

Etymology. Named after type locality (Illugi), noun in apposition.

Distribution. Northeast Papua New Guinea (type locality only).

Remarks. Ecnomus illugi separates from other PNG species on the basis of the distinctive, greatly enlarged basal section of inferior appendages, and digitiform mesal projection on the inferior appendages.

Ecnomus skruim sp. nov.

Figures 19, 20

Type material. Holotype male, Papua New Guinea, Mamai Plantation, E of Glasgow, 150 m, light trap, 27 Feb 1965, R. Straatman (genitalia prep. CT-153 figured, BP-8324, BPBM).

Paratypes: 7 males, same data as holotype (genitalia preps. CT-155, 156, 165-169, BPBM); 2 males, same data as holotype, 30 Jan 1965 (genitalia preps. CT-143, 144, BPBM); 2 males, Papua New Guinea, Lae, Singnawa River, 6°45'S, 147°10'E, 80 m, light trap, 13 Apr 1966, O.R. Wilkes (genitalia preps. CT-123, 173, BPBM); 1 male, Papua New Guinea, Wau, Morobe District, 1050 m, 11 Nov 1961, J. Sedlacek (genitalia prep. PT-1441, BPBM).

Description. Male. Wings fawn. Ventrolateral processes of segment 10 long, broad based, bilobed, with 3 small setae apically. Superior appendages in lateral view robust, length about 3.5 × width (Fig.19), in ventral view with field of mesally directed spiny setae apically; inferior appendages in ventral view robust, length about 3 × width, incised subapically, tapered to rounded apices (Fig. 20), in lateral view robust, straight, length about 2.5 × width; parameres in lateral view branched, with dorsal branch long and slender, down curved apically, ventral branch shorter, slightly down turned apically; phallus with acute apex extended into a short projection (Fig. 19).

Female unknown.

Length of forewing: male 3.2–4.2 mm.

Etymology. Papua New Guinean word meaning to join (arms), referring to the forked parameres.

Distribution. Northeast and southeast Papua New Guinea.

Remarks. Ecnomus skruim is separated from other PNG species on basis of the distinctive, branched parameres. Similar branched parameres also occur in the Sulawesi (Indonesian) species *E. selnk* Cartwright, *E. tipis* Cartwright and *E. tang* Cartwright.

Ecnomus masong sp. nov.

Figures 21, 22

Type material. Holotype male, Papua New Guinea, Umboi Island, about 8 km WNW Lab Lab, 300 m, Malaise trap, 8–19 Feb 1967, G.A. Samuelson (genitalia prep. CT-172 figured, BP-8324, BPBM).

Paratypes: 1 male, similar data to holotype, 600 m, light trap, 21-28 Feb 1967 (genitalia prep. CT-137, BPBM); 2 males, Papua New Guinea, New Britain, Gazelle Peninsula, Upper Warangoi, Illugi, 220 m, Malaise trap, 15 Dec 1962, J. Sedlacek (genitalia preps. CT-135, PT-1439, BPBM).

Description. Male. Wings fawn. Ventrolateral processes of segment 10 long, broad based, with 3 small setae apically. Superior appendages in lateral view long, length about 3.5 × width , narrowed over middle section, dilated subapically (Fig. 21), in ventral view with field of mesally directed spiny setae apically; inferior appendages long and slender, length about 5 × width, tapered slightly apically (Figs 21, 22), basal section of inferior appendages with dense group of long hairs near mid-dorsal margin; parameres in lateral view robust, dilated and slightly down turned subapically; phallus with acute apex extended into a long projection (Fig. 21).

Female unknown.

Length of forewing: male 3.3–3.6 mm.

Etymology. Papua New Guinean word for fine hairs, referring to dense group of long hairs on basal section of inferior appendages.

Distribution. Northeast Papua New Guinea.

Remarks. Ecnomus masong separates from other PNG species on basis of the distinctive group of long hairs on basal section of inferior appendages and long slender inferior appendages. I have not noted this group of hairs on any other *Ecnomus* species from Indonesia, PNG or Australia.

Ecnomus tamiok sp. nov.

Figures 23, 24

Type material. Holotype male, Papua New Guinea, Morobe Distriet, Ulap, 800–1100 m, Sep 1968, W.A. Steffan and Y.M.Huang (genitalia prep. CT-124 figured, BP-8324, BPBM).

Paratypes: 1 male, same data as holotype (genitalia preps. CT-127, BPBM); 1 male, Papua New Guinea, 14.4 km W Lae, 28-30 Oet 1965, W.A. Steffan and Y.M.Huang (genitalia prep. CT-139, BPBM); 1 male, Papua New Guinea, Madang, 5°16'S, 145°45'E, 24 May 1990, W.F. Humphreys (genitalia prep. CT-261, RMNH).

Description. Male. Wings fawn. Ventrolateral processes of segment 10 long, broad based, with 3 small setae apically. Superior appendages in lateral view long, dilated strongly apically, length about 2.5 × maximum width (Fig. 23), in ventral view with field of mesally directed spiny setae apically; inferior appendages relatively hairy, in ventral view robust, length about 2 × width, strongly inflexed at about the middle, tapered to pointed apiees (Fig. 24), in lateral view tapered distally, length about 2 × width; parameres in lateral view robust, dilated slightly and down eurved apically; phallus with acute apex extended into a short projection (Fig. 23).

Female unknown.

Length of forewing: male 3.0–3.4 mm.

Etymology. Papua New Guinean word for axe, referring to shape of superior appendages.

Distribution. Northeast Papua New Guinea.

Remarks. Ecnomus tamiok separates from other PNG species on basis of the distinetive dilated apiees on the superior appendages and the strongly inflexed inferior appendages.

Ecnomus bullatus sp. nov.

Figures 25, 26

Type material. Holotype male, Papua New Guinea, Mamai Plantation, E of Port Glasgow, 150 m, light trap, 27 Feb 1965, R. Straatman (genitalia prep. CT-154 figured, BP-8324, BPBM).

Paratypes: 1 male, same data as holotype, 27 Jan 1965 (genitalia prep. CT-152, BPBM); 1 male, same data as holotype, 30 Jan 1965 (genitalia prep. CT-141, BPBM).

Description. Male. Wings fawn. Ventrolateral proeesses of segment 10 long, with 3 small setae apieally. Superior appendages in lateral view long, length about 4 × width, with a swelling on dorsobasal margin (Fig. 25), in ventral vicw with field of mesally directed spiny setae apically; inferior appendages in ventral view short, length about 3 × width, broad based, narrowed at about the middle, tapered to pointed apiees (Fig. 26), in lateral view short, straight, length about 3 × width, tapered distally; parameres in lateral view robust, dilated and down turned subapieally; phallus with ventral subapical swelling and aeute apex extended into a short projeetion (Fig. 25).

Female unknown.

Length of forewing: male 3.2–3.8 mm.

Etymology. Latin, swelling, referring to superior appendages.

Distribution. Southeast Papua New Guinea.

Remarks. Ecnomus bullatus separates from other PNG species on the distinetive superior appendages with the swelling on the dorsobasal margin.

Ecnomus aliceae sp. nov.

Figures 27, 28

Type material. Holotype male, Papua New Guinea, Central Provinee, Eilogo River, near Sergeri, 9°27'S, 147° 27'E, net, 21 May 1986, A. Wells (genitalia prep. CT-240 figured, T-16798, NMV).

Paratype male, Papua New Guinea, Mamai Plantation, E of Port Glasgow, 150 m, 30 Jan 1965, R. Straatman (genitalia prep. CT-140, BPBM).

Description. Male. Wings pale fawn, venation eharaeteristie of genus. Ventrolateral proeesses of segment 10 broad based, with 3 small setae apieally. Superior appendages in lateral view robust, length about 3.5 × width (Fig. 27), in ventral view with field of mesally directed spiny setae apieally; inferior appendages in ventral view long, slender, length about 4 × width, narrowed or ineised at about the middle, tapered to pointed apiees (Fig. 28), in lateral view long, straight, length about 4 × width; parameres in lateral view long, slender, slightly dilated and down turned apieally; phallus slender, with acute apex extended into a short projeetion (Fig. 27).

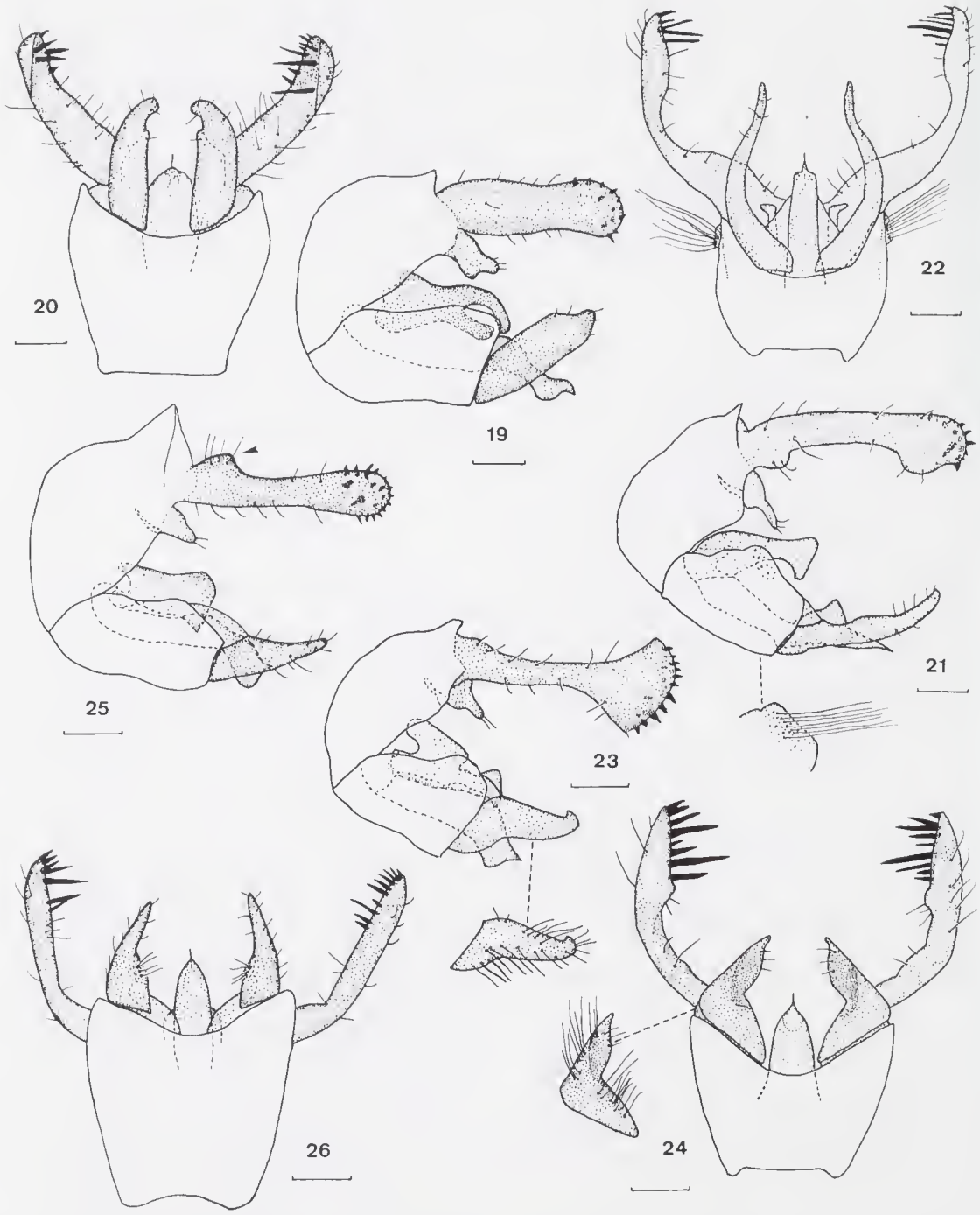
Female unknown.

Length of forewing: male 3.2–3.4 mm.

Etymology. The speeies is named for Alice Wells (eolleetor).

Distribution. Central and southeast Papua New Guinea.

Remarks. Ecnomus aliceae separates from other PNG species on the combination of the straight superior appendages and the slender inferior appendages.



Figures 19–26. *Ecnomus* spp. Male genitalia in lateral and ventral views. 19, 20: *E. skruim* sp. nov. 21, 22: *E. masong* sp. nov. (with basal segment of inferior appendage showing hairs, lateral view). 23, 24: *E. tamiok* sp. nov. (with inferior appendage showing hairs, lateral and ventral views). 25, 26: *E. bullatus* sp. nov. All scale lines 0.1 mm.

Ecnomus laensis sp. nov.

Figures 29, 30

Type material. Holotype male, Papua New Guinea, 14.4 km W Lae, 28–30 Oct. 1965, W.A. Steffan and Y.M. Huang (genitalia prep. CT-138 figured, BP-8324, BPBM).

Description. Male. Wings fawn. Ventrolateral proeesses of segment 10 broad based, with 3 small setae apieally. Superior appendages in lateral view long, length about 4 × width (Fig. 29), in ventral view with field of mesally direeted spiny setae apieally; inferior appendages in ventral view slender, length about 2.5 × width, broad based, with subapieal swelling, tapered to narrowly rounded apiees (Fig. 30), in lateral view long, straight, length about 3 × width, tapered slightly to rounded apiees; parameres in lateral view robust, strongly dilated and down turned apieally; phallus robust (Fig. 29).

Female unknown.

Length of forewing: male 3.8 mm.

Etymology. Named after type loeality (near Lae).

Distribution. Northeast Papua New Guinea (type loeality only).

Remarks. Ecnomus laensis separates from other PNG speeies on the eombination of the straight superior appendages and the inferior appendages with a subapieal swelling and tapered to narrowly rounded apiees.

Ecnomus ulap sp. nov.

Figures 31, 32

Type material. Holotype male, Papua New Guinea, Morobe District, Ulap, 800–1100 m, Nov 1968, W.A. Steffan and Y.M. Huang (genitalia prep. CT-128 figured, BP-8324, BPBM).

Description. Male. Wings fawn. Ventrolateral proeesses of segment 10 broad based, with 3 small setae apieally. Superior appendages in lateral view robust, broad based, slightly eonstrieted at about two-thirds length, length about 2.5 × width (Fig. 31), in ventral view with field of mesally direeted spiny setae apieally; inferior appendages in ventral view length about 2.5 × width, narrowed near middle, with short pointed apiees (Fig. 32), in lateral view long, straight, length about 3 × width, tapered slightly to pointed apiees; parameres in lateral view robust, dilated and down turned apically; phallus dilated subapically, with aeute apex extended into a short projeetion (Fig. 31).

Female unknown.

Length of forewing: male 3.6 mm.

Etymology. Named after type loeality (Ulap).

Distribution. Northeast Papua New Guinea (type loeality only).

Remarks. Ecnomus ulap separates from other PNG speeies on the eombination of the robust and downturned parameres and the shape of the inferior appendages.

Ecnomus wamena sp. nov.

Figures 33, 34

Type material. Holotype male, Indonesia, Irian Jaya, Baheim Valley, Wamena, 1500 m, at light, 17 Oct 1993, A.J. de Beer, A.L.M. Rutten and R. de Vos (genitalia prep. CT-247 figured, ZMA).

Paratypes: 3 males, same data as holotype (ZMA).

Other material. 1 male, Papua New Guinea, Central Province, Eilogo River near Sergeri, 9°27'S, 147°27'E, net, 21 May 1986, A. Wells (genitalia prep. CT-241, NMV); 1 male, Papua New Guinea (Paniai, 3 Sep 1939, Nieuw Guinea Exp. K.N.A.G. 1939, RMNH).

Description. Male. Wings fawn, venation eharaeteristie of genus. Ventrolateral proeesses of segment 10 long and broad based, with 3 small setae apieally. Superior appendages in lateral view long, eonstrieted slightly at about two-thirds length, length about 3 × width (Fig. 33), in ventral view with field of mesally direeted spiny setae apieally; inferior appendages in ventral view length about 3 × width, narrowed slightly near middle, with short pointed apiees (Fig. 34), in lateral view robust, length about 3 × basal width, tapered and upturned slightly to rounded apiees; parameres in lateral view dilated and down turned apieally; phallus with aeute apex extended into a short projeetion (Fig. 33).

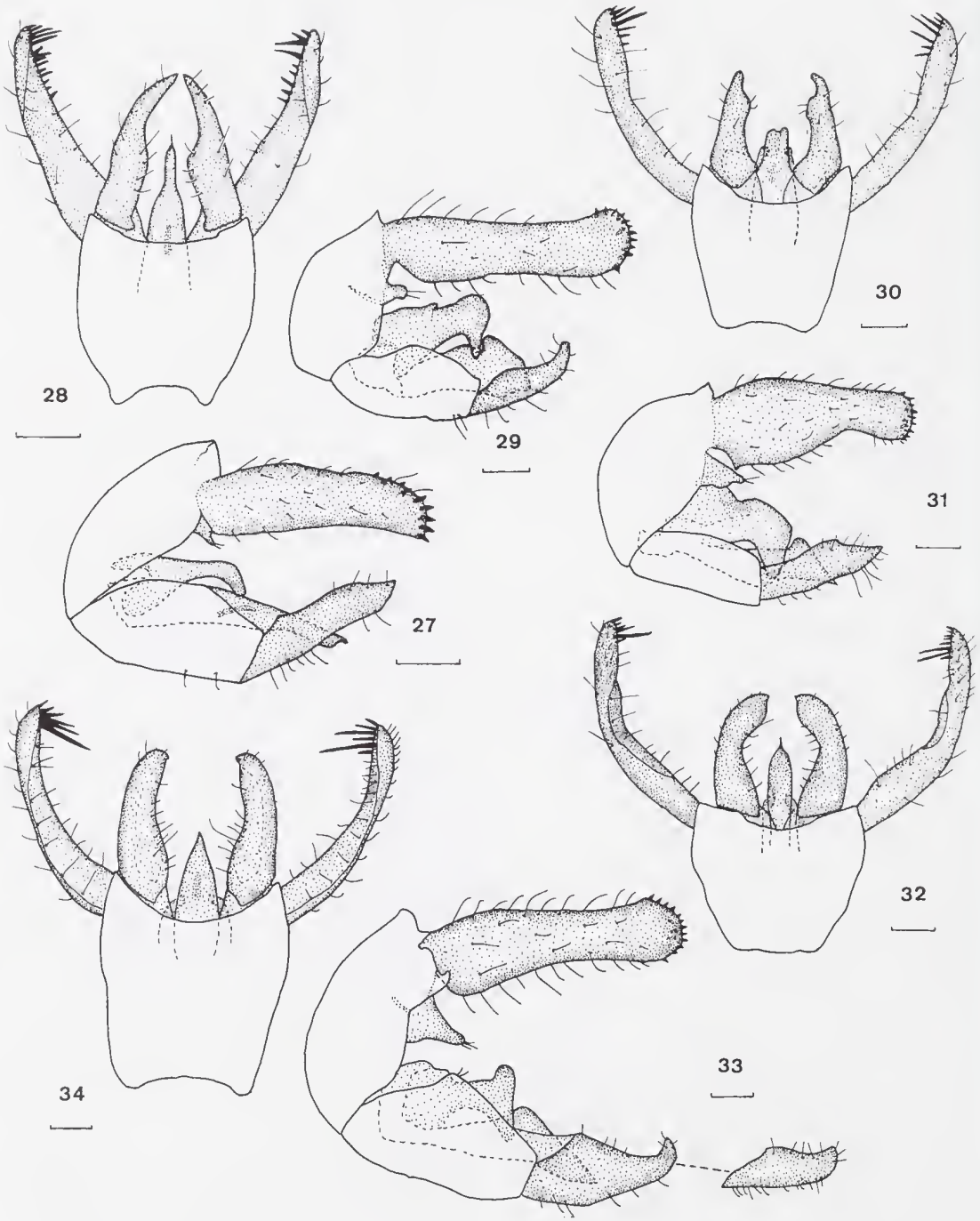
Female unknown.

Length of forewing: male 4.7–6.0 mm.

Etymology. Named after type loeality (Wamena).

Distribution. Irian Jaya (Indonesia) and eentral Papua New Guinea.

Remarks. Ecnomus wamena separates from other PNG and Irian Jaya speeies on the eombination of the downturned parameres and the shape of the inferior appendages. The Papua New Guinean speeimen (CT-241) differs slightly from the type material in that the inferior appendages in lateral view are less upturned at the apiees.



Figures 27–34. *Ecnomus* spp. Male genitalia in lateral and ventral views. 27, 28: *E. aliceae* sp. nov. 29, 30: *E. laensis* sp. nov. 31, 32: *E. ulap* sp. nov. 33, 34: *E. wamena* sp. nov. (with variation in form of inferior appendage [CT–241], lateral view). All scale lines 0.1 mm.

Ecnomus milnensis sp. nov.

Figures 35, 36

Type material. Holotype male, Papua New Guinea, Milne Bay, 10 m, 10°18'S, 150°20'E, light trap, Mar 1965, R.A. Straatman (genitalia prep. CT-120 figured, BP-8324, BPBM).

Paratypes: 15 males, same data as holotype (genitalia preps. CT-134, 145, 146, 150, 151, 157-164, 170, 171, BPBM); 1 male, Papua New Guinea, Mamai Plantation, near Port Glasgow, 27 Jan 1965, R.A. Straatman (genitalia prep. CT-130, BPBM).

Description. Male. Wings fawn. Ventrolateral processes of segment 10 long, broad based, with 3 small setae apically. Superior appendages in lateral view long, length about 3 × width, with a small ventromesally directed digitiform projection on ventrobasal margin (Fig. 35), in ventral view with field of mesially directed spiny setae apically; inferior appendages in ventral view robust, length about 2 × width, broad based, narrowed at about the middle, tapered to pointed and inflexed apices (Fig. 36), in lateral view length about 4 × width; parameres in lateral view robust, straight; phallus with acute apex extended into a long projection (Fig. 35).

Female unknown.

Length of forewing: male 4.0–4.6 mm.

Etymology. Named after type locality (Milne Bay).

Distribution. Southeast Papua New Guinea.

Remarks. Ecnomus milnensis separates from other PNG species on basis of the distinctive small ventromesally directed digitiform projection on ventrobasal margin of the superior appendages, reminiscent of the Australian species *E. turgidus* Neboiss and *E. digrutus* Cartwright, and the Indonesian species *E. bengkok* Cartwright.

Ecnomus dadi sp. nov.

Figures 37, 38

Type material. Holotype male, Papua New Guinea, Mamai Plantation, E of Port Glasgow, 150 m, 10°17'S, 149°35'E, light trap, 27 Feb 1965, R.A. Straatman (genitalia prep. CT-125 figured, BP-8324, BPBM).

Description. Male. Wings fawn. Ventrolateral processes of segment 10 long, with 3 small setae apically. Superior appendages in lateral view long and slender, length about 6.5 × width (Fig. 37), in ventral view with field of mesally directed spiny setae apically; inferior appendages in ventral view short, robust, length about 2 × width, broad based, narrowed at about the middle, tapered to pointed apices (Fig. 38), in lateral view short, broad based, length about 2 × width; parameres in lateral view slender, straight in apical third; phallus with acute apex extended into a long projection (Fig. 37).

Female unknown.

Length of forewing: male 3.2 mm.

Etymology. Dadi, anagram of addi *(E. addi* Malicky).

Distribution. Southeast Papua New Guinea (type locality only).

Remarks. Ecnomus dadi separates from other PNG species on the combination of the very long and slender superior appendages and the short, robust and broad based inferior appendages.

Ecnomus iomari sp. nov.

Figures 39, 40

Type material. Holotype male, Papua New Guinea, Central Province, Iomari Ck, Bereima-Port Moresby Road, UV light, 23 May 1986, A. Wells and J. Ismay (genitalia prep. CT-243 figured, T-16799, NMV).

Paratype male, Papua New Guinea, Umboi Island, about 8 km WNW Lab Lab, 300 m, Malaise trap, 8–19 Feb 1967, G.A. Samuelson (genitalia prep. CT-129, BPBM).

Description. Male. Wings pale fawn, venation characteristic of genus. Ventrolateral processes of segment 10 long, with 3 small setae apically. Superior appendages in lateral view long, tapered slightly distally, length about 3.5 × width (Fig. 39), in ventral view with field of mesally directed spiny setae apically; inferior appendages moderately hairy, in ventral view short, robust, length about 2.5 × width, broad based, narrowed or incised at about the middle, tapered to pointed apices (Fig. 40), in lateral view short, broadbased, straight, length about 2.5 × width; parameres in lateral view slender, straight in apical third, slightly dilated apically in dorsolateral view; phallus stout, tapered gradually from about middle, with acute apex (Fig. 39).

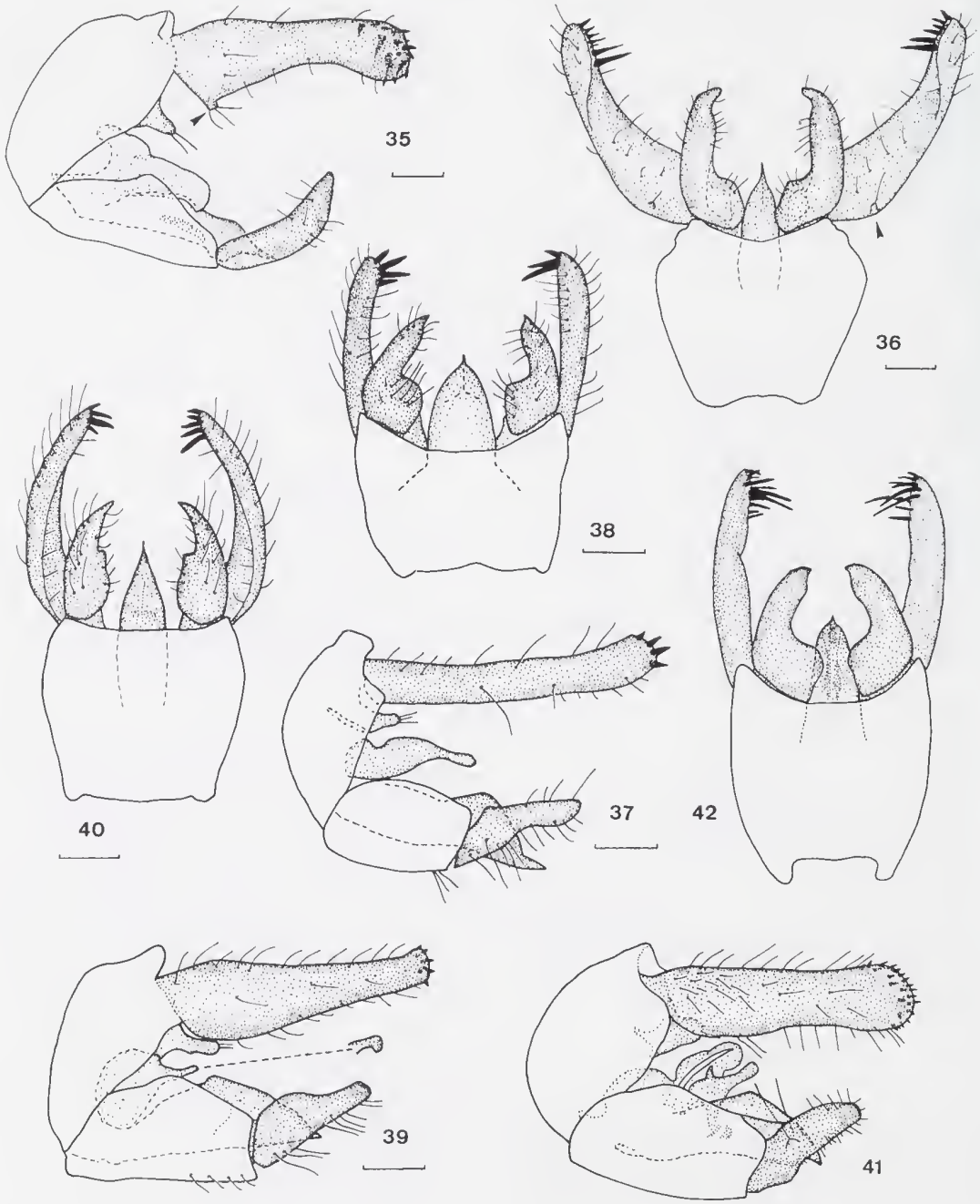
Female unknown.

Length of forewing: male 3.4–3.9 mm.

Etymology. Named after type locality (Iomari Creek).

Distribution. Central and northeast Papua New Guinea.

Remarks. Ecnomus iomari separates from other PNG species on the combination of the slightly tapered superior appendages and the simple and slender parameres.



Figures 35–42. *Ecnomus* spp. Male genitalia in lateral and ventral views. 35, 36: *E. milnensis* sp. nov. 37, 38: *E. dadi* sp. nov. 39, 40: *Ecnomus iomari* sp. nov. (with apex of paramere, dorsolateral view). 41, 42: *E. papuanus* Ulmer; 41 (reproduced from Neboiss, 1986: 151). All scale lines 0.1 mm.

Ecnomus papuanus Ulmer

Figures 41, 42

Ecnomus papuanus Ulmer 1938: 400–402, figs 3-5.—Neboiss 1986: 151.

Type material. Lectotype male, Papua New Guinea, Queen Augusta River Expedition (Sepik River area), 15–31 Jul. 1913 (figures based on genitalia prep. PT-1440 figured by Neboiss 1986, Berlin Museum). Type not seen.

Other material. 1 male, same data as lectotype (Hamburg Museum?). Specimen not seen.

Description. (revised after Ulmer, 1938). Male. Wings yellow and brown. Ventrolateral processes of segment 10 long, broad, with 3 small setae apically. Superior appendages in lateral view long, length about 4 × width (Fig. 41), in ventral view with field of mesally directed spiny setae apically; inferior appendages in ventral view robust, length about 2 × basal width, broad based, narrowed at about the middle, tapered slightly distally (Fig. 42), in lateral view robust, straight, length about 3 × width; parameres in lateral view complex, slender, straight in apical third, with dorsal spine medially, and subapical dorsal and ventral processes; phallus tapered gradually from about middle, with acute apex (Fig. 41).

Female unknown.

Length of forewing: male 4 mm.

Distribution. Western Papua New Guinea.

Remarks. Ecnomus papuanus separates from other PNG species on the combination of the long and straight superior appendages and the complex structure of the parameres. Neboiss' (1986: 151) figures have been redrawn to allow direct comparisons and to accompany the description that is revised in light of new interpretations of *Ecnomus* genitalic structures.

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Index and checklist of Papua New Guinean and Irian Jayan species of *Ecnomus*