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DESCRIPTIONS OF FOUR NEW SPECIES OF ECNOMUS McLACHLAN (TRICHOPTERA: ECNOMIDAE) FROM NORTH SULAWESI

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ABSTRACT

Descriptions and keys are provided for males of four new species of *Ecnomus* from North Sulawesi. The species described are *Ecnomus buntak* sp. n., *E. puntung* sp. n., *E. tang* sp. n. and *E. tipis* sp. n. Females of four species are also described but have not been positively associated with the males and are designated as *Ecnomus* species A, B, C and D.

INTRODUCTION

Ecnomus has not previously been recorded from Sulawesi, but has been recorded from Sumatra and Java (Mosely, 1932; Ulmer, 1951).

The material studied was collected by participants of the Project Wallace 1985 expedition to Dumoga Bone National Park, Sulawesi. Some details on the National Park, sampling sites and collecting techniques are given by Wells (1990).

Depository institutions are abbreviated as follows:
Museum of Victoria, Melbourne (MVM);
Northern Territory Museum of Arts and Sciences, Darwin (NTMD);
Rijksmuseum van Natuurlijke Historie, Leiden (RMNH);
Zoölogisch Museum, Universiteit van Amsterdam (ZMA);

PT- numbers refer to the notebook used by Dr. A. Neboiss (MVM); CT- numbers refer to the notebook of the author.

Genus *Ecnomus* McLachlan

Ecnomus McLachlan, 1864.

Type species

Philopotamus tenellus Rambur, 1842 (by original designation).

Ecnomus is primarily distributed in Africa (about 50 species; Barnard and Clark, 1986) and Australia (40 species; Cartwright, 1990), but is also common throughout south-east Asia including seven species recorded from Indonesia (Fischer, 1960-73).

Species are usually identified by differences in male and female genitalia, which often requires clearing the abdomen in KOH. The association of males and females can be a problem and in this genus specimens should not be asigned to the same species unless collected in copula (Kimmins, 1957) or bred through from larvae. Cartwright (1990) has described how a pair of males and females in *Ecnomus* form a

'key in lock' mechanism when copulating.

Key to males of North Sulawesi species of *Ecnomus*

1. Superior appendages short (Figs 1, 3) 2
-. Superior appendages long (Figs. 5, 7) 3

2.Superior appendages very short, length about same as width, not dilated apically (Fig. 1) .....*E. buntak* sp. n.
- Superior appendages with length about 1.3x width, truncate, dilated apically (Fig. 3) .....*E. puntung* sp. n.

3. Inferior appendages in ventral view, with mesal projection (Fig. 6) .....*E. tang* sp. n.
- Inferior appendages in ventral view, without mesal projection, but with a mesal swelling (Fig. 8) ....*E. tipis* sp. n.

Ecnomus buntak sp. n.
(figs 1, 2)

Type material

Holotype ♂, Sulawesi Utara, Dumoga Bone National Park, Tumpah River, 1 km above Toraut River junction, 00°35'N 123°54'E, light trap, 17 May 1985, A. Wells (T-10718, MVM); Paratypes 6 ♂, same data as holotype (genitalia prep. CT-187 figured; MVM); 6 ♂, Tumpah River tributary, first fall, 00°36'N 123°54'E, light trap, 4 May 1985, A. Wells (MVM, RMNH, ZMA).

Other material examined

Sulawesi Utara, Dumoga Bone National Park, 1♂, Edwards Camp near Tumpah River, 650m, 00°35'N 123° 51'E, MV light, 22 May 1985, A. Wells (MVM); 2 ♂, Tumpah River tributary above first fall, 00°36'N 123°54'E, light trap, 6 May 1985, A. Wells (MVM); 2 ♂, Toraut River, 200m above Tumpah River junction, at light, Aug. 1985, D. Dudgeon (ZMA); 1 ♂, Motolanga River, Dolodua-Malibagu road, 00°28'N 123°58'E, light trap, 9 May 1985, Wells and Dowling (MVM); 1 ♂, beach on River Tumpah, picnic site, 225m, 00°34'N 123°54'E, Oct. 1985, M. Malipatil (NTMD).

DESCRIPTION

Male wings pale fawn, venation characteristic of genus; anterior wing with R1 forked, apical forks 1, 2, 3, 4 and 5 present; posterior wing with forks 2 and 5 present. Anterior wing with footstalk of fork 1 longer than fork.

Ventro-lateral processes of segment ten long, slightly curved, with three small spines apically. Superior appendages in lateral view, very short and broad, length about same as width (fig. 1); inferior appendages in ventral view, long and slender with slightly incised mesal margin apically (fig. 2) in lateral view long and robust, length about 4x width; parameres short, hidden by processes of segment ten; phallus robust (fig. 1), laterally compressed (figs 1, 2).

Female unknown.

Length of forewing: ♂ 4.0-4.2 mm.

Remarks

The males can be distinguished from the other Sulawesi species by the very short superior appendages and the long processes on segment ten. *E. buntak* has superior and inferior appendages which are alike but different in shape to *E. auratus* Kimmins from Sarawak and *E. ceylanicus* Mosely from Ceylon.

Distribution

North Sulawesi (Indonesia).

Etymology

Species name derived from Indonesian word buntak meaning short and stout, referring to superior appendages.

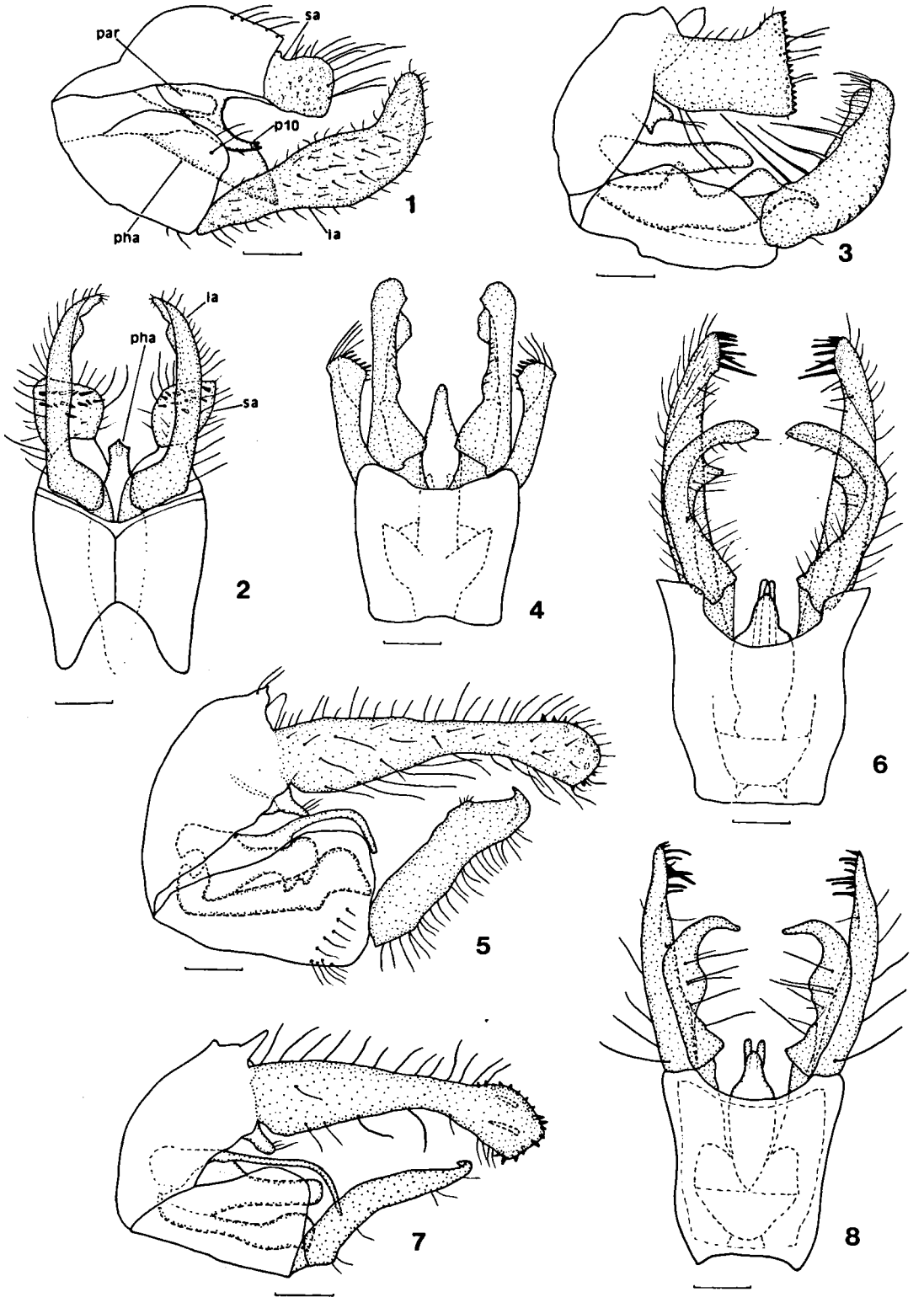
Ecnomus puntung sp. n.
(figs 3, 4)

Type material

Holotype ♂, Sulawesi Utara, Dumoga Bone National Park, Edwards Camp near Tumpah River, 650m, 00°35'N 123°51'E, MV light, 22 May 1985, A. Wells (T-10727, MVM); Paratypes 20 ♂, same data as holotype (genitalia prep. PT-1568 figured; MVM, RMNH, ZMA).

Other material examined

Sulawesi Utara, Dumoga Bone National Park, 53 ♂, Edwards Camp near Tumpah River, 650m, 22 May 1985, A. Wells (MVM); 10 ♂, same loc., 664m, MV light, 22-23 Oct. 1985, M. Malipatil (NTMD); 1 ♂, Toraut and Tumpah River junction, 00°34'N 123°55'E, light trap, 16 May 1985, A. Wells (MVM); 1 ♂, same loc., MV light, 26 May 1985, Wells and Wilson (MVM); 1 ♂, Tumpah River and tributary junction, 00°35'N 123°54'E, light trap, 26 May 1985, A. Wells (MVM); 5 ♂, Tumpah River tributary above first fall, 00°36'N 123°54'E, light trap, 6 May 1985, A. Wells (MVM); 1 ♂, Tumpah River tributary, first fall, 00°36'N 123°54'N, light trap, 4 May 1985, A. Wells (MVM); 1 ♂, basecamp on Toraut River, 211m, cleared area, MV light, 4 Oct.-8 Nov.



Figs. 1-8: *Ecnomus* spp. male genitalia.-(1,2) *Ecnomus buntak* sp. n.; (1) lateral; (2) ventral; (3,4) *Ecnomus puntung* sp. n.; (3) lateral; (4) ventral; (5,6) *Ecnomus tang* sp. n.; (5) lateral; (6) ventral; (7,8) *Ecnomus tipis* sp. n.; (7) lateral; (8) ventral. Abbreviations: ia-inferior appendages; par-parameres; pha-phallus; p10-ventro-lateral processes of segment ten; sa-superior appendages. All scale lines 0.1 mm.

1985, M. Malipatil (NTMD); 3 ♂, Pononontuma River bridge, 6.5 km N of Malibagu, 00°25'N 123°58'E, light trap, 18 May 1985, A. Wells and J. van Tol (MVM); 3 ♂, same loc., MV light, 24 May 1985, Wells and Wilson (MVM); 4 ♂, Toraut River near Tumpah River junction, at light, Aug. 1985, D. Dudgeon (ZMA) 1 ♂, Tumpah River, at light, Aug. 1985, D. Dudgeon (ZMA).

DESCRIPTION

Male wings pale fawn, venation characteristic of genus, similar to *E. buntak* sp. n. Anterior wing with footstalk of fork 1 equal in length to fork. Ventro-lateral processes of segment ten short, bilobed with three short setae apically. Superior appendages in lateral view, short and broad, length about 1.3x width, apices dilated and truncate (fig. 3); inferior appendages in ventral view, length about 3x width, broadest near base, with broad mesal lobe dorsally (fig. 4), in lateral view length about 3x width, broadest in middle, with several long hair-like setae dorsally (fig. 3) and a series of grooves ventrally (Figs 3, 4); parameres straight and robust; phallus extended into a long, slender projection (fig. 3).

Female unknown.

Length of forewing: ♂ 3.7-4.4 mm.

Remarks

The male can be distinguished from other Sulawesi species by the distinctive truncate superior appendages, similar to *E. serratus* Ulmer from Java and Sumatra, which has obliquely truncate superior appendages.

Distribution

North Sulawesi (Indonesia).

Etymology

Species name derived from Indonesian word puntung meaning blunt, referring to the superior appendages.

Ecnomus tang sp. n.
(Figs 5, 6)

Type material

Holotype ♂, Sulawesi Utara, Dumoga Bone National Park, Toraut River, 200m above Tumpah River junction, 00°34'N 123°55'S, light trap, 2 May 1985, A. Wells (T-10738, MVM); Paratypes 5 ♂, same data as holotype (genitalia prep. PT-1569 figured; MVM, RMNH, ZMA).

Other material examined

Sulawesi Utara, Dumoga Bone National Park, 1♂, Tumpah River, 1 km above Toraut River junction, 00°35'N, 123°54'E, light trap, 17 May 1985, A. Wells (MVM); 1♂, Toraut and Tumpah River junction, 00°34'N 123°55'E, MV light, 26 May 1985, Wells and Wilson (MVM); 1♂, Dumoga Ketjil, 00°31'N 123°57'E, light trap, 11 May 1985, Wells and Dowling (MVM); 1 ♂, Pononontuma River bridge, 6.5 km N of Malibagu, 00°25'N 123°58'E, light trap, 18 May 1985, A. Wells and J. van Tol (MVM); 2♂, Dumoga-Ketjil Impoundment, 00°32'N, 123°56'E, light trap, 20 May 1985, Wells and Wilson (ZMA); 1♂, Motolanga River, Duloduа-Malibagu road, 00°28'N, 123°58'E, light trap, 9 May 1985, Wells and Dowling (MVM).

DESCRIPTION

Male wings pale, venation characteristic of genus similar to *E. buntak* sp. n. Anterior wing with footstalk of fork 1 equal in length to fork. Ventro-lateral processes of segment ten short, with three short setae apically. Superior appendages in lateral view, long and slender, length about 4x width, apices slightly dilated (fig. 5); inferior appendages in ventral view, slender, with small mesal projection in apical third, apices inflexed (fig. 6), in lateral view, straight and robust, length about 4x width; parameres branched with dorsal branch long and slender, downcurved apically, ventral branch robust with a bulbous head; phallus with a bulbous head (fig. 5).

Female unknown.

Length of forewing: ♂ 3.6-4.0 mm.

Remarks

The male is close to *E. tipis* sp. n. and to *E. forcipatus* Mosely from Peninsula Malaysia in the shape of all genitalic structures, although the species can be distinguished by small differences in the shapeof the inferior appendages, especially the size of the mesal projection.

Distribution

North Sulawesi (Indonesia).

Etymology

Species name derived from Indonesian word tang meaning tongs, referring to the inferior appendages.

Ecnomus tipis sp. n.
(figs 7, 8)

Type material

Holotype ♂, Sulawesi Utara, Dumoga Bone National Park, Tumpah River, 1 km above Toraut River junction, 00°35'N 123°54'E, light trap, 17 May 1985, A. Wells (T-10742, MVM); Paratype ♂, Edwards Camp near Tumpah River, 650m, 00°35'N 123°51'E, MV light, 22 May 1985, A. Wells (genitalia prep. PT-1570 figured; MVM).

DESCRIPTION

Male wings pale fawn, venation characteristic of genus, similar to *E. buntak* sp. n. Anterior wing with footstalk of fork 1 equal in length to fork. Ventrolateral processes of segment ten short, with three short setae apically. Superior appendages in lateral view, long and slender, length about 3.5x width, apices dilated (fig. 7); inferior appendages in ventral view, slender with swelling near middle and inflexed apices (fig. 8), in lateral view, long and slender, length about 5x width; in lateral view parameres branched with dorsal branch long and slender, downcurved apically, ventral branch straight and robust; phallus with bulbous head (fig. 7).

Female unknown.

Length of forewing: ♂ 3.6-3.7 mm.

Remarks

The two male specimens collected resemble *E. tang* sp. n. and *E. forcipatus* Mosely from Peninsula Malaysia in all genitalic structures but can be separated by slight differences especially on the inferior appendages including the lack of a prominant mesal projection on the inferior appendages.

Distribution

North Sulawesi (Indonesia).

Etymology

Species name derived from Indonesian word tipis meaning thin, referring to the superior and inferior appendages.

Ecnomus sp. A (♀)
(Figs 9, 10)

Material examined

Sulawesi Utara, Dumoga Bone National Park, 1 ♀, Tumpah River tributary above first fall, 00°36'N 123°54'E, light trap, 6 May 1985, A. Wells (genitalia prep. CT- 183 figured; MVM); 1 ♀, Motolanga River, Dolodua-Malibagu road, 00°28'N 123°58'E, light trap, 9 May 1985, Wells and Dowling (MVM).

DESCRIPTION

Female wings pale, venation characteristic of genus, similar to *E. buntak* sp. n. Anterior wing with footstalk of fork 1 longer than fork. Ventral plates elongate, length about 3x width, apices extended into long slender projections. Abdominal segment nine elongate and laterally compressed (figs 9, 10).

Length of forewing: ♀ 4.4 mm.

Remarks

These two females are distinguished from all congeners by their distinctive elongate abdominal segment nine and ventral plates. The genitalia of the female here descrived as *Ecnomus* sp. A is very atypical. The long abdominal segment ten has some similarity with females of the genus *Ecnomina* Kimmins from Australia.

Distribution

North Sulawesi (Indonesia).

Ecnomus sp. B (♀)
(figs 11, 12)

Material examined

Sulawesi Utara, Dumoga Bone National Park, 3 ♀, beach on Tumpah River, picnic site, 225m, 00°34'N 123°54'E, MV light, Oct. 1985, M. Malipatil (genitalia prep. CT-184 figured; NTMD, ZMA); 1 ♀, Tumpah River, 1 km above Toraut River junction, 17 May 1985, A. Wells (MVM).

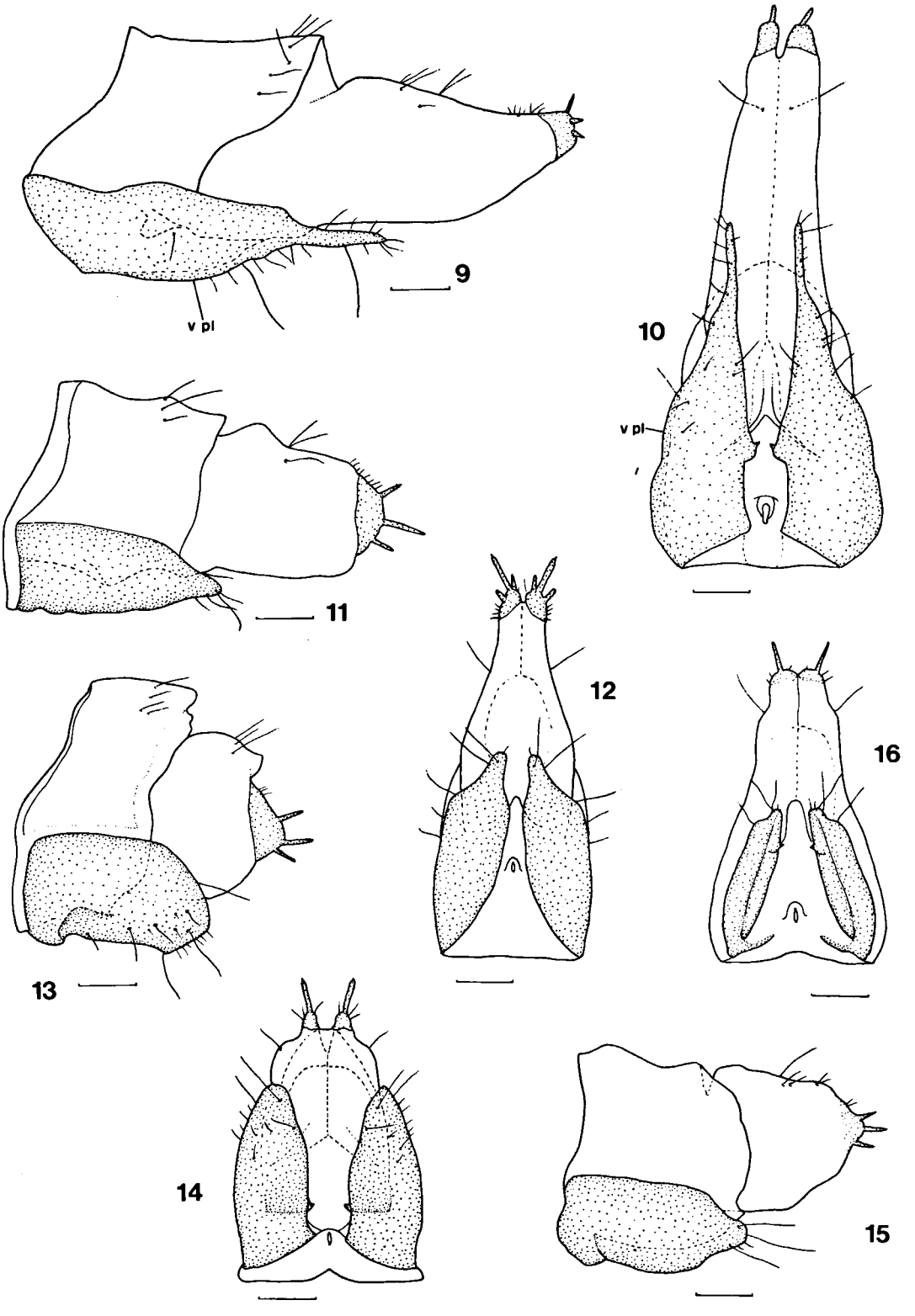
Description

Female wings pale, venation characteristic of genus, similar to *E. buntak* sp. n. Anterior wing with footstalk of fork 1 equal in length to fork. Ventral plates with length about 2x width, narrowing apically, apices extended into short projections (figs 11, 12).

Length of forewing: ♀ 3.9-4.2 mm.

Remarks

Ecnomus sp. B has a slightly elongate abdominal segment nine which is intermediate in length between



Figs. 9-16: *Ecnomus* spp. female genitalia.-(9,10) *Ecnomus* sp. A; (9) lateral; (10) ventral; (11,12) *Ecnomus* sp. B; (11) lateral; (12) ventral; (13,14) *Ecnomus* sp. C; (13) lateral; (14) ventral; (15,16) *Ecnomus* sp. D; (15) lateral; (16) ventral. Abbreviation: vpl-ventral plates. All scale lines 0.1 mm.

Ecnomus sp. A and *Ecnomus* sp. C and D.

Distribution
North Sulawesi (Indonesia).

Ecnomus sp. C (♀)
(figs 13, 14)

Material examined

Sulawesi Utara, Dumoga Bone National Park, many ♀, Edwards Camp near Tumpah River, 650m, 22 May 1985 (genitalia prep. CT-181 figured; MVM); 1 ♀, same loc., 21 May 1985, A. Wells (MVM); 1 ♀, same loc., 664m, MV light, 22-23 Oct. 1985, M. Malipatil (NTMD); 26 ♀, Tumpah River and tributary junction, 00°35'N 123°54'E, 19 May 1985, Wells, Wilson and Tan (MVM); 2 ♀, same loc., light trap, 20 May 1985, A. Wells (MVM); 8 ♀, same loc., MV light, 26 May 1985, A. Wells (MVM); many ♀, Tumpah River tributary, first fall, light trap, 4 May 1985, A. Wells (MVM); 14 ♀, Tumpah River tributary above first fall, 6 May 1985, A. Wells (MVM); 1 ♀, basecamp on River Toraut, 211m, cleared area, MV light, 4 Oct.-8 Nov. 1985, M. Malipatil (NTMD); 2 ♀, Tumpah River, 1 km above Toraut River junction, 26 May 1985, A. Wells (MVM); 12 ♀, Toraut and Tumpah River junction, 00°34'N 123°55'E, light trap, 10 Jun. 1985, J. Martin (MVM) 3 ♀, Barneys Camp, 302m, 00°34'N 123°54'E, MV light, 4 Oct.-8 Nov. 1985, M. Malipatil (NTMD); 11 ♀, Motolanga River, Dolodua-Malibagu road, light trap, 7 May 1985, A. Wells (MVM); 6 ♀, same loc., 9 May 1985, Wells and Dowling (MVM); 11 ♀, Ponontumo River bridge, 18 May 1985, A. Wells and J. van Tol (MVM); 37 ♀, same loc., 24 May 1985, Wells and Wilson (MVM); 36 ♀, below Toraut and Tumpah River junction, at light, Aug. 1985, D. Dudgeon (ZMA); 1 ♀, Tumpah River, at light, Aug. 1985, D. Dudgeon (ZMA).

DESCRIPTION

Female wings pale fawn, venation characteristic of genus, similar to *E. buntak* sp. n. Anterior wing with footstalk of fork 1 equal in length to fork. Ventral plates with shallow concavity near mesal margin in middle, length about 1.5x width, apices smoothly rounded (figs 13, 14).

Length of forewing: ♀ 3.6-4.4 mm.

Remarks

The female can be distinguished from other species by the large concavity on each of the ventral plates. *Ecnomus* sp. C can be tentatively associated with males of *E. puntung* sp. n. as they have been commonly collected from the same sites.

Distribution
North Sulawesi (Indonesia).

Ecnomus sp. D (♀)
(figs 15, 16)

Material examined

Sulawesi Utara, Dumoga Bone National Park, 3 ♀, Toraut and Tumpah River junction, 26 May 1985, Wells and Wilson (genitalia prep. CT-182 figured; MVM); 2 ♀, Tumpah River and tributary junction, 19 May 1985, Wells, Wilson and Tan (MVM); 1 ♀, Edwards Camp near Tumpah River, 650m, 22 May 1985, A. Wells (MVM); 1 ♀, basecamp, River Toraut, 250m, in forest, MV light, 4 Oct.-8 Nov. 1985, M. Malipatil (NTMD); 18 ♀, Dumoga River at Dumoga Ketjil, 11 May 1985, Wells and Dowling (MVM); 1 ♀, Dumoga-Ketjil rice paddy, 00°31'N 123°57'E, light trap, 8 May 1985, A. Wells (MVM); 6 ♀, same loc., 11 May 1985, A. Wells (ZMA); 1 ♀, Dumoga-Ketjil Impoundment, 00°32'N 123°56'E, light trap, 20 May 1985, Wells and Wilson (MVM).

Description

Female wings pale fawn, venation characteristic of genus, similar ro *E. buntak* sp. n. Anterior wing with footstalk of fork 1 equal in length to fork. Ventral plates with a strong ridge along mesal margin, narrowing apically, length about 2x width (figs 15, 16).

Length of forewing: ♀ 3.9-4.6 mm.

Remarks

The female is distinguished by the mesal ridge on the ventral plates, which is similar to the Australian species, *E. russellius* Neboiss.

Distribution
North Sulawesi (Indonesia).

DISCUSSION

Generally, the males of the new species have affinities with described species from SE-Asia, particularly in the shape of the superior and inferior appendages. There is a need for the re-examination of older type material and the collection and study of new material especially from unsurveyed areas of SE-Asia, to enable affinities to be elucidated for the genus *Ecnomus.*

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