

BMOL  
72

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Грето Зенек

***AFRONURUS SIBUYANENSIS* SPEC. NOV.,  
A NEW MAYFLY FROM THE PHILIPPINES.  
(EPHEMEROPTERA: HEPTAGENIIDAE)\***

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*A. sibuyanensis* sp. n. is described and figured from imaginal and subimaginal males and females, from the Sibuyan Island in the centre of the Philippine archipelago. (Holotype ♂: Pawala R., Magdiwang, alt. 70-80 m, 19 March 1987; deposited in coll. R.A. Müller, St Gallen, Switzerland; paratypes in author's collection). Diagnostic characters are compared with those of *A. philippinensis* Flowers & Pescador, 1984 and *A. lobatus* (Ulmer, 1924) comb. nov. (transferred from *Ecdyonurus*).

**INTRODUCTION**

On one of his zoological missions to the Philippines, Mr R.A. Müller (St. Gallen, Switzerland) collected a small series of Ephemeroptera, which were offered to the author for inspection. All specimens appear to belong to a single, hitherto unknown species of *Afronurus*, which is described herein.

The Ephemeroptera of the Philippines are still poorly known. So far, fewer than 25 species have been recorded from the entire archipelago (HUBBARD & PESCADOR, 1978; MÜLLER-LIEBENAU,

\* Results of the Roland Müller Zoological Missions to the Philippines, No. 1

1980; FLOWERS & PESCADOR, 1984), five of which are referable to the Heptageniidae. The new *Afronurus* is the sixth Philippine member of this family.

#### PREPARATION AND CONDITION OF MATERIAL

All specimens were originally preserved dry, in small paper envelopes, which caused a considerable loss of legs and cerci. Before study, most of them were relaxed in a 5% solution of sodium phosphate for 24-48 h and transferred then to 70% alcohol. A small number of specimens are kept dry and set on pins.

#### *AFRONURUS SIBUYANENSIS* SPEC. NOV.

Figures 1-10

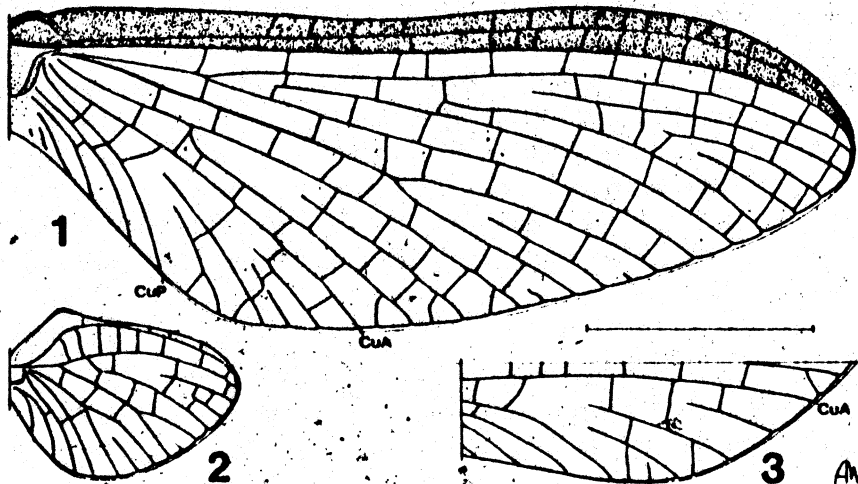
**M a t e r i a l.** — Holotype: ♂ imago, Philippines, Romblon province, Sibuyan Island, Ga-Ong Camp at Pawala River, municipality Magdiwang, alt. 70-80 m, 19-III-1987, R.A. Müller leg. Paratypes (same locality and collector as holotype): 1 ♀ subimago, 19-III-1987; 1 ♂ imago, 20-III-1987; 7 ♂ imagos, 3 ♀ imagos, 21-III-1987; 1 ♂ imago, 1 ♀ imago, 22-III-1987; 2 ♂ subimagos, 24-III-1987; 2 ♂ imagos, 1 ♀ imago, 1 ♀ subimago, 26-III-1987; 2 ♂ imagos, 1 ♂ subimago, 1 ♀ subimago, 29-III-1987; 4 ♂ imagos, 2 ♀ imagos, 1 ♀ subimago, 30-III-1987; 4 ♂ imagos, 1-IV-1987; 2 ♂ imagos, 2-IV-1987; 2 ♂ imagos, 1 ♂ subimago, 6-IV-1987.

Holotype (in alcohol) and 23 paratypes (20 specimens in alcohol, 3 specimens pinned) in the collection of Mr. R.A. Müller (St Gallen, Switzerland); 17 paratypes (14 specimens in alcohol, 3 specimens pinned) in the author's collection.

**♂ IMAGO.** — **H e a d:** Dark brown, frontal area slightly paler; eyes brownish black above, black beneath, dorsally contiguous, each eye about 1.25-1.30 times wider than long in dorsal view; base of ocelli black; antennae brown with flagellum paler towards apex.

**T h o r a x:** Pronotum brown, laterally slightly paler; mesonotum dark brown with posterior margin and notal hump blackish brown; metanotum dark brown with notal hump nearly black; pleura uniformly pale yellowish brown; sterna yellowish, prosternum washed with grey.

**W i n g s** (Figs 1-2): Membrane of fore and hind wing hyaline, costal and subcostal area in fore wing brown to dark brown; veins in fore wing pale brown, in hind wing translucent yellowish; marginal posterior sclerotisation in fore and hind wing set in from the margin; fore wing with anterior pair of intercalary veins between CuA and CuP often weakly developed, in some specimens only represented by a single vein (Fig. 3).



Figs 1-3. *Afronurus sibuyanensis* sp. n., ♂ imago: (1) fore wing; - (2) hind wing; - (3) fore wing, detail of cubital region (other specimen than Fig. 1). - [Bar 2 mm]

**L e g s:** Prothoracic legs brown, coxa, trochanter and base of femur slightly paler; meso- and metathoracic legs with coxa, trochanter and base of femur pale yellowish brown, femur progressively brown towards apex, tibia pale brown, apex sometimes slightly washed with greyish brown, tarsus greyish brown, progressively darker towards apex. Length ratios (femur : tibia : tarsus) of prothoracic legs: 1 (≅ 2.0-2.2 mm) : 1.15-1.20 : 1.15-1.20; mesothoracic legs: 1 (≅ 2.1 mm) : 0.85 : 0.40; metathoracic legs: 1 (≅ 2.3 mm) : 0.70-0.75 : 0.30. Length ratios of tarsal joints (measured along dorsal margin) of prothoracic legs: 1 : 1.35-1.45 : 1.15-1.20 : 0.70-0.75 : 0.50-0.55; mesothoracic legs: 1 : 0.75-0.85 : 0.60-0.65 : 0.40-0.45 : 1.30; metathoracic legs: 1 : 0.80 : 0.55 : 0.40-0.45 : 1.45-1.50. Claws of all legs dissimilar.

**A b d o m e n:** Tergites and sternites uniformly dark brown to dark reddish brown, apical segments (especially sternites) slightly paler. Genitalia (Fig. 4) with styliger plate separated into lateral parts (bases of forceps) and a median part by pseudo sutures; lateral parts firmly sclerotized, brown, articulating with sternite 9, inner apical angle protruded; median part weakly sclerotized, pale brown, hardly separated from sternite 9, posterior margin strongly convex. Forceps dark brown. Penis with sclerotized parts brown; lateral margins parallel, straight to slightly concave; distal lobes separated for nearly half the length of the

penis, each lobe apically rounded, with a hardly sclerotized oval spot on the dorsal side. No median titulators present. There is little variation in the shape of the penis, but due to slight rotation of both penis halves (probably caused by contraction of penis muscles during preservation), there may be an apparent variation in the roundness and rate of divergency of the lobes when figured in a two-dimensional way (Figs 6-8). Cerci uniformly brown from base to apex; darker bands at alternate articulations very vaguely indicated in some specimens.

**Length (in mm):** Body 6.9-8.0; — fore wing 6.7-7.7; — hind wing 2.0-2.1; — cerci 21.3-23.4.

**♀ IMAGO. — Head:** Brown, frontal area pale brown; eyes dark brown to black, dorsally widely separated by about 5 times the width of the anterior ocellus; base of ocelli black; antennae brown with apex of flagellum paler.

**Thorax:** Pronotum pale brown, yellowish brown towards lateral margins; mesonotum brown, mesonotal hump dark brown; metanotum dark brown; pleura and sterna yellowish brown.

**Wings:** Membrane of fore and hind wing pale yellowish, costal and subcostal area in fore wing brown; veins in fore and hind wing brown and slightly more sturdy than in ♂ imago; marginal posterior sclerotisation in fore and hind wing set in from the margin.

**Legs:** Prothoracic legs uniformly brown; meso- and metathoracic legs yellowish brown, distal parts of femur slightly darker, tarsus greyish brown. Length ratios (femur : tibia : tarsus) of prothoracic legs: 1 (= 1.8 mm) : 1.05 : 0.50; mesothoracic legs: 1 (= 2.05 mm) : 0.90-0.95 : 0.35; metathoracic legs: 1 (= 2.30 mm) : 0.80 : 0.30. Length ratios of tarsal joints of prothoracic legs: 1 : 1 : 0.75 : 0.55 : 1.15; mesothoracic legs: 1 : 0.75 : 0.65 : 0.35 : 1.40; metathoracic legs: 1 : 0.60 : 0.50 : 0.35 : 1.35.

**Abdomen:** Tergites uniformly brown, apical tergites progressively more reddish brown; sternites brown, slightly paler than tergites; sternite 9 (Fig. 9) triangular with distal margin concave, lateral margins thick and heavier sclerotized than median parts. Cerci brown, articulations alternately narrowly bordered with darker brown in most specimens.

**Length (in mm):** Body 6.7-8.0; — fore wing 7.7-8.2; — hind wing 1.9-2.2; — cerci 14.9-16.2.

♂ SUBIMAGO. — H e a d: Greyish brown, eyes black, dorsally separated by about 1 times the width of the anterior ocellus.

T h o r a x: Nota dark greyish brown, pleura yellowish brown, washed with grey, sterna pale yellowish brown. The mesonotum of specimens relaxed with sodium phosphate shows brown sclerotized areas embedded in the subimaginal skin along the anterior and lateral margins of the scutoscutellum, along the parapsidal sutures, on the axillary sclerites and a pair of oval spots on the posterior part of the scutoscutellum.

W i n g s: Uniformly grey.

L e g s: Prothoracic legs brown; meso- and metathoracic legs yellowish brown, tibia and tarsus somewhat paler than femur.

A b d o m e n: Tergites uniformly dark greyish brown, apical tergites progressively paler; sternites greyish brown, Genitalia (Fig. 5) yellowish brown, forceps brown; median part of styliger plate clearly more separated from sternite 9 than in ♂ imago. Cerci greyish brown, alternate articulations vaguely bordered with brown.

L e n g t h (in mm): Body 6.9-7.9; — fore wing 7.0-7.7; — hind wing 1.9-2.1; — cerci 15.7-16.1.

♀ SUBIMAGO. — H e a d: Greyish brown, eyes black, dorsally separated by about 6 times the width of the anterior ocellus.

T h o r a x: Nota greyish brown, pleura yellowish brown, sterna pale yellowish brown. Sclerotized areas on mesonotum as in ♂ subimago.

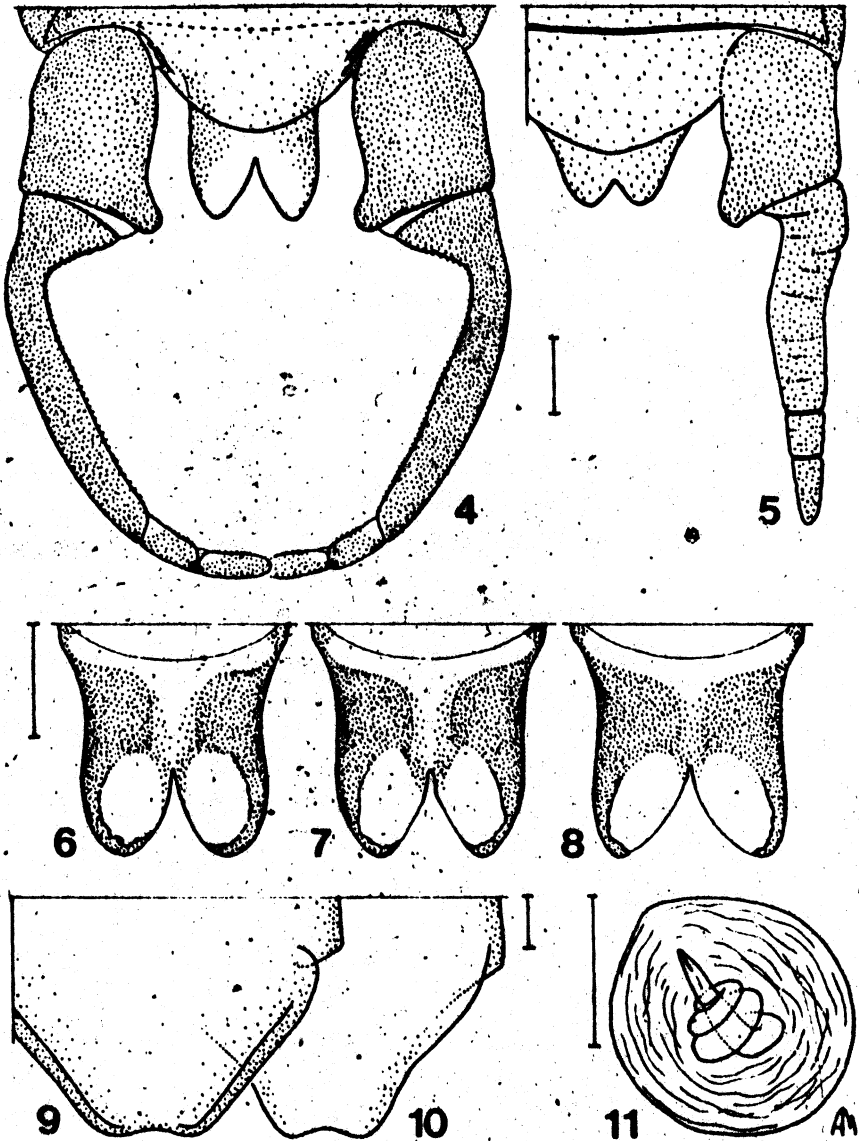
W i n g s: Uniformly grey.

L e g s: Prothoracic legs brown; meso- and metathoracic legs pale yellowish brown, tarsus slightly washed with grey.

A b d o m e n: Uniformly brown to reddish brown, apical segments progressively paler. Sternite 9 (Fig. 10) as in ♀ imago, but narrower in apical half. Cerci greyish brown, alternate articulations vaguely bordered with brown.

L e n g t h (in mm): Body 7.7; — fore wing 6.9-7.8; — hind wing 1.9-2.1; — cerci 15.4.

EGG (taken from ♀ subimago after treatment with 5% solution of sodium phosphate). — Ellipsoid, length 200-217  $\mu$ m, width 175-192  $\mu$ m. Chorion covered with short coiled threads with small terminal adhesion knobs; density of threads high at each pole, much lower in equatorial region. Large equatorial threads, as mentioned for *Afronurus*



Figs 4-10. *Afronurus sibuyanensis* sp. n.: (4) genitalia ♂ imago (ventral view); - (5) genitalia ♂ subimago (ventral view, right forceps omitted); - (6-8) penis ♂ imago (dorsal view, 3 different specimens); - (9) last sternite ♀ imago (ventral view); - (10) last sternite ♀ subimago (ventral view); - (11) encysted nematod from abdomen. - [All bars 0.1 mm]

*peringueyi* (Esben-Petersen) by KOSS & EDMUNDS (1974) and for *A. philippinensis* (Flowers & Pescador) by FLOWERS & PESCADOR (1984), not observed in *A. sibuyanensis*. Micropyle tageniform, sperm guide oval to nearly round, micropylar canal about 1.4 times longer than sperm guide.

LARVA. — Unknown.

PARASITES. — Most specimens contain encysted nematods, characteristically coiled (Fig. 11), attached to the soft tissue of the body or queued up in the femora along the dorsal margin. Abdominal cysts with diameter 140-170  $\mu\text{m}$ , of globular shape; cysts in femora slightly smaller and more compressed.

ECOLOGY. — All specimens were collected at light (description of light screens given by MÜLLER, 1970), merely between 6.30 and 9.45 p.m., both on clear and cloudy nights, sometimes with rain, at air-temperatures of 23-28°C.

Light screens were placed at short distance from the Pawala River in primary forest at the northern, rather steep slopes of the Guitinguitin Range (Manabo Forest). The river is about 25-30 m wide and fast flowing over a bed of stones and large boulders (up to 5 m), no sand. Discharge is strongly correlated with the amount of rain; water is colourless and clear, temperature 24°C.

E t y m o l o g y. — "sibuyanensis", named after the type locality, Sibuyan Island.

## DISCUSSION

The genus *Afronurus* has been established for a species from South Africa by LESTAGE (1924), and 18 species have been added since. Most of these have been described from Africa, but some were recorded also from Israel (DEMOULIN, 1973), the Himalaya (DUBEY, 1971) and the eastern Oriental Region (ULMER, 1939; UÉNO, 1961; FLOWERS & PESCADOR, 1984).

As a generic definition, based on all the known species is still lacking, and phylogenetic relationships within the Heptageniidae are often still poorly understood, it is not certain whether all African and Oriental species really are congeneric. *A. sibuyanensis* is placed in *Afronurus* here, because of the characteristics mentioned by FLOWERS

& PESCADOR (1984), viz. the lack of titulators in the penis and the shape of the styliger plate, in which the forceps bases are separated from the median part.

Among the Heptageniidae from Southeast Asia, *A. sibuyanensis* appears to be closely related to *Ecdyonurus lobatus* Ulmer, 1924, described from the Philippine island of Mindanao. Judging from the detailed description and figures by ULMER (1924) this species belongs in *Afronurus* for the same reasons, as mentioned for *A. sibuyanensis*. In a later paper, ULMER (1939) himself already pointed at the close resemblance between *E. lobatus* and species of *Afronurus*. A transfer from *Ecdyonurus* to *Afronurus* is, therefore, proposed: *Afronurus lobatus* (Ulmer, 1924) comb. nov.

A third Philippine species, *Afronurus philippinensis* Flowers & Pescador, 1984, was described from the Laguna province, on the island of Luzon.

The three *Afronurus* species, now known from the Philippines, are closely related, but differ in the shape of the penis. In *A. lobatus* the lateral margins are converging from the base towards the apex, whereas the penile lobes are rounded distally and separated only for a short distance. In *A. sibuyanensis* the lateral sides are parallel, the penile lobes are distally rounded, but they are separated for almost half the length of the penis. In *A. philippinensis* the lateral margins are diverging towards the apex, the lobes are truncate distally and widely separated for a long distance.

Among the remaining Oriental *Afronurus*, UENO (1961) refers to a species from Thailand, without, however, giving any name or description. Two Himalayan species, *A. solangensis* Dubey, 1971, and *A. curtus* Dubey, 1971, have been described from a single ♀ each (judging from the original descriptions and figures even a ♀ subimago). Their generic affinities, therefore, are questionable, since in Heptageniidae the genera are mainly recognized by peculiarities of ♂ imago or larval stages. The male is known only of *A. javanicus* Ulmer, 1939, described in detail by ULMER (1939), from a single specimen from Java. The shape of its penis is similar to that in *A. lobatus*; titulators are apparently lacking. *A. javanicus*, however, differs from the Philippine species in the shape of the styliger plate, in which the forceps bases are not really separated from the median part, thus representing the common type of styliger plate in Heptageniidae.



## ACKNOWLEDGEMENTS

Thanks are due to Mr ROLAND A. MÜLLER (St Gallen, Switzerland) for making the material available for study and for providing information on the type locality. His field work has been greatly facilitated through the good offices of the Mayor of Magdiwang, Mr RODOLPHO ALINO, while his expedition guides, GILBERT and CATALINO, rendered the assistance in collecting.

## REFERENCES

- DEMOULIN, G., 1973. Contribution à l'étude des Éphéméroptères d'Israël. Introduction et I. Heptageniidae. *Bull. Inst. r. Sci. nat. Belg.* 49(8): 1-19.
- DUBEY, O.P., 1971. Torrenticole insects of the Himalaya. VI. Descriptions of nine new species of Ephemerida from the Northwest Himalaya. *Orient. Insects* 5: 521-548.
- FLOWERS, R.W. & M.L. PESCADOR, 1984. A new *Afronurus* (Ephemeroptera: Heptageniidae) from the Philippines. *Int. J. Ent.* 26: 362-365.
- HUBBARD, M.D. & M.L. PESCADOR, 1978. A catalog of the Ephemeroptera of the Philippines. *Pacif. Insects* 19: 91-99.
- KOSS, R.W. & G.F. EDMUNDS, 1974. Ephemeroptera eggs and their contribution to phylogenetic studies of the order. *Zool. J. Linn. Soc.* 55: 267-349.
- LESTAGE, J.A., 1924. Les Éphémères de l'Afrique du Sud. Catalogue critique & systématique des espèces connues et description de trois genres nouveaux et de sept espèces nouvelles. *Revue zool. afr.* 12: 316-352.
- MÜLLER, R., 1970. Lichtfang-Geräte. *Ent. Z. Frankf./M.* 80: 181-194.
- MÜLLER-LIEBENAU, I., 1980. Jubabaetis gen. n. and Platybaetis gen. n., two new genera of the family Baetidae from the Oriental region. In: J.F. Flanagan & K.E. Marshall [Eds], *Advances of Ephemeroptera biology*, pp. 103-114. Plenum, New York-London.
- UENO, M., 1961. Mayflies of Thailand. *Nature Life southeast Asia* 1: 207-208.
- ULMER, G., 1924. Ephemeropteren von den Sunda-Inseln und den Philippinen. *Treubia* 6: 28-91.
- ULMER, G., 1939. Eintagsfliegen (Ephemeropteren) von den Sunda-Inseln. *Arch. Hydrobiol. (Suppl.)* 16: 443-492.

Received August 28, 1987