KOREAN JOURNAL OF ENTOMOLOGY
Vol. 33, No. 4, pp. 257～261, December 2003

Research Paper

Two New Species of *Afronurus* (Ephemeroptera: Heptageniidae) from Vietnam

NGUYEN, Van Vinh and Yeon Jae BAE*

Department of Biology, Seoul Women's University, Seoul 139-774, Korea

ABSTRACT **Two new species of the heptageniid mayfly genus *Afronurus* Lestage, *Afronurus meo* sp. n. and *Afronurus mnong* sp. n., are described from Vietnam with line-drawings of key characters. The larvae of *A. meo* can be characterized by rowed minute spines in the posterior margin of the abdominal terga 1-9 and distinct markings on anterior head, dorsal femora, and abdominal terga. The larvae of *A. mnong* can be characterized by scattered simple stout setae on the anterior margin and dorsal surface of femora, rowed acute spines on the posterior margin of abdominal terga 1-9, and plain brown body color. Their diagnoses, material data, distributions, and habitat and biological data are provided.**

Key words : ***Afronurus meo*, *Afronurus mnong*, description, mayflies, taxonomy**

INTRODUCTION

The heptageniid mayfly genus *Afronurus* was established by Lestage (1924) from the African representatives assigned to the genus *Ecdyonurus* Eaton. Although the generic concept of *Afronurus* was sometimes questioned (see Kang and Yang, 1994), the larvae of the genus can be characterized by greatly expanded labrum and elongated and pointed gills 1.

Presently, the genus *Afronurus* includes 21 species worldwide: 12 species from Africa and nine species from the Oriental region (Ulmer, 1939; Flowers and Pescador, 1984; Kang and Yang, 1994). Members of *Afronurus* have not been reported from Vietnam.

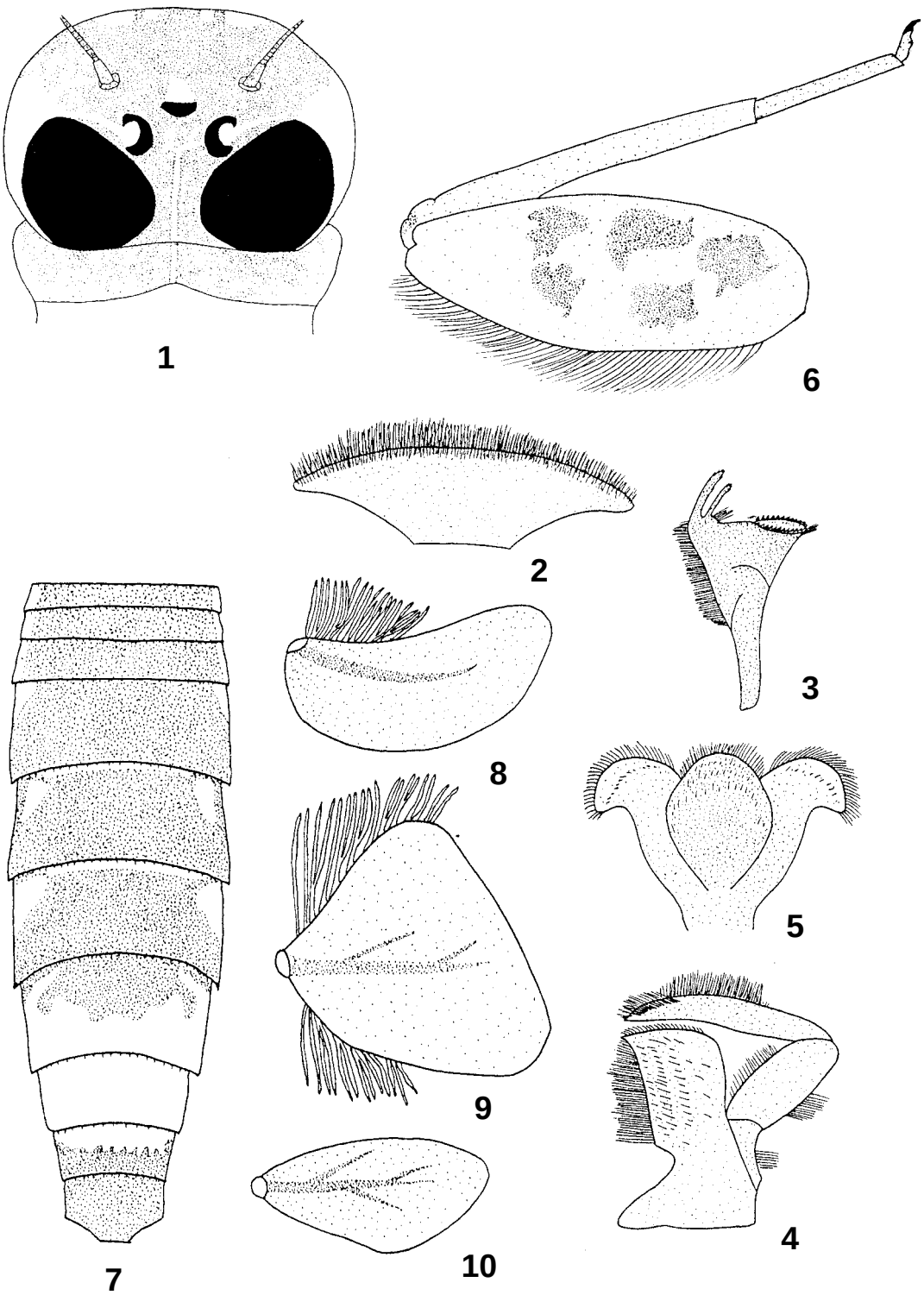
In a series of systematic study of Vietnamese mayflies, we herein report two new species of *Afronurus*. Materials used in this study were collected from Vietnam during the field trips in 2000-2001. Larvae were collected by Surber nets and kick nets. All the materials are preserved in 80% ethyl alcohol and deposited in the Aquatic Insect Collection of Seoul Women's University (SWU-AIC). In the future, the type materials will be appropriately returned to the places (e.g. Hanoi University of Science) where they originated.

*** Corresponding author**
E-mail: yjbae@swu.ac.kr, Tel: 82-2-970-5667

TAXONOMIC ACCOUNTS

Afronurus meo sp. n. (Figs. 1-10)

Larva. Male body length 5.2 mm; caudal filaments 5.5 mm. Female body length 6.2-6.5 mm; caudal filaments 6.3-7.0 mm. Body orange brown, with light yellow markings. HEAD: Head (Fig. 1) 1.1 mm in length, 1.6 mm in width, with 4 light yellow round markings on anterior margin (lateral markings larger and often merged with smaller submedian markings), and with light yellow areas in lateral regions, around ocelli, and along ecdysial lines. Antennae 1.1 mm in length, light yellow. Labrum (Fig. 2) 0.45 mm in width, greatly expanded laterally; anterior area with dense long hairlike setae. Mandibles (Fig. 3) lateral margin with dense hairlike setae; incisors serrate; inner incisor slender, slightly shorter to subequal in length to outer incisor. Maxillae (Fig. 4) galea-lacinia with pectinate setae on crown, with long hairlike setae on inner margin, with scattered hairlike setae on ventral surface; maxillary palp basal segment 0.45 mm in length, with rowed hairlike setae on inner and outer margins; apical segment 0.65 mm in length, apically pointed, with rowed hairlike setae on outer margin, and with dense hairlike setal field apically. Hypopharynx (Fig. 5) lingua conical; superlinguae with well developed lateral expansions,



Figs. 1–10. *Afronurus meo*, larva: 1, head; 2, labrum (dorsal); 3, left mandible (dorsal); 4, right maxilla (dorsal); 5, hypopharynx (ventral); 6, foreleg (dorsal); 7, abdomen (dorsal); 8, gill 1; 9, gill 3; 10, gill 7.

with rowed dense marginal setae. Labium with U-shaped separation between glossae; paraglossae moderately expanded laterally; labial palp basal segment 0.50 mm in length; apical segment 0.60 mm in length. THORAX: Pronotum (Fig. 1) 1.6 mm in width, expanded laterally, with light yellow

round markings; posterior margin concave. Femora orange brown with dark brown markings as in Fig. 6; tibiae yellowish brown; tarsi light brown. Forefemora (Fig. 6) with long hairlike setae on posterior margin; forefemora, foretibiae, foretarsi, and foreclaws 1.2 mm, 0.8 mm, 0.5 mm, and 0.1 mm, respectively. Midfemora, midtibiae, midtarsi, and midclaws 1.1 mm, 0.9 mm, 0.4 mm, and 0.1 mm, respectively. Hindfemora, hindtibiae, hindtarsi, and hindclaws 1.4 mm, 1.0 mm, 0.4 mm, and 0.1 mm, respectively. ABDOMEN: Terga (Fig. 7) orange brown with light yellow markings as in Fig. 7; terga 1–9 with row of minute spines on posterior margin. Gills (Figs. 8–10) hyaline; tracheae and dorsal part of lamellae light brown. Caudal filaments light brown.

Adult. Unknown.

Diagnosis. The larvae of *A. meo* can be distinguished from other congeners by the combination of the following characters: anterior margin of the head with four light yellow round markings (lateral markings larger and often merged with smaller submedian markings); posterior margin of the abdominal terga 1–9 with rowed minute spines; abdominal terga with distinct markings as in Fig. 7; body size is relatively small (5.2–7.0 mm). The larvae of *A. meo* are similar to those of *A. hyalinus* (Ulmer) (see Kang and Yang, 1994) and *A. philippinensis* Flowers and Pescador (1984), but they can be distinguished by body size and markings.

Material examined. Holotype. Mature male larva (SWU–EPH–3207): Vietnam, Lao Cai Province, Sa Pa, Cat Cat (1400 m), 18 October 2000, V. V. Nguyen, deposited in the Aquatic Insect Collection of Seoul Women's University. Paratypes: 5 larvae (SWU–EPH–3208, 3209): same data as holotype. Other material: 2 immature larvae: same data as holotype.

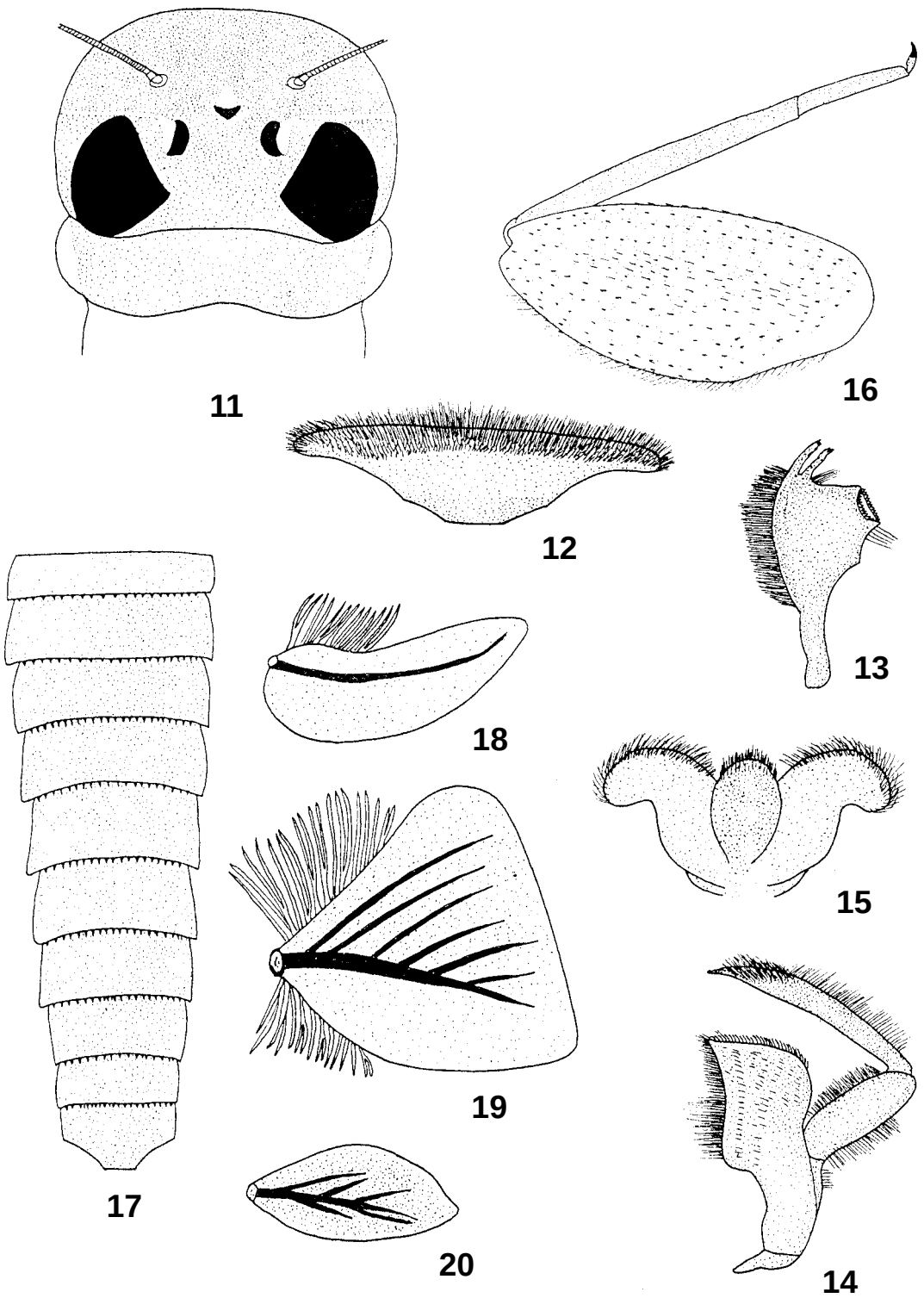
Etymology. The specific name of this species is in honor of the ethnic minority people "Meo" in Vietnam, who live around the holotype locality.

Distribution. Northern Vietnam.

Habitat and biology. The larvae of *A. meo* occur in high mountain areas in northern Vietnam ranging 1300–1400 m in altitude where the streams are about 10–12 m wide and 15–40 cm deep during the dry season (November–April). They are found underneath stones and trapped debris in the moderately flowing sections of the streams. The substrate consists of large stones, coarse shifting sand, and terrestrial vegetation. The water temperature ranges 17–20°C, and pH ranges 7.5–7.8.

Afronurus mnong sp. n. (Figs. 11–20)

Larva. Body length 5.5 mm; cerci 6.5 mm, terminal filament 7.2 mm. Body light brown to brown, without distinct markings. HEAD: Head (Fig. 11) brown, without distinct markings, 1.4 mm in length, and 2.2 mm in width. Antennae 1.2 mm in length; pedicel light brown; flagellum light yellow. Labrum (Fig. 12) 0.90 mm in width; anterior area greatly expanded laterally, with dense long hairlike setae. Mandibles (Fig. 13) lateral margin with dense hairlike setae; incisors serrate; inner incisor slender, slightly shorter to subequal in length to outer incisor. Maxillae (Fig. 14) galea–lacinia with pectinate setae on crown, with long hairlike setae on inner margin, with scattered hairlike setae on ventral surface; maxillary palp basal segment 0.48 mm in length, with rowed hairlike setae on inner and outer margins; apical segment 0.55 mm in length, apically pointed, with rowed hairlike setae on outer margin, and with dense hairlike setal field apically. Hypopharynx (Fig. 15) lingua conical; superlinguae with well developed lateral expansions, with rowed dense marginal setae. Labium with U–shaped separation between glossae; paraglossae moderately expanded laterally; labial palp basal segment 0.60 mm in length; apical segment 0.75 mm in length. THORAX: Nota brown with somewhat lighter markings; pronotum (Fig. 11) 2.1 mm in width, expanded laterally; posterior margin concave. Forefemora (Fig. 16) with sparse simple stout setae (setae color blackish brown) on anterior margin and dorsal surface, with long hairlike setae on posterior margin; forefemora, foretibiae, foretarsi, and foreclaws 1.7 mm, 1.4 mm, 0.4 mm, and 0.1 mm, respectively. Midlegs and hindlegs similar to forelegs; midfemora, midtibiae, midtarsi, and midclaws 1.9 mm, 1.4 mm, 0.4 mm, and 0.1 mm, respectively; hindfemora, hindtibae, hindtarsi, and hindclaws 2.2 mm, 1.7 mm, 0.4 mm, and 0.1 mm, respectively. ABDOMEN: Terga (Fig. 17) brown, with somewhat lighter sublateral markings; terga 1–9 with rowed acute spines on posterior margin. Gills (Figs. 18–20) hyaline; tracheae distinct. Caudal filaments brown, with whorl of simple stout setae apically on each segment (setae on every 2nd segment pronounced).



Figs. 11–20. *Afronurus mnong*, larva: 11, head; 12, labrum (dorsal); 13, left mandible (dorsal); 14, right maxilla (dorsal), 15, hypopharynx (ventral); 16, foreleg (dorsal); 17, abdomen (dorsal); 18, gill 1; 19, gill 3; 20, gill 7.

Adult. Unknown.

Diagnosis. The larvae of *A. mnong* can be distinguished from other congeners by the combination of the following characters: body brown, without distinct markings; forefemora (Fig. 16) with scattered stout setae on anterior margin and

dorsal surface; abdominal terga 1–9 (Fig. 17) brown, without distinct markings, with rowed acute spines on posterior margin.

Material examined. Holotype: Mid-grown female larva (SWU-EPH-3210), Vietnam, Nghe An Province, Con Cuong, Khe Choang, 12 January 2001 (V.V. Nguyen), deposited in the Aquatic Insect Collection of Seoul Women's University. Paratypes: 2 larvae (SWU-EPH-3211): same data as holotype.

Etymology. The specific name of this species is in honor of the ethnic minority people "M'nông" in Vietnam, who live around the holotype locality.

Distribution. Vietnam.

Habitat and biology. The larvae of *A. mnong* occur in the lower reaches of mountain streams ranging 550–650 m in altitude where the streams are about 15–18 m wide and 10–45 cm deep during the dry season (November–April). The substrate is mostly stony and sandy. The water temperature ranges 25–27°C, and pH ranges 7.2–7.6.

ACKNOWLEDGMENTS

This work was supported by the grant No. R01-2001-000-00086-0 from the Basic Research Program of the Korea Science & Engineering Foundation.

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(Received 20 October 2003; Accepted 24 November 2003)