FOUR NEOPH EmersoniD MoTHS FROM VIETNAM

Abstract.—Four neophemerid mayflies, Potamantlius amahilis (Eaton), P. caenoides (Ulmer) (new record), P. edmundsi Bae & McCafferty (new record), and P. unicntibus (new SPECIES), are reviewed based on materials collected throughout Vietnam. Description, larval habitats, and life histories and biological data, taxonomic remarks, and a larval key are provided for known species and stages.

Key Words.—Potamantlius unicntibus, Neophemeridae, Ephemeroptera, taxonomy, Vietnam.

The Neophelemidae is a small group of mayflies that contains three genera and twelve species worldwide (Bae & McCafferty 1998). The family is distributed throughout the Holarctic and Oriental regions. The larvae of Neophemeridae have unique operculum gills on the second abdominal segment that are fused medially. This character easily distinguishes them from the larvae of other mayfly families, particularly from those of Caenidae. The adults and subimagos are characterized by the MP2 and CuA veins of forewings that are arched basally, by the A1 vein of forewings that has 1 to 2 veins, and by either slightly furred or atrophied penes. The family was comprehensively revised by Bae & McCafferty (1998).

In Southeast Asia, members of the family have been studied by Eaton (1892), Ulmer (1932, 1939), Lestage (1930), Dang (1967), and Bae & McCafferty (1998); and three nominal species, Potamantlius amahilis (Eaton), P. caenoides (Ulmer), and P. edmundsi Bae & McCafferty, are known. One species, Neophelemia projecta Zhou & Zheng (2001), was recently described from southern China. In Vietnam, only P. amahilis is known (Lestage 1930, Ulmer 1932, Dang 1967, Bae & McCafferty 1998).

The purpose of this study is to review and additinally describe the Vietnamese species of Neophemeridae. All larval and adult materials used in this study were collected throughout Vietnam during field trips in 2000-2002. The materials are preserved in 80% ethyl alcohol and are housed in the Aquatic Insect Collection of Seoul Women's University (SWU-ASIC). In the future, the holotype material will be appropriately returned to an authorized institution or museum in Vietnam (e.g., Hanoi University of Science). Terminology, measurement, and other taxonomic methods are followed from Bae & McCafferty (1991, 1998).

Potamanthius amahilis (EATON)

Rheoanthis amahilis Eaton, 1892: 188.

Potamantlius amahilis Eaton: Lestage 1930: 120; synonymized by Ulmer, 1932.


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In a Malaysian river, the larvae were also taken from the *Saraca* root balls in muddy pool areas by G. F. Edmunds, Jr. (Bae & McCafferty 1998).

Remarks.—The lectotype (male imago) of this species was designated by Bae & McCafferty (1998) from Indonesia (Sumatra). We report this species from Vietnam for the first time. This species is known to be widespread in insular and peninsular Southeast Asia.

*Potamanthellus edmundsi* Bae and McCafferty


Diagnosis.—Larvae of *P. edmundsi* can be distinguished from other species of *Neoephemeridae* by the combination of lacking a diagonal ridge on the operculate gills, having rudimentary posteromedian tubercles on the abdominal terga 6–8, having a transverse setal row on the dorsal forefemora, mid-sized body (10–11 mm), and relatively short caudal filaments (0.5 × length of body) that have moderately developed lateral hairlike setae.


Distribution.—Malaysia (Malay Peninsula), Thailand, Vietnam.


Habitat and Biology.—Larvae of *P. edmundsi* occur in the lower reaches of mountain streams (alt. 500–650 m) in limestone areas where the streams are 20–80 m wide, 10–50 cm deep, contain a large number of rapids and backwaters. In these streams, water temperature ranges 18–25°C; pH ranges 7.6–8.1; and the substrates are mostly stony on a sandy bottom. The larvae often occur together with other mayfly larvae such as *Rheoanthis magnificus* and *Ephemerella* spp.

Remarks.—*Potamanthellus edmundsi* Bae & McCafferty (1998) was described based on larval materials from Malaysia (Malay Peninsula) and Thailand. From our studies of *P. edmundsi* from Vietnam, this species seems to be widespread in peninsular Southeast Asia. Although *Potamanthellus cuaroensis* (Dang 1967) was previously synonymized with *P. amabilis* (Eaton 1892) (see Remarks under *P. amabilis*, above), it has been also assumed that *P. cuaroensis* is closely related to *P. edmundsi* because the larvae of *P. edmundsi* were collected at a place (Con Cuong) near the type locality (Cua Rao) of *P. cuaroensis* (Con Cuong is located in ca. 60 km NW from Cua Rao). It is, however, noted that types and all reference materials of *P. cuaroensis* were lost (N. T. Dang, personal communication); and diagnostic characters in Dang's (1967) description are not enough to taxonomically associate *P. edmundsi* with *P. cuaroensis*. Adults of this species are required to verify the relations of the Vietnamese populations of *P. edmundsi* with other species of *P. amabilis*-group. *Potamanthellus amabilis*-group (*P. amabilis*, *P. cuaroensis*, *P. ganges*, *P. edmundsi*, and *P. chinensis*) is characterized by the reduced or absent diagonal ridge on the operculate gills and presumably by the atrophied genitalia (widely separated penes beyond the subgenital plate) (Bae & McCafferty 1998).

*Potamanthellus unicantius* Nguyen and Bae, NEW SPECIES

(Figs. 1–9)

Types.—Holotype: mature female larva (SWU-EPH-3546), VIETNAM, Lao Cai Prov., Sa Pa, Trung Trai, alt. 1200 m, 29 Dec 2000, V. V. Nguyen & T. K. T. Cao. deposited at...
apically dark surface.

greatly
row,
respectively. Foretemora (Figs. 1 and lateral margins
mm.
setae along margins. Labial palpi (Fig. 7) J-segmented: segment
incisors of right mandible (Fig. 4) trifurcate and bifurcate.
setae on anierolaterally
head brown, with
Body (Fig. 
same as holotype, deposited at
SWU-AIC.

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0.50 mm, and 0.25 mm, respectively; midlomena light yellow, without markings; midtibiae and midtarsi
brown with row of hairlike setae on inner margin; midtibiae basally brown and apically dark brown.

Hindlomena, hindtibiae, hindtarsi, and hindtarsi 1.90 mm, 1.00 mm, 0.80 mm, and 0.30 mm, respectively; color and setation similar to midlegs. Abdomen: Terga 1–10 (Fig. 1) brown, with longitudinal dark brown
median stripe; posteromedian tubercle on abdominal tergum 1 small, on tergum 2 distinct, on tergum 6
mutualy, and on tergum 7–10 absent; posterolateral projections on tergum 6–9 moderately developed, with weakly developed simple stout setal fields. Gills (Fig. 1) on abdominal segments 1–6: gills 1 vestigial, 2-segmented, anterolaterally oriented, and with dense hairlike setae marginally; gills 2
operculate, subquadrate, brown (lacking tiny light spots), with minute setae on dorsal surface, with row of
hairlike setae along medial margin, with marginal membrane posteriorly, and without diagonal ridge; gills 3–5 double, fringed, concealed under operculate gills; gills 6 single, exposed (in all specimens
examined herein, gills 6 are exposed as in Fig. 1), with row of marginal fringes. Cerci and median
terminal filiment brown, robust, ca. 0.5 X length of body, with whorls of dark brown stout setae, without
lateral setae.

Male and Female Adults: Unknown.

Diagnosis.—Larvae of P. unicusibius are distinguished from other species of Neoephemeridae by the combination of lacking diagonal ridge on the operculate gills, lacking posteromedian tubercles on the abdominal terga 6–8 (tubercle on tergum 6 sometimes rudimentary), greatly elongated labial palp segment 3 (5.6 X length of segment 2), transverse row of
stout setae on the dorsal foretemora, two rows of greatly developed hairlike setae diagonally arranged on the dorsal surface of foretibiae, and single row of greatly developed hairlike setae diagonally arranged on the dorsal surface of foretarsi (Figs. 1 and 8).

Distribution.—Northern Vietnam.

Etymology.—The specific name unicusibius is Latin, from unicus (unique) and tibia (tibia), an allusion of the unique foretibiae that have two rows of long filtering setae.


Habitat and Biology.—Larvae of P. unicusibius occur in the high mountain areas of northern Vietnam ranging 1100–1300 m in altitude where the streams are 15–18 m wide and 10–50 cm deep during the dry season. The stream banks are covered by tropical evergreen trees. The stream substrates consist of mixed sand, gravel, and larger stones with rich organic matter. In streams of Sa Pa in December, water temperature is 17°C and pH is 7.6–8.0. The larvae occur in slow current areas and pools. General kick sampling yields the larvae. Well-developed hairlike setal rows on the forelegs as well as highly setaceous mouthparts indicate that the larvae are probably active filterers or deposit filters. Some mayfly larvae, e.g., larvae of Potamanthidae (Bae & McCafferty 1991, 1995; McCafferty & Bae 1992), having similar filtering setae on the forelegs show such filtering behavior.

Remarks.—When considering phylogenic characters, the combination of the characters of the absence of lateral setae in caudal filaments, setaceous mouthparts, and the absence of natal expansions in the larvae of P. unicusibius does not agree with the current generic concepts of neoephemerid genera, i.e., Potamanthellus, Ochomerovia, and Neoephemera (see character table and cladogram in Bae & McCafferty 1998). We, therefore, provisionally classify this species in Potamanthellus based on general phentic similarity of the larval body, although those larval characters are considered plesiomorphic. The unique setal rows on the foretibiae and foretarsi and extremely setaceous mouthparts could be the autopomorphies of this taxon. When the adults of this species are known, its phylogeny and phylogenetic classification have to be re-worked.
KEY TO VIETNAMESE SPECIES OF NEOEPHEMERIDAE

Known larvae
1a. Foretibiae with two diagonal rows of long hairlike setae dorsally (Fig. 1) ........................................... Potamanthelius anicitibus
1b. Foretibiae without diagonal rows of long hairlike setae dorsally ........... 2
2a (1b). Abdominal terga 6–8 with distinct posteromedian tubercles ........... Potamanthelius caenoides
2b. Abdominal terga 6–8 with rudimentary posteromedian tubercles or lacking them ........................................... 3
3a (2b). Operculate gills with rudimentary diagonal ridge ....................... Potamanthelius amabilis
3b. Operculate gills without diagonal ridge ..................................... Potamanthelius edmundsi

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LITERATURE CITED


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