

## Two Heptageniid Mayflies, *Iron martinus* Braasch and Soldán and *Iron longitibius* New Species (Ephemeroptera: Heptageniidae), from Vietnam

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베트남산 납작하루살이류 2종, *Iron martinus* Braasch and Soldán 및 *Iron longitibius* New Species (하루살이목: 납작하루살이과). 원 빈 · 배연재\* (서울여자대학교 생물학과)

베트남산 납작하루살이류 2종 (*Iron martinus* Braasch and Soldán 및 *I. longitibius* new species)의 유충을 기재하였다. *Iron martinus* 유충은 1~9 배마디에 있는 한쌍의 등가시에 의하여 구별되고, *I. longitibius* 유충은 상대적으로 긴 앞다리 종아리마디에 의하여 구별된다. 그들의 기재, 진단 형질, 검색 형질의 그림, 관찰한 표본, 분포, 서식처 및 생물 자료를 제시하였다.

**Key words :** description, larva, taxonomy, tropical Asia

### INTRODUCTION

The heptageniid mayfly genus *Iron* Eaton is a common aquatic insect group in temperate streams. The larvae are abundantly found in torrential areas of mountain streams such as riffles and cascades of clean upper reaches of the streams. Their extremely flattened body and sucking disks, which are formed by the abdominal gills, enable them to inhabit the torrential microhabitats clinging on the stones (Edmunds *et al.*, 1976). In most species of the genus, the first abdominal gills are greatly extended beneath the abdomen.

The genus *Iron* is a cold-adapted group of mayflies in the northern hemisphere. They are widely distributed in the Holarctic region, but less diverse in the Neotropical and Oriental regions (Edmunds *et al.*, 1976; Dudgeon, 1999). Members of the genus have not been well known in tropical Asia. Braasch and Soldán (1984) described one species, *Iron martinus*, from northern Vietnam, but no other species in the genus has

been reported from Southeast Asia.

In a series of the systematic study of Vietnamese mayflies, we report two species of *Iron* including *I. martinus* and a new species in this paper.

### MATERIALS AND METHODS

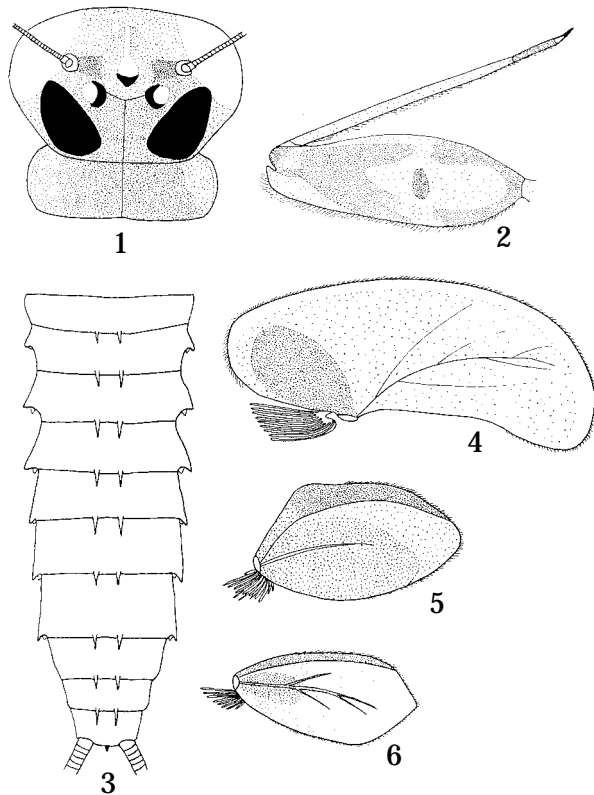
Materials were collected from Vietnam during the field trips in 2000~2002. Larvae were collected by Surber nets and kick nets. All the larvae are preserved in 80% ethyl alcohol and deposited in the Aquatic Insect Collection of Seoul Women's University (SWU-AIC). In the future, the type material will be appropriately returned to the places (e.g., Hanoi University of Science or authorized museums) where it was held originally.

### TAXONOMIC ACCOUNTS

*Iron martinus* Braasch and Soldán (Figs. 1-6)

*Iron martinus* Braasch and Soldán, 1984: 113

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**Figs. 1–6.** *Iron martinus* Braasch and Soldán: (1) head, (2) foreleg, dorsal, (3) abdomen, dorsal, (4) gill 1, (5) gill 3, (6) gill 7.

(Larva).

**Description. Mature larva.** Male body length 9.9 mm; cerci 19.2 mm. Female body length 11.5 mm; cerci 18.6 mm. Body brown, with dark brown markings. **Head.** Head (Fig. 1) 2.0 mm in length, 3.1 mm in width, with light brown round markings anteromedially, with light brown area anterolaterally. Antennae 2.3 mm in length; pedicel dark brown; flagellum light brown apically. Labrum 0.90 mm in width, with distinct median notch on anterior margin, with long hairlike setae dorsally and marginally. Mandible incisors slightly to moderately serrate; outer incisor heavier and longer. Maxillae without armature on crown of galea–lacinia; apex of galea–lacinia terminating with three stout teeth and single plumose seta; ventral surface of galea–lacinia with submedian row of setae; maxillary palp basal segment 0.80 mm, with sparse long hairlike setae; apical segment 0.95 mm, with numerous hairlike setae apically. Hypopharynx lingua with anterolateral lobes; superlinguae slightly expand-

ed laterally, with row of dense hairlike setae. Labium with broad rectangular separation between glossae; glossae pointed apically; paraglossae slightly expanded laterally; labial palp basal segment 0.90 mm; apical segment 1.10 mm, with rows of pectinate and hairlike setae on outer margin. **Thorax:** Pronotum 2.7 mm in width. Forelegs (Fig. 2) light yellow with irregular dark brown markings and median black spot; forecoxae with distinct posterior projection dorsally; forefemora with row of long hairlike setae along posterior margin; foretibiae and foretarsi with rowed dense hairlike setal field dorsally; foreclaws with four denticles. Forefemora 2.6 mm, foretibiae 2.4 mm, foretarsi 0.9 mm, and foreclaws 0.3 mm in length. Midlegs and hindlegs similar to forelegs in color and setation. Midfemora 3.1 mm, midtibiae 2.8 mm, midtarsi 0.8 mm, and midclaws 0.3 mm in length. Hindfemora 3.4 mm, hindtibiae 2.4 mm, hindtarsi 0.7 mm, and hindclaws 0.3 mm in length. **Abdomen:** Terga 1–2 light brown; terga 3–9 medially and laterally dark brown, with small light brown spots submedially; terga 1–9 with paired long acute submedian spines (spines dark brown to blackish brown) on posterior margin (Fig. 3); terga 1–10 with rowed long median hairlike setal field; terga 2–7 with moderately developed posterolateral projections. Gills (Figs. 4–6) on abdominal segments 1–7, with fine hairlike setae along margin; gills 1 (Fig. 4) greatly extended beneath abdomen forming sucking disc, relatively longer than wide; gills 7 (Fig. 6) folded and curved downward. Cerci with rowed hairlike setal field dorsally, without distinct whorls of spines or setae on joints, ca.  $1.9 \times$  length of body.

**Adult.** Unknown.

**Diagnosis.** The larvae of *I. martinus* can be easily distinguished from those of other congeners by the paired long acute submedian spines on the abdominal terga 1–9 (Fig. 3).

**Material examined.** 18L: Lao Cai Prov., Sa Pa, Cat Cat (alt. 1400 m), 2000 X 18, 2002 III 21, 2002 IV 21–22, Y.J. Bae, V.V. Nguyen & D.H. Hoang; 7L: Lao Cai Prov., Sa Pa, Thac Bac (alt. 2400–2700 m), 2000 X 19, V.V. Nguyen; 1L: Lao Cai Prov., Sa Pa, Muong Hoa (alt. 1500 m), 2000 X 20, V.V. Nguyen; 3L: Ha Giang Prov., Vi Xuyen, Tay Con Linh, 2000 X 9, V.V. Nguyen; 9L: Vinh Phuc Prov., Tam Dao N.P., Thac Bac Cr. (alt. 300–900 m), 2000 X 16, 2001 II 14–15, 2002 III 15, V.V. Nguyen; 4L: Dak Lak Prov., Dak Pri' Cr.

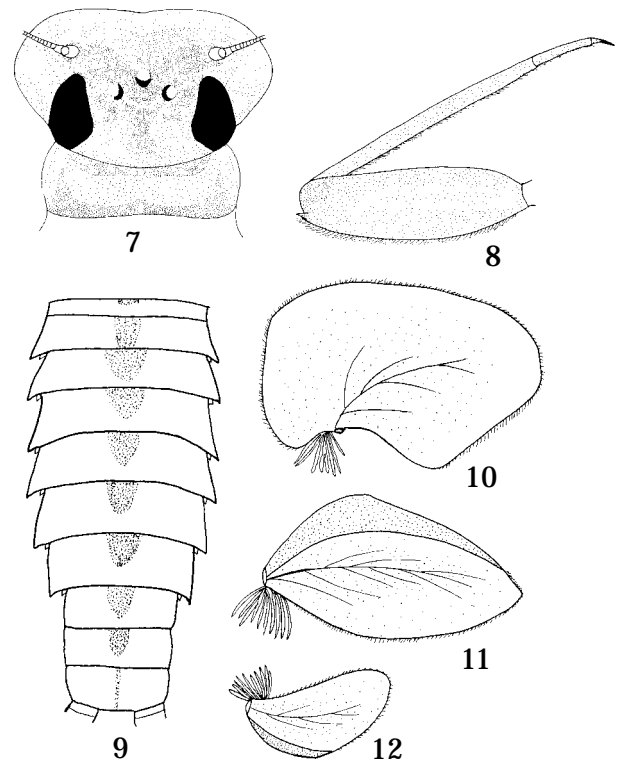
(alt. 700~900 m), 2001 III 3, D.H. Hoang; 6L: Da Nang Prov., Bana, Nui Chua, Mo Cr., 2002 IV 1, 2002 IV 4, V.V. Nguyen & D.H. Hoang; 1L: Thua Thien Hue Prov., Aluoi, Hong Thuy, 2002 I 9, T.K.T. Cao.

**Distribution, habitat and biology.** Braasch and Soldán (1984) firstly reported this species from northern Vietnam (Tam Dao National Park in Lao Cai Province), but we found this species is distributed throughout Vietnam (see Material examined, above). The larvae of *I. martinus* are found in mountain streams ranging 300~2,800 m in altitude. The streams are 15~20 m wide and 10~55 cm deep in the dry season (November~April). The water temperature range is 18~24°C and the pH range is 7.5~7.8. The larvae are found underneath stones in moderately flowing area of the streams where the substrate is mostly stony on a sandy bottom. General sampling such as Surber sampling can yield the larvae.

**Remarks.** We collected the larvae of this species from the holotype locality of this species and many other places throughout Vietnam. Since Braasch and Soldán's (1984) original description was written in German, we provide the larval description in English based on our material for a wider readership.

*Iron longitibius* sp. n. (Figs. 7–12)

**Description. Mature larva.** Body length 17.5 mm; cerci 25.5 mm. Body light brown, with reddish brown markings. **Head:** Head (Fig. 7) 3.1 mm in length, 4.9 mm in width; anterior margin of head slightly concave, with numerous hairlike setae along anterior margin. Antennae 2.6 mm in length; pedicel apically dark brown; flagellum apically light brown. Labrum 1.15 mm in width, with distinct median notch on anterior margin, with long hairlike seta dorsally and marginally. Mandible incisors slightly to moderately serrate; outer incisor heavier and longer. Maxillae without armature on crown of galea-lacinia; apex of galea-lacinia terminating with three stout teeth and single plumose seta; ventral surface of galea-lacinia with submedian row of setae; maxillary palp basal segment 1.20 mm, with sparse hairlike setae; apical segment 1.62 mm, with numerous hairlike setae apically. Hypopharynx lingua with anterolateral lobes; superlinguae slightly expanded laterally, with row of dense hairlike setae.



**Figs. 7–12.** *Iron longitibius* sp. n. (7) head, (8) foreleg, dorsal, (9) abdomen, dorsal, (10) gill 1, (11) gill 3, (12) gill 7.

Labium with broad rectangular separation between glossae; glossae apically pointed; paraglossae slightly expanded laterally; labial palp basal segment 1.30 mm; apical segment 1.35 mm, with rows of hairlike setae on outer margin. **Thorax:** Pronotum (Fig. 7) 4.2 mm in width. Forelegs (Fig. 8) brown, with light yellow markings; forecoxae with distinct posterior projection dorsally; forefemora with row of long hairlike setae along posterior margin, without distinct setae dorsally; foretibiae and foretarsi with rowed dense hairlike setal field dorsally; foretibiae relatively long (ca.  $1.2 \times$  length of forefemora). Forefemora 3.6 mm, foretibiae 4.1 mm, foretarsi 1.1 mm, and foreclaws 0.5 mm in length. Midlegs and hindlegs similar to forelegs in color and setation. Midfemora 4.0 mm, midtibiae 4.1 mm, midtarsi 1.0 mm, and midclaws 0.4 mm in length. Hindfemora 4.8 mm, hindtibiae 3.9 mm, hindtarsi 0.9 mm, and hindclaws 0.4 mm in length. **Abdomen:** Terga 1–10 (Fig. 9) brown, with distinct median dark brown markings, with rowed long median hairlike setal field, with rowed spines on posterior

margin (long and short spines alternating); terga 2–7 with moderately developed posterolateral projections. Gills (Figs. 10–12) on abdominal segments 1–7, with fine hairlike setae along margin; gills 1 (Fig. 10) greatly extended and overlapping beneath abdomen, broadened anteriorly forming sucking disc; gills 2–7 with small process on anterobasal margin; gills 7 (Fig. 12) elongated and curved downward. Cerci light brown, without markings, with rowed hairlike setal field dorsally, with whorls of marginal spines on joints, ca.  $1.5 \times$  length of body.

**Adult.** Unknown.

**Diagnosis.** The larvae of *I. longitibius* sp. n. can be easily distinguished from those of other congeners by the relatively long foretibiae (ca.  $1.2 \times$  length of forefemora) (Fig. 8). Their relatively large body size (17.5 mm) and median dark brown markings on the abdominal terga 1–9 (Fig. 9) also may distinguish them from other congeners.

**Etymology.** The specific name *longitibius* (Latin) is from a combination of *long* and *tibia*, an allusion to the relatively long foretibiae of the larvae.

**Material examined.** Holotype: mature larva (SWU-EPH-3202), VIETNAM, Lao Cai Prov., Sa Pa, Thac Bac Cr. (alt. 2400 m), 2000 X 19, V.V. Nguyen, deposited in SWU-AIC. Paratype: 1 larva (SWU-EPH-3203): Lao Cai Prov., Sa Pa, Mong Sen (alt. 1700 m), 2000 XII 29, T.K.T. Cao, deposited in SWU-AIC.

**Distribution, habitat and biology.** This species is limited to high mountain areas in northern Vietnam. The larvae of *I. longitibius* are found in the high mountain streams ranging 1,400–2,800 m in altitude. The streams are 12–15 m wide and 10–40 cm deep in the dry season. The water temperature range is 18–22°C and the pH range is 7.2–7.8. The larvae are found underneath stones in moderately flowing areas of the streams where the substrate is mostly stony on a sandy bottom. A rather common heptageniid mayfly *Epeorus aculeatus* Braasch is

found together with this species in the streams.

## ABSTRACT

Larvae of two heptageniid mayflies, *Iron martinus* Braasch and Soldán and *Iron longitibius* sp. n., are described from Vietnam. The larva of *I. martinus* is distinguished by the paired spines on the abdominal segments 1–9; the larva of *I. longitibius* sp. n. is distinguished by the relatively long foretibiae. Their descriptions, diagnoses, line drawings of key characters, material examined, distributions, and habitat and biology data are provided.

## ACKNOWLEDGEMENTS

We thank Mr. D.H. Hoang (SWU) and Ms. T.K.T Cao (IEBR, Hanoi) for their field trip assistance and Dr. X.Q. Nguyen (Hanoi University of Science, Hanoi) for his general help. 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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(Manuscript received 3 December 2003,  
Revision accepted 28 February 2004)