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Full Length Article

A new record of monogeneric family Vietnamellidae (Insecta: Ephemeroptera) from India

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ABSTRACT

A new record of monogeneric family Vietnamellidae (Insecta: Ephemeroptera) is established for India with *Vietnamella* sp. A described based on the larvae from Arunachal Pradesh, India. This species can be distinguished from other known species of this genus in the larval stage by the following combination of characters: (i) outer pair of projections in head large and stout, triangular, cone-shaped with serrated spines; (ii) posterolateral angles of abdominal terga 2–9 extended into sharp projections; (iii) caudal filaments pale yellowish brown with dense lateral setae on inner and outer margins of middle part; (iv) femora of mid- and hind-legs broader; and (v) second segment of the maxillary palpi shorter than first segment.

Introduction

The genus *Vietnamella* was established by Tschernova, 1972, based on larval materials of *V. thani*, the type species collected from Vietnam. The taxonomic history of this small, aberrant genus is dealt with in detail by Hu et al. (2017), while redescribing *V. sinensis* from China. This genus is known from Vietnam and southern and south-eastern China and includes only 3 recognized species viz., *V. thani* (Tschernova, 1972) and *V. sinensis* (Hsu, 1936) known from larvae and adults, and *V. ornata* (Tschernova, 1972) described only from adults. The larvae of *Vietnamella* can be distinguished from those of *Austremerella* by the presence of cephalic horns, restricted setae on the labrum, fused and laterally oriented incisors on the mandibles, maxillary palpi, the shorter terminal labial palpal segments, the truncate glossae and paraglossae, the longer prothorax, the single denticle of the tarsal claws, and gills on the abdominal segment 1 (McCafferty and Wang, 1997). Jacobus and McCafferty (2006) restricted Vietnamellidae to include only *Vietnamella* and moved *Austremerella* back to a revalidated Austremerellidae.

Description is given herein based on larval material belonging to the genus, *Vietnamella* Tschernova, 1972 collected from Arunachal Pradesh. However, the 'species' is not formally named since the adult stage is unknown at this point. This is the first record of the monogeneric family Vietnamellidae in India.

Material and methods

Larval materials were collected from streams and rivers of Arunachal Pradesh, India. The larvae were collected by D-frame aquatic insect net and by hand picking. All materials were stored in 85% ethanol. Permanent mounts of specimens were made in Hoyer's medium to enable detailed microscopic observations, and all photographs were taken using a Leica M205A microscope. Terminology and procedures used in the description follow those of Hu et al. (2017). The type specimens are deposited in Central Entomology Laboratory (CEL), Zoological Survey of India (ZSI), Kolkata, India.

Result

Vietnamella sp. A

Material examined

Holotype: 1 larva, INDIA, Arunachal Pradesh, Lower Subansiri district, Rashpothar, ca 45 km SE of Tamen, outskirts of TWS, Parsen River, 27.713413 N, 94.179297 E, 475 m, 19.ix.2016, coll. Bikramjit Sinha (Reg. No. 7360/H13). Paratypes: 4 larvae, same data as holotype (Reg. No. 7361/H13).

Description

Larva (in alcohol): body length 7.0–8.0 mm, cerci 3.5–4.0 mm,

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Figs. 1–3. Larva of *Vietnamella* sp. A: 1. Habitus in dorsal view; 2. Head and foreleg (dorsal); 3. Head and foreleg (ventral).

terminal filament 4.0–4.5 mm (Fig. 1). Body yellowish brown, with dense setae laterally and on free margins of head.

Head (Fig. 2–3)

Two pairs of projections below eyes near slightly concave anterior margin of head capsule; inner pair of projections small, spine-like and sharp, outer pair large and stout, triangular, cone-shaped with serrated spines, length more slightly than width of head capsule; antenna length more than half width of head and positioned between projections; ocelli elevated on small tubercles; vertex of head rough; compound eyes large, dark.

Mouthparts

Labrum (Fig. 4): anterior half of dorsal surface and margins with relatively long setae, ventral surface with shorter setae but those near margins longer and denser, two setal tufts near anteromedian corners. Hypopharynx (Fig. 5): lingua and superlinguae nearly round, with setae on surface, those near margins longer. Left mandible (Fig. 6): slender, with very thin setae on lateral surface; outer incisor totally fused, spoon-like, inner incisor transformed into tufts of spines; prosthema stouter than inner incisor, consisting of numerous spines; molar block-like with rough surface, additional small tuft of spine-like setae on mesal apex. Right mandible (Fig. 7): similar to left but molar with apparent independent tooth and larger tuft of spine-like setae. Maxilla (Fig. 8–9): slender, apex with 3 fused medio-apical teeth or canines, 2 dentisetae and an additional spine-like seta at apex; a small tuft of setae located dorsally; a median seta on inner margin; maxillary palpi 3-segmented, with tiny setae, length ratio from basal to apical 1: 0.9: 0.7, tip of apical segment sclerotized; cardo with setae. Labium (Fig. 10): glossae and paraglossae almost fused, with dense setae on surface, setae on dorsal surface and margins longer; labial palpi 3-segmented, basal segment broader and longer than the second, apical segment very small; palpi with tiny setae; submentum broad.

Thorax (Fig. 1–2)

Pronotum with sharp anterolateral projections and small, slightly rounded protuberances mesal to anterolateral projection. Forelegs (Fig. 11): coxae with setae on dorsal surface but trochanters without setae; length ratio of femora: tibiae: tarsi = 1: 1: 0.4; femora strongly expanded except at base, expansion forming distinct transverse ridge dorsally, leading margin of fore-femora serrated with projections or teeth progressively smaller distally; inner, outer, basal margins and ridge with a row of setae; tibiae with small spines on surface, inner margin with dense setal row; tarsi with very sparse setae. Midlegs (Fig. 12): length ratio of femora: tibiae: tarsi = 1: 0.8: 0.3; coxae with obvious dorsal projection and setae; trochanters with setae; femora wider and flatter than tibiae and tarsi, inner, outer and basal margin with setae. Hindlegs (Fig. 13): setal pattern similar to midleg; length ratio of femora: tibiae: tarsi = 4: 2.5: 1; tarsi of all legs dark brown; inner margin of mid and hindleg with ridge distally; all claws similar, with one denticle (Fig. 14).

Abdomen (Fig. 15)

Terga 1–10 with a pair of median ridges or tubercles progressively larger posteriorly; posterolateral angles of terga 2–9 extended into sharp projections, lateral margins of terga with dense setae; sterna with a pair of short dark submedian stripes. Gills on terga 1–7; gills 1 long, finger-like, with setae (Fig. 16); gills 2–6 similar in structure, with dorsal and ventral lamellae, the latter further divided into 2 clusters, each with several smaller lobes (Fig. 17–18); gills 7 smaller, usually covered by gills 6, also with 2 lamellae but ventral lamella divided into 3 lobes only (Fig. 19). Caudal filaments pale yellowish brown with dense lateral setae on inner and outer margins of middle part (Fig. 1).

Adult

Unknown.



Figs. 4–10. Mouthparts of *Vietnamella* sp. A: 4. Labrum; 5. Hypopharynx; 6. Left mandible; 7. Right mandible; 8. Maxilla; 9. Partial enlarged detail of maxilla; 10. Labium.

Distribution

India (Arunachal Pradesh).

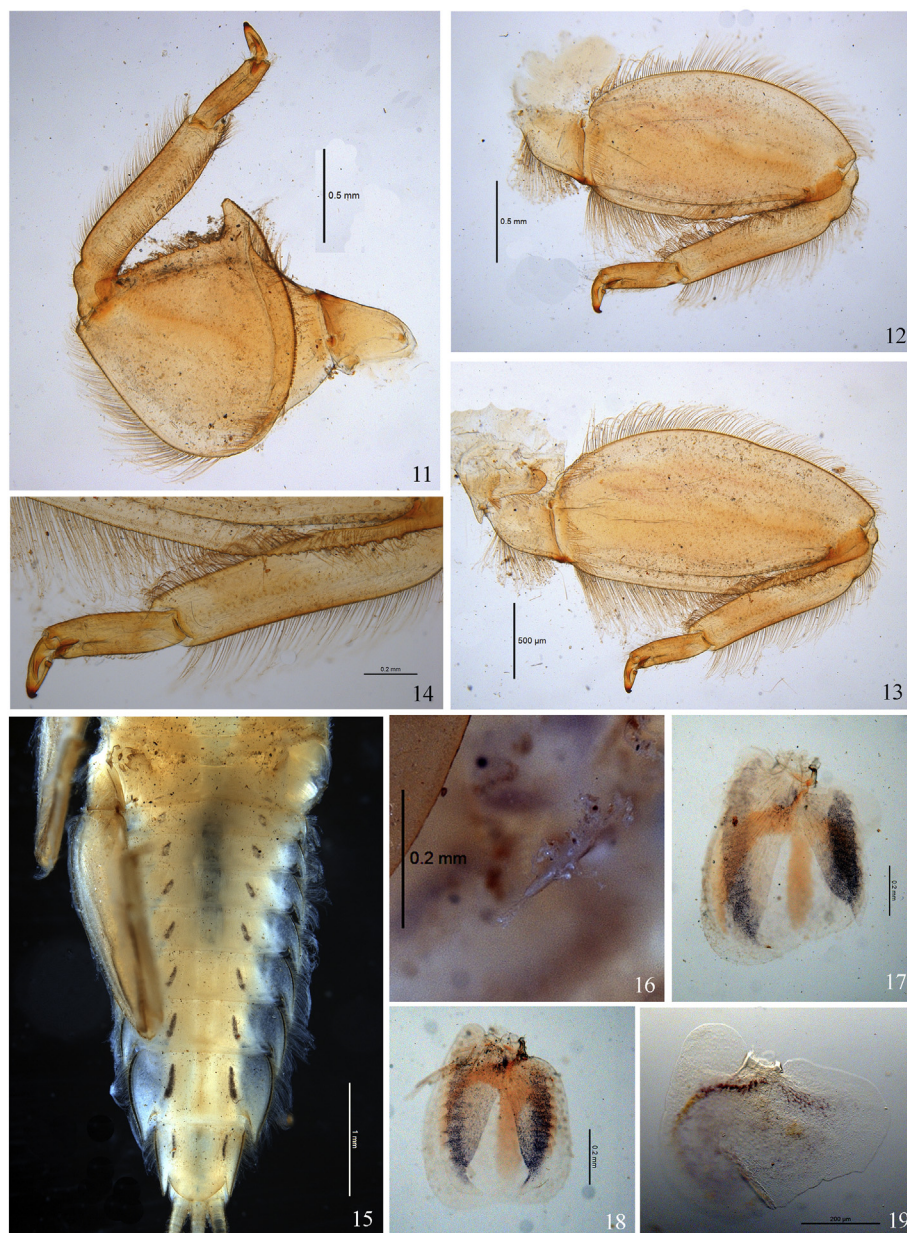
Ecology

The larvae were collected in river, Parsen, Rashpothar, ca 45 km SE of Tamen, outskirts of TWS that was 5.0–5.5 m wide and 70 cm deep, with high water current (Fig. 20). Substrates mainly consisted stones and sand. The larvae cling to the underside of boulders in the middle of streams where the boulders lie amidst sand and silt.

Diagnosis

Vietnamella sp. A can be distinguished from the other two species of

this genus viz., *V. sinensis* (Hsu, 1936) and *V. thani* Tschernova, 1972 by the following combination of characters in the larval stage: (i) outer pair of projections in head large and stout, triangular, cone-shaped with serrated spines (Fig. 2); (ii) posterolateral angles of abdominal terga 2–9 extended into sharp projections (Fig. 2); (iii) caudal filaments pale yellowish brown with dense lateral setae on inner and outer margins of middle part (Fig. 2); (iv) femora of mid- and hind-legs broader (Fig. 12–13); and (v) second segment of the maxillary palpi shorter than first segment (Fig. 8).



Figs. 11–19. Larva of *Vietnamella* sp. A: 11. Foreleg; 12. Midleg; 13. Hindleg; 14. Claw; 15. Ventral view of abdomen; 16. Gill I; 17. Gill II; 18. Gill V; 19. Gill VII.



Fig. 20. Habitat of *Vietnamella* sp. A in the river, Parsen.

Discussion

Comparison of the presently described species with *Vietnamella thani* and *V. sinensis*, whose larvae are known, is presented in Table 1. *Vietnamella ornata* is known from Yunnan Province, China at the eastern edge of the Himalaya. Its larva is presently unknown. Since the larvae described here are from Arunachal Pradesh State of India, which is close to the type locality of *V. ornata*, the possibility of presently described larva as the unknown larva of *V. ornata* could not be ruled out. Hence a provisional name to this larva viz., *Vietnamella* sp. A is provided.

Family Vietnamellidae is so far reported from China, Vietnam and Thailand and this is a new record for India. Based on limited morpho-systematic analysis of autapomorphies of Vietnamellidae, Kluge (2004) considers *Vietnamella* as a derived clade from the Ephemerelloidea whereas according to Jacobus and McCafferty (2006), this is a basal detached clade of Ephemerelloidea and Hu et al. (2017) also agrees with this view. However, species of Ephemerelloidea are in need of

Table 1Comparison of larval characters of known species of *Vietnamella* Tschernova, 1972.

| Characters | <i>Vietnamella thani</i> | <i>Vietnamella sinensis</i> | <i>Vietnamella</i> sp. A |
|--|---|--|---|
| Outer pair of projections in head | Longer, triangular, cone-shaped without serrated spines | Shorter, triangular, cone-shaped without serrated spines | Large and stout, triangular, cone-shaped with serrated spines |
| Posterolateral angles of abdominal terga | 1–9 extended into sharp projections | 1–9 extended into sharp projections | 2–9 extended into sharp projections |
| Femora of mid- and hind-legs | Broader | Slender | Broader |
| caudal filaments | Pale brownish yellow | Dark brown to black with median pale band | Pale yellowish brown |
| Length of maxillary palp | Shorter | Longer | Shorter |

combined molecular and morphological phylogenetic analyses supported by further intensive collection, rearing and association of life stages to arrive at meaningful phylogenetic and biogeographic conclusions, crucial to conservation planning of this enigmatic oriental family of mayflies. Our report of *Vietnamellidae* extends the known distribution of this family to Himalaya biodiversity hotspot, highlighting the global significance of the region.

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Declaration of conflict interest

The authors declare that there is no conflict of interest.

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