


A new species of *Dudgeodes* Sartori, 2008 (Ephemeroptera: Teloganodidae) from Megamalai hills of southern Western Ghats, India


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Abstract

Dudgeodes sartorii **sp. nov.** is described based on nymphs from the Megamalai hills of Western Ghats, Southern India. The nymph of *Dudgeodes sartorii* **sp. nov.** can be distinguished from other Indian species of *Dudgeodes* by i) prothorax with two rounded tubercles; (ii) outer margin of mesothorax with simple setae; (iii) distinct maculae in the distal region of femora; (iv) transverse row of setae on fore femora narrower with blunt apex and (v) dark brownish band on the 5th segment of cerci

Key words: Mayfly, Pannota, Teloganellidae, nymphal description, Oriental Region

Introduction

Teloganodidae (Allen, 1965) is an ancient group of mayflies of Gondwanan origin that currently are known from throughout the Oriental region and from the southern tip of Africa (McCafferty & Wang 2000; Jacobus & McCafferty 2006) as well as from Madagascar (Oliarinony et al. 2016). The family Teloganodidae currently includes five genera in the Afrotropical realm: *Ephemerellina* Lestage, 1924, *Lestagella* Demoulin, 1970, *Lithogloea* Barnard, 1932, *Manohyphella* Allen, 1973 and *Nadinetella* McCafferty & Wang, 1998. Oriental realm incorporates four genera: *Derlethina* Sartori, 2008, *Dudgeodes* Sartori, 2008, *Indoganodes* Selvakumar, Sivaramakrishnan & Jacobus, 2014 and *Teloganodes* Eaton, 1882. The genus *Janohyphella* Selvakumar, Sivaramakrishnan & Jacobus, 2014, was established under the family Teloganodidae but was later included within the genus *Teloganella* Ulmer, 1939 of family Teloganellidae by Kluge et al. (2015).

Among the Oriental Teloganodidae, *Dudgeodes* is distinguished from other genera by the absence of gill VI, incised last gill, and by the shape of the incisor of right mandible (Selvakumar et al. 2018). So far, about 15 species of *Dudgeodes* were discovered: *D. bauernfeindi* Garces & Sartori, 2020 (Philippines), *D. bharathidasani* Anbalagan, 2015 (India), *D. celebensis* Sartori, 2008 (Sulawesi), *D. freitagii* Garces & Sartori, 2020 (Philippines), *D. hutanis* Sartori, 2008 (Borneo), *D. lugens* Navás, 1933 (China), *D. luntian* Garces & Sartori, 2020 (Philippines), *D. palnius* Selvakumar, Sivaramakrishnan & Jacobus, 2014 (India), *D. pangantihoni* Garces & Sartori, 2020 (Philippines), *D. pescadori* Sartori, 2008 (Philippines), *D. romani* Martynov, Palatov & Boonsoong, 2016 (Thailand), *D. stephani* Sartori, 2008 (Borneo), *D. tabang* Garces & Sartori, 2020 (Philippines), *D. ulmeri* Sartori, 2008 (Java, Sumatra), *D. vonrinteleni* Garces & Sartori, 2020 (Philippines).

In this contribution, a new species, *Dudgeodes sartorii* **sp. nov.**, is described based on nymphs from the Western Ghats of Southern India.

Materials and Methods

The specimens were collected from the Megamalai hills of the Western Ghats (Fig. 3). The nymphs were collected using kick-net sampling and handpicking. The collected specimens were preserved in 80% ethanol. The morphological characters of new species were studied using Magnus MSZ binocular stereo microscope and photographs were acquired using Canon EOS 1500D and editing of photographs was carried out using Adobe Photoshop 7.0. Specimens studied under Scanning electron microscope were first dehydrated using ethanol and dried by critical point method and examined with an EVO-18 scanning electron microscope at 10 k. Digital SEM photographs were edited using Adobe Photoshop 7.0. Type specimens are to be deposited in Zoological Survey of India, Southern Regional Centre, Chennai, Tamil Nadu, India (ZSI-SRC) but temporarily stored in The American College Museum, Madurai, Tamil Nadu, India (AMC) due to current restrictions.

Dudgeodes sartorii sp. nov.

Figs. 1–2

Materials examined. Holotype: Male larva (AMC ZN 188), India, Tamil Nadu, Theni district, Megamalai hills, Manalar bridge, 9°69833'N & 77°40083'E; 1422 m; 22.x.2020, Cols. Pandiarajan Srinivasan & Isack Rajasekaran.

Paratype: 3 nymphs (AMC ZN 189), same data as holotype. The type specimens are deposited in The American College museum, Madurai, Tamil Nadu, India.

Description. Larva. Body length up to 3 mm in female and 2.5 mm in male (Fig. 1A) without cerci; cerci length subequal to body length. General coloration of dorsal side of head, thorax and abdomen yellowish to brown; ventral region of entire body pale (Fig. 1B); antenna with black spot increasing in size in the distal part of each antennal segment; legs yellowish; femora yellowish in middle, lateral parts paler, distal region of the inner margin bears black dotted large maculae; cerci translucent. Head: Head capsule with hair like setae on lateral margins in front of eyes to labrum insertion. Antennae length 1.3 times head width, flagellum with 14–16 segments. Antenna with black spots increasing in size in the proximal part of each segment (Fig. 1C). Scape two times larger than pedicel. Dorsal part of male eyes blackish (Fig. 1A). Labrum compact, ca. 2.1 times wider than long (Fig. 1D), with smooth anterior emargination; dorsal face covered medially by scattered simple long setae; anterior margin with row of small thin setae. Hypopharynx with superlinguae oval with row of long, simple setae at apex (Fig. 1E). Mandibles slender with one thin seta in middle of outer margin (Fig. 1F&1G). Right mandible (Fig. 1F) with outer incisor composed of one large entire tooth; inner incisor with two teeth; prosthema reduced, with appearance of cluster of thin setae; a small row of four long and thin setae below mola and some short setae above mola. Left mandible (Fig. 1G) with outer incisor consisting of one slightly concave tooth; inner incisor with two teeth inserted transversely subequal in size; prosthema small; no setae below mola. Maxilla (Fig. 1H) slender, with well-developed canina, two indented dentisetae and three long setae on inner apical region and cluster of long, simple setae at crown; inner margin at base of lacinia, with one long setae dorsally and one long setae ventrally; maxillary palp highly reduced. Submentum well developed laterally; glossae and paraglossae partially fused; paraglossae larger than glossae; labial palp three-segmented, articulation between segments I and II barely visible and subequal in length (Fig. 1I); segment III ca. 1.7 times as long as wide. Thorax: Prothorax with two rounded tubercles on dorsal surface (Fig. 2A). Mesothorax with two rounded tubercles on dorsal surface, smaller specimens lack tubercles on mesothorax (Fig. 2A); outer margin of prothorax and mesothorax bears simple setae (Fig. 2B). Forefemur (Fig. 2C) greatly dilated, ca. 1.3 times longer than wide; outer margin covered by stout and long setae, meeting transverse row of narrower setae with blunt apex (Fig. 2F); without thin setae at apex; inner margin with short row of long and thin setae proximally, reaching distally to transverse row. Middle (Fig. 2D) and hind femora (Fig. 2E) similar, more slender, ca. 1.6 times longer than wide; dorsal and inner margins each with row of long and stout setae. Tibia with row of long and stout setae on inner margin, and row of long and thin setae on outer margin. Tarsal claw hooked, bearing five blunt teeth increasing in size medially (Fig. 2G) and two pointed teeth subapically; outer tooth well developed, inner one smaller (Fig. 2H); apex of claw with a single row of three to four thin setae laterally. Abdomen: Terga median tubercles absent in I–III, present and increasing in size from IV–VIII and small median tubercles present in IX–X (Fig. 2I); transverse longitudinal dark blackish band near the surface of posterior margin on tergal segments I–VIII (Fig. 2I). Posterolateral projections absent on segments I–IV; slightly marked on segment V; distinct on segments

VI–IX. Lateral margins of terga with long thin setae. Gills on segments II–V; gill II with dorsal lamella operculate, oval and with entire margin (Fig. 2J); gills III–V (Figs. 2K–2M) with ventral lamella incised medially; ventral lobe flabelliform, well-developed and purple on gills II–IV; gill V lacks lobes on the ventral lamella. Cerci with stout setae on each segment; setae subequal or smaller than length of corresponding segment (Fig. 2N). A dark brownish band on the 5th segment of cerci (Fig. 2N).

Winged stages. Unknown.

Diagnosis. *Dudgeodes sartorii* **sp. nov.** can be distinguished from other Indian species of *Dudgeodes* by the following combination of characters: (i) prothorax with two rounded tubercles (Fig. 2A); (ii) outer margin of mesothorax bears simple setae (Fig. 2B); (iii) distinct maculae in the distal region of femora (Figs. 2C, 2D & 2E); (iv) transverse row of setae on fore femora narrower with blunt apex (Fig. 2F) and (v) dark brownish band on the 5th segment of cerci (Fig. 2N).

Etymology. This species is dedicated to Dr. Michel Sartori for his outstanding contribution to the Oriental Teloganodidae.

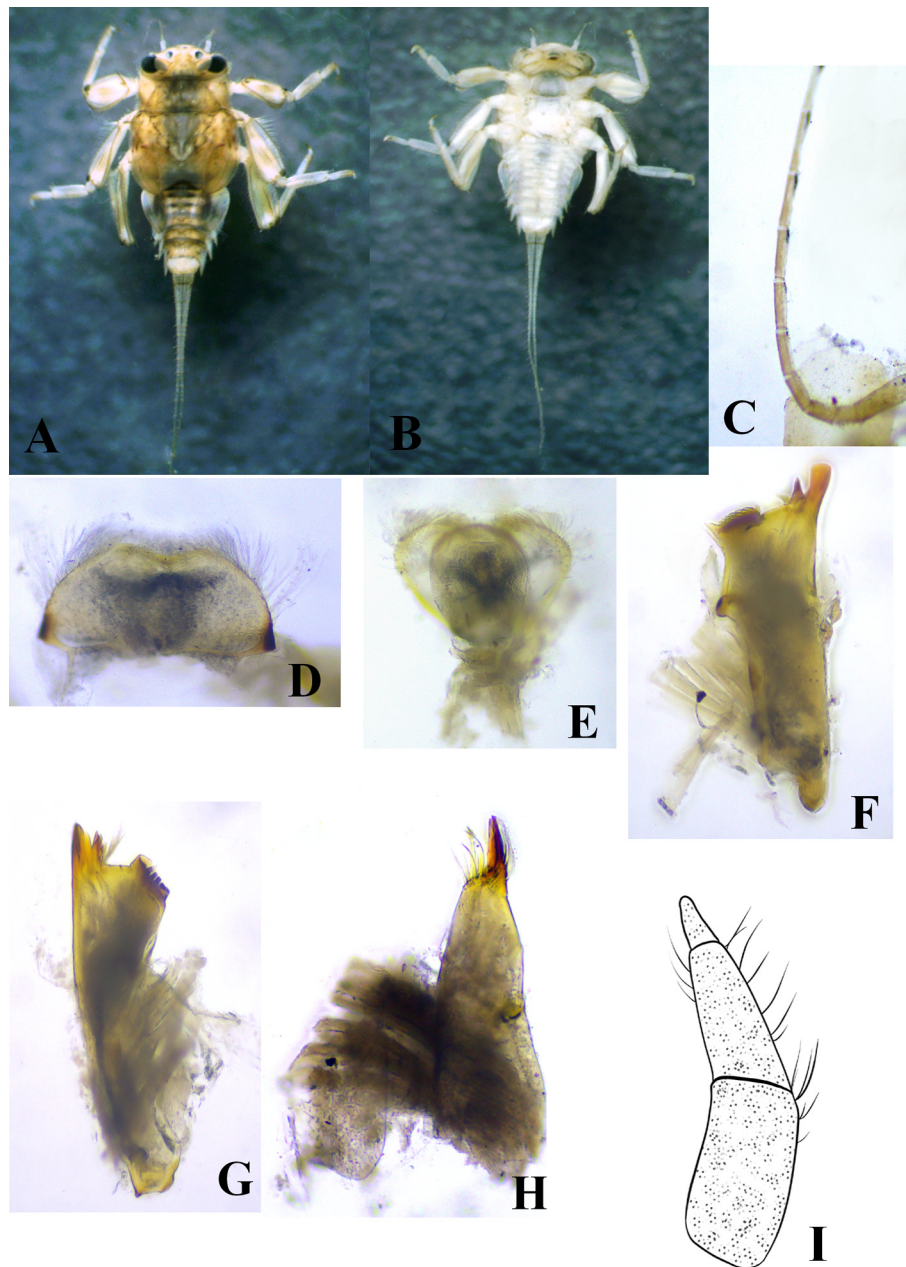


FIGURE 1. *Dudgeodes sartorii* **sp. nov.**, nymph. A, Male nymph, dorsal view; B, Male nymph, ventral view; C, black spots increasing in size in the proximal part of antennal segments; D, labrum; E, hypopharynx; F, right mandible; G, left mandible; H, maxilla; I, labial palp, ventral view.

Ecology. The nymphs of *Dudgeodes sartorii* **sp. nov.** were collected in the Megamalai hills, Theni district (10–17 m wide, 3.4–5.8 cm depth). The water current ranges about 1.98 m/sec. The water temperature ranges between 19°C–22°C and pH 7.0–7.4. Substratum is of high cobble and decayed leaf litter with high water current.

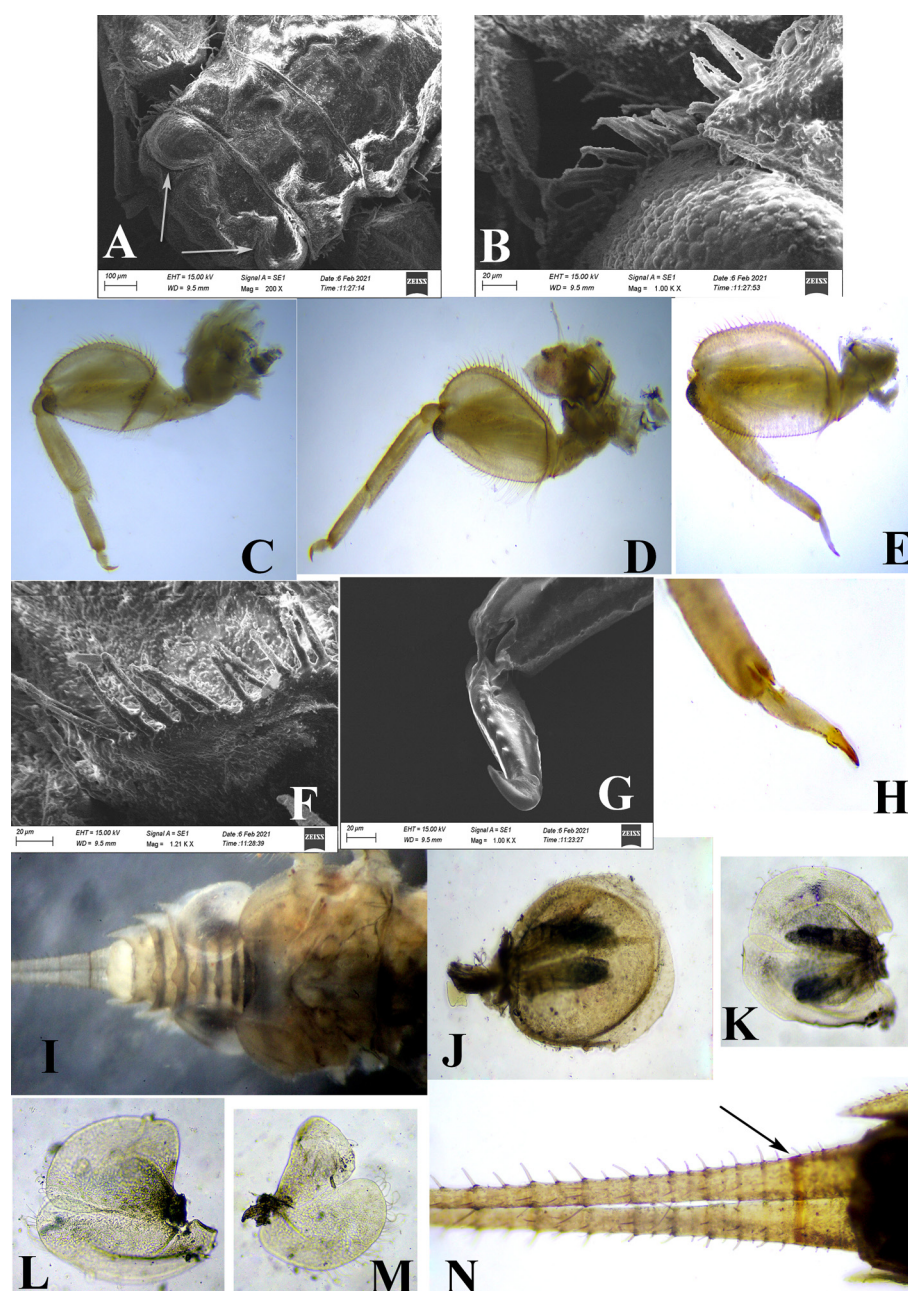


FIGURE 2. *Dudgeodes sartorii* **sp. nov.**, nymph. A, SEM view of tubercles in prothorax (arrow indicates tubercles); B, SEM view of setae in outer margin of prothorax and mesothorax; C, foreleg; D, midleg; E, hind leg; F, SEM view of transverse setae in fore femur; G, SEM view of midclaw; H, hind claw; I, abdominal tubercles; J, gill II; K, gill III; L, gill IV; M, gill V; N, whorls of spines in cerci (arrow indicates dark brownish band on the 5th segment of cerci).

Key to known nymphs of Indian *Dudgeodes*

1. Prothorax with 2 rounded tubercles. *D. sartorii* **sp. nov.**
- Prothorax with 4 rounded tubercles 2
2. Whorl of spines in cerci longer than length of corresponding segment; 3rd segment of labial palp ca. 2.5 times as long as wide *D. palnius*
- Whorl of spines in cerci considerably shorter than the length of corresponding segment; 3rd segment of labial palp ca. 2.7 times as long as wide *D. bharathidasani*