

A new mayfly species of *Sparsorythus* Sroka & Soldán, 2008 (Insecta: Ephemeroptera: Tricorythidae) from the Western Ghats, Kerala, India

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ABSTRACT

A new mayfly species *Sparsorythus chitturensis* sp. nov. is described from Kerala, southern India based on nymphal characters. The new species is differentiated from all other known Oriental species by the following combination of characters: (i) segment III of labial palp blunt at apex; (ii) hypopharyngeal lingua is not divided by a rill; and (iii) wing pads reaching the middle of abdominal segment II of final instar larvae. Distribution and ecological notes were provided for the described species.

Key words : Bharathapuzha, Kerala, mayfly, new species, pannota.

INTRODUCTION

The Tricorythidae are widespread in South-east Asia and the Indian subcontinent (Barber-James *et al.*, 2013). Presently, the family Tricorythidae consists of six genera: *Tricorythus* Eaton, 1868; *Madecassorythus* Elouard and Oliariny, 1997; *Ranorythus* Oliariny and Elouard, 1997; *Spinirythus* Oliariny and Elouard, 1998 (Oliariny *et al.*, 1998); *Dicercomyzon* Demoulin, 1954 and *Sparsorythus* Sroka and Soldán, 2008, and are distributed in the Afrotropical (Barber-James, 2008) and Oriental (Sroka and Soldán, 2008) realms (Muthukatturaja and Balasubramanian, 2021). Thirteen species of *Sparsorythus* have so far been discovered from Oriental region: *S. bifurcatus* Sroka and Soldán, 2008 (Vietnam); *S. jacobsoni* Sroka and Soldán, 2008 (Wonosobo, Java); *S. dongnai* Sroka and Soldán, 2008 (Vietnam); *S. buntawensis* Batucan, Nuñez and Lin, 2016 (Philippines, Batucan *et al.*, 2016); *Tricorythus (Sparsorythus) celebensis* Kluge, 2010 (Indonesia: Sulawesi) were described based on nymph and adults of both sexes; *S. sescarorum* Garces, Bauernfeind and Freitag, 2018 (Philippines) was described based on larva, male imago and female subimago; *S. nanjangudensis* Muthukatturaja and Balasubramanian, 2021 (India) was described based on larva and male imago; *S. sivaramkrishnani* Sivaruban, Srinivasan, Barathy, Rosi and Isack, 2021 and *S. srokai* (Srinivasan *et al.*, 2021) were described

based on male and female larva from India; *S. gracilis* Sroka and Soldán, 2008 (India) and *S. grandis* Sroka and Soldán, 2008 (Indonesia: Java) were described based on mature female larva; *S. ceylonicus* Sroka and Soldán, 2008 was described based on mature male larva from Sri Lanka; *S. multilaberculatus* Sroka and Soldán, 2008 was described based on male imago from Thailand and Vietnam; later, the nymph of *S. multilaberculatus* was described by Piraonapicha and Sangradub, 2019.

The Western Ghats is one of the mega biodiversity hotspot in India, and is recognized for its high biodiversity and natural heritage. It also serves habitat for 76 species of mayflies (Ramani *et al.*, 2020). With this, three species of the genus *Sparsorythus* are endemic to Western Ghats (Srinivasan *et al.*, 2021). In this study, we added one more new species *Sparsorythus chitturensis* sp. nov. (nymph) from southern India.

MATERIALS AND METHODS

The nymphs were collected by using kick-net and handpicking methods. Collected nymphs were preserved in 95% ethanol. Preserved materials were studied with the aid of nikon 1270i stereo zoom binocular microscope. Photographs were taken by using Amscope 3.7 HD camera and were subsequently improved with Adobe Photoshop 7.0. Holotype and paratypes were stored in absolute alcohol and deposited in Zoological Museum Thiagarajar College (ZMTC), Madurai, Tamil Nadu.

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RESULTS AND DISCUSSION

Sparsorythus chitturensis Balasubramanian and Muthukatturaja sp. nov. (Figs. 1-17).

Materials Examined : *Holotype* (in alcohol): mature nymph, India, Kerala, Palakkad district, Chittur, Bharathapuzha river, 10.543190°N & 76.136630°E; 41 m.a.s.l., 29/XI/2018, collected by Balasubramanian and Muthukatturaja. *Paratypes* : 5 mature nymphs, same data as holotype.

Diagnosis : The nymph of *Sparsorythus chitturensis* sp. nov. can be differentiated from all known species of Oriental *sparsorythus* by the following combination of characters: (i) segment III of labial palp blunt at apex; (ii) left mandibular prosthema not wider apically; (iii) hypopharyngeal lingua is not divided by long rill; (iv) pronotum not widened apically; (v) fore claw broader, curved, with two prominent denticles and two prominent, lateral subapical teeth; (vi) wing pads reaching the middle of abdominal segment II of final instar larvae.

Description : Mature Nymph. *Dimensions* (mm) : body length (excluding cerci) 3.6-4.0 in male and female nymphs; cerci length 2.4-2.6; antennae length 0.9; width of compound eye 0.2; length of compound eye 0.2; distance between compound eyes 0.6. General body coloration brown, young specimens generally paler; legs brown to yellowish brown.

Head : Head two times wider than long and brown; scape and pedicel of antennae brown, flagellum pale brown to translucent; compound eyes black; ocelli black. Mouth parts. Labrum (Fig. 1) two times wider than long; anterior margin with few middle-sized, thin bristles; angular margin with few long, filtering setae; cluster of middle-sized, thin setae below angular margin. Maxillae (Fig. 2) oblong shaped, truncate apically; two clusters of long, thin filtering setae at galea-lacinia; inner margin of lacinia with long, thin, fringed setae; maxillary palp absent. Mandibles (Figs. 3-4) with row of very long filtering setae on outer margin; mandibular body covered with small, thin, stout hair-like setae; inner and outer incisors of right mandible with bifurcated apex and numerous thin bristles (Fig. 8); inner incisors (kinetodontium) of left mandible bifurcated, outer incisor with blunt apex and with numerous thin bristles; three long thin setae, group of long spine-like setae below mola of right mandible; left mandibular prosthema (Fig. 4) not wider apically, with numerous pointed teeth and with one or two bristle-like processes at base; right mandibular prosthema

notched, broadened apically with few pointed teeth. Hypopharyngeal lingua triangular, covered with thin, stout spine-like setae at anterior margin and not divided by long rill; superlingua membranous and translucent (Fig. 5). Labium (Fig. 6): glossae and paraglossae fused together, rounded and triangular anteriorly (Fig. 7); short, stout spines and numerous spine-like setae on anterior margin; cluster of long, thin, filtering setae below lateral margin; labial palp three-segmented; segment I broader, with tiny hair-like setae; length of segment I $\frac{1}{2}$ of segment II; segment III eight times shorter than segment II; inner and outer margin of segment II with row of long, thin, submarginal filtering setae and slightly curved basally; segment III very small, blunt at apex, without any setae.

Thorax : brown; pronotum not extended antero-laterally. In final instar larval wing pads dark and reaching the middle of abdominal segment II. Foreleg (Fig. 9). length ratio of femur: tibia: tarsus (mm) = 0.6: 0.6: 0.4; coxa and trochanter with short, thin hair-like setae; femoral surface (Fig. 12) with transverse row of long, cuneate-like setae (apex of setae bifurcated, with thin hair-like setae) and sparse, short hair-like setae; middle of outer margin with few cuneate-like setae; inner margin of tibia with row of thin, spike-like filtering setae and $\frac{1}{2}$ of inner margin of tibia with row of stout spines; surface of tibia with few long, thin bristles and numerous long, thin hair-like setae; surface of tarsi with long, thin hair-like setae; claw broader, curved with 2 prominent denticles and 2 lateral subapical teeth (Fig. 15). Midleg (Fig. 10). length ratio of femur: tibia: tarsus (mm) = 0.6: 0.5: 0.3; coxa and trochanter similar to foreleg; femoral surface (Fig. 13) with sparse, short hair-like setae and rows of middle-sized, cuneate-like setae medially; outer margin of femora with row of long, cuneate-like setae; $\frac{1}{2}$ base of outer margin of femora with long, thin bristles; $\frac{1}{2}$ base of inner margin with rows of short, cuneate-like setae; tibia with row of middle-sized, cuneate-like setae at outer margin, inner margin with row of stout spines; surface of tibia with few long, thin bristles and numerous long, thin hair-like setae; tarsi with row of stout spines; claw similar to foreleg. Hindleg (Fig. 11). length ratio of femur: tibia: tarsus (mm) = 0.7: 0.7: 0.35; coxae and trochanter similar to foreleg; femora similar to midleg and broader than remainders (Fig. 14); tibia with row of long and middle-sized, cuneate-like setae at inner margin; outer margin with row of long, cuneate-like setae; tibia similar to midleg; claw broader basally,

strongly curved with two prominent denticles and 2 lateral subapical teeth.

Abdomen : coloration uniform brown to yellowish brown; posterolateral segments on terga VII–IX slightly pointed; lateral margins brown; sterna pale. Gills: absent on segment I and VII; dorsal lamella of gills grayish, with short, hair-like setae on margins; ventral lamella modified to two branches with numerous fringed filaments (Fig. 16). Caudal filaments: pale yellow; cerci length subequal to median terminal filament; terminal filaments with annulations and articulations.

Adults : Unknown.

Etymology : The new species *chitturensis* refers to the locality Chittur, Palakad district, where the new species was collected.

Distribution : The species is so far known only from the type locality, Bharathapuzha River, Chittur, Kerala, India.

Ecology : Nymphs were collected in November, 2018 in Bharathapuzha river (Fig. 17), Chittur, Palakkad district, Kerala, India. Width of the river is 150 m; an average water flows only in 60 m and 45 cm depth at the time of collection. The current velocity of the water flow was 0.6 m/sec, substratum mainly with boulders and rocks, river not covered by canopy. Water pH is about 7.8 - 8.1; water temperature is $28 \pm 2^\circ\text{C}$ and air temperature about $30 \pm 2^\circ\text{C}$. The new species associated with other mayfly genera are: *Clypeocaenis gayathri* and *Caenis* sp. (Caenidae), *Teloganodes* sp. (Teloganodidae), *Choroterpes* sp. (Leptophlebiidae), *Baetis* sp. and *Labiobaetis* sp. (Baetidae).

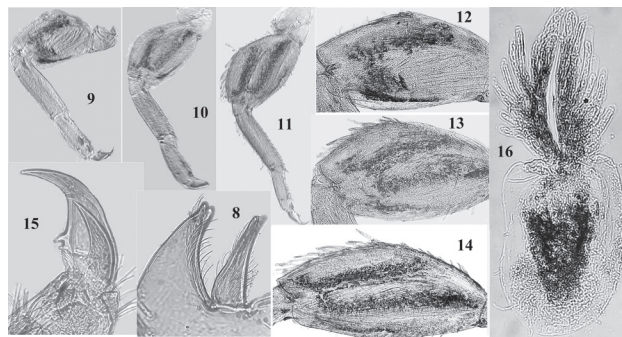
Besides *Sparsorythus chitturensis* sp. nov. four endemic species viz., *S. nanjangudensis*, *S. gracilis*, and *S. srokai* from Western Ghats, and *S. sivaramkrishnani* from Eastern Ghats were described from India. However, *Sparsorythus chitturensis* sp. nov. can be easily distinguished from the other Oriental species by the following combination of characters: (i) segment III of labial palp blunt at apex; (ii) hypopharyngeal lingua is not divided by a rill; and (iii) wing pads reaching the middle of abdominal segment II of final instar larvae.

The nymph of *Sparsorythus chitturensis* sp. nov. is similar to *S. Ceylonicus* and *S. sescarorum* by the wing pads reaching the middle of abdominal segment II of final instar larvae. However, the larval characters such as hypopharyngeal lingua rounded, approximately as long as wide, divided by a short

rill in the middle; and right prostheca bifurcated, with a few number of projections, bearing several setae on the inner side of *S. Ceylonicus* (Sroka and



Figs. (1-7) Mature nymph *Sparsorythus chitturensis* sp. nov. dorsal view: (1) labrum, (2) maxillae, (3) right mandible, (4) left mandible, (5) hypopharynx, (6) labium, (7) glossae enlarged.



Figs. (8-16) Mature Nymph *Sparsorythus chitturensis* sp. nov. dorsal view: (8) right mandible enlarged, (9) foreleg, (10) midleg, (11) hindleg, (12) forefemur, (13) midfemur, (14) hindfemur, (15) foreclaw, (16) Gill II.



Fig. 17. Habitat of *Sparsorythus chitturensis* sp. nov.

Soldán, 2008), and labrum 2.8 - 3.0 times wider than long; hypopharyngeal lingua with a short and shallow medio-longitudinal groove and wide apico-medial emargination; and claws strongly hooked, with 2–3 teeth and a pair of strong pointed processes approximately in the middle of *S. sescarorum* (Garces *et al.*, 2018) are useful to differentiate both species from the new species (*Sparsorythus chitturensis* sp. nov. absence of rill in the hypopharyngeal lingua; right prostheca notched, broadened apically with few pointed teeth; labrum two times wider than long; and claw broader basally, strongly curved with two prominent denticles and 2 lateral subapical teeth). *S. Jacobsoni* is also similar to *Sparsorythus chitturensis* sp. nov. by the absence of rill in the hypopharyngeal lingua but it was differentiated with the large U-shaped medial incurvation of hypopharyngeal lingua.

AUTHORS' CONTRIBUTION

Conceived and designed (CB, MM); Collected data and contributed to the data (CB, MM); Analysis and wrote the paper (MM); Done the manuscript correction (CB).

DECLARATION

The authors declare that they have no conflict of interests.

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