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Nymphal redescription of *Thalerosphyrus flowersi* Venkataraman & Sivaramakrishnan 1987 (Ephemeroptera, Heptageniidae, Ecdyonurinae) with a brief note on the taxonomic status

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ABSTRACT: The nymphs of *Thalerosphyrus flowersi* are described from fresh material from additional localities from the hill streams of southern Western Ghats. Brief comment on the taxonomic status of the species is appended.

Keywords: *Thalerosphyrus flowersi*, nymphal redescription, taxonomic status

Introduction

The genus *Thalerosphyrus* Eaton 1881 (Ephemeroptera: Heptageniidae) includes six valid species, viz. *Th. determinatus* (Walker, 1853) from Java, *Th. sinuosus* (Navas, 1933) from Java and Sumatra, *Th. vietnamensis* (Dang, 1967) from Vietnam, *Th. bishopi* Braasch and Soldan, 1986 from West-Malaysia, *Th. flowersi* Venkataraman and Sivaramakrishnan, 1987 from South India and *Th. lamuriensis* Sartori, 2014 from Sumatra. Recently, Sartori (2014) has given detailed taxonomic descriptions of the species of *Thalerosphyrus* in Java and Sumatra, with comments on the diversity of the genus in the Oriental Realm. He has also provided a key to the *Thalerosphyrus* nymphs occurring in Java and Sumatra. Due to incomplete description of the nymphs of *Th. flowersi*, presumably this species could not be accommodated in Sartori's (2014) key. Hence, this species is redescribed here based on fresh material from additional localities and an attempt is made to accommodate this species in

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previously published key (Sartori, 2014). Differential diagnosis is also refined with brief remarks on the taxonomic status of the species. Sivaruban *et al.* (2010) studied the life cycle of *Th. flowersi* from Kumbbakarai stream on the Western Ghats of peninsular India.

Materials and Methods

All materials used for this study were collected from the streams of the southern Western Ghats Region (India). All specimens were preserved in 85% ethanol. Parts of the specimens were mounted on slides to enable detailed microscopic observations. All the specimens are stored in the Department of Zoology, University of Madras (UM), Guindy Campus, Chennai. Photographs were taken on stereo and bright field microscopes (Magnus & Nikon Eclipse 80i). Final plates were assembled in Adobe Photoshop 7.0. Terminology and procedures used in the redesription follow that of Sartori (2014).

Results and Discussion

***Thalerosphyrus flowersi* Venkataraman & Sivaramakrishnan 1987**

Material examined: 2 nymphs: India, Tamil Nadu, Theni, Kurangani stream, 10°05'01.97" N, 77°14'55.35" E, 1744 m, 26.iii.2014, Coll. Selvakumar. 1 nymph, India, Tamil Nadu, Tirunelveli, Sengottai, Kannupulimedu, 08°56'20.35" N, 77°12'25.74" E, 164 m; 17.vii.2013, Coll. C. Selvakumar. 1 nymph, India, Tamil Nadu, Tirunelveli, Kadayam, Ramanathi river, 08°50'53.4"N, 77°18'51.2" E, 237 m; 21.vii.2013, Coll. C. Selvakumar. 1 nymph, India, Tamil Nadu, Tirunelveli, Alwarkurichi, Gadana river, 08°48'04.5" N, 77°18'05.3" E, 144 m; 20.vii.2013, Coll. C. Selvakumar. 1 nymph, India, Karnataka, Sringeri, Nanthinihole, 13°23'23.52" N, 75°10'47.02" E, 640 m, 03.v.2013, Colls. C. Selvakumar & K. G. Sivaramakrishnan. 1 nymph, India, Tamil Nadu, Kodaikanal, Gundar, 10°13'36.09" N, 77°27'04.02" E,2323 m; 31.iii.2012, Colls. C. Selvakumar & Sivaramakrishnan. 2 nymphs: India, Kerala, Athirapalli waterfalls, 10°17'08.08" N, 76°34'08.52" E, 93 m, 16.iii.2012, Coll

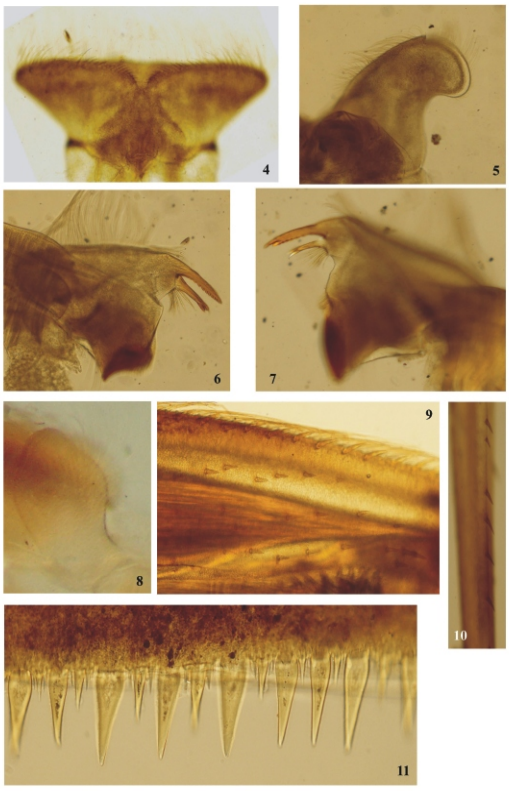
Figs 1-3. *Thalerosphyrus flowersi*,
1. Habitus in dorsal view,
2. Habitus in ventral view,
3. Detail of abdominal segments VI-IX in ventral view.

C. Selvakumar. 6 nymphs, India, Tamil Nadu, Valparai, Puthuthottam, 10°20'48.32" N, 76°58'24.04" E, 1155 m; 29.xi.2009, Colls. C. Selvakumar & Sivaramakrishnan.

Description of the nymph

Body length 11 mm and cerci length 15 mm (full grown nymph). Dorsal and ventral side colour pattern as in Figs. 1, 2.

Head. Labrum greatly expended laterally, 3x as broad as long, with narrow and somewhat acute apexes (Fig. 4); dorsal surface and anterior margin covered with long and thin setae; ventral surface with a long median arch of 12 strong and pointed setae ending close to anterior margin. Hypopharynx with robust lingua bearing a tuft of small setae, superlinguae densely covered with long and thin setae replaced before apex by very small setae up to lower part of superlinguae (Fig. 5). Left mandible (Fig. 6) with 8-9 fimbriate setae below inner incisor and 6 long simple and thin setae below mola. Right mandible (Fig. 7) with 89 fimbriate setae below inner incisor and 8 long simple and thin setae below mola. Crown of galea-lacinia of maxillae composed of 17-18 comb-shape setae, median ones bearing 1214 teeth. Labium with glossae rhomboid, clearly concave on their inner and outer margins near apex (Fig. 8), dorsal surface with numerous stout setae and numerous thin and simple setae.



Figs 4-11. *Thalerosphyrus flowersi*, 4. Labrum, 5. Apex of superlingua of hypopharynx, 6. Left mandible, 7. Right mandible, 8. Labial glossae, 9. Bristles on the dorsal face of hind femur, 10. Outer margin of hind tibia, 11. Posterior margin of abdominal tergite IV.

Thorax. Pronotum greatly expended laterally and posteriorly (Fig. 1). Femora with submarginal rows of pointed bristles on inner and outer margins, only slightly increasing in numbers from fore to hind leg. Bristles on upper face of hind femora with subparallel or slightly convergent margins, apex pointed (Fig. 9). Outer margin of hind tibia with a row of 1314 pointed bristles in marginal or submarginal position (Fig. 10). Tarsal claw with 34 teeth.

Abdomen. Posterolateral expansions not developed on segments III, moderately developed on

fimbriate setae below inner incisor and 8 long simple and thin setae below mola. Crown of galea-lacinia of maxillae composed of 17-18 comb-shape setae, median ones bearing 1214 teeth. Labium with glossae rhomboid, clearly concave on their inner and outer margins near apex (Fig. 8), dorsal surface with numerous stout setae and numerous thin and simple setae.

Thorax. Pronotum greatly expended laterally and posteriorly (Fig. 1). Femora with submarginal rows of pointed bristles on inner and outer margins, only slightly increasing in numbers from fore to hind leg. Bristles on upper face of hind femora with subparallel or slightly convergent margins, apex pointed (Fig. 9). Outer margin of hind tibia with a row of 1314 pointed bristles in marginal or submarginal position (Fig. 10). Tarsal claw with 34 teeth.

Abdomen. Posterolateral expansions not developed on segments III, moderately developed on segment III and strongly increasing in size up to VIII where they may be longer than segment IX (Fig. 3). Gill I with asymmetrical, elongated and rounded plate, less than twice as long as wide (vide Fig. 3a, Venkataraman & Sivaramakrishnan, 1987); gill IIIVI strongly asymmetrical, transverse (vide Fig. 3b, Venkataraman & Sivaramakrishnan, 1987), gill VII oval and asymmetrical with slightly pointed apex (vide4 Fig. 3c, Venkataraman & Sivaramakrishnan, 1987). Posterior margin of tergites with irregularly pointed teeth, and numerous microdenticles (Fig. 11). Terminal filament well developed, cerci whitish with 4-5 dark brown bands increasing in size towards apex; segments with whorls of stout and pointed setae.

Differential diagnosis

Thalerosphyrus flowersi can be distinguished from all other species by the following *combination of* characters: (i) posterolateral expansions on the abdomen greatly enlarged (Fig. 2), reaching their maximum on segment VIII; (ii) protonum greatly enlarged laterally (Fig. 1); (iii) bristles on the dorsal face of hind femora pointed at apex (Fig. 9); (iv) hypopharynx with outer margin of superlinguae evenly covered with long setae ending at apex by minute setae (Fig. 5); (v) posterior margin of tergites with irregularly pointed teeth, and numerous microdenticles (Fig. 11) and (vi) segments of terminal filament with whorls of stout and pointed setae present.

The *Th. flowersi* can be accommodated in the recent key to the *Thalerosphyrus* nymphs occurring on Java and Sumatra (Sartori, 2014). The first part of the first couplet of that key can be modified and a new couplet added to include *Th. flowersi* as follows:

1. Posterolateral expansions on the abdomen greatly enlarged (Fig. 2), reaching their maximum on segment VIII; protonum greatly enlarged laterally (Fig. 1)…….....……..2

2. Bristles on the dorsal face of hind femora truncate or rounded at apex (Fig. 33, Sartori, 2014); hypopharynx with outer margin of superlinguae evenly covered with long setae (Fig. 28, Sartori, 2014); posterior margin of tergites with long and pointed teeth regularly alternating with small ones, and few microdenticles (Fig. 37, Sartori, 2014).....*Th. lamuriensis*

3. Bristles on the dorsal face of hind femora pointed at apex (Fig. 9); hypopharynx with outer margin of superlinguae evenly covered with long setae ending at apex by minute setae (Fig. 5); posterior margin of tergites with irregularly pointed teeth, and numerous microdenticles (Fig. 11).... *Th. flowersi*

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