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A new species of *Prosopistoma* Latreille, 1833 (Ephemeroptera: Prosopistomatidae) from South India

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Abstract

A new species of *Prosopistoma* (Ephemeroptera: Prosopistomatidae) is described on the basis of mature nymphs from Coorg, Karnataka, South India. *Prosopistoma coorgum*, new species can be readily distinguished from the other members of *Prosopistoma* by the following combination of characters: inner margin of outer canine near apex with 2–3 short spines, the length ratio of maxillary palp segments (3.3:4.8:1), ventral margin of fore tibia with 6–8 pectinate setae, and gill II leaf-like and cleft.

Key words: *Prosopistoma*, mayfly, new species, India

Introduction

Prosopistomatidae is a monogeneric family of Ephemeroptera and 25 species of *Prosopistoma* Latreille, 1833 have been recorded in the World (Barber-James, 2009; Shi & Tong, 2013; Bojkova & Soldan, 2015). Of these 25 species, 13 species are recorded from the Oriental region (Shi & Tong, 2013). In India, only one species (*Prosopistoma indicum* Peters, 1967) has been reported (Sivaramakrishnan et al., 2009). In the present study, we describe a new mayfly species of *Prosopistoma* from South India.

Material and methods

Taxon sampling. Specimens used for the description and illustration were collected from the Kaveri River in the Coorg district, Karnataka, India in December 2014 and January 2015 (Fig. 1). The nymphs were collected from boulders and pebbles within the riffles habitat in moderate to fast current. The collected specimens were preserved in the field in vials containing 99% ethanol in the field. Holotype and paratypes are stored in 70% ethanol. Type specimens are deposited in the Insect Molecular Biology Laboratory, Department of Environmental Biotechnology, Bharathidasan University (BDU), Tiruchirappalli, Tamil Nadu province, India. The DNA barcoding gene of *cytochrome oxidase* subunit I was amplified for this new species using standard LCO-HCO primers and their sequences has been deposited in the GenBank database (Accession number: KR822423).

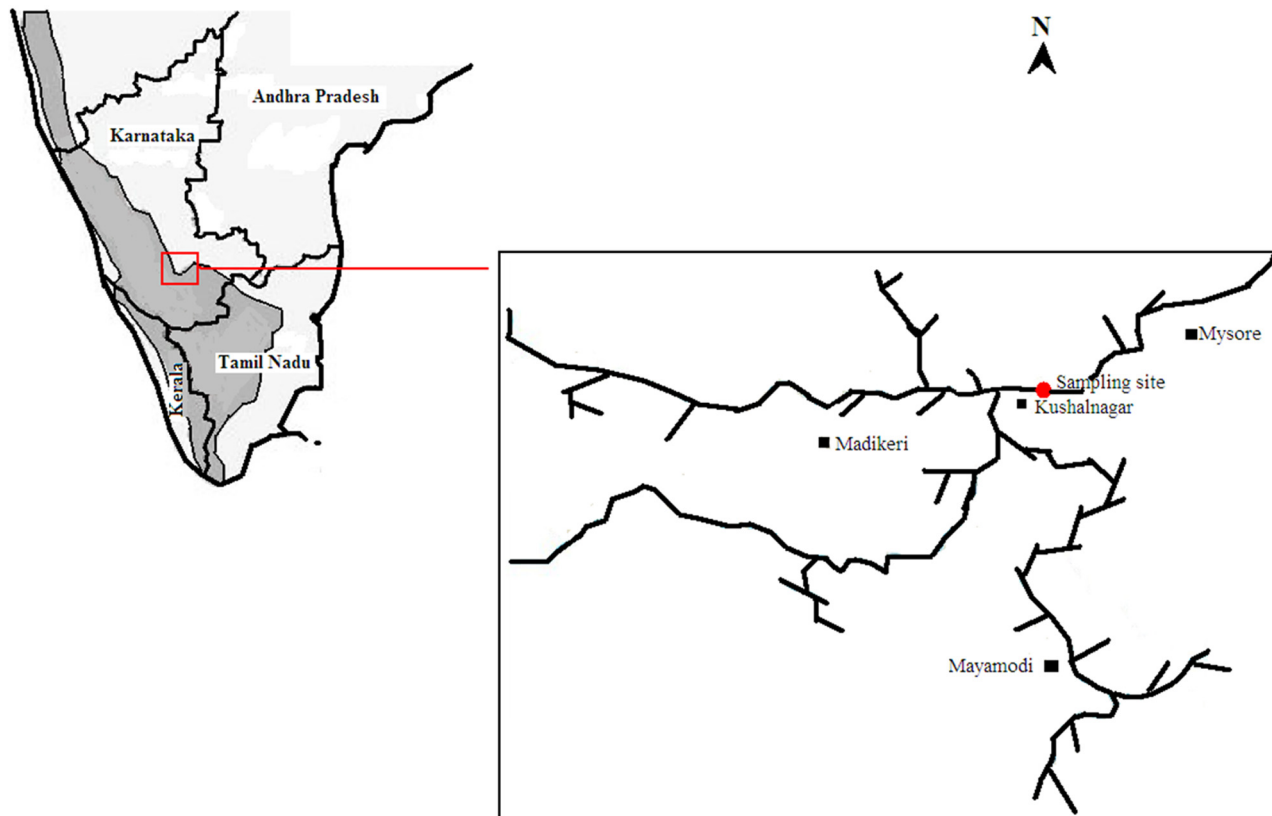


FIGURE 1. Map showing the sampling site in Kaveri river tributary at Coorg district of South India.

Results

Prosopistoma coorgum Balachandran and Anbalagan, new species

(Figs. 2–4)

Type series. Holotype (deposited in ethanol): 1 mature nymph, INDIA, Kaveri River, Kushalnagar, Coorg district, Karnataka state, 18-I-2015, 829 m (12°44'.80" N, 75°96'.97"E), collected by S. Anbalagan & C. Balachandran. Paratypes (deposited in ethanol): 1 mature nymph on slide and 8 mature nymphs, same data as holotype; 4 nymphs, India, Kaveri River, Madikeri, Coorg district, Karnataka state, 19-I-2015, 1020 m (12°42'N, 75°73'E) (Coll. S. Anbalagan & C. Balachandran, Department of Environmental Biotechnology, Bharathidasan University, Catalogue number: PS012).

Description. Mature Nymph (Fig. 2). Body length 3.4–3.8 mm, excluding caudal filaments. Head yellow dorsally with a U-shape brown marking encompassing median ocellus. Epicranial sutures evident, passing through anterior margin of lateral ocelli, and between compound eyes and antennal bases, continuing to lateral margin of head. Carapace (Figs. 2A, 2C) general coloration medium brown, light yellowish brown around edges of carapace along flange, width 1.1 times longer than length measured along median suture; four distinctive orange markings present on each side of the midline: one on lateral region and three close to the mid line; proportional lengths of anterior, middle and posterior markings 1.00:0.44:0.16. Cuticle of carapace finely punctuated. Distal end of carapace concave over exhalent notch (Figs. 2A, 2C).

Head. Width 4.5 times longer than length. Antennae (Fig. 3A) composed of 6 segments, slightly longer than distance from antennal base to anterior margin of head; segment (scape) usually retracts into head capsule, making it invisible; segment III the longest, about 2.4–3.2 times the combined length of segments IV–VI. Labrum (Fig. 3B) protrudes apicomediaally with surface punctuated, approximately 2.9 times wider at its midpoint than long, anterior margin fringed with dense fine setae. Left and right mandibles similar. Outer canine of mandibles (Fig. 3C) slightly

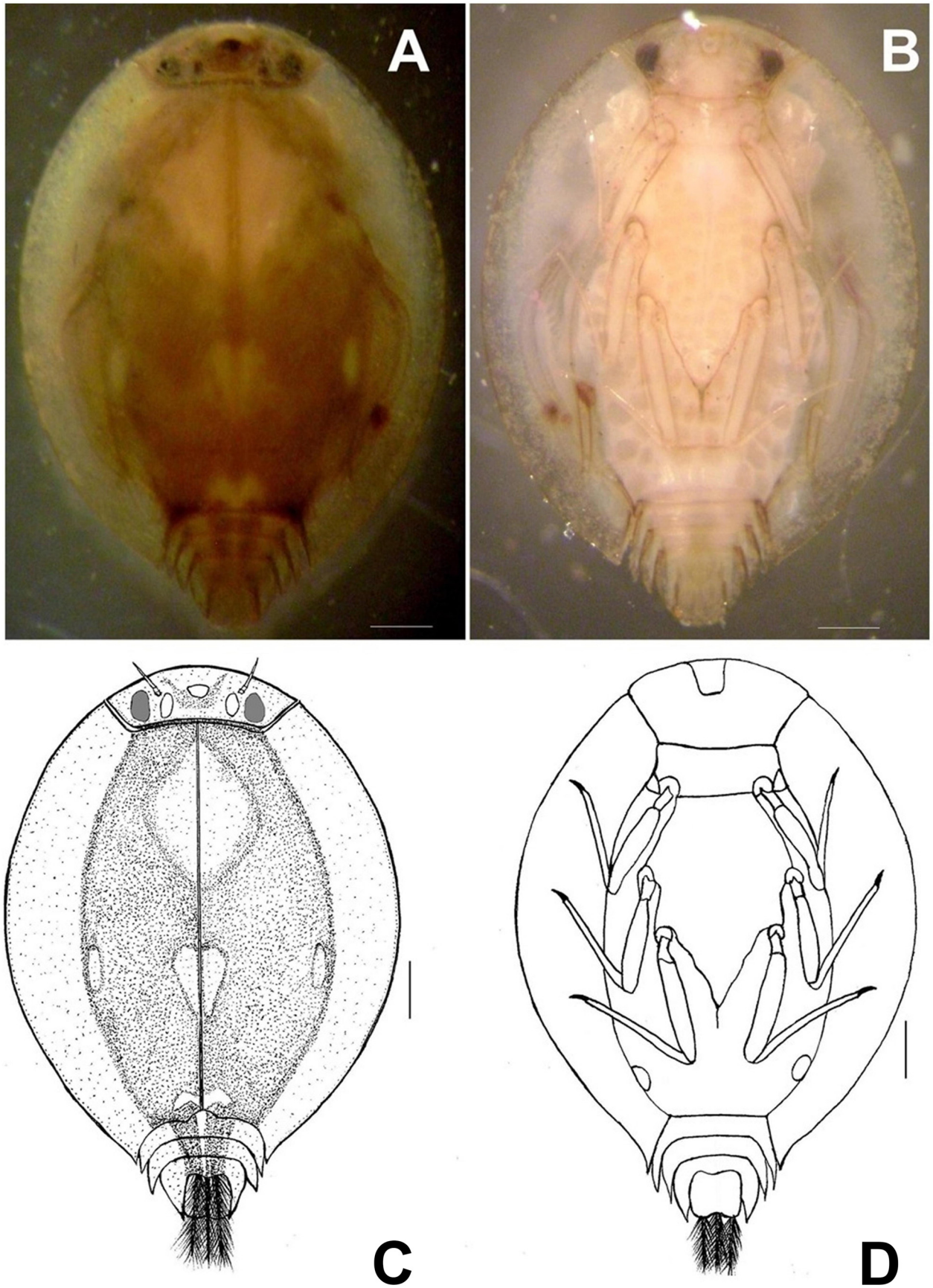


FIGURE 2. Mature Nymph of *Prosopistoma coorgum* sp. n. A, dorsal view (photography); B, ventral view (photography). C, dorsal view (line drawing); D, ventral view (line drawing). Scale bar 1 mm.

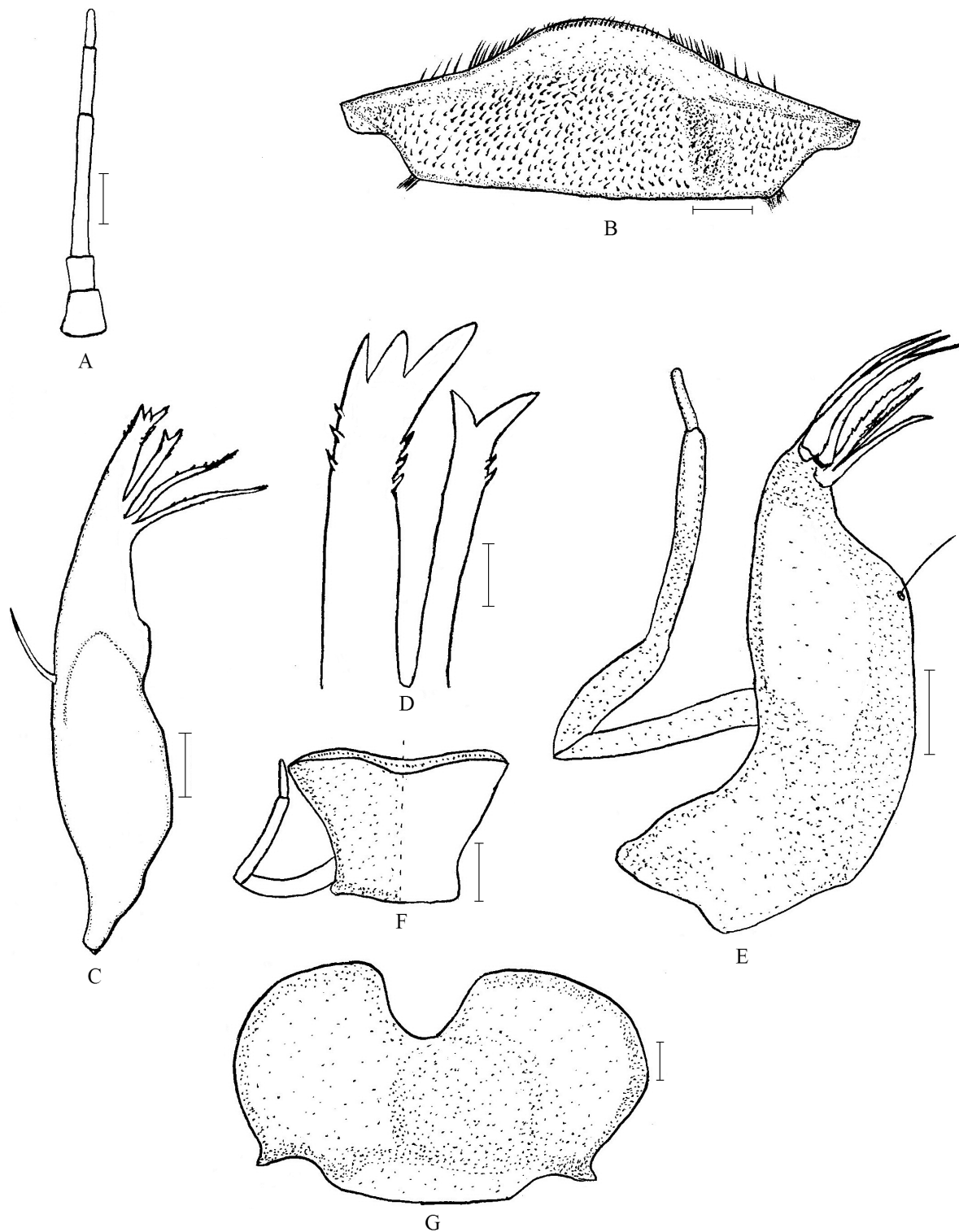


FIGURE 3. Mature Nymph of *Prosopistoma coorgum* sp. n. A, antenna (excluding the scape); B, labrum; C, mandible; D, details of canines in mandible; E, maxilla; F, labial palpi with prementum; G, postmentum. Scale bar 0.05 mm.

longer than inner canine with three apical teeth, outer tooth small and outer margin serrated near apex with 2–3 small short spines, inner tooth larger with margin serrated near apex with 3 small spines; inner canine (Fig. 3D) with two apical teeth, inner tooth a little larger, outer margin smooth; inner margin serrated near apex with 2–3 spines; two long serrated bristles arising from base of inner canine; a single stout seta present lateromedially on each mandible. Maxillae (Fig. 3E) crowned by rigid canine and three subequal dentisetae; three long feathered setae with stout bristles arising from base of apical canine and dentisetae on galea-lacinia. A single unserrated

bristle arising about two-thirds of way down the sclerotized section of galea-lacinia. Maxillary palpi (Fig. 3E) 3-segmented, segments II the longest, length ratio of maxillary palp segments from basal one to apical: 3.3:4.8:1. Labium composed of pre and postmentum (Fig. 3F & G); prementum trapezoid, cutting edge with fine teeth; scale-like structures present along basal margin of postmentum. Labial palpi (Fig. 3F) 3-segmented, length ratio of labial palpus segments from basal one to apical 2:2.5:1.

Legs (Figs. 4A). Dorsal margin of fore femur with 8–10 simple, short setae; ventral margin of fore tibia with 6–8 pectinate setae (Fig. 4A). Mid and hind tibia each with one pair of stout distal setae, one pectinate seta, and a smooth seta (Fig. 4B). Ventral and basal half surface of all femora with dense scale-like structures (Fig. 4A); mid and hind femora with scale-like covering along the dorsal and ventral surface. All claws slender and smooth without denticles.

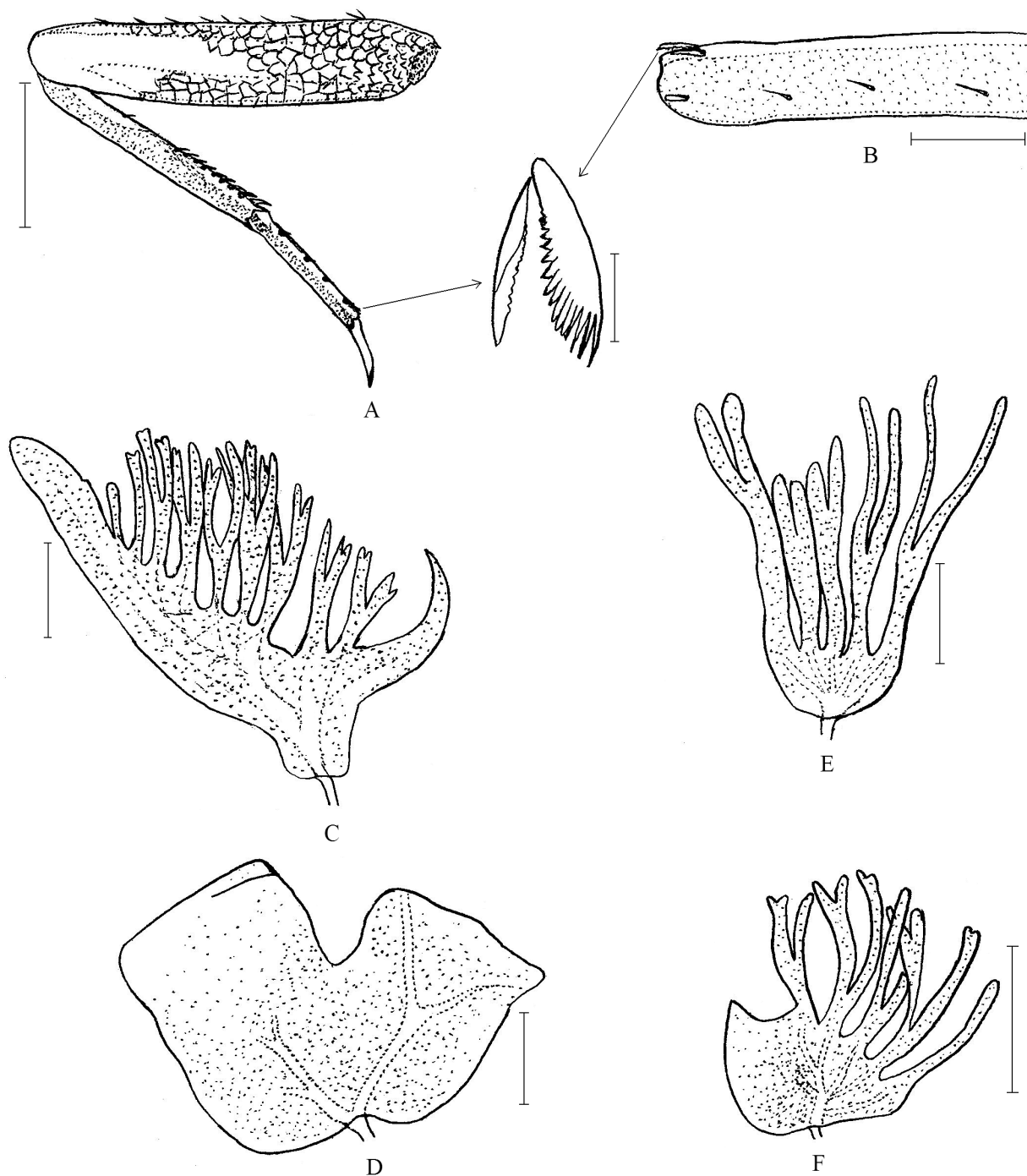


FIGURE 4. From mature nymph of *Prosopistoma coorgum* sp. n. A, fore leg; B, tibia of middle leg; C-F, gills I-IV. Scale bar 0.2 mm.

Abdomen. Abdominal gills as in figures 4C–F. Gill I with long lamellate with bifurcate upper portion, lower portion divided into ribbons, many of which branch dichotomously (Fig. 4C); gill II leaf-like and cleft (Fig. 4D), covering the gills III–V (Figs. 4E & F), gill VI tiny, unbranched. Posterolateral projections of abdominal segments VII–IX broad, apex pointed (Fig. 2A). The three caudal filaments are short and retractile as in all Prosopistomatidae.

Imago. Unknown.

Etymology. The species is named after the place of collection, Coorg.

Habitat. *P. coorgum* **sp. n.** nymphs were associated with boulders and pebbles, and they coexist with nymphs of *Choroterpes* Eaton, 1881, *Thalerosphyrus* Eaton, 1881 and *Platybaetis* Muller-Liebenau, 1980.

Discussion

Among the 13 species of *Prosopistoma* recorded from the Oriental region, *P. coorgum* **sp. n.** is distinguished by having the following characters: mesonotum with four distinctive markings present on each side of the midline and ventral margin of fore tibia with 6–8 pectinate setae. *Prosopistoma coorgum* **sp. n.** is morphologically close to *P. ocellatum* Shi & Tong, 2013, from China, sharing many characteristics including 6-segmented antenna, labrum approximately 3.0 times wider than long, maxilla with three long feathered setae with stout bristles arising from base of apical canine, and ventral and basal half surface of all femora with dense scale-like structures (Fig. 4A). This new species is distinguished from *P. ocellatum* in that the outer canine of its inner tooth margin has 3 small spines near the apex in the new species, while *P. ocellatum* has 4–6 small point spines; the ventral margin of fore tibia has 6–8 pectinate setae in the new species, 10–11 pectinate setae in *P. ocellatum*, and abdominal gill II leaf-like and cleft in the new species, unbranched in *P. ocellatum*. In addition, *P. coorgum* **sp. n.** is similar to *P. indicum* in sharing the carapace width little longer than length, segment II of labial palpi longer than segment I and posterolateral projections of abdominal segments VII–IX broad and pointed at apex. However, this new species is distinguished from *P. indicum* by the mesonotum with four pairs of eyespot markings, 6-segmented antenna, inner margin of outer canine near apex with 2–3 small short spines, 4-segmented maxillary palpi and ventral margin of fore tibia with 8 pectinate setae.

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