



A new species of *Choroterpes* (Ephemeroptera: Leptophlebiidae) from a tropical stream of south India

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Abstract

Choroterpes alagarensis new species (type locality: Alagar hill, Madurai) (Ephemeroptera: Leptophlebiidae) is described from male and female imago, sub imago and nymphs. This species is found in leaf packs, woody debris, pebbles and boulders and occurs in slow flowing stream areas.

Key words: *Choroterpes*, new species, tropical stream

Introduction

An assessment of the current condition and impacts of water resource development in forests streams and rivers of India is essential on the basis of aquatic macroinvertebrate community structure especially mayfly larvae. Among the mayflies, *Choroterpes* is an extremely widespread genus whose range in India between Tamil Nadu and Karnataka (Anbalagan et al., 2004; Dinakaran and Anbalagan, 2007). *Choroterpes* may be abundant in a variety of substrates (Dinakaran and Anbalagan, 2006). However, the present study describes a mayfly species from a small tropical stream of Alagar hill, Tamil Nadu, south India which would contribute to the knowledge on the distribution of *Choroterpes* and other mayflies in south India.

Study area. Alagar hill. Reserve forests of Alagar hill (10°14'180"N and 77°58'567"E) are 22km Northeast of Madurai city. There are two springs Garudathirtham (350m), a seasonal one, the other, the perennial Nuburagangai (425 m). The specimen was collected from the Nuburagangai stream. The monthly mean temperature is 27.5°. The maximum temperature goes up to 41°C during daytime in the summer (April and May) and night temperature is 29°C. In the cool season (December) the day temperature is 29°C and night temperature is 22°C. The rainfall regime is erratic. This area comes under dissymmetric rainfall regime with the bulk of the rains during the retreating northeast monsoon (October–November). Some rain is also received during the southwest monsoon (June–August).

Material and methods

Nymphs were collected by manually from the boulders, pebbles leaf litter and woody debris. Rearing was done in the field using plastic cups with screened windows, as described in Edmunds et al. (1976). Adults were collected at yellow light. Physico-chemical parameters were estimated by APHA (1995). Altitude, latitude and longitude location were taken through GPS (Global Positioning System: Garmin –12 maps). Specimens are deposited in Centre for Research in Aquatic Entomology Laboratory (CRE), The Madura College, Madurai, India.

***Choroerpes alagarensis* Dinakaran, Balachandran & Anbalagan, new species**

(Figure: 1–12)

Holotype: ♂ **imago** (in alcohol)

Body length 4.8mm, fore wing 5.0mm. Head: yellowish brown, antenna yellowish brown and transparent, scape and pedicel washed with yellowish brown. Upper portion of eyes dark brown, stalk short, lower portion black. Ocelli pale yellow and their bases whitish. Thorax: pronotum yellowish brown washed with black laterally and on basal margin; meso- and metanota light yellowish brown, margins and carinae darker. Pleura dark brown; thoracic sterna light yellow. Forewing (Fig. 1): membrane hyaline, transparent, dark yellow at base; longitudinal veins transparent dark yellow, cross veins hyaline. Hind wing (Fig. 2): membrane hyaline, dark brown marking on nodus, C and Sc translucent dark yellow in basal half, remaining veins hyaline. Foreleg: Light brown, tarsus lighter; femur with dark brown spots at apical, middle and basal; tarsal formula: 0.4:1.0 (1.5 mm): 0.04: 0.02: 0.15: 0.1: 0.08. Hind legs: transparent yellow, dark brown spots at apical, middle and basal in femora, tibiae light brown at the femoral joint. Abdomen (Fig. 3 & 4): terga transparent brownish yellow, washed with dark brown, with pale median, submedian line and lateral markings. Abdominal sterna transparent yellowish brown, sternum IX with brown basal and lateral margins. Genitalia (Fig. 5): forceps expanded in basal 1/3; styliger plate whitish, forceps and penes yellow. Penis lobes short and membranous. Caudal filaments transparent, light brown.

♂ **sub imago** (in alcohol)

Colour of ocelli and eyes as in male imago. Head and antennae: light brownish yellow, Thorax: terga yellowish brown, pleura and sterna washed with brownish yellow. Legs as in male imago. Membrane of fore and hind wing translucent yellow, other details of colouration as in male imago. Abdomen: terga light brown, marks on terga as in male imago except dark brown spot on terminal abdominal segment. Colour and marks of sterna as in male imago. Male genitalia: pale yellow. Caudal filament: light brown in colour.

Allotype:

♀ **imago** (in alcohol)

Body length: 4.4mm to 4.7mm. Fore wing: 6.5mm–7.5mm. Head: brown, antenna yellowish brown, scape and pedicel washed with yellowish brown, upper portion of the eye yellowish brown, stalk and short, lower portion brown. Ocelli light yellow, and their bases white. Thorax: pronotum yellowish brown washed with black laterally and on basal margin, meso and metanotum light yellowish brown, margins and carinae darker. Pleura light brown, thoracic sterna pale yellow. Fore wing: colour and marks as in male imago except membrane in cells C and Sc longitudinal and cross veins of fore wing darker. Hind wing: colour and marks as in male imago. Fore and hind leg as in male imago except basal marks in femur extend with tibia. Abdomen: terga of segment IV – X opaque brown, terga V–IX light brown, other details of colouration and marks as in male imago. Genital extension light brown, subanal plate blackish white at base, translucent apically, cone shaped without apical notch. Caudal and marks as in male imago.

♀ **sub imago** (in alcohol)

Colour of antennae, ocelli and eyes as in female imago. Head light brown. Colour and mark of thorax and leg as in female imago but paler. Wing: colour of membrane and veins of fore and hind wings as in male sub imago. Abdomen: terga opaque, light brown, sterna whitish brown, marks as in female imago. Caudal filament light brown.

Mature nymph (in alcohol):

Body length: 5–6mm. Head: light yellowish brown washed with brown, clypeus yellowish and brownish spots present anterior to median ocellus, and pale areas between lateral ocelli and eyes. Antennae yellow, basal segments light yellowish brown. Mouthparts: Labrum (Fig. 6) is expanded and angle laterally, length of labrum slightly more than 1/3 the total width, anteromedian emargination well broad and ‘U’ shaped; mandibles (Fig. 7) with outer margin slightly angled a tuft of setae at angle; maxilla (Fig. 8) with anteriomedian tooth obsolete; hypopharynx as in figure 9; segment of two labial palpi 3/4 the length of segment one, segment three slightly shorter than segment 2, with 3 large dorsal seta on segment 3 (Fig. 10);

labrum yellowish brown, basal 2/3 of mandibles brown, outer margin of maxilla, labium yellowish brown. Thorax: terga dark brown, pronotum crescent shaped sub median spots and later margin yellowish brown, mesonotum washed with brown on lateral margin; pleura washed with yellowish brown, sterna yellowish brown. Legs: yellowish white, femora with 3 dark brown spots on apical, median and basal spots, apical and median spot at tibiae and tarsi pale yellow; claw with 2 sections of 15+4 denticles (Fig. 11), with denticles in both sections increasing in size toward apex. Abdomen: terga washed with brown, sterna yellowish brown, male with dark brown at base of each segment, female with sterna washed with yellowish brown, posterior-lateral spines present on segment II–IX; gills (Fig. 12) brownish white, trachea brown, secondary trachea lacking side branches, caudal filaments yellowish brown.

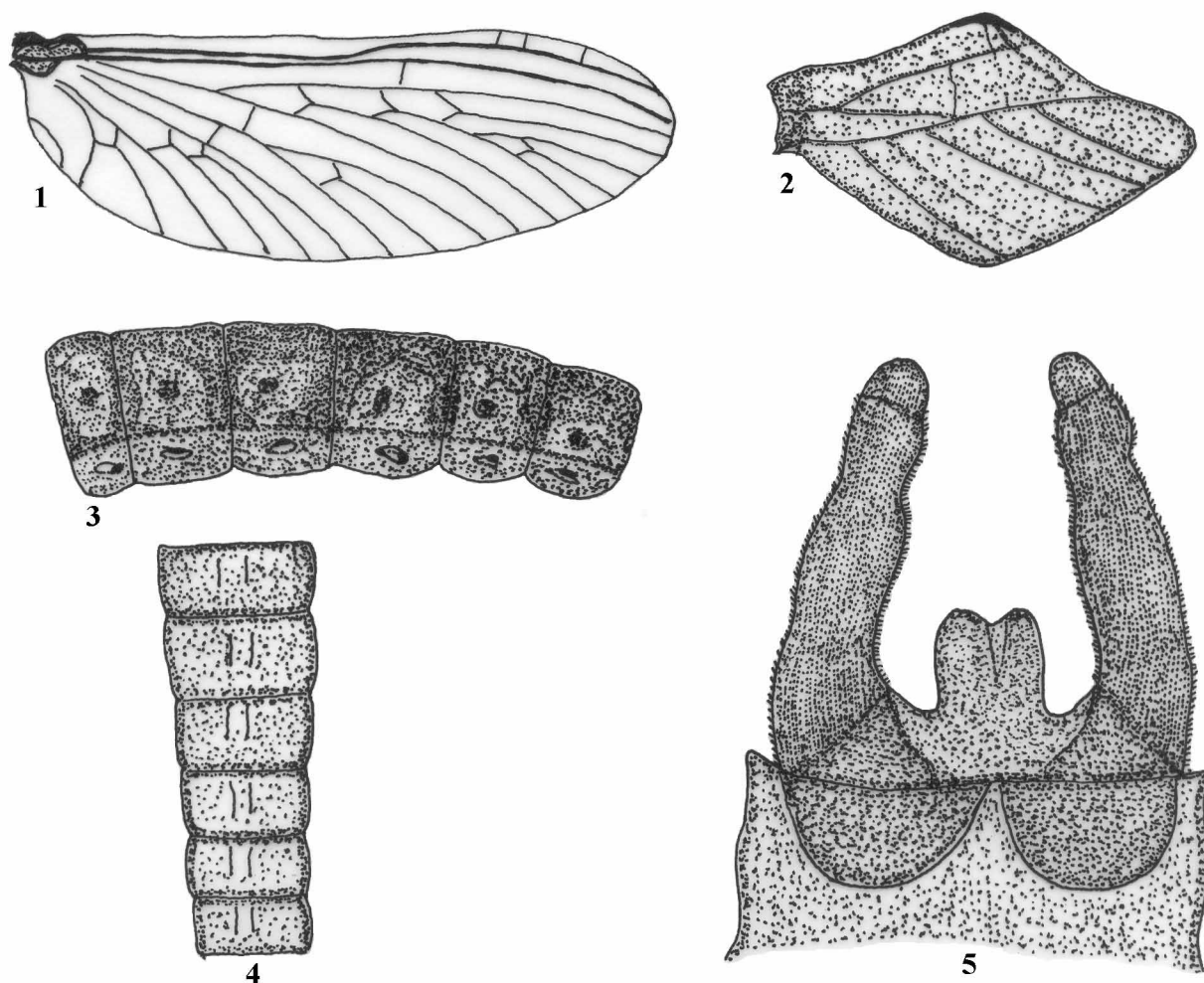


FIGURE 1–5. *C. alagarensis*. 1, fore wing; 2, hind wing; 3, lateral view of male abdominal segments; 4, tergites II – VII of male abdomen; 5, male genitalia.

Etymology. *alagarensis*: named for the place of collection, Alagar hills, Tamil Nadu, South India.

Specimens examined. Male imago Holotype labeled India, Tamil Nadu, Nuburagangai stream, 425 m, 10°14'180"N and 77°58'567"E; 10/xii/2006, Col. S. Anbalagan & S. Dinakaran. Female imago Allotype (with nymphal and subimago exuvia) same locality and date as holotype, Col. S. Anbalagan & S. Dinakaran. Paratypes (22 ♂♂, 15 ♀♀, 65 nymphs): Nuburagangai stream, 12 ♂, 10 ♀ reared with nymphal exuviae; 11 ♂, 9 ♀ (CRE), Nuburagangai stream, 425 m, 10°14'180"N and 77°58'567"E; 12/xii/2006, Col. S. Anbalagan & S. Dinakaran. 25 nymphs (CRE), same locality, date and collectors as holotype; 3 ♂, 2 ♀, 17 nymphs (CRE); Thadaganachiamman stream, 375 m, 8° 57'.938", 77° 08'.73", 25/xii/2006, Col. C. Balachandran & S. Anbalagan; 5 ♂, 3 ♀, 15 nymphs (CRE); Thalayar, 400 m, 10° 14'.733"N, 77° 30'.98"E, 19/iii/2007 Col. C.

Balachandran & S. Anbalagan; 3 ♂, 1 ♀, 8 nymphs (CRE); Ayyanar falls, 350 m, 8° 42'.718"N, 77° 07'.29"E, 24/vi/2006, Col. C. Balachandran & S. Anbalagan.

Ecology. This species found in leaf packs, gravels, boulders, submerged roots and woody debris and occurs in slow flowing stream areas. *Baetis* sp., *Caenis* sp., and *Goerodes palnius* were associated with this species.

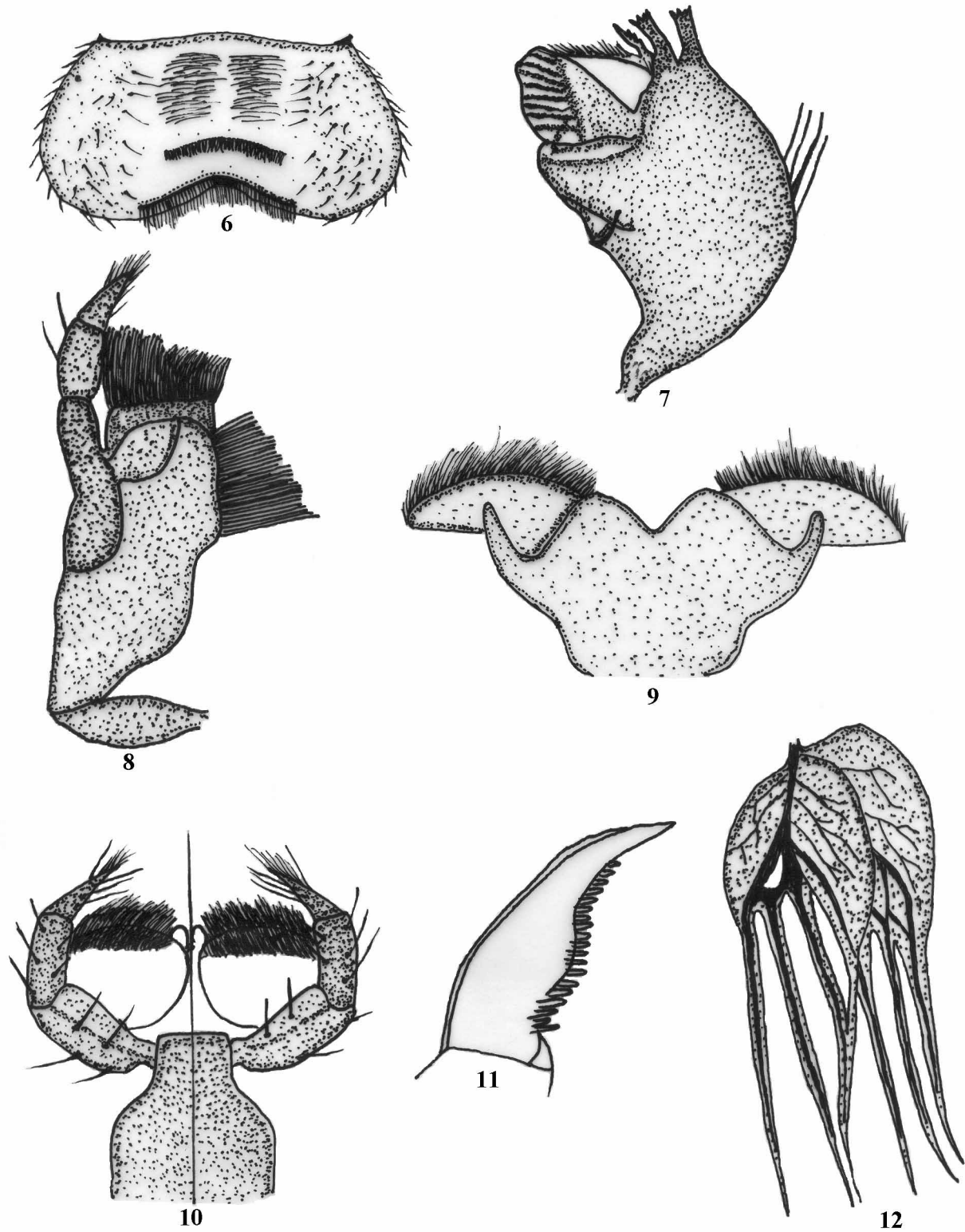


FIGURE 6–12. Nymph of *C. alagarensis*. 6, labrum; 7, right mandible, dorsal; 8) maxilla, ventral; 9) hypopharynx, ventral; 10, labium: right, ventral view, 11) fore claw of nymph and 12) gill IV.

Diagnosis. *Choroterpes alagarensis* can be separated from *Choroterpes nanjingensis* by the following combination of characters. In the imago: (1) hind wing dark brown marking on nodus; (2) forceps and penes yellow; (3) penis lobes short. In the nymph: (1) labrum anteromedian emargination well broad and 'U' shaped; (2) mandibles with outer margin slightly angled a tuft of setae at angle; (3) apical, median and basal part of femora with dark brown spots.

Discussion

The literature on Leptophlebiidae family is extensive, especially in America and Europe. This is the second largest Indian family of mayflies in terms of numbers of species and few species of this group are recorded from peninsular India (Sivaramakrishnan, 1984). Despite the advances which have been made leptophlebiid classification, knowledge of the systematics and ecology of this group in tropical Asia is meager (Dudgeon, 1999). In other areas from Asia, *Choroterpes* is recorded in China (Wu et al., 1987; Yu & Su, 1987; Kang & Yang, 1994) and in Taiwan, Malaysia, Borneo, Sumatra and Java (You et al., 1980; You & Su, 1987; Wu & You, 1989; 1992; You & Gui, 1995).

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