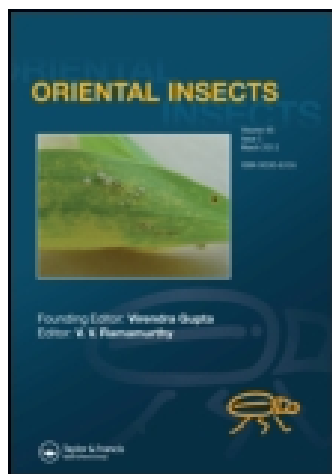


This article was downloaded by: [Научная библиотека СПбГУ]

On: 28 April 2015, At: 05:36

Publisher: Taylor & Francis

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



## Oriental Insects

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/toin20>

### A new species of mayfly (Ephemeroptera: Leptophlebiidae) from the Western Ghats, India

C. Selva Kumar<sup>a</sup>, M. Arunachalam<sup>b</sup> & K.G. Sivaramakrishnan<sup>c</sup>

<sup>a</sup> Department of Zoology, University of Madras, Guindy Campus, Chennai, 600 025, India

<sup>b</sup> Sri Paramakalyani Centre for Environmental Sciences, Manonmaniam Sundaranar University, Alwarkurichi, 627 412, India

<sup>c</sup> Department of Zoology, Madras Christian College (Autonomous), Tambaram East, Chennai, 600 059, India

Published online: 21 Nov 2013.

To cite this article: C. Selva Kumar, M. Arunachalam & K.G. Sivaramakrishnan (2013) A new species of mayfly (Ephemeroptera: Leptophlebiidae) from the Western Ghats, India, *Oriental Insects*, 47:2-3, 169-175, DOI: [10.1080/00305316.2013.811020](https://doi.org/10.1080/00305316.2013.811020)

To link to this article: <http://dx.doi.org/10.1080/00305316.2013.811020>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms &

Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

## A new species of mayfly (Ephemeroptera: Leptophlebiidae) from the Western Ghats, India

C. Selva Kumar<sup>a\*</sup>, M. Arunachalam<sup>b</sup> and K.G. Sivaramakrishnan<sup>c</sup>

<sup>a</sup>Department of Zoology, University of Madras, Guindy Campus, Chennai 600 025, India; <sup>b</sup>Sri Paramakalyani Centre for Environmental Sciences, Manonmaniam Sundaranar University, Alwarkurichi 627 412, India; <sup>c</sup>Department of Zoology, Madras Christian College (Autonomous), Tambaram East, Chennai 600 059, India

(Received 10 May 2012; final version received 10 December 2012)

A new species of mayfly *Choroterpes (Euthraulius) nambiyarensis* sp. nov. is described from the nymphs collected in the southern Western Ghats, India. The types are deposited in the Zoological Survey of India, Kolkata, India.

**Keywords:** southern Western Ghats; Ephemeroptera; Leptophlebiidae; *Choroterpes* complex; new species

### Introduction

The mayfly genus *Choroterpes* Eaton and the closely related *Neochoroterpes* Allen form the *Choroterpes* complex (= *Choroterpes* group of O'Donnell and Jockush 2008). Its distribution is from California through southern Europe to the Philippines, and down to the tip of Africa. This complex includes three subgenera: *Choroterpes* s. str. Eaton (14 species), *Choroterpes (Euthraulius)* Barnard (27 species) and *Choroterpes (Cryptopenella)* Gillies (three species). The *Neochoroterpes* until recently also considered a subgenus of *Choroterpes*, contains four species in southwestern USA and Mexico (Flowers 2009). *Choroterpes (Euthraulius) alagarensis* Dinakaran et al. (2009) from south India, *Choroterpes (Euthraulius) parvula* from north India (Gillies 1951), one species each described from Sri Lanka (Hagen 1858), Pakistan (Ali 1967) and Myanmar (Eaton 1892) is the species known of the subgenus *Euthraulius* from the Indian subregion. The genus *Choroterpes* is also known from China (Wu et al. 1987; You and Su 1987; Kang and Yang 1994), Taiwan, Malaysia, Borneo, Sumatra and Java (You et al. 1980; You and Su 1987; Wu and You 1989, 1992; You and Gui 1995).

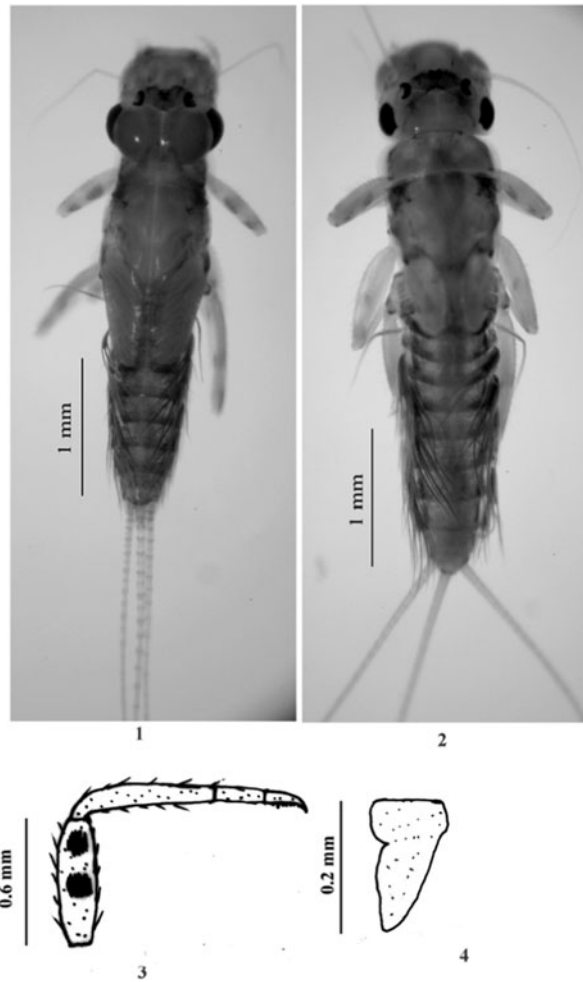
The *Choroterpes* complex is recognised by the following characters (Flowers 2009): in the nymphs (1) first abdominal gill is a pair of slender filaments different from gills 2–6; (2) the apex of glossae provided with broad spatulate setae and (3) the posterior row of setae on the labrum arises close to its middle (except in some *Neochoroterpes*); in the adults (1) in forewing, MP (Media Posterior) has a symmetrical fork while in MP<sub>2</sub> it is asymmetrical; (2) cubital area broad with four (sometimes three) intercalaries; (3) forceps in the male abruptly widened in its basal 1/4th–1/3rd and (4) penes as two simple lobes, very short to elongate and lacking spines or accessory lobes. The nymphs of the subgenus *Choroterpes* s. str. are distinguished by a broad, terminal lobe on the lamina of gills 2–6; in contrast the subgenus *Euthraulius* has gills

\*Corresponding author. Email: [selva06@gmail.com](mailto:selva06@gmail.com)

2–6 bearing three narrow filaments on the apex of each lamina; while in the subgenus *Cryptopenella* – originally described as a genus (Gillies 1951) but placed as a subgenus by Zhou (2006) – penes is very short and do not protrude beyond the styliiger plate.

The *Neochoroterpes* of Allen (1974) described as a subgenus of *Choroterpes* – raised to generic rank without any explanation by Henry (1993) have short penes lobes – although not as short as in *C. (Cryptopenella)*, with the nymphs resembling those of *C. (Euthraulius)*, but without the row of setae across the middle of the labrum.

Recently, while inventorying the mayfly fauna of Kalakad-Mundanthurai Tiger Reserve (KMTR) of the southern Western Ghats, the nymphs of Leptophlebiidae belonging to a new species of *Choroterpes* were collected, and it is described herein. This new species falls under the subgenus *Euthraulius*, as its nymphs are with the gills 2–7 similar, with the dorsal and ventral lamellae plate like, terminating in three slender, subequal processes. This new species resembles *C. (E.) alagarensis* Dinakaran et al. (2009) from south India. The type material is deposited in the Zoological Survey of India, Kolkata (ZSI-K).



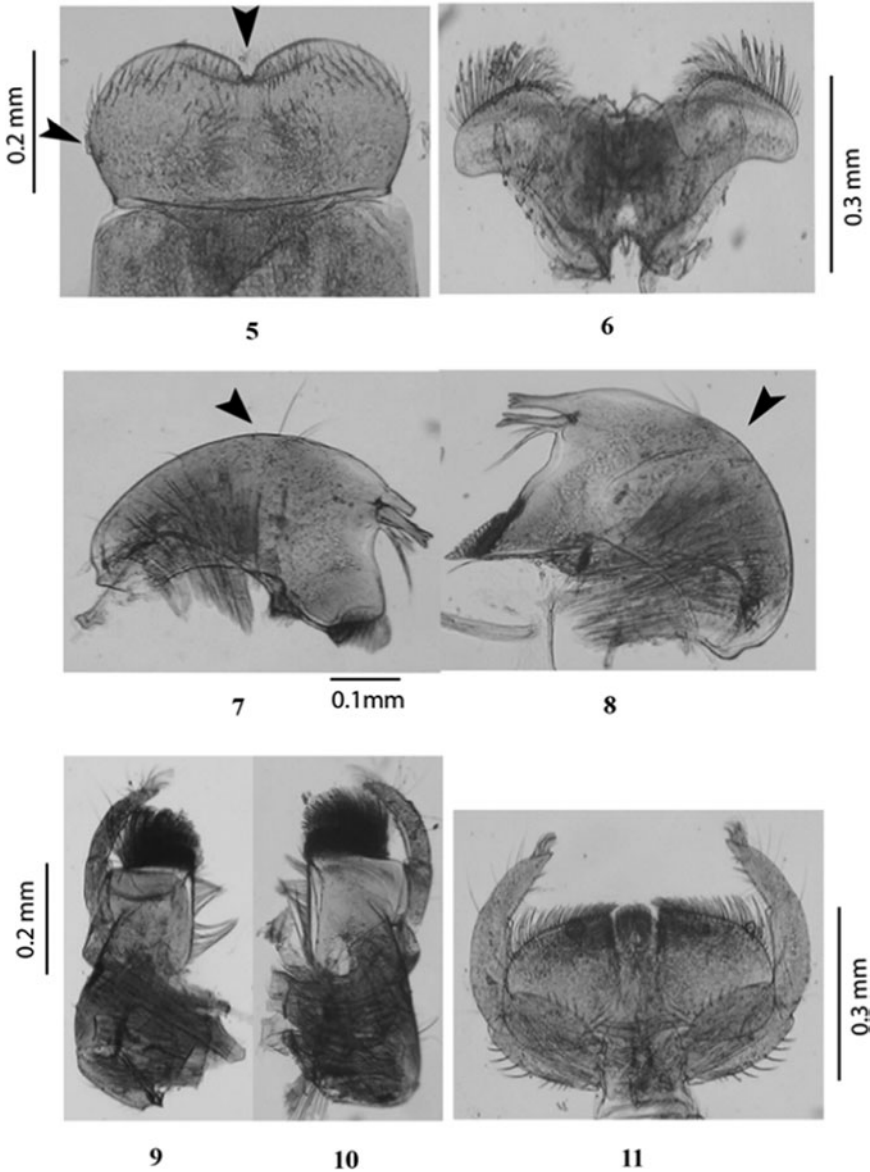
Figures 1–4. *C. (E.) nambiyarensis* sp. nov. 1, male nymph; 2, female nymph; 3, leg; 4, paraproct.

*Choroerpes (Euthraulius) nambiyarensis* sp. nov. (Figures 1–16, 18–26)

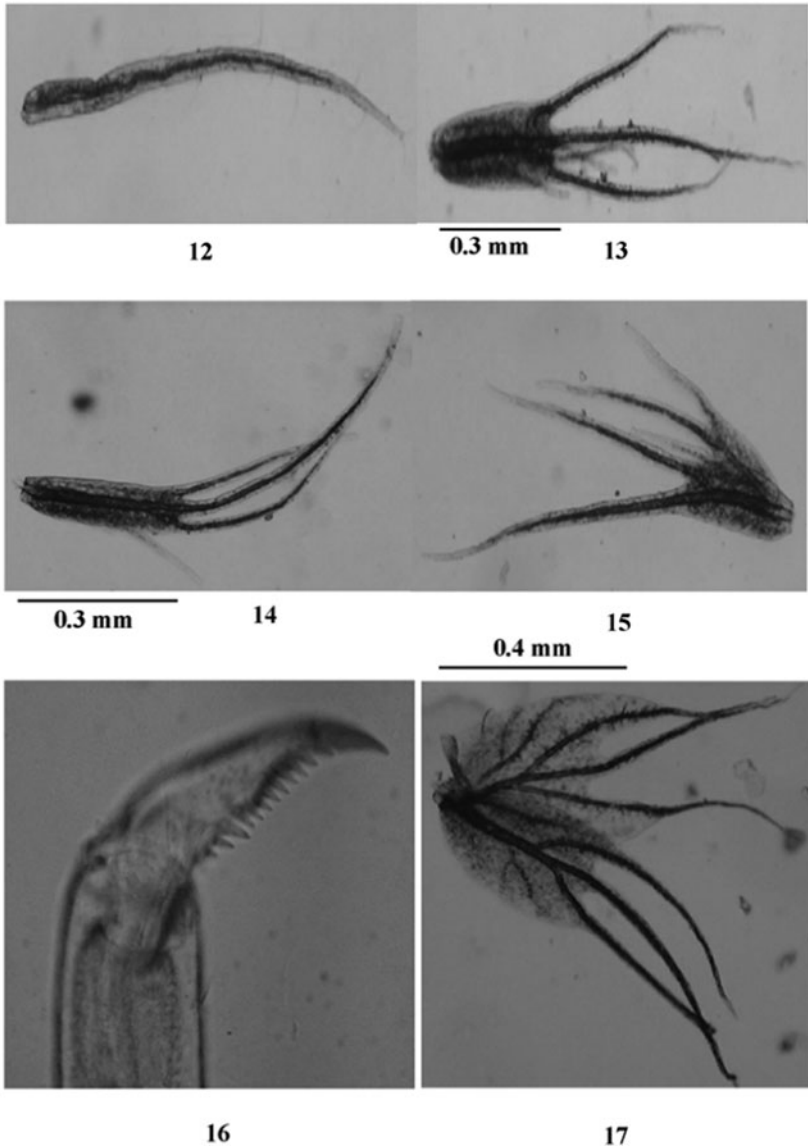
Description

Male (mature nymph in alcohol) body length 3–4 mm; terminal filament: 7 mm; cerci: 4 mm (Figures 1,2).

Head pale yellowish brown washed with brown, clypeus with yellowish and brownish spots anterior to median ocellus, and pale areas between lateral ocelli and eyes. Antennae yellow, basal segments pale yellowish brown. Mouthparts with labrum expanded and angulate laterally, slightly  $>0.5 \times$  as long as total width, anteromedian emargination



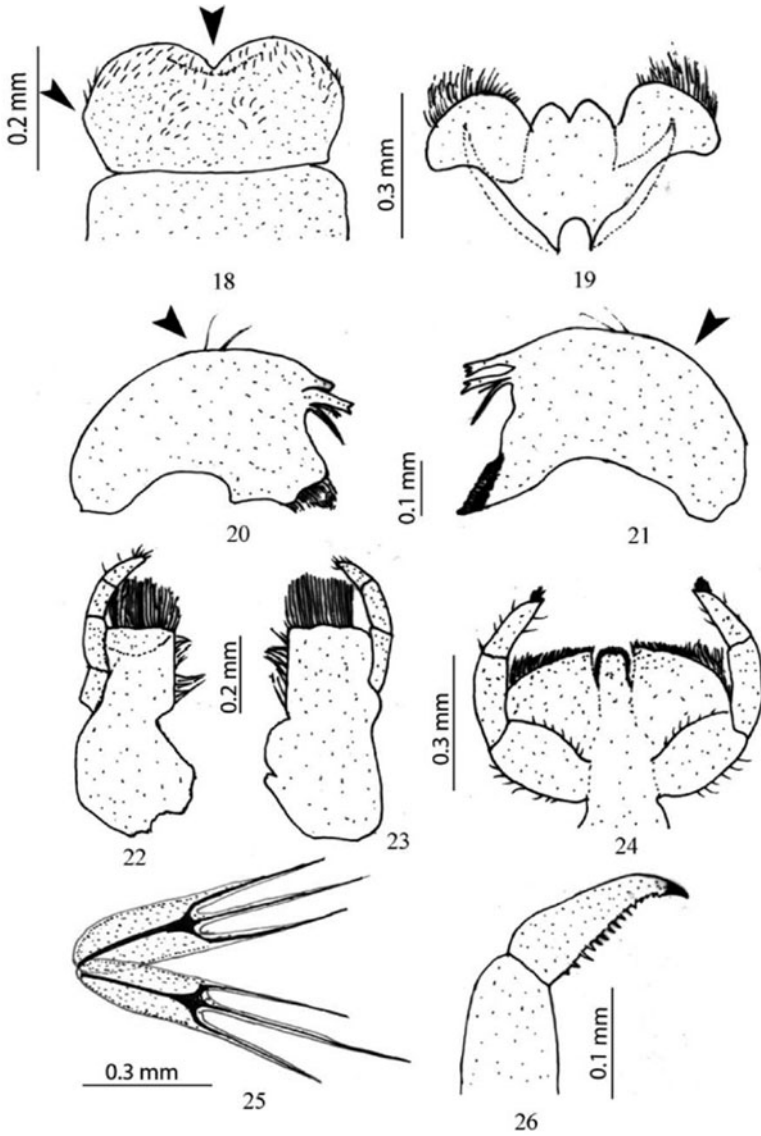
Figures 5–11. *C. (E.) nambiyarensis* sp. nov. 5, labrum; 6, hypopharynx; 7, left mandible; 8, right mandible; 9, left maxilla; 10, right maxilla; 11, labium.



Figures 12–17. *C. (E.) nambiyarensis* sp. nov. 12, gill-I; 13, gill-IV; 14, gill-VI; 15, gill-VII; 16, claw; 17, IV gill of *C. (E.) alagarensis*.

narrow and deeply cleft ('V' shaped), lateral margin broadly acute (Figures 5,18); mandibles with outer margin deeply angulate with a tuft of setae at angle (Figures 7,8,20,21); maxilla with palpi three segments, terminal segment smallest and with bristles (Figures 9,10,22,23); hypopharynx as in Figures 6 and 19; segment 2 of labial palpi  $0.75 \times$  as long as segment 1, segment 3 slightly shorter than 1 and 2, with three large dorsal setae on segment 3 (Figures 11,24) and labrum yellowish brown, basal 2/3rd of mandibles brown and outer margin of maxilla, labium yellowish brown.

Thorax with terga brown, pronotum with crescent-shaped submedian spots, its lateral margin yellowish brown, mesonotum washed with brown on lateral margin; pleura washed



Figures 18–26. *C. (E.) nambiyarensis* sp. nov. 18, labrum; 19, hypopharynx; 20, left mandible; 21, right mandible; 22, left maxilla; 23, right maxilla; 24, labium; 25, gill-IV; 26, claw.

with yellowish brown, sterna yellowish brown. Legs yellowish white, femora with two dark brown spots on median and basal spots, tibiae and tarsi pale yellow (Figure 3) and claws with around 12 denticles similar in size (Figures 16,26).

Abdomen with terga washed with brown, sterna yellowish brown, male with pale brown patches at base of each segment, female with sterna washed with yellowish brown, posteriolateral spines present on segments II–IX; gills blackish white, trachea black, secondary trachea lacking, without side branches, caudal filaments yellowish brown and terminal filament longer than cerci (Figures 12–15,25). Paraprocts smooth, without bristles or pores and their inner and outer marginal areas with chitinous thickening (Figure 4).

*Holotype*

m, mature nymph, India: Tamil Nadu: Tirunelveli district: Nambiyar River, near Forest check post, 227 m, 08°26'27.3", 77°31'37.9", 22.ii.2010. Coll. C Selva Kumar, KG Sivaramakrishnan, in alcohol, Ref. No. 4850/H13 dt. 16/12/11; *paratypes*, 1m, 2f, nymphs, 22.ii.2010. Coll. C Selva Kumar, KG Sivaramakrishnan, in alcohol, Ref. No. 4851 dt. 16/12/11 (ZSI-K).

*Etymology*

This species is named after the type locality, Nambiyar River, Tirunelveli district, Tamil Nadu, India.

*Comments*

This new species resembles *C. (E.) alagarensis* Dinakaran et al. but distinguished by (in the nymph) (1) the anteromedian emargination of labrum comparatively narrow and deeply cleft ('V' shaped), lateral margin broadly acute; (2) mandibles with outer margin comparatively deeply angulate with a tuft of setae at angle; (3) apical and median dark brown maculae at femora and (4) dorsal and ventral lamellae plate like, narrow, terminating in three slender subequal processes, with tracheae unbranched.

**Acknowledgements**

The authors thank Dr K.A. Subramanian, Z.SI, Kolkata, for critical review of the manuscript. C.S. thanks Dr S. Janarthanan for encouragement and support, and acknowledges the award of Dr D. S. Kothari Post-Doctoral fellowship by the UGC, New Delhi [F No. 4-2/2006(BSR)/13-670/2012 (BSR)]. K.G.S. thanks UGC for the award of Emeritus Fellowship (No. F.6-39/2011: SA-II).

**References**

- Ali SR. 1967. The mayfly nymphs (Order: Ephemeroptera) of Rawalpindi District. Pakistan Journal of Science. 1967:73–86.
- Allen RK. 1974. *Neochoroterpes*, a new subgenus of *Choroterpes* Eaton from North America (Ephemeroptera: Leptophlebiidae). Canadian Entomologist. 106:161–168.
- Dinakaran S, Balachandran C, Anbalagan S. 2009. A new species of *Choroterpes* (Ephemeroptera: Leptophlebiidae) from a tropical stream of south India. Zootaxa. 2064:21–26.
- Eaton AE. 1892. New species of Ephemeridae from the Tenasserim Valley. Transactions of the Entomological Society of London. 1892:185–190.
- Flowers RW. 2009. Life was a beach: A panbiogeographic analysis of the cosmopolitan mayfly genus *Choroterpes* (Ephemeroptera: Leptophlebiidae: Atalophlebiinae). Aquatic Insects. 31 (Suppl. 1):585–593.
- Gillies MT. 1951. Further notes on Ephemeroptera from India and Southeast Asia. Proceedings of the Royal Entomological Society of London (B). 20:121–130.
- Hagen H. 1858. Synopsis der Neuroptera Ceylons. Verhandelingen der Zoologisch Botanischen Gesellschaft in Wien. 8:471–488.
- Henry BC. 1993. A revision of *Neochoroterpes* (Ephemeroptera: Leptophlebiidae) new status. Transactions of the American Entomological Society. 119:317–333.
- Kang SC, Yang CT. 1994. Leptophlebiidae of Taiwan. Journal of Taiwan Museum. 47:57–82.
- O'Donnell B, Jockusch EL. 2008. Phylogenetic relationships of leptophlebiid mayflies as inferred by histone H3 and 28S ribosomal DNA. Systematic Entomology. 33:651–667.
- Wu T, You DS. 1989. Two new species of the genus *Choroterpes* from China (Ephemeroptera: Leptophlebiidae). Acta Zootaxonomica Sinica. 14:91–95.
- Wu T, You DS. 1992. A new species of the genus *Choroterpes* from Anhui Province, China (Ephemeroptera: Leptophlebiidae). Acta Zootaxonomica Sinica. 17:64–66.



- Wu T, Ying XD, Chen HD. 1987. Two species of nymphs of *Choroterpes* from Yi Xing. *Journal of Nanjing Normal University, Natural Science*. 4:81–84.
- You DS, Su CR. 1987. Descriptions of the nymphs of *Choroterpes nanjingensis*, *Potamanthodes fujianensis* and *Isonychia kiangsinensis*. *Acta Zootaxonomica Sinica*. 12:332–336.
- You DS, Gui H. 1995. Economic insect fauna of China. Fasc. 48. Ephemeroptera. Beijing: Science Press, 15 pp.
- You DS, Wu T, Gui H, Xu JZ, Su CR. 1980. A new species of the genus *Choroterpes* from Nanjing (Ephemeroptera: Leptophlebiidae). *Acta Zootaxonomica Sinica*. 5:388–391.
- Zhou CF. 2006. The status of *Cryptopenella* Gillies, with description of a new species from southwestern China (Ephemeroptera: Leptophlebiidae). *Oriental Insects*. 40:295–302.