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Nanocladius (Plecopteracoluthus) shigaensis sp. nov. (Chironomidae: Orthocladiinae) whose larvae are phoretic on nymphs of stoneflies (Plecoptera) from Japan

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Abstract

We identified a new species, *Nanocladius (Plecopteracoluthus) shigaensis*, from Shiga and Gifu Prefectures, Japan, whose larvae are phoretic on nymphs of Plecoptera. Although this new species is morphologically similar to *Nanocladius (Plecopteracoluthus) asiaticus* Hayashi (1998), which is phoretic on Megaloptera larvae, it differs from *N. (P.) asiaticus*: the color of the larval head capsule is light brown in *N. (P.) shigaensis* and dark brown in *N. (P.) asiaticus* and the larval capsule index of the former is significantly larger than that of the latter. Moreover, analyses based on DNA sequence of cytochrome *c* oxidase subunit I (*COI*) supported the hypothesis that *N. (P.) shigaensis* and *N. (P.) asiaticus* are two distinct species. This is the first record of a phoretic chironomid on a plecopteran nymph in the Palaearctic region.

Key words: Diptera, symbiosis, coronal triangle filaments, capsule index, cytochrome *c* oxidase subunit I (*COI*), genetic distance

Introduction

There are numerous reports of chironomid larvae living on aquatic animals, including members of the Insecta (Ephemeroptera, Odonata, Plecoptera, Hemiptera, Megaloptera, Trichoptera, and Diptera), Crustacea, Gastropoda, Bivalvia, Hydrozoa, Mollusca, Porifera, and Pisces (e.g., Steffan 1967; Tokeshi 1993, 1995; Jacobsen 1995; Pennuto 1997; Ashe & O'Connor 2002; Roque *et al*. 2004a, 2004b; Roque & Trivinho-Strixino 2005; Henriques-Oliveira & Nessimian 2009; Mangan & Bilger 2012). Concerning Plecoptera nymphs as hosts, there are 18 records in the Nearctic and Neotropical regions (Steffan 1965, 1967; Dosdall & Mason 1981; Dosdall *et al*. 1986; Bottorff & Knight 1987; Giberson *et al*. 1996; Doucett *et al*. 1999; Dorvillé *et al*. 2000, Roque *et al*. 2004b). Among them, only two cases were described as parasitic: *Nanocladius (Plecopteracoluthus)* sp. on *Pteronarcys biloba* (Plecoptera: Pteronarcyidae) (Doucett *et al*. 1999) and *Nanocladius (Plecopteracoluthus)* sp. nr. *branchicolus* on *P. biloba* (Giberson *et al*. 1996). The others are regarded as phoretic or symbiotic. Most of the phoretic or parasitic chironomids recorded on Plecoptera are members of the genus *Nanocladius* (13/18=72%), and the other genera are *Cricotopus*, *Tvetenia*, *Paratanytarsus*, *Polypedilum*, and *Rheotanytarsus* (Dosdal *et al*. 1986).

The genus *Nanocladius* was established by Kieffer (1913) and includes 34 valid species worldwide (Ashe & O'Connor 2012). The genus is divided into two subgenera: subgen. *Nanocladius*, which includes 30 species, and subgen. *Plecopteracoluthus* Steffan 1965 n. stat. amended by Sæther (1977a), which includes 4 valid species (ibid).

Hayashi & Kobayashi (2000) noted that no chironomids phoretic on Plecoptera nymphs had been found in

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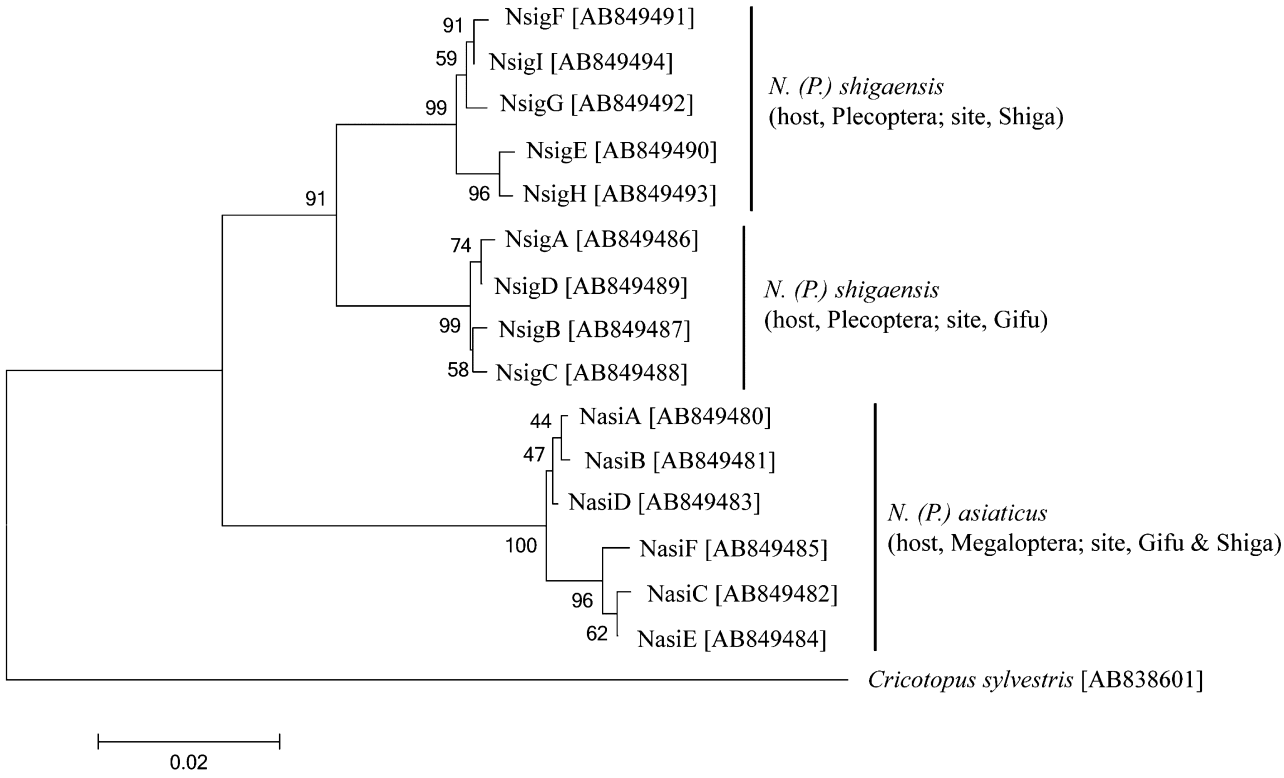

FIGURE 7. Neighbor-joining tree based on 658 bp of partial *COI* sequences and K2P model. Numbers at the nodes indicate percent bootstrap value of 1000 replications. *Cricotopus sylvestris* was used as the outgroup.

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