A comparative morphological analyses of four species of Camptocercus Baird,1843 (Cladocera: Anomopoda: Chydoridae)

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Abstract

Study of four poorly known cladocera species of the genus Camptocercus Baird,1843 (Anomopoda: Chydoridae): North American C. oklahomensis Mackin, 1930, and three Palearctic species, C. uncinatus Smirnov, 1971, C. fennicus Stenroos, 1898, and C. lilljeborgi Schoedler, 1862, revealed strong differences between them in both outer morphology and morphology of appendages. C. oklahomensis lacks a head keel, typical for the most species of the genus, and has numerous characters confirming its basal position within the genus, namely less elongated postabdomen with groups of elementary marginal denticles and less specialized morphology of the thoracic limbs. C. uncinatus and C. fennicus have similar limb morphology, these species form a monophyletic clade with South-East Asian species C. vietnamensis Thanh, 1980. C. lilljeborgi have a straight ventral margin of valves with specially dense setation, similar to the species of the genus Graptoleberis Sars, 1862. C. lilljeborgi also has most derived appendages, i.e. exopodites of limbs III–V have seta 4 reduced to a state of a small stub, and seta 3 with extremely wide basal portion. The level of differences in thoracic limb morphology in Camptocercus is unusual for the subfamily Aloninae, where in most genera limb morphology is relatively uniform. Morphology and phylogenetic relationships of the studied species are discussed.

Key words: Cladocera, Chydoridae, Camptocercus, taxonomy, morphology, thoracic limbs

Introduction

The genus Camptocercus Baird, 1843 (Cladocera: Anomopoda: Chydoridae) is among unusual and well-diagnosed genera of the subfamily Aloninae Dybowski & Grochowski. The main features of the genus are: a low, elongated body, extremely elongated postabdomen, and abdomen with an abdominal joint and a saddle-shaped middle segment. Most species of the genus also have a well-developed dorsal keel on both head and valves, but it is absent in two American species: C. oklahomensis Mackin, 1930 and C. aloniceps Ekman, 1901. Generic status and composition of Camptocercus was never questioned. The genus was revised by Smirnov (1998), who listed nine species within the genus. One more species, C. vietnamensis Thanh, 1980, was recently redescribed by Sinev (2011), although it was presumed as synonym by Smirnov (1998). According to Sinev & Atroshenko (2011), Camptocercus is a most specialized genus within the Arthrocauda-clade of the subfamily, closely related to Kozhowia Vasiljeva & Smirnov, 1969 and Parakozhowia Kotov, 2000, two endemic genera of Baikal Lake.

Main trend of modern Aloninae systematic is a broad use of limbs morphology for genera and species diagnosis and for the phylogenetic reconstructions (Kotov 2009; Sinev & Atroshenko, 2011; Van Damme et al. 2011). But the morphology of appendages were adequately studied only for two species of the genus, Camptocercus rectirostris (see Alonso 1996; Hudec 2010) and C. vietnamensis (see Sinev 2011). Less detailed description of limbs were available for three more species, C. uncinatus Smirnov, 1971, C. lilljeborgi Schoedler, 1862 (Smirnov 1971) and C. streletskae Smirnov, 1998 (Smirnov 1998). The only feature of limb morphology which was in used in the systematics of the genus is the morphology of setae on inner distal lobe of limb I, which varies greatly among species (see Smirnov 1998). The aim of present study is an investigation of morphology of four species of Camptocercus—C. uncinatus, C. oklahomensis, C. fennicus Stenroos, 1898, and C. lilljeborgi.
The sole exception is the genus *Leydigia* (see Kotov, 2009), where the diversity of limb morphology reaches same level as in *Camptocercus*.

*Leydigia* is similar to *Camptocercus*, also being one of the most morphologically divergent genera of Aloninae, and having numerous advanced features in outer morphology namely characteristic body shape, dense seta on the valve ventral margin, broad postabdomen with extremely strong lateral groups of setules, basal claw of postabdomen with reduced of absent basal spine, antenna with clusters of long thick setules, and male postabdomen with a penis-like process. Unlike *Camptocercus*, which is encountered in a variety of environments, *Leydigia* is specially adapted to benthic life at muddy bottom (Kotov 2006). In my opinion, uniform thoracic limb morphology within the most Aloninae genera can be attributed to a high level of competition between genera, where most “optimal” combinations are already attained. *Camptocercus* and *Leydigia* are both extremely specialized and free from competition from other genera, so diversification of thoracic limbs morphology between species became possible.

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**References**


http://dx.doi.org/10.4081/jlimnol.2013.s2.e6


http://dx.doi.org/10.2307/3222295


http://dx.doi.org/10.1080/1125000209356439


http://dx.doi.org/10.5962/bhl.title.14414


http://dx.doi.org/10.1163/156854085x00800


http://dx.doi.org/10.11646/zootaxa.3693.3.3


http://dx.doi.org/10.1134/s1995425510040119


http://dx.doi.org/10.1111/j.1096-3642.2010.00639.x
