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A new and a rare species of *Chydorus* Leach, 1816 (Branchiopoda: Cladocera: Anomopoda) from Cat Tien National Park, Vietnam

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Abstract

The present study of cladocera of the genus *Chydorus* from South Vietnam revealed a new species, *C. idrisi* sp. nov. and a rare species, *C. breviceps* (Stingelin, 1905). *C. idrisi* sp. nov. belongs to the *C. eurynotus* Sars, 1901 group, characterized by small labral plate with rounded tip and by absence of honeycomb sculpture on the valves. *C. idrisi* sp. nov. differs from other species of the group by the sculpture of valves, morphology of rostrum, postabdominal claw, inner distal lobe of first thoracic limb and male postabdomen. Morphology of *C. breviceps* was studied for the first time. *C. breviceps* has only one major head pore, and differs from the majority of *Chydorus* species by numerous other characters. Taxonomic position of studied species is discussed.

Key words: Cladocera, *Chydorus*, South-East Asia, morphology, taxonomy

Introduction

The genus *Chydorus* Leach, 1816 is one of the most diverse and taxonomically difficult genera of the family Chydoridae. Both tropical and temperate species of the genus were intensively investigated at the end of XX century (Alonso, 1988; Chengalath & Hann, 1981; Frey, 1980, 1982a,c,d, 1985, 1987a; Michael & Hann, 1979; Paggi, 1972; Rajapaksa & Fernando, 1986), but current taxonomic studies of the genus became much less intensive. According to Smirnov (1996), the genus consists of 30 species, and one more species was described recently (Smirnov & Sheveleva, 2010), but diversity of the genus is probably much higher. Recent studies of *Chydorus sphaericus* (Müller, 1875) complex (Belyaeva & Taylor, 2009) revealed several yet undescribed cryptic species in Northern Hemisphere. Several tropical species of the group, like *Chydorus eurynotus* Sars, 1901, *Chydorus ventricosus* Daday, 1898, and *Chydorus pubescens* Sars, 1901 are still presumed to be circumtropical (Smirnov, 1996). Such distribution contradicts the “Frey’s non-cosmopolitanism paradigm” (Frey 1982b, 1987b), now universally accepted in the cladoceran taxonomy (Kotov *et al.* 2010a) and suggests a presence of numerous species-complexes within the genus. The diversity of the genus seems to be underestimated for all geographic regions but Europe.

The cladoceran fauna of South-East Asia has been intensively studied during the last decades, but only few recent works deal with the morphology and taxonomy of the subfamily Chydorinae (Kotov *et al.*, 2013; Sinev & Korovchinsky, 2013, Sinev & Sanoamuang, 2011, 2013). According to Korovchinsky (2013), of 30 *Chydorus* taxa recorded for South-East Asia, only 7 are good species, 7 are synonyms, and more than half (16) are vague taxa, usually with no reliable descriptions from the region provided. Detailed descriptions are available only for several *Chydorus* species of local fauna: *C. angustirostris* Frey, 1987, *C. sinensis* Frey, 1987 and *C. obscurirostris tasekberae* Frey, 1987, three honeycombed species described by Frey (1987a), and for two Oriental species described from Sri Lanka: *C. ventricosus* (Rajapaksa & Fernando, 1986) and *C. reticulatus* Daday, 1898 (Michael & Hann, 1979). Outer morphology of several more species was investigated by Idris (1983), Kotov *et al.* (2013), and Sinev & Korovchinsky (2013).

One of vague taxa of *Chydorus* from South-East Asia is *C. cf. pubescens* described by Idris & Fernando (1981).

1982a). Frey (1982a) considered placement of *C. nitidulus* into the genus *Ephemeroporus* Frey, 1982 together with the species of the *C. barroisi*-group, but come to conclusion that *C. nitidulus* “is not a member of *Ephemeroporus* in spite of its resemblance in headshield and antennal characters” (Frey, 1982, p. 263). Smirnov (1996) also listed *C. nitidulus* in genus *Chydorus*. *C. nitidulus*, while lacking head pores, differs from the species of *Ephemeroporus* s. str. in shape and armament of postabdomen, lacking characteristic long spines in anal region, and in morphology of the ventral margin of valves. Unfortunately, morphology of thoracic limbs remains unstudied to this species.

Recent studies of Aloninae revealed that head pores morphology alone is not sufficient as genus criteria, since closely related species can have different number of head pores (Sinev, 1999; Sinev & Sanoamuang, 2007). Probably, situation is the same within *Chydorus* s. lato; reduction of head pores took place independently within *Ephemeroporus* s. str., in *Estatherosporus*, and in *Chydorus breviceps*–*C. nitidulus*–*C. tilhoi* clade. While *C. nitidulus* and *C. tilhoi* are not completely studied, some common features between these species are apparent: elongated body, shortened rostrum, and very large labral plate. General morphology of limbs of *C. tilhoi* was studied by Smirnov (1971, as *C. brevilabris*), and it is similar to that of *C. breviceps*; both species have very large exopodite V and thin, not hook-like IDL seta 3; these two characters are not present in any other species of *Chydorus*.

Differences in limb morphology became main reason for separation of new genera during the revision of *Alona* s. lato, the main group of subfamily Aloninae (Sinev, 2004; Van Damme *et al.*, 2009, 2011, Van Damme & Sinev, 2011, Sinev & Shiel, 2008, Sinev & Kobayashi, 2012), and this principle can be applied to Chydorinae as well. Morphology of thoracic limbs within the majority of *Chydorus* species is very uniform, similar to that of *Chydorus idrisi* **sp. nov.** (see Frey, 1980, 1985, 1987a, Rajapaksa & Fernando, 1986, Alonso, 1996). The only significant variable feature is morphology of IDL setae, where proportions of setae differ from species to species, but seta 3 almost always remains hook-like (*C. gibbus* being an exception). The same can be said about *Ephemeroporus* s. str (see Alonso, 1987, 1996). In contrast, morphology of all limbs in *C. breviceps* is quite different from that of the typical *Chydorus*, sharing some features with *Ephemeroporus* (see Table 1). The revealed differences suggest that *C. breviceps* group should be treated as a separate genus, but such decision should be done only after revision of *C. nitidulus* and *C. tilhoi*.

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References

- Alonso, M. (1987) Morphological differentiation of two new *Ephemeroporus* species (Cladocera, Chydoridae) belonging to the *barroisi* complex: *E. margalefi* and *E. epiaphantoi*, in Spain. *Hydrobiologia*, 145, 131–146.
http://dx.doi.org/10.1007/978-94-009-4039-0_15
- Alonso, M. (1988) *Chydorus pizarri* sp. nov., a new chydorid (Cladocera) from western Spain. *Limnetica*, 4, 27–40 .
- Alonso, M. (1996) *Crustacea, Branchiopoda*. In: Ramos, M.A. *et al.* (Eds.), *Fauna Ibérica. Vol. 7*. Museo Nacional de Ciencias Naturales, CSIC, Madrid, pp. 1–486.
- Belyaeva, M. & Taylor, D.J. (2008) Cryptic species within the *Chydorus sphaericus* species complex (Crustacea: Cladocera) revealed by molecular markers and sexual stage morphology. *Molecular Phylogenetics and Evolution*, 50, 534–546.
<http://dx.doi.org/10.1016/j.ympev.2008.11.007>
- Chengalath, R. & Hann, B.J. (1981) A new species of *Chydorus* (Cladocera: Chydoridae) from Ontario, Canada. *Transactions of American Microscopic Society*, 100, 229–238.
<http://dx.doi.org/10.2307/3225548>

- Chiang, S. (1963) Description of two new species of Chinese freshwater Cladocera with notes on four new records. *Acta Zoologica Sinica*, 15, 255–262.
- Chiang, S. & Du, N. (1979) *Fauna Sinica. Crustacea. Freshwater Cladocera*. Science Press, Academia Sinica, Peking, 297 pp. [China]
- Frey, D.G. (1980) On the plularity of *Chydorus sphaericus* (O.F. Muller) (Cladocera, Chydoridae), and designation of a neotype from Sjaelso, Denmark. *Hydrobiologia*, 69, 83–123.
- Frey, D.G. (1982a) Relocation of *Chydorus barroisi* and related species (Cladocera, Chydoridae) to a new genus and description of two new species. *Hydrobiologia*, 86, 231–269.
<http://dx.doi.org/10.1007/bf00006141>
- Frey, D.G. (1982b) Questions concerning cosmopolitanism in Cladocera. *Archiv für Hydrobiologie*, 93, 484–502.
- Frey, D.G. (1982c) The honeycombed species of *Chydorus* (Cladocera, Chydoridae): comparison of *C. Bicornutus* and *C. bicollaris* n. sp. with some preliminary comments on *faviformis*. *Canadian Journal of Zoology*, 60, 1892–1916.
<http://dx.doi.org/10.1139/z82-246>
- Frey, D.G. (1982d) The reticulated species of *Chydorus* (Cladocera, Chydoridae): two new species with suggestions of convergence. *Hydrobiologia*, 93, 255–279.
<http://dx.doi.org/10.1007/bf00012335>
- Frey, D.G. (1985) A new species of the *Chydorus sphaericus* group (Cladocera, Chydoridae) from Western Montana. *Internationale Revue der gesamten Hydrobiologie und Hydrographie*, 70 (1), 3–20.
<http://dx.doi.org/10.1002/iroh.19850700102>
- Frey, D.G. (1987a) The North American *Chydorus faviformis* (Cladocera, Chydoridae) and the honeycombed taxa of other continents. *Philosophical Transactions of the Royal Society of London B*, 315, 353–402.
<http://dx.doi.org/10.1098/rstb.1987.0012>
- Frey, D.G. (1987b) The taxonomy and biogeography of the Cladocera. *Hydrobiologia*, 145, 5–17.
- Idris, B.A.G. (1983) *Freshwater Zooplankton of Malaysia (Crustacea: Cladocera)*. Penerbit Universiti Pertanian Malaysia. Printed by Syarikat Percetakan Selangor, Kuala Lumpur, 153 pp.
- Idris, B.A.G. & Fernando, C.H. (1981) Cladocera of Malaysia and Singapore with new records, redescription and remarks on some species. *Hydrobiologia*, 77, 233–256.
<http://dx.doi.org/10.1007/bf00019671>
- Korovchinsky, N.M. (2013) Cladocera (Crustacea: Branchiopoda) of South East Asia: history of explorations, taxon richness and notes on zoogeography. *Journal of Limnology*, 72 (2), 109–124.
<http://dx.doi.org/10.4081/jlimnol.2013.s2.e7>
- Kořínek V. (1984) Cladocera. Hydrobiological survey of Lake Bangweulu Luapula river basin. Scientific results. *Hydrobiological Club of Brussels*, 2, 4–117.
- Kotov, A.A., Sinev, A.Y. & Berrios, V.L. (2010) The Cladocera (Crustacea: Branchiopoda) of six high altitude water bodies in the North Chilean Andes, with discussion of Andean endemism. *Zootaxa*, 2430, 1–66.
- Kotov, A.A., Van Damme, K., Bekker, E.I., Siboulapha, S., Silva-Briano, M., Ortiz, A.A., de la Rosa, R.G. & Sanoamuang, L. (2013) Cladocera (Crustacea: Branchiopoda) of Vientiane province and municipality, Laos. *Journal of Limnology*, 72 (2), 81–180.
<http://dx.doi.org/10.4081/jlimnol.2013.s2.e6>
- Michael, R.G. & Hann, B.J. (1979) On the resurrection of the Cladoceran species *Chydorus reticulatus* Daday, 1898 (Chydoridae, Cladocera) and its relationship to *Chydorus ventricosus* Daday, 1898. *Hydrobiologia*, 65, 225–232.
<http://dx.doi.org/10.1007/bf00038863>
- Paggi, J.C. (1972) Nota sistemática acerca de algunos Cladoceros del género Chydorus Leach 1843, de la República Argentina. *Physis*, 31 (82), 223–236.
- Rajapaksa, R. & Fernando, C.H. (1986) A review of the systematic and distribution of *Chydorus ventricosus* Daday, 1898, with the first description of the male and redescription of the species. *Canadian Journal of Zoology*, 64, 818–832.
- Sars, G.O. (1901) Contributions to the knowledge of the fresh-water Entomostraca of South America, as shown by artificial hatching from dried material. 1. Cladocera. *Archiv for Mathematik og Naturvidenskab*, 23 (3), 1–102.
- Sinev, A.Y. (1999) *Alona costata* Sars, 1862 versus related palaeotropical species: the first example of close relations between species with a different number of main head pores among Chydoridae (Crustacea: Anomopoda). *Arthropoda Selecta*, 8, 131–148.
- Sinev, A.Y. (2004) *Armatalona* gen. n. – a new genus of subfamily Aloninae (Anomopoda, Chydoridae), separated from genus *Alona* Baird, 1840. *Hydrobiologia*, 520, 29–47.
<http://dx.doi.org/10.1023/b:hydr.0000027723.38965.11>
- Sinev, A.Y. & Kobayashi, T. (2012) Redescription of the endemic Australian cladoceran *Alona willisi* (Smirnov, 1989) and its assignment to *Acanthalona* gen. nov. (Cladocera: Anomopoda: Chydoridae). *Zootaxa*, 3390, 43–55.
- Sinev, A.Y. & Korovchinsky, N.M. (2013) Cladocera (Crustacea: Branchiopoda) of Cat Tien National Park, South Vietnam. *Journal of Limnology*, 70 (2), 125–141.
<http://dx.doi.org/10.4081/jlimnol.2013.s2.e8>
- Sinev, A.Y. & Sanoamuang, L. (2007) *Alona siamensis* sp. n., a new species of cladocera from South-East Asia, related to *Alona dentifera* (Sars, 1901) (Anomopoda: Chydoridae). *Arthropoda Selecta*, 16, 143–150.

- Sinev, A.Y. & Sanoamuang, L. (2011) Hormonal induction of males as a method for studying tropical cladocerans: description of males of four chydorid species (Cladocera: Anomopoda: Chydoridae). *Zootaxa*, 2826, 45–56.
- Sinev, A.Y. & Sanoamuang, L. (2013) Notes on the cladoceran *Pleuroxus* (*Picripleuroxus*) *quasidenticulatus* (Smirnov, 1996) (Anomopoda: Chydoridae) from South-East Asia and Far East of Russia. *Invertebrate Zoology*, 10 (2), 269–280.
- Sinev, A.Y. & Shiel, R.J. (2008) Redescription of *Alona macracantha* Smirnov and Timms, 1983 and its assignment to *Maraura* gen. nov. (Cladocera: Anomopoda: Chydoridae). *Journal of Natural History*, 42, 45–46, 2809–2824.
<http://dx.doi.org/10.1080/00222930802361048>
- Smirnov, N.N. (1971) Chydoridae of the world fauna. *Fauna SSSR. Rakoobraznie*, 1 (2), 1–531. [in Russian]
- Smirnov, N.N. (1996a) *Cladocera: the Chydorinae and Sayciinae (Chydoridae) of the world. Guides to the identification of the microinvertebrates of the Continental Waters of the world, Vol. 11*. SPB Academic Publishing, Amsterdam, 197 pp.
- Smirnov, N.N. & Sheveleva, N.G. (2010). *Chydorus irinae* sp. n. (Anomopoda, Chydoridae, Chydorinae) from the Tom' River (the Amur basin, Russia). *Zoologicheskij Zhurnal*, 89, 635–638.
- Stingelin, T. (1905) Untersuchungen über die Cladocerenfauna von Hinterindien, Sumatra und Java, nebst einem Beitrage zur Cladoceren kenntnis von Hawaii Inseln (Reise von Dr. Walter Volz). *Zoologische Jahrbucher, Abteilung für Systematik*, 21, 327–370.
- Van Damme, K., Brancelj, A. & Dumont, H.J. (2009) Adaptations to the hyporheic in Aloninae (Crustacea: Cladocera): allocation of *Alona protzi* Hartwig, 1900 and related species to *Phreatalona* gen. nov. *Hydrobiologia*, 618, 1–34.
<http://dx.doi.org/10.1007/s10750-008-9607-6>
- Van Damme, K. & Sinev, A.Y. (2011) A new genus of cave-dwelling microcrustaceans from the Dinaric Region (south-east Europe): adaptations of true stygobitic Cladocera (Crustacea: Branchiopoda). *Zoological Journal of the Linnean Society*, 161, 31–52.
<http://dx.doi.org/10.1111/j.1096-3642.2010.00639.x>
- Van Damme, K., Sinev, A.Y. & Dumont, H.G. (2011) Separation of *Anthalona* gen.n. from *Alona* Baird, 1843 (Branchiopoda: Cladocera: Anomopoda): morphology and evolution of scraping stenothermic alonines. *Zootaxa*, 2875, 1–64.