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Ephemeroporus quasimodo sp. nov. (Crustacea: Cladocera: Chydoridae), a new species from the Brazilian Cerrado

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Abstract

A new species of Chydoridae cladoceran (Crustacea: Cladocera: Chydoridae) is described from the Cerrado (a Brazilian tropical savanna ecoregion), Central Brazil. *Ephemeroporus quasimodo* sp. nov. differs from other species of the genus in a high dorsal keel on carapace and posterior part of the head shield, which resembles a hunchback. Parthenogenetic females, ehippial females and males are described, including details of trunk limb morphology. The species is endemic to shallow wetlands found in the Cerrado, where pristine conditions are preserved. Some questions on genus morphology and taxonomic status of *Ephemeroporus* species occurring in Brazil are discussed.

Key words: Anomopoda, Chydorinae

Introduction

Information on the Cladocera (Crustacea) species in Brazil is still incomplete, despite old history of studies (Richard 1895, Sars 1901) and the recent effort in reducing the gaps of knowledge of the Brazilian biodiversity, supported by governmental agencies (Santos-Wisniewski *et al.* 2011).

Aquatic biota of the Cerrado (a Brazilian tropical savanna ecoregion) is a target of several projects of the Research Group on Aquatic Environments of the Universidade Católica de Brasília (GEEA). The projects have been directed to studies of pristine aquatic ecosystems, which could offer reference data for evaluation and restoration efforts in this domain.

The intensification of the cladoceran inventory due to performing of these projects led, apart the offering a list of species for previously unstudied areas (Sousa & Elmoor-Loureiro 2012, 2013; Sousa *et al.* 2013), to the first record of the genus *Monospilus* Sars, 1862 from the Neotropical Region (Sousa & Elmoor-Loureiro 2013), as well finding of new endemic species, such as *Celsinotum candango* Sinev & Elmoor-Loureiro 2010. Other new species have been recognized, although not yet formally described, as *Ephemeroporus* sp. listed in Sousa & Elmoor-Loureiro (2012).

Of ten *Ephemeroporus* species presented in the world checklist of freshwater Cladocera taxa, six have been reported from the Neotropical Region (Kotov *et al.* 2013): *Ephemeroporus acanthodes* Frey, 1982, *Ephemeroporus archboldi* Frey, 1982, *Ephemeroporus barroisi* (Richard, 1894), *Ephemeroporus hybridus* (Daday, 1905), *Ephemeroporus poppei* (Richard, 1897), and *Ephemeroporus tridentatus* (Bergamin, 1939). Of these species, just *E. poppei* has not been reported from Brazil.

In Brazilian freshwaters, the majority of the records belong to three species—*E. barroisi*, *E. hybridus*, and *E. tridentatus*—co-occurring throughout almost all the territory (cf. Elmoor-Loureiro 2000, 2010). In the Southern region, however, *E. hybridus* is the single species reported (Hollwedel *et al.* 2003; Bohrer *et al.* 1988; Gazulha 2012).

Less frequently reported taxa are *E. archboldi*, cited from Lagoa Bonita, Federal District (Smirnov 1996), and *E. acanthodes*, found in the upper Paraná river floodplain (Serafim-Junior *et al.* 2003) and Lençóis Maranhenses (Van Damme & Dumont 2010).

description available for *E. tridentatus* (Paggi, 1983). However, Paggi (1983) registered three setae on filter comb of trunk limb V, while four setae were observed in *E. quasimodo* **sp. nov.**, which is the number proposed in the description of the genus in Alonso (1996). On the other hand, Alonso (1996) reported the occurrence of the accessory seta on trunk limb I of the genus (which is seen in figure 127A, for *E. phintonicus*). Despite numerous attempts, the accessory seta was not found in *E. quasimodo* **sp. nov.**, and it should be pointed out that it was also not mentioned or drawn for *E. tridentatus* (Paggi, 1983). Therefore, a more thorough study on trunk limb morphology of the different species of *Ephemeroporus* is necessary, allowing the parameters for the genus to be established.

With addition of the new species, the list of *Ephemeroporus* in Brazil rises to six species: *E. acanthodes*, *E. archboldi*, *E. barroisi*, *E. hybridus*, *E. quasimodo* **sp. nov.**, and *E. tridentatus*. Nevertheless, this list should not be considered as complete.

As previously discussed in the literature, what is called *E. barroisi* around the world represents a group of cryptic species (Frey 1982; Kotov *et al.* 2011). The difficulties for bringing light to this complex of species derive from the lack of types or specimens from type locality (Syria). Separation of North American *E. acanthodes* (Frey 1982) and Iberian *E. margaleffi* and *E. epiaphantoi* (Alonso 1987) was based on the comparison with specimens from Iran regarded as true *E. barroisi*. Then Yalim & Çiplak (2010) assumed that specimens from Mediterranean Anatolia, Turkey, represent the species originally described by Richard, and provided a description of parthenogenetic female, ephippial female and male. Unfortunately, their redescription was not so accurate (Kotov *et al.* 2012) and could not support a future revision of Brazilian populations identified as *E. barroisi*, in order to clarify their taxonomic status.

Another question that could be raised is the validity of the occurrence of *E. archboldi*, in Brazil, which was reported only from Lagoa Bonita, Federal District (Smirnov 1996, as *E. cf. archboldi*). However, this pond has been sampled for about 30 years, mainly for educational purposes, and this species has not been identified again in any sample (Elmoor-Loureiro unpublished data).

The present paper describe a new species of *Ephemeroporus* from the Brazilian Cerrado biome, whose most diagnostic feature is the high dorsal keel on the carapace and posterior part of the head shield. Its potential use as a bioindicator of the pristine condition of the Cerrado's freshwaters was also discussed, and some questions were raised on morphology and taxonomic status of *Ephemeroporus* species occurring in Brazil, which will hopefully contribute to inspire future studies.

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References

- Alonso, M. (1987) Morphological differentiation of two new *Ephemeroporus* species (Cladocera, Chydoridae) belonging to the *barroisi* complex: *E. margaleffi* and *E. epiaphantoi*, in Spain. *Hydrobiologia*, 145, 131–146.
http://dx.doi.org/10.1007/978-94-009-4039-0_15
- Alonso, M. (1996) Crustacea Branchiopoda. Vol. 7. *Fauna Iberica*. Museo Nacional de Ciencias Naturales. Consejo Superior de Investigaciones Científicas, Madrid, 486 pp.
- Bohrer, M.B.C., Rocha, M.M. & Godolphim, B.F. (1988) Variações espaço-temporais das populações de Cladocera (Crustacea-Branchiopoda) no Saco de Tapes, Laguna dos Patos, RS. *Acta Limnológica Brasiliensis*, 2, 549–570.
- Elmoor-Loureiro, L.M.A. (2000) Brazilian cladoceran studies: where do we stand? *Náuplius*, 8, 117–131.
- Elmoor-Loureiro, L.M.A. (2010) Cladóceros do Brasil: Famílias Chydoridae e Eurycercidae. Available from: <http://>

cladocera.wordpress.com (accessed 15 September 2013)

- Elmoor-Loureiro, L.M.A., Santos-Wisniewski, M.J. & Rocha, O. (2009) New records of *Parvalona parva* (Daday, 1905) (Crustacea, Anomopoda, Chydoridae) from Brazil, with description of the male. *Zoologia*, 26, 369–373.
<http://dx.doi.org/10.1590/s1984-46702009000200022>
- Fonseca, B.M., Mendonça-Galvão, L., Padovesi-Fonseca, C., Abreu, L.M. & Fernandes, A.C.M. (2014) Nutrient baselines of Cerrado low-order streams: comparing natural and impacted sites in Central Brazil. *Environmental Monitoring and Assessment*, 186 (1), 19–33.
<http://dx.doi.org/10.1007/s10661-013-3351-8>
- Frey, D.G. (1982) Relocation of the *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. (1991a) The species of *Pleuroxus* and of three related genera (Anomopoda, Chydoridae) in Southern Australia and New Zealand. *Records of the Australian Museum*, 43, 291–372.
<http://dx.doi.org/10.3853/j.0067-1975.43.1991.49>
- Frey, D.G. (1991b) A new genus of alonine chydorid cladocerans from athalassic saline waters of New South Wales, Australia. *Hydrobiologia*, 224, 11–48.
<http://dx.doi.org/10.1007/bf00006361>
- Fryer, G. (1968) Evolution and adaptative radiation in the Chydoridae (Crustacea: Cladocera): a study in comparative functional morphology and ecology. *Philosophical Transactions of the Royal Society of London B*, 254, 221–385.
<http://dx.doi.org/10.1098/rstb.1968.0017>
- Gazulha, V. (2012) *Zooplâncton Limnico: Manual Ilustrado*. Technical Books, Rio de Janeiro, 151p.
- Hollwedel, W., Kotov, A.A. & Brandorff, G.-O. (2003) Cladocera (Crustacea: Branchiopoda) from the Pantanal (Brazil). *Arthropoda Selecta*, 12 (2), 67–93.
- Kotov, A.A. (2000a) Analysis of *Kozhowia* Vasiljeva & Smirnov, 1969 (Chydoridae, Anomopoda, Branchiopoda), and a description of *Parakozhowia* n. gen. *Hydrobiologia*, 437, 17–56.
- Kotov, A.A. (2000b) Redescription and assignment of the chydorid *Indialona ganapati* Petkovski, 1966 (Branchiopoda: Anomopoda: Aloninae) to *Indialonini*, new tribus. *Hydrobiologia*, 439, 161–178.
- Kotov, A.A. (2006) Adaptations of the Anomopoda (Cladocera) for benthic mode of life. *Zoologicheskii Zhurnal*, 85, 1043–1059.
- Kotov, A.A. (2008) Finding of *Pleuroxus smirnovi* sp. nov. from the Pamir region revealed today's imperfect state of systematics and biogeography of the Chydorinae (Cladocera: Chydoridae). *International Revue of Hydrobiology*, 93, 200–209.
<http://dx.doi.org/10.1002/iroh.200711007>
- Kotov, A.A., Jeong, H.G. & Lee, W. (2012) Cladocera (Crustacea: Branchiopoda) of the south-east of the Korean Peninsula, with twenty new records for Korea. *Zootaxa*, 3368, 50–90.
- Kotov, A.A., Sinev, A.Y., Korovchinsky, N.M., Smirnov, N.N., Bekker, E.I. & Sheveleva, N.G. (2011) Cladocera (Crustacea, Branchiopoda) of the Zeya basin (Amurskaya Area, Russian Federation). 1. New taxa for fauna of Russia. *Zoologicheskii Zhurnal*, 90, 131–142.
- Kotov, A., Forró, L., Korovchinsky, N.M. & Petrusek, A. (2013) World checklist of freshwater Cladocera species. Available from: <http://fada.biodiversity.be/group/show/17> (accessed 12 August 2013)
- Padovesi-Fonseca, C. & Martins-Silva, M.J. (2012). Biologic integrity analysis as protection tool of Cerrado's pristine areas. In: Bilibio, C., Hensel, O. & Selbach, J.F. (Orgs.), *Sustainable water management in tropics and subtropics and case studies in Brazil*. Vol. 3. UNIPAMPA/UNIKASSELL/PGCULT/UFMA, Jaguarão, pp. 685–721.
- Paggi, J.C. (1983) Aportes al conocimiento de la Fauna Argentina de Cladóceros. IV. *Ephemeroporus tridentatus* (Bergamin 1929) (Chydoridae, Chydorinae). *Revista de La Asociación de Ciencias Naturales Del Litoral*, Santa Fe, 14 (1), 63–77.
- Paggi, J.C. (1989) A new species of *Ilyocryptus* (Anomopoda: Macrothricidae) from the River Parana basin, Argentina. *Hydrobiologia*, 182, 239–248.
<http://dx.doi.org/10.1007/bf00007518>
- Ratter, J.A., Ribeiro, J.F. & Bridgewater, S. (2006) The Cerrado of Brazilian Amazonia. In: Posey, D.A. & Balick, M.J. (Orgs.), *Human impacts on Amazonia: The role of traditional ecological knowledge in conservation and development*. Columbia University Press, pp. 85–97.
- Richard, J. (1895) Description d'un nouveau Cladocère, *Bosminopsis deitersi*, n. gen., n.sp. *Bulletin de la Société Zoologique de France*, 20, 96–98.
- Santos-Wisniewski, M.J., Matsumura-Tundisi, T., Negreiros, N.F., Silva, L.C., Santos, R.M. & Rocha, O. (2011) O estado atual do conhecimento da diversidade dos Cladocera (Crustacea, Branchiopoda) nas águas doces do estado de Minas Gerais. *Biota Neotropica*, 11 (3), 1–15.
<http://dx.doi.org/10.1590/s1676-06032011000300024>
- 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, 1–102.
- Sars, G.O. (1904) Pacificische plankton-Crustaceen. (Ergebnisse einer Reise nach dem Pacific. Schauinsland 1896/97). *Zoologische Jahrbücher, Systematik*, 19 (5), 629–646.

- Serafim-Junior, M., Lansac-Tôha, F.A., Paggi, J.C., Velho, L.F.M. & Robertson, B. (2003) Cladocera fauna composition in a river-lagoon system of the upper Paraná river floodplain, with a new record for Brazil. *Brazilian Journal of Biology*, 63 (2), 349–356.
<http://dx.doi.org/10.1590/s1519-69842003000200020>
- Sinev, A. & Elmoor-Loureiro, L.M.A. (2010) Three new species of Chydoridae cladocerans of subfamily Aloninae (Branchiopoda: Anomopoda: Chydoridae) from Brazil. *Zootaxa*, 2390, 1–25.
- Smirnov, N.N. (1971) *Chydoridae fauny mira. Fauna USSR. Rakoobraznie, 1*. Leningrad, 531 pp. [English translation: *Chydoridae of the world*. Israel Program for Scientific Translations, Jerusalem, 1974]
- Smirnov, N.N. (1996) *Cladocera: The Chydorinae and Sayciinae (Chydoridae) of the world*. SPB Academic Publishing, Amsterdam, 197 pp.
- Smirnov, N.N. & Kotov, A.A. (2009) Morphological radiation with reference to the carapace valves of the Anomopoda (Crustacea: Cladocera). *International Review of Hydrobiology*, 94, 580–594.
<http://dx.doi.org/10.1002/iroh.200811121>
- Sousa, F.D.R. & Elmoor-Loureiro, L.M.A. (2008) Cladóceros fitófilos (Crustacea, Branchiopoda) do Parque Nacional das Emas, estado de Goiás. *Biota Neotropica*, 8 (1), 159–166.
<http://dx.doi.org/10.1590/s1676-06032008000100019>
- Sousa, F.D.R. & Elmoor-Loureiro, L.M.A. (2011) First report of *Ilyocryptus paranaensis inarmatus* Kotov, Elíaz-Gutiérrez & Gutiérrez-Aguirre, 2001 (Cladocera, Anomopoda, Ilyocryptidae) in South America. *Brazilian Journal of Biology*, 71 (4), 1025–1026.
<http://dx.doi.org/10.1590/s1519-69842011000500024>
- Sousa, F.D.R. & Elmoor-Loureiro, L.M.A. (2012) How many species of cladocerans (Crustacea, Branchiopoda) are found in Brazilian Federal District? *Acta Limnologica Brasiliensia*, 24, 351–362.
<http://dx.doi.org/10.1590/s2179-975x2013005000008>
- Sousa, F.D.R. & Elmoor-Loureiro, L.M.A. (2013) Cladocerans (Crustacea: Anomopoda and Ctenopoda) of the Sempre Vivas National Park, Espinhaço Range, Minas Gerais, Brazil. *Check List*, 9, 4–8.
- Sousa, F.D.R., Elmoor-Loureiro, L.M.A. & Mendonça-Galvão, L. (2013) Cladóceros (Crustacea, Anomopoda e Ctenopoda) do Cerrado do Brasil Central: Inventário da comunidade associada à macrófitas em zonas úmidas naturais. *Biota Neotropica*, 13 (3). Available from: <http://www.biotaneotropica.org.br/v13n3/pt/abstract?inventory+bn00413032013> (accessed 28 May 2014)
- Sousa, F.D.R., Elmoor-Loureiro, L.M.A., Mendonça-Galvão, L. & Rodrigues Junior, I. (2010) Crustacea, Cladocera, Anomopoda, Ilyocryptidae, *Ilyocryptus sarsi* Stingelin, 1913: A new record and geographic. *Check List*, 6, 330–331.
- Van Damme, K. & Dumont, H.J. (2010) Cladocera of the Lençóis Maranhenses (NE - Brazil): faunal composition and a reappraisal of Sars' Method. *Brazilian Journal of Biology*, 70 (Supplement 3), 755–779.
<http://dx.doi.org/10.1590/s1519-69842010000400008>
- Van Damme, K., Sinev, A.Y. & Dumont, H.J. (2011) Separation of *Anthalona* gen.n. from *Alona* Baird, 1843 (Branchiopoda: Cladocera: Anomopoda): morphology and evolution of scraping stenothermic aloninaes. *Zootaxa*, 2875, 1–64.
- Yalim, F.B. & Çiplak, B. (2010) Redescription of *Ephemeroporus barroisi* (Richard, 1894) (Cladocera, Chydoridae) on the basis of material from Mediterranean Anatolia (Turkey). *Turkish Journal of Fisheries and Aquatic Sciences*, 10, 551–558.