



<http://dx.doi.org/10.11646/zootaxa.3841.2.2>

<http://zoobank.org/urn:lsid:zoobank.org:pub:DCED6990-9B2B-49F8-9E6C-6355B5DF3F05>

Revision of the Holarctic genus *Rhynchotalona* Norman, 1903 (Anomopoda: Chydoridae)

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Abstract

We revise the Holarctic genus *Rhynchotalona* Norman, 1903 (Anomopoda: Chydoridae). Palaeartic *R. falcata* (Sars, 1862) is redescribed, including morphology of thoracic limbs and gamogenetic stages. North American populations previously identified as *R. falcata*, revealed two new species of the genus. *R. weiri* sp. nov. differs from *R. falcata* in smaller size, much shorter rostrum, different shape of main head pore and different morphology of postabdomen in male and female. *R. longisteta* sp. nov. differs from *R. falcata* in long posterior setae of the valve postero-ventral portion. Both new species also differ from each other and from *R. falcata* in the morphology of thoracic limbs. Our data suggests that the Palaeartic *R. falcata* is absent in North America, confirming Frey's non-cosmopolitanism paradigm for the Chydoridae. The genus diagnosis is emended, taking into consideration the newly described taxa. A key for species determination is provided.

Key words: Anomopoda, *Rhynchotalona*, systematics, morphology, new species, North-East USA

Introduction

Comparative studies of Chydoridae (Branchiopoda: Anomopoda) from North America and Eurasia, conducted mostly by Prof. David G. Frey and alumni (Frey, 1980, 1985, 1988; Michael & Frey 1983, 1984, Kubersky, 1977) revealed that in North America many Eurasian taxa are replaced by closely related species. These studies became a base for the “Frey’s non-cosmopolitanism paradigm” (Frey 1982, 1987), now universally accepted in the cladoceran taxonomy (Kotov *et al.* 2010a; Xu *et al.*, 2009). But after the death of D. G. Frey taxonomical studies of Chydoridae in USA and Canada came to a standstill, and many names of European species are still applied to North American populations. Few taxonomical works have been published on the Chydoridae of USA and Canada during this century (Sinev, 2009, 2013; Sinev & Atroschenko, 2011) in contrast to Mexico which has been intensively investigated during last decade (Kotov & Elías-Gutiérrez, 2002, 2004; Kotov *et al.*, 2003; Elías-Gutiérrez *et al.*, 1997, 2001, 2006; Elías-Gutiérrez & Valdes-Morena, 2008; Sinev & Silva-Briano, 2012; Sinev & Zawisza, 2013).

The genus *Rhynchotalona* Norman, 1903 (Chydoridae: Aloninae) can be easily differentiated from all other alonines by its long rostrum. After the description of *Disparalona* Fryer, 1968 (Fryer, 1968), only a single species, *Rhynchotalona falcata* (Sars, 1862) remained within the genus, and, in our opinion, here the easiness of a generic identification led to a situation when possible species-level differences between populations from different regions were neglected. The taxon identified as *R. falcata* from China (Chiang & Du, 1979) recently was allocated to a new genus and species, *Nedorhynchotalona chiangi* Kotov & Sinev, 2011 (Kotov & Sinev, 2011). At present, *R. falcata* is recorded from Europe, Siberia, Central Asia and North America (see Smirnov, 1971). The second species of the genus, *R. kistarae* Røen, 1973, was described from Greenland. According to Røen (1973), *R. kistarae* differs from *R. falcata* in a shorter rostrum, a specific shape of labrum, a rounded postero-dorsal corner of carapace, absence of a denticle on postero-ventral corner of carapace, and a smaller size (up to 0.32 mm). Postabdomen of *R. kistarae*,

Acknowledgements

We are deeply grateful to Dr. Frank Ferrari, Dr. John Fornshell and Dr. Chad Walters (National Museum of Natural History, The Smithsonian Institution, USA) for their kind assistance and hospitality during our stays at the Museum. We are very grateful to Prof. N.N. Smirnov for help during different phases of our work. This work is supported by the Russian Science Foundation grant 14-14-00778. The SEM work is performed at User Facilities Center of M.V. Lomonosov Moscow State University under the financial support of Ministry of Education and Science of Russian Federation.

References

- Alonso, M. (1996) *Crustacea, Branchiopoda. Vol. 7. Fauna Iberica*. Museo Nacional de Ciencias Naturales. Consejo Superior de Investigaciones Científicas, Madrid, 486 pp.
- Birge, E.A. (1893) Notes on Cladocera. III. *Transactions of the Wisconsin Academy of Science, Arts and Letters*, 9, 275–317.
- Birge, E.A. (1918) The water fleas (Cladocera). In: Ward, H.G. & Whipple, C.G. (Eds.), *Freshwater Biology*. Wiley, New York, 676–740.
- Behning, A.L. (1941) *The Cladocerans of the Caucasus*. Gruzmedgiz Publishing, Tbilisi, 384 pp. [in Russian]
- Chiang, S. & Du, N. (1979) *Fauna Sinica. Crustacea. Freshwater Cladocera*. Science Press, Academia Sinica, Peking, 297 pp.
- Chengalath, R. (1982) A faunistic and ecological survey of the littoral cladocera of Canada. *Canadian Journal of Zoology*, 60, 2668–2682.
<http://dx.doi.org/10.1139/z82-343>
- Chengalath, R. (1987) The distribution of chydorid Cladocera in Canada. *Hydrobiologia*, 145, 151–157.
<http://dx.doi.org/10.1007/bf02530275>
- Dodson, S.I. & Frey, D.G. (1991) Cladocera and other Branchiopoda. *Ecology and classification of North American Freshwater Invertebrates*. Academic Press, Inc., 723–786.
- Elías-Gutiérrez, M., Ciro-Perez, J., Gutierrez-Aguirre, M. & Cervantes-Martinez, A. (1997) A checklist of the littoral cladocerans from Mexico, with descriptions of five taxa recently recorded from the Neovolcanic Province. *Hydrobiologia*, 360, 63–73.
http://dx.doi.org/10.1007/978-94-011-4964-8_7
- Elías-Gutiérrez, M., Smirnov, N.N., Suárez-Morales, E. & Dimas-Flores, N. (2001) New and little known cladocerans (Crustacea: Anomopoda) from southeastern Mexico. *Hydrobiologia*, 442, 41–54.
- Elías-Gutiérrez, M., Kotov, A.A. & Garfías-Espejo, T. (2006) Cladocera (Crustacea: Ctenopoda, Anomopoda) from southern Mexico, Belize and northern Guatemala, with some biogeographical notes. *Zootaxa*, 1119, 1–27.
- Elías-Gutiérrez, M. & Valdes-Morena, M. (2008) A new cryptic species of *Leberis* Smirnov, 1989 (Crustacea, Cladocera, Chydoridae) from the Mexican semi-desert region, highlighted by DNA barcoding. *Hidrobiológica*, 18, 63–74.
- Flössner, D. (1972) *Krebstiere, Crustacea (Kiem- und Blattfüßer: Branchiopoda, Fischläusse, Branchiura)*. Die Tierwelt Deutschlands. Gustav Fischer Verlag, Jena, 499 pp.
- Flössner, D. (2000) *Die Haplopoda und Cladocera (ohne Bosminidae) Mitteleuropas*. Backhuys, Leiden, 428 pp.
- Frey, D.G. (1980) On the plurality of *Chydorus sphaericus* (O.F. Muller) (Cladocera, Chydoridae), and designation of a neotype from Sjaelso, Denmark. *Hydrobiologia*, 69, 83–123.
- Frey, D.G. (1982) Questions concerning cosmopolitanism in Cladocera. *Archiv für Hydrobiologie*, 93, 484–502.
- 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, 3–20.
<http://dx.doi.org/10.1002/iroh.19850700102>
- Frey, D.G. (1987) The taxonomy and biogeography of the Cladocera. *Hydrobiologia*, 145, 5–17.
<http://dx.doi.org/10.1007/bf02530260>
- Frey, D.G. (1988) Separation of *Pleuroxus laevis* Sars, 1861 from two resembling species in North America: *Pleuroxus stramineus* Birge, 1879 and *Pleuroxus chiangi* sp. n. (Cladocera, Chydoridae). *Canadian Journal of Zoology*, 66, 2534–2563.
<http://dx.doi.org/10.1139/z88-376>
- Fryer, G. (1968) Evolution and adaptive radiation in the Chydoridae (Crustacea: Cladocera): a study of comparative functional morphology and ecology. *Philosophical Transactions of the Royal Society of London, Series B*, 254, 221–385.
- Herrick, C.L. (1884) A final report on the Crustacea of Minnesota. *Geological and Natural History Survey of Minnesota*, 12th annual report, 1–191.
- Hellich, B. (1877) Die Cladoceren Böhmens. *Archiv für die naturwissenschaftlichen Landesdurchforschung von Böhmen*, 3 (4), 1–131.
<http://dx.doi.org/10.5962/bhl.title.13316>
- Herr, O. (1917) *Die Phyllopodenfauna der preussischen Oberlausitz und der benachbarten Gebiete*. *Abhandl. Naturforsch.*

Gesellsch. Zu Goerlitz, 28, 1–162.

- Kotov, A.A. (2000) 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. *Zoologicheskyy Zhurnal*, 85 (9), 1043–1059.
- Kotov, A.A. (2009) A revision of *Leydigia* Kurz, 1875 (Anomopoda, Cladocera, Branchiopoda), and subgeneric differentiation within the genus. *Zootaxa*, 2082, 1–68.
- Kotov, A.A. & Elías-Gutiérrez, M. (2002) Analysis of the morphology of *Spinalona anophthalma* Ciro-Pérez & Elías-Gutiérrez, 1997 (Aloninae, Anomopoda, Cladocera). *Hydrobiologia*, 468, 185–192.
- Kotov, A.A. & Elías-Gutiérrez, M. (2004) Notes on Aloninae Dybowski & Grochowski, 1894 *emend.* Frey, 1967 (Cladocera: Anomopoda: Chydoridae): 2. *Leydigia* cf. *striata* Birabeén, 1939 in South Mexico. *Arthropoda Selecta*, 13 (1–2), 1–6.
- Kotov, A.A. & Elías-Gutiérrez, M. (2009) A phylogenetic analysis of *Ilyocryptus* Sars, 1862 (Cladocera: Ilyocryptidae). *International Review of Hydrobiology*, 94 (2), 208–225.
<http://dx.doi.org/10.1002/iroh.200811102>
- Kotov, A.A. & Elías-Gutiérrez, M. & Nieto, M.G. (2003) *Leydigia louisiana* Jenkin, 1934 in the Neotropics, *L. louisiana mexicana* n. subsp. in the Central Mexican highlands. *Hydrobiologia*, 510, 239–255.
<http://dx.doi.org/10.1023/b:hydr.0000008645.71534.81>
- Kotov, A.A., Korovchinsky, N.M., Sinev, A.Y. & Smirnov, N.N. (2011) Cladocera (Crustacea, Branchiopoda) of the Zeya basin (Amurskaya Area, Russian Federation). 3. Systematic-faunistic and zoogeographic analysis. *Zoologicheskyy Zhurnal*, 90, 402–411.
- Kotov, A.A. & Sinev, A.Y. (2011) Cladocera (Crustacea, Branchiopoda) from the Zeya river basin from the Zeya river basin. 2. Description of new taxa. *Zoologicheskyy zhurnal*, 90, 272–284.
- Kotov A.A., Sinev, A.Y. & Berrios, V.L. (2010a) 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., Sinev, A.Y., Glagolev, S.M., Smirnov, N.N. (2010b) Water fleas (Cladocera). In: Alexeev, V.R. & Tsalolokhin, S.Y. (Eds.), *Key book for zooplankton and zoobenthos of fresh waters of European Russia*. KMK, Moscow, pp. 151–276.
- Kubersky, E.S. (1977) Worldwide distribution and ecology of *Alonopsis* (Cladocera: Chydoridae) with a description of *Alonopsis americana* sp.nov. *Internationale Revue der gesamten Hydrobiologie und Hydrographie*, 62, 649–685.
<http://dx.doi.org/10.1002/iroh.1977.3510620505>
- Lilljeborg, W. (1900) *Cladocera Sueciae*. Nova acta regiae societatis scientiarum upsalaensis, *Seriei Tertiae*, 19, 1–701.
- Manujlova, E.F. (1964) The cladocerans of fauna of the USSR. *Opredeliteli po faune SSSR*, 88, 1–327. [in Russian]
- Margaritora, F.G. (1983) Cladoceri (Crustacea, Cladocera). *Guide per il riconoscimento delle specie animali delle acque interne italiane*, Verona, 22, 1–169.
- Margaritora, F.G. (1985) Cladocera. *Fauna d'Italia Edizioni Calderini*, Bologna, 23, 1–399.
- Michael, R.G. & Frey, D.G. (1983) Assumed amphi-atlantic distribution of *Oxyurella tenuicaudis* (Cladocera, Chydoridae) denied by a new species from North America. *Hydrobiologia*, 106, 3–35.
<http://dx.doi.org/10.1007/bf00016413>
- Michael, R.G. & Frey, D.G. (1984) Separation of *Disparalona leei* (Chien, 1970) in North America from *D. rostrata* (Koch, 1841) in Europe (Cladocera, Chydoridae). *Hydrobiologia*, 114, 81–108.
<http://dx.doi.org/10.1007/bf00018107>
- Müller, P.E. (1867) Danmarks Cladocera. *Naturhistorisk tidsskrift*, 3, 53–240.
- Negrea, S. (1983) Cladocera. *Fauna Republicii Socialiste România, București. Crustacea*, 4, 1–399.
- Norman, C.A.M. (1903) New generic names for some Entomostraca and Cirripedia. *Annals of Magazine of Natural History*, Series 7, 11, 367–369.
- Norman, A.M. & Brady, G.S. (1867) A monograph of the British Entomostraca belonging to the families Bosminidae, Macrothricidae and Lynceidae. *Natural History Transactions of Northumberland and Durham*, 1, 354–408.
- Olesen, J. (1996) External morphology and phylogenetic significance of the dorsal/neck organ in the Conchostraca and head pores of the cladoceran family Chydoridae (Crustacea, Branchiopoda). *Hydrobiologia*, 330, 213–226.
<http://dx.doi.org/10.1007/bf00024209>
- Rajapaksa, R. & Fernando, C.H. (1986) Tropical species of *Kurzia* (Crustacea, Cladocera) with a description of *Kurzia brevilabris* sp. nov. *Canadian Journal of Zoology*, 64, 2590–2602.
<http://dx.doi.org/10.1139/z86-379>
- Rajapaksa, R. & Fernando, C.H. (1987) A redescription of *Euryalona orientalis* (Daday, 1898), with a consideration of the other species in the genus *Euryalona* (Cladocera: Chydoridae). *Hydrobiologia*, 150, 75–90.
<http://dx.doi.org/10.1007/bf00006611>
- Røen, U. (1973) *Rhynchotalona kistaræ* sp.n. from South Greenland (Crustacea, Cladocera, Chydoridae, Aloninae). *Steenstrupia*, 3, 89–92.
- Sars, G.O. [1861] (1993) Om de i Christiania's omegn forekommende ferskvandskredsdyr. - On the freshwater Crustacea occurring in the vicinity of Christiania. University of Bergen, Norway, 199 pp.
- Sars, G.O. (1862a) *Hr. Studios medic. G. O. Sars meddeelte en afdalrige Afbildninger ledsaget Oversigt af de af ham i Omegnen*

- af *Christiania iagttagne Crustacea cladocera*. Forh. VidenskSelsk. Krist, Aar 1861, 144–167.
- Silva-Briano, M. (1998) A revision of the Macrothricid-like anomopods, *Ph. D. Thesis Universiteit Ghent*, 388 pp.
- Sinev, A.Y. (2004a) *Miralona* gen. n. – a new genus of the subfamily Aloninae (Anomopoda, Chydoridae) from Australia. *Hydrobiologia*, 526, 3–14.
<http://dx.doi.org/10.1023/b:hydr.0000041619.35211.4a>
- Sinev, A.Y. (2004b) Redescription of two species of the genus *Leydigopsis* Sars, 1901 (Branchiopoda, Anomopoda, Chydoridae). *Invertebrate zoology*, 1 (1), 75–92.
- Sinev, A.Y. (2009) Notes on morphology and taxonomic status of some North American species of the genus *Alona* Baird, 1843 (Cladocera: Anomopoda: Chydoridae). *Fundamental and Applied Limnology*, 175 (1), 59–77.
<http://dx.doi.org/10.1127/1863-9135/2009/0175-0059>
- Sinev, A.Y. (2013) Cladocerans of *Alona affinis* group (Cladocera: Anomopoda: Chydoridae) from North America. *Zootaxa*, 3693 (3), 329–343.
<http://dx.doi.org/10.11646/zootaxa.3693.3.3>
- Sinev, A.Y. & Atroschenko, M.M. (2011) Revision of the genus *Alonopsis* Sars, 1862 and its position within Aloninae (Cladocera: Anomopoda: Chydoridae). *Zootaxa*, 2800, 1–17.
- Sinev, A.Y. & Silva-Briano, M. (2012) Cladocerans of genus *Alona* Baird, 1843 (Cladocera: Anomopoda: Chydoridae) and related genera from Aguascalientes State, Mexico. *Zootaxa*, 3569, 1–24.
- Sinev, A.Y. & Zawisza, E. (2013) Comments on cladocerans of crater lakes of the Nevado de Toluca Volcano (Central Mexico), with the description of a new species, *Alona manueli* sp. nov. *Zootaxa*, 3647 (2), 390–400.
<http://dx.doi.org/10.11646/zootaxa.3647.2.10>
- 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. Guides to the identification of the microinvertebrates of the continental waters of the world 11*. SPB Academy Publishing, Amsterdam, 197 pp.
- Smirnov, N.N. & Kotov, A.A. (2010) The morphological radiation of setae of the Cladocera (Crustacea) and their potential for morphogenesis. *International Revue of Hydrobiology*, 95, 482–519.
<http://dx.doi.org/10.1002/iroh.201011244>
- Šrámek-Hušek, R., Strašcraba, M. & Brtek, J. (1962) Lupenonožci-Branchiopoda. *Fauna ČSSR, Praha*, 16, 1–472.
- Streletskaia, E.A. (1975) Spisok kolovratok, vetvistousykh i veslonogikh rakoobraznykh vodoemov basseinov Kolymy i Anadyr' // *Gidrobiologicheskie issledovaniya vnutrennikh vodoemov Severo-Vostoka SSSR*. Vladivostok, 28 pp. [pp. 32–59, in Russian]
- Streletskaia, E.A. (2010) Review of the fauna of Rotatoria, Cladocera, and Copepoda of the basin of the Anadyr' River. *Contemporary Problems of Ecology*, 3 (4), 469–480.
<http://dx.doi.org/10.1134/s1995425510040119>
- Sweetman, J.N. & Smol, J.P. (2006) Patterns in the distribution of cladocerans (Crustacea: Branchiopoda) in lakes across a north-south transect in Alaska, USA. *Hydrobiologia*, 553, 277–291.
<http://dx.doi.org/10.1007/s10750-005-1333-8>
- Tanaka, S. (1989) Occurrence of littoral Chydoridae (Crustacea, Cladocera) in Japan. *Memoirs of the Faculty of Education Toyama University, Series B, Natural Sciences*, 37, 1–13.
- Tash, J.C. (1971) Some crustacean zooplankton of the Noatak River area, northern Alaska. *Arctic*, 24 (2), 108–112.
<http://dx.doi.org/10.14430/arctic3120>
- Van Damme, K. & Sinev, A.Y. (2013) Tropical Amphi-Pacific disjunctions in the Cladocera (Crustacea: Branchiopoda). *Journal of Limnology*, 70 (2), 209–244.
<http://dx.doi.org/10.4081/jlimnol.2013.s2.e11>
- Yoon, S.M. (2010) Arthropoda: Branchiopoda: Anostraca, Notostraca, Spinicaudata, Laevicaudata, Ctenopoda, Anomopoda, Haplopoda Branchiopods. *Invertebrate fauna of Korea*, 21 (2), 1–156.
- Xu, S., Hebert, P.D.N., Kotov, A.A. & Cristescu, M.E. (2009) The non-cosmopolitanism paradigm of freshwater zooplankton: insights from the global phylogeography of the predatory cladoceran *Polyphemus pediculus* (Crustacea, Onychopoda). *Molecular Ecology*, 18 (24), 5161–5179.
<http://dx.doi.org/10.1111/j.1365-294x.2009.04422.x>