Zootaxa 3703 (1): 063–066
www.mapress.com/zootaxa/

Correspondence

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://dx.doi.org/10.11646/zootaxa.3703.1.13
http://zoobank.org/urn:lsid:zoobank.org:pub:D0E56A0C-58EB-4FF7-85EF-A6FF8BE6BFD6

Phylum Kinorhyncha*

MARTIN V. SØRENSEN
Natural History Museum of Denmark, University of Copenhagen, Universitetsparken 15, 2100 Copenhagen, Denmark; e-mail:mvsorensen@snm.ku.dk

* *In*: Zhang, Z.-Q. (Ed.) Animal Biodiversity: An Outline of Higher-level Classification and Survey of Taxonomic Richness (Addenda 2013). *Zootaxa*, 3703, 1–82.

Abstract

The phylum Kinorhyncha includes 196 described species, distributed on 21 (soon 22) genera, and nine families. Two genera are currently not assigned to any family. The families are distributed on two orders, Cyclorhagida and Homalorhagida. Currently, kinorhynch classification does not reflect actual relationships revealed as a result of numerical phylogenetic analyses, but such studies are currently being carried out, and a revision of the kinorhynch classification is expected within a short time.

Key words: Kinorhyncha, Cyclorhagida, Homalorhagida, taxonomy, diversity

Introduction

Until very recently, Kinorhyncha was one of the few animal phyla left that never had been subject for modern numerical phylogenetic analyses on phylum level, hence the current classification of the group is still the reflection a traditional view based on phenetics rather than phylogenetic relationships.

Through time, only a few handfuls of researchers have studied kinorhynch systematics, hence, even after knowing the group for more than 150 years, the study of the group is still on a pioneer stage. The first kinorhynch species was described by Dujardin (1851), but Karl Zelinka was the first person to carry out thorough studies on the group, and his classification is still reflected in present days' kinorhynch system. Karl Zelinka published a series of papers focusing on kinorhynch systematics, and his monography "Monographie der Echinodera" (Zelinka, 1928) still stands as a monument in kinorhynch literature. After Zelinka scaled down his activities, the phylum was only studied sporadically until Robert P. Higgins initiated his research in the beginning of the 1960'ies. Today, R. P. Higgins is still the single person that contributed with most to kinorhynch systematics, and nearly 1/3 of the currently known species bear his name among the authorities. During his studies, R. P. Higgins also appointed several higher-level taxa (genera, families, suborders), and the most commonly used kinorhynch classification is based on the works of R. P. Higgins, summarized in Higgins (1990). A slightly different classification was proposed by Adrianov & Malakhov (1999). It mainly differs from Higgins (1990) at the suborder level, but since relationships between the families are completely unresolved, formation of suborders becomes somehow ambiguous anyway, and this specific taxonomic level is practically never used in current days' taxonomic studies.

Just recently, Yamasaki *et al.* (2013) published the first phylum level phylogeny, based on analyses of molecular sequence data of 18S rRNA and 28S rRNA, and the results of a second analyses using the same molecular markers, but with a slightly extended taxon sampling is currently on its way (Dal Zotto *et al.*, in

Accepted by Zhi-Qiang Zhang: 15 Aug. 2013; published: 30 Aug. 2013

press). However, both studies are still based on too restricted taxon sampling, and should therefore be seen as preliminary. Through a collaboration between the authors of the papers mentioned above and additional kinorhynch systematists, new studies based on a much more comprehensive molecular taxon sampling and inclusion of morphological data are currently being carried out, and it is expected that a more complete kinorhynch phylogeny, and hence an emended classification, will be presented in 2014.

Kinorhyncha currently includes 196 valid species, based on description of adult stages, and with several new species being in press currently, the number will soon surpass 200 species. The species are distributed on 21 genera, and the description of one additional genus is currently in press (Dal Zotto *et al.*, in press). Recognition of all higher level taxa, from order to genus level, is almost exclusively based on segment composition. The trunk of an adult kinorhynch consists of eleven segments, and each segment may either be composed of a closed cuticular ring, or a combination of dorsal (tergal) and ventral (sternal) plates. Furthermore, presence or absence spines and processes may play a role in some cases. See Sørensen & Pardos (2008) and Neuhaus (2013) for the two most recent and comprehensive introductions to systematic studies of kinorhynchs and identification of the genera.

Classification

Phylum **KINORHYNCHA** Dujardin, 1851
- Order **Cyclorhagida** Zelinka, 1896 (7 families)
  - Family **Antygomonidae** Adrianov & Malakhov, 1994 (1 genus)
    - Genus *Antygomonas* Nebelsick, 1990 (3 species)
  - Family **Cateriidae** Gerlach, 1956 (1 genus) [1]
    - Genus *Cateria* Gerlach, 1956 (2 species)
  - Family **Centroderidae** Zelinka, 1896 (3 genera)
    - Genus *Campyloderes* Zelinka, 1913 (2 species) [2]
    - Genus *Centroderes* Zelinka, 1907 (1 species) [3]
    - Genus *Condyloderes* Higgins, 1969 (5 species)
  - Family **Echinoderidae** Bütschli, 1876 (5 genera)
    - Genus *Cephalorhyncha* Adrianov, 1999 (3 species) [4]
    - Genus *Echinoderes* Claparède, 1863 (77 species)
    - Genus *Fissuroderes* Neuhaus & Blasche, 2006 (5 species)
    - Genus *Meristoderes* Herranz, Thormar, Benito, Sánchez & Pardos, 2012 (6 species) [5]
    - Genus *Polacanthoderes* Sørensen, 2008 (1 species)
  - Family **Dracoderidae** Higgins & Shirayama, 1990 (1 genus) [6]

1. Cateriidae is currently classified under Cyclorhagida (see, e.g., Higgins, 1990; Adrianov & Malakhov, 1999; Sørensen & Pardos, 2008). Morphology indicates a close relationship between species of Cateriidae and the newly described genus *Franciscideres*. Phylogenetic analyses of molecular sequence data suggest that *Franciscideres* is a homalorhagid ingroup taxon (Dal Zotto *et al.*, in press), and even though molecular data are unavailable from species of *Cateria*, the morphological similarities between the two genera imply that relocation of *Cateria* to Homalorhagida should be considered.
2. The species *Campyloderes adherens* Nyholm, 1947 was recently shown to be conspecific with *Centroderes spinosus* (Reinhard, 1881) and it is therefore no longer valid (see Neuhaus *et al.*, 2013).
3. The species *Centroderes eisigii* Zelinka, 1928 was recently shown to be females of *Centroderes spinosus* and *C. eisigii* is therefore a junior synonym of *C. spinosus* (see Neuhaus *et al.*, 2013).
4. *Cephalorhyncha* was originally assigned to the monogeneric family, Cephalorhynchidae Adrianov & Malakhov (1999), but later Neuhaus & Blasche (2006) suggested a reassignment to Echinoderidae, which has generally been followed since then.
5. Photographic documentation and information about differential characters are provided for one additional but yet undescribed species of *Meristoderes* (see Sørensen *et al.*, 2013).
6. Dracoderidae is currently classified under Cyclorhagida (see, e.g., Higgins & Shirayama, 1990; Adrianov & Malakhov, 1999; Sørensen & Pardos, 2008), but phylogenetic analyses of molecular sequence data suggest that the family is a homalorhagid ingroup (Yamasaki *et al.*, 2013; Dal Zotto *et al.*, in press).

Genus *Dracoderes* Higgins & Shirayama, 1990 (4 species) [7]

Family **Semnoderidae** Remane, 1936 (2 genera)

Genus *Semnoderes* Zelinka, 1907 (3 species)

Genus *Sphenoderes* Higgins, 1969 (2 species)

Family **Zelinkaderidae** Higgins, 1990 (2 genera)

Genus *Triodontoderes* Sørensen & Rho, 2009 (1 species)

Genus *Zelinkaderes* Higgins, 1990 (4 species)

Order **Homalorhagida** Zelinka, 1896 (2 families)

Family **Neocentrophyidae** Higgins, 1969 (2 genera)

Genus *Neocentrophyes* Higgins, 1969 (2 species)

Genus *Paracentrophyes* Higgins, 1983 (3 species)

Family **Pycnophyidae** Zelinka, 1896 (2 genera)

Genus *Kinorhynchus* Sheremetevskij, 1974 (19 species)

Genus *Pycnophyes* Zelinka, 1907 (51 species)

Family unplaced

Genus *Franciscideres* Dal Zotto, De Domenico, Garaffoni & Sørensen, in press (1 species) [8]

Genus *Tubulideres* Sørensen, Heiner, Ziemer & Neuhaus, 2007 (1 species)

Genus *Wollunquaderes* Sørensen & Thormar, 2010 (1 species)

References

Adrianov, A.V. & Malakhov, V.V. (1999) *Cephalorhyncha of the World Ocean*. KMK Scientific Press, Moscow, 328 pp.

Dal Zotto, M., Di Domenico, M., Garaffoni, A. & Sørensen, M.V. (in press) *Franciscideres* gen. nov. - a new, highly aberrant kinorhynch genus from Brazil, with an analysis of its phylogenetic position. *Systematics and Biodiversity*

Dujardin, F. (1851) Sur un petit animal marin, l'Echinodère, formant un type intermédiaire entre les Crustacés et les Vers. *Annales des Sciences naturelles (3) Zoologie*, 15, 158–173.

Higgins, R.P. (1990) Zelinkaderidae, a new family of cyclorhagid Kinorhyncha. *Smithsonian Contributions to Zoology*, 500, 1–26.
http://dx.doi.org/10.5479/si.00810282.500

Higgins, R.P. & Shirayama, Y. (1990) Dracoderidae, a new family of the cyclorhagid Kinorhyncha from the Inland Sea of Japan. *Zoological Science*, 7, 939–946.

Neuhaus, B. (2013) 5. Kinorhyncha (=Echinodera). *In*: Schmidt-Rhaesa, A. (Ed.), *Handbook of Zoology. Gastrotricha, Cycloneuralia and Gnathifera. Volume 1: Nematomorpha, Priapulida, Kinorhyncha, Loricifera.* De Gruyter, Berlin/ Boston, pp. 181–348.
http://dx.doi.org/10.1515/9783110272536.1

Neuhaus, B. & Blasche, T. (2006) *Fissuroderes*, a new genus of Kinorhyncha (Cyclorhagida) from the deep sea and continental shelf of New Zealand and from the continental shelf of Costa Rica. *Zoologischer Anzeiger*, 245, 19–52.
http://dx.doi.org/10.1016/j.jcz.2006.03.003

Neuhaus, B., Pardos, F., Sørensen, M.V. & Higgins, R.P. (2013) Redescription, morphology, and biogeography of *Centroderes spinosus* (Reinhard, 1881) (Kinorhyncha, Cyclorhagida) from Europe. *Cahiers de Biologie Marine*, 54, 109–131.

Sørensen, M.V., Herranz, M., Rho, H.S. Min, W., Yamasaki, H., Sánchez, N. & Pardos, F. (2012) On the genus *Dracoderes* Higgins & Shirayama, 1990 (Kinorhyncha: Cyclorhagida) with a redescription of its type species, *D. abei*, and a description of a new species from Spain. *Marine Biology Research*, 8, 210–232.
http://dx.doi.org/10.1080/17451000.2011.615328

Sørensen, M.V. & Pardos, F. (2008) Kinorhynch systematics and biology – an introduction to the study of kinorhynchs, inclusive identification keys to the genera. *Meiofauna Marina*, 16, 21–73.

7. Photographic documentation and information about differential characters are provided for one additional but yet undescribed species of *Dracoderes* (see Sørensen *et al.*, 2012).

8. *Franciscideres* is currently considered *incertae sedis* but phylogenetic analyses of molecular sequence data suggest that the genus should be considered homalorhagid ingroup taxon (Dal Zotto *et al.*, in press).

Sørensen, M.V., Rho, H.S., Min, W., Kim, D. & Chang C.Y. (2013) Occurrence of the newly described kinorhynch genus *Meristoderes* (Cyclorhagida: Echinoderidae) in Korea, with the description of four new species. *Helgoland Marine Research*, 67, 219–319.
http://dx.doi.org/10.1007/s10152-012-0323-2

Yamasaki, H., Hiruta, S.F. & Kajihara, H. (2013) Molecular phylogeny of kinorhynchs. *Molecular Phylogenetics and Evolution*, 67, 303–310.
http://dx.doi.org/10.1016/j.ympev.2013.02.016

Zelinka, K. (1928).*Monographie der Echinodera*. Engelmann, Leipzig, 396 pp.