

**Establishment of *Cylominae* Zaitzev, 1908 as a valid name
for the subfamily *Rygmodinae* Orchymont, 1916
with an updated list of genera (Coleoptera: Hydrophilidae)**

Matthias SEIDEL^{1,2}, Emmanuel ARRIAGA-VARELA^{1,2} & Martin FIKÁČEK^{2,1})

¹)Department of Zoology, Faculty of Science, Charles University, Viničná 7, CZ-123 83 Praha 2, Czech Republic;
e-mails: seidelma@natur.cuni.cz, arriagavarelae@natur.cuni.cz

²)Department of Entomology, National Museum, Cirkusová 1740, CZ-19300 Praha 9 – Horní Počernice,
Czech Republic; e-mail: mfikacek@gmail.com

Abstract. *Cylominae* Zaitzev, 1908 is established as a valid subfamily name for *Rygmodinae* Orchymont, 1916, syn. nov., due to the recent transfer of *Cyloma* Sharp, 1872 to the subfamily. The history of nomenclature of the subfamily is reviewed and an updated overview of family-group and genus-group names currently assigned to the subfamily is provided.

Key words. Coleoptera, Hydrophilidae, *Cylominae*, *Rygmodinae*, genus, new synonym, new status, nomenclature

Introduction

Recent advances in the phylogenetic studies stabilized the subfamilial classification of the family Hydrophilidae. Six major clades of Hydrophilidae were recognized in the multi-gene analysis performed by SHORT & FIKÁČEK (2013) and established as subfamilies: mainly aquatic Hydrophilinae, Chaetarhriinae, Enochrinae and Acidocerinae, and mostly terrestrial Sphaeridiinae and *Rygmodinae*. The subfamily assignment of most genera was also revised in the course of the study. Subsequent studies either corroborated the proposed classification (BLOOM et al. 2014, FIKÁČEK et al. 2015, TOUSSAINT et al. 2016) or corrected the subfamily assignment of genera previously not available for studies (FIKÁČEK & VONDRÁČEK 2014). However, nomenclatural issues concerning some family-group names resulting from these changes were not addressed properly. For this reason, the nomenclature of the family-group and genus-group names of the subfamily *Rygmodinae* is revised here, in order to make it stable before the ongoing revision of this clade will be published.

History of the subfamily

The tribe Cylomina was the first established family-group taxon (ZAITZEV 1908) encompassing the New Zealand genera *Cyloma* Sharp, 1872, *Psephoboragus* Broun, 1893 (currently a junior subjective synonym of *Cyloma*) and *Cylomissus* Broun, 1903. Several years later, ORCHYMONT (1916) proposed the tribe Rygmodini, providing just a very inaccurate diagnosis. His concept of Rygmodini became clear after a more detailed definition was provided by ORCHYMONT (1919) – the group encompassed 14 genera endemic to New Zealand, i.e. *Adolopus* Sharp, 1884, *Cyloma*, *Gitocyloma* Broun, 1915 (junior subjective synonym of *Cyloma*), *Namostygnus* Broun, 1909 (junior subjective synonym of *Cyloma*), *Psephoboragus*, *Cylomissus*, *Exydrus* Broun, 1886, *Hydrostygnus* Sharp, 1884, *Rygmodes* White, 1846, *Saphydrus* Sharp, 1884, *Tormissus* Broun, 1893, *Thomosis* Broun, 1904 (junior subjective synonym of *Tormissus*), *Tormus* Sharp, 1884, *Stygnohydrus* Broun, 1893 (junior subjective synonym of *Tormus*), and the Australian endemic *Pseudohydrobius* Blackburn, 1898. ORCHYMONT (1919) explained the establishment of the Rygmodini by the fact that *Rygmodes* (the type genus) is the oldest described taxon in the group. Although he commented on the name Cylomina Zaitzev, 1908, he ignored its priority over Rygmodini. The status proposed by ORCHYMONT (1919), i.e. Rygmodini as a valid name, with Cylomina as its synonym, was corroborated by KNISCH (1924).

HANSEN (1991) performed the first phylogenetic analysis of the Hydrophilidae and proposed a new classification of the family (the so-called Hansen's Classification). In the course of this work, he redefined Rygmodini as containing six genera only: *Pseudohydrobius*, *Rygmodes*, *Rygmodes* Orchymont, 1933, *Saphydrus*, *Rygmodes*, *Eurygmus* Hansen, 1990, and *Cylorygmus* Orchymont, 1933. The genera *Tormus*, *Tormissus*, *Hydrostygnus* and *Exydrus* were transferred to a newly established tribe Tormissini, and the genera *Cyloma* and *Adolopus* to the tribe Coelostomatini; several genus-level synonymies were also proposed. The transfer of *Cyloma* from Rygmodini to Coelostomatini resulted in placing Cylomina Zaitzev, 1908 in synonymy with Coelostomatini Heyden, 1891.

SHORT & FIKÁČEK (2013) reassessed the phylogeny and classification of Hydrophilidae based on a multigene dataset. They found a strong support for most of the genera assigned to 'basal sphaeridiine clades' in Hansen's Classification (i.e. Rygmodini, Tormissini, Andotypini and Borborophorini) to form a monophyletic group. Based on these results, the subfamily Rygmodinae was established for the clade, and the remaining family-group names were synonymized with it. The genera *Adolopus* and *Cyloma* were transferred back to Rygmodinae from Coelostomatini, and the genera *Tormus* and *Afrotormus* Hansen, 1999 (previously classified in Tormissini) were moved to Hydrophilinae. Furthermore, *Anticura* Spangler, 1979 was moved from Hydrophilinae to Rygmodinae. Due to the ongoing revision of the group, no formal family-group taxa (tribes, subtribes) were established inside of the subfamily. In this revised concept, Rygmodinae contained 18 genera. Subsequently, one new genus was described by FIKÁČEK et al. (2014) and *Pseudorygmodes* Hansen, 1999 was transferred from Rygmodinae to Chaetarthriinae by FIKÁČEK & VONDRÁČEK (2014).

When reassigning *Cyloma* back from Coelostomatini to Rygmodinae, SHORT & FIKÁČEK (2013) did not resurrect the family-group name Cylomina from synonymy with Coelostomatini and therefore overlooked its nomenclatural priority over Rygmodinae. Here we fix

this issue, and establish Cylominae Zaitzev, 1908, stat. nov., as a valid subfamily name, with Rygmodinae Orchymont, 1916 standing as its synonym. The names standing previously in synonymy with Rygmodinae Orchymont, 1916 are transferred under Cylominae Zaitzev, 1908. An updated overview of family-group and genus-group names currently assigned to the subfamily is provided below.

Spelling corrections

When ZAITZEV (1908) introduced Cylomina in his catalogue, the name was listed as 'Cyl(l)omina', corresponding to his spelling of the type genus – '*Cyl(l)oma*'. This is the reason why Cylomina was listed as Cyllomina by some subsequent authors (e.g. HANSEN 1991, BOUCHARD et al. 2011), but all of them considered this spelling as an unjustified emendation, since SHARP's (1872) original spelling of the genus was *Cyloma*. In agreement with that, we are using Cylomina as the correct original spelling of ZAITZEV's (1908) name.

BOUCHARD et al. (2011: 7–9, 157) considered *Cyloma* as a neuter noun of Greek origin, based on the ending *-loma* (Greek word for margin), and in agreement with that corrected the genitive stem for formation of family-group names from '*Cylom-*' used by all previous authors to '*Cylomat-*'. However, as discussed by NEWTON & THAYER (1992: 15), *Cyloma* was explicitly stated as 'a word without any classical derivation' in the original description by SHARP (1872: 152). As such, the stem formation for the family-group name follows Article 29.3.3 of the International Code of Zoological Nomenclature (ICZN 1999). This Article states that 'if a generic name is or ends in a word not Greek or Latin, or is an arbitrary combination of letters, the stem for the purposes of the Code is that adopted by the author who establishes the new family-group taxon'. ZAITZEV's (1908) establishment of Cylomina (stem: *Cylom-*) hence determined the stem formation for family-group names derived from *Cyloma*. Consequently, we consider the stem formation done by BOUCHARD et al. (2011) as incorrect, and establish the subfamily name as Cylominae.

Updated overview of family- and genus-group names within Cylominae

Subfamily Cylominae Zaitzev, 1908

Cylominae Zaitzev, 1908: 400. Type genus: *Cyloma* Sharp, 1872.

= Cyllomina: ZAITZEV (1908): 400 (incorrect original spelling based on incorrect subsequent spelling of the name of type genus).

= Rygmodini Orchymont, 1916: 238, **syn. nov.** Type genus: *Rygmodus* White, 1846.

= Andotypini Hansen, 1991: 186. Type genus: *Andotypus* Spangler, 1979. Synonymized with Rygmodinae by SHORT & FIKÁČEK (2013).

= Borborophorini Hansen, 1991: 190. Type genus: *Borborophorus* Hansen, 1990. Synonymized with Rygmodinae by SHORT & FIKÁČEK (2013).

= Tormissini Hansen, 1991: 181. Type genus: *Tormissus* Broun, 1893. Synonymized with Rygmodinae by SHORT & FIKÁČEK (2013).

Adolopus Sharp, 1884

Adolopus Sharp, 1884: 478. Type species: *Adolopus helmsi* Sharp, 1884 (designated by KNISCH 1924: 108).

Distribution. New Zealand (HANSEN 1999).

***Andotypus* Spangler, 1979**

Andotypus Spangler, 1979a: 303. Type species: *Andotypus ashworthi* Spangler, 1979 (by original designation).

Distribution. Chile (FIKÁČEK et al. 2014).

***Anticura* Spangler, 1979**

Anticura Spangler, 1979b: 698. Type species: *Anticura flinti* Spangler, 1979 (by original designation).

Distribution. Argentina, Chile (HANSEN 1999, FIKÁČEK & VONDRÁČEK 2014).

***Austrotypus* Fikáček, Minoshima & Newton, 2014**

Austrotypus Fikáček, Minoshima & Newton, 2014: 559. Type species: *Austrotypus nothofagi* Fikáček, Minoshima & Newton, 2014 (by original designation).

Distribution. Australia (New South Wales, Queensland), Peru (FIKÁČEK et al. 2014).

***Borborophorus* Hansen 1990**

Borborophorus Hansen, 1990: 326. Type species: *Borborophorus pubescens* Hansen, 1990 (by original designation).

Distribution. Australia (New South Wales, Queensland) (HANSEN 1999).

***Coelostomopsis* Hansen, 1990**

Coelostomopsis Hansen, 1990: 333. Type species: *Coelostomopsis picea* Hansen, 1990 (by original designation).

Distribution. Australia (Queensland) (HANSEN 1999).

***Cyloma* Sharp, 1872**

Cyloma Sharp, 1872: 152. Type species: *Cyloma lawsonus* Sharp, 1872 (by monotypy).

= *Cyloma*: ZAITZEV (1908): 400 (incorrect subsequent spelling).

= *Psephoboragus* Broun, 1893b: 1402. Type species: *Psephoboragus signatus* Broun, 1983 (designated by KNISCH 1924: 109). Synonymized by HANSEN (1991).

= *Namostygnus* Broun, 1909: 98. Type species: *Namostygnus rufipes* Broun, 1909 (by monotypy). Synonymized by HANSEN (1991).

= *Gitocyloma* Broun, 1915: 277. Type species: *Gitocyloma nigratus* Broun, 1915 (by monotypy). Synonymized by HANSEN (1991).

Distribution. New Zealand (HANSEN 1999).

***Cylomissus* Broun, 1903**

Cylomissus Broun, 1903: 613. Type species: *Cylomissus glabratus* Broun, 1903 (by monotypy).

= *Cylomissus* Zaitzev, 1908: 400 (incorrect subsequent spelling).

Distribution. New Zealand (HANSEN 1999).

***Cylorygmus* Orchymont, 1933**

Cylorygmus Orchymont, 1933: 293. Type species: *Cylorygmus lineatopunctatus* Orchymont, 1933 (by original designation).

Distribution. Chile (HANSEN 1999, FIKÁČEK & VONDRÁČEK 2014), South Africa (Western Cape) (HEBAUER 2002).

***Eurygmus* Hansen, 1990**

Eurygmus Hansen, 1990: 322. Type species: *Eurygmus helocharoides* Hansen, 1990 (by original designation).

Distribution. Australia (Queensland) (HANSEN 1999).

***Exydrus* Broun, 1886**

Exydrus Broun, 1886: 940. Type species: *Cyclonotum flavicorne* Broun, 1886 (designated by KNISCH 1924: 106).

Distribution. New Zealand (HANSEN 1999).

***Hydrostygnus* Sharp, 1884**

Hydrostygnus Sharp, 1884: 475. Type species: *Hydrostygnus brouni* Sharp, 1884 (designated by HANSEN 1999: 238)

Distribution. New Zealand (HANSEN 1999).

***Petasopsis* Hansen, 1990**

Petasopsis Hansen, 1990: 331. Type species: *Petasopsis brevitarsis* Hansen, 1990 (by original designation).

Distribution. Australia (Queensland) (HANSEN 1999).

***Pseudohydrobius* Blackburn, 1898**

Pseudohydrobius Blackburn, 1898: 231. Type species: *Pseudohydrobius floricola* Blackburn, 1898 (by monotypy).

Distribution. Australia (New South Wales, Victoria, Queensland) (HANSEN 1999, FIKÁČEK & WATTS 2015).

***Rygmodes* White, 1846**

Rygmodes White, 1846: 11. Type species: *Rygmodes modestus* White, 1846 (designated by KNISCH 1924: 107).

Distribution. New Zealand (HANSEN 1999).

***Rygmostralia* Orchymont, 1933**

Rygmostralia Orchymont, 1933: 293. Type species: *Rygmostralia brunnea* Orchymont, 1933 (by original designation).

Distribution. Australia (New South Wales) (HANSEN 1999).

***Saphydrus* Sharp, 1884**

Saphydrus Sharp, 1884: 467. Type species: *Saphydrus suffusus* Sharp, 1884 (designated by KNISCH 1924: 108).

Distribution. New Zealand (HANSEN 1999).

***Tormissus* Broun, 1893**

Tormissus Broun, 1893a: 1021. Type species: *Tormissus magnulus* Broun, 1893 (designated by KNISCH 1924: 107).
= *Thomosis* Broun, 1904: 273. Type species: *Thomosis guanicola* Broun, 1904 (by monotypy). Synonymized by HANSEN (1991).

Distribution. New Zealand (HANSEN 1999).

Acknowledgements

We thank Petr Kment, Jiří Hájek and Lukáš Sekerka (National Museum, Prague) for help and discussions on nomenclatural problems treated in this paper, and to Alfred F. Newton (Field Museum, Chicago) for comments on the stem formation of family-group names derived from *Cyloma* and further corrections of the manuscript. This work was supported by the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No. 542241 to M. Seidel and E. Arriaga-Varela, and the Ministry of Culture of the Czech Republic (DKRVO 2016/14, National Museum, 00023272) to Martin Fikáček. The work of the first two authors at the Department of Zoology, Charles University in Prague was partly supported by grant SVV 260 313/2016.

References

- BLACKBURN T. 1898: Further notes on Australian Coleoptera, with descriptions of new genera and species. XXIV. *Transactions of the Royal Society of South Australia* **22**: 221–233.
- BLOOM D. D., FIKÁČEK M. & SHORT A. E. Z. 2014: Clade age and diversification rate variation explain disparity in species richness among water scavenger beetle (Hydrophilidae) lineages. *PLoS ONE* **9(6)**(e98430): 1–9. doi:10.1371/journal.pone.0098430
- BOUCHARD P., BOUSQUET Y., DAVIES A. E., ALONSO-ZARAZAGA M. A., LAWRENCE J. F., LYAL C. H. C., NEWTON A. F., REID C. A. M., SCHMITT M., ŠLIPÍŇSKI S. A. & SMITH A. B. T. 2011: Family-group names in Coleoptera (Insecta). *ZooKeys* **88**: 1–972.
- BROUN T. 1886: *Manual of the New Zealand Coleoptera. Part IV*. Colonial Museum and Geological Survey Department, Wellington, pp. 817–973.
- BROUN T. 1893a: *Manual of the New Zealand Coleoptera. Part V*. Colonial Museum and Geological Survey Department, Wellington, pp. 975–1320.
- BROUN T. 1893b: *Manual of the New Zealand Coleoptera. Part VII*. Colonial Museum and Geological Survey Department, Wellington, pp. 1395–1504.
- BROUN T. 1903: Descriptions of new genera and species of New Zealand Coleoptera. *Annals and Magazine of Natural History, Series 7* **11**: 602–618.
- BROUN T. 1904: Description of a new Coleopterous Insect from Bounty Island. *Annals and Magazine of Natural History, Series 7* **14**: 273–274.
- BROUN T. 1909: Descriptions of Coleoptera from the Subantarctic Islands of New Zealand; with remarks on the affinities of the genera, etc. *Subantarctic Islands of New Zealand* **1**: 78–123.
- BROUN T. 1915: Descriptions of new genera and species of Coleoptera. Part IV. *Bulletin of the New Zealand Institute* **1**: 267–346.
- FIKÁČEK M., MARUYAMA M., KOMATSU T., VON BEEREN C., VONDRÁČEK D. & SHORT A. E. 2015: Protosternini (Coleoptera: Hydrophilidae) corroborated as monophyletic and its larva described for the first time: a review of the myrmecophilous genus *Sphaerocetum*. *Invertebrate Systematics* **29**: 23–36.
- FIKÁČEK M., MINOSHIMA Y. N. & NEWTON A. F. 2014: A review of *Andotypos* and *Austrotypos* gen. nov., rygmoline genera with an austral disjunction (Hydrophilidae: Rygmolinae). *Annales Zoologici (Warszawa)* **64**: 557–596.
- FIKÁČEK M. & VONDRÁČEK D. 2014: A review of *Pseudorygmodus* (Coleoptera: Hydrophilidae), with notes on the classification of the *Anacaenini* and on distribution of genera endemic to southern South America. *Acta Entomologica Musei Nationalis Pragae* **54**: 479–514.
- FIKÁČEK M. & WATTS C. H. S. 2015: Notes on the Australian *Anacaenini* (Coleoptera: Hydrophilidae): description of male of *Phela breviceps* Hansen and unravelling the identity of *Crenitis neogallica* Gentili. *Zootaxa* **3980**: 427–434.
- HANSEN M. 1990: Australian *Sphaeridiinae* (Coleoptera: Hydrophilidae): A taxonomic outline with descriptions of new genera and species. *Invertebrate Taxonomy* **4**: 317–395.

- HANSEN M. 1991: The hydrophiloid beetles. Phylogeny, classification and a revision of the genera (Coleoptera, Hydrophiloidea). *Biologiske Skrifter* **40**: 1–367.
- HANSEN M. 1999: *World Catalogue of Insects, Vol. 2: Hydrophiloidea (Coleoptera)*. Apollo Books, Stenstrup, 416 pp.
- HEBAUER F. 2002: New Hydrophilidae of the Old World (Coleoptera, Hydrophilidae). *Acta Coleopterologica* **18(3)**: 3–24.
- INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE (ICZN) 1999: *International Code of Zoological Nomenclature, Fourth Edition*. International Trust for Zoological Nomenclature, London, 306 pp.
- KNISCHA A. 1924: Hydrophilidae. In: SCHENKLING S. (ed.): *Coleopterorum Catalogus, Pars 79*. W. Junk, Berlin, 306 pp.
- NEWTON A. F. Jr. & THAYER M. K. 1992: Current classification and family-group names in Staphyliniformia (Coleoptera). *Fieldiana: Zoology (New Series)* **67**: 1–92.
- ORCHYMONT A. d' 1916: De la place qui doivent occuper dans la classification les sous-familles des Sphaeridiinae et des Hydrophilinae. *Bulletin de la Société Entomologique de France* **1916**: 235–240.
- ORCHYMONT A. d' 1919: Contribution à l'étude des sous-familles des Sphaeridiinae et des Hydrophilinae (Col. Hydrophilidae). *Annales de la Société Entomologique de France* **88**: 105–168.
- ORCHYMONT A. d' 1933: Contribution à l'étude des Palpicornia VIII. *Bulletin et Annales de la Société Entomologique de Belgique* **73**: 271–314.
- SHARP D. 1872: Description of a new genus and species of Hydrophilidae from New Zealand, and of a new species of Philhydus from Great Britain. *Entomologist's Monthly Magazine* **9**: 152–153.
- SHARP D. 1884: Revision of the Hydrophilidae of New Zealand. *Transactions of the Entomological Society of London* **1884**: 465–480.
- SHORT A. E. Z. & FIKÁČEK M. 2013: Molecular phylogeny, evolution and classification of the Hydrophilidae (Coleoptera). *Systematic Entomology* **38**: 723–752.
- SPANGLER P. J. 1979a: A new genus of water scavenger beetle from Chile (Coleoptera: Hydrophilidae: Sphaeridiini). *Coleopterists Bulletin* **33**: 303–308.
- SPANGLER P. J. 1979b: A new genus of water beetle from austral South America (Coleoptera: Hydrophilidae). *Proceedings of the Biological Society of Washington* **92**: 697–718.
- TOUSSAINT E. F., FIKÁČEK M. & SHORT A. E. 2016: India-Madagascar vicariance explains cascade beetle biogeography. *Biological Journal of the Linnean Society*, in press, doi: 10.1111/bij.12791.
- WHITE A. 1846: Insects. Pp. 1–24. In: RICHARDSON J. & GRAY J. E. (eds): *The Zoology of the Voyage of H. M. S. Erebus & Terror. Vol. 2*. E. W. Janson, London.
- ZAITZEV F. A. 1908: Catalogue des Coléoptères aquatiques des familles Dryopidae, Georyssidae, Cyathoceridae, Heteroceridae et Hydrophilidae. *Horae Societatis Entomologicae Rossicae* **38**: 283–420.

