



## 20 years of *Zootaxa*: Tardigrada (Ecdysozoa: Panarthropoda)

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### Abstract

Over the last two decades, *Zootaxa* has hosted nearly 200 papers concerning tardigrade taxonomy, systematics, phylogeny, and evolution. A total of 160 researchers from all continents (except the Antarctic) published descriptions of almost 200 new taxa, mostly species, but also genera and higher taxonomic ranks, such as families and superfamilies. This editorial is dedicated to the late Professor Clark W. Beasley who was the first tardigrade Associate Editor for *Zootaxa*.

**Key words:** Tardigrada, Heterotardigrada, Eutardigrada, Arthrotardigrada, Echiniscoidea, Apochela, Parachela, taxonomy, systematics, biodiversity loss

Tardigrades, also known as water bears, are a phylum of microscopic invertebrates. Although their exact phylogenetic position within the megaclade Ecdysozoa has not yet been resolved, it is thought that together with arthropods and onychophorans they most likely constitute the superclade Panarthropoda. Water bears inhabit a great variety of ecosystems throughout the globe: they have been recorded from the tropics to the poles, and from ocean depths to mountain tops. Though they require liquid water to be active, tardigrades can withstand drying out, freezing, and other harsh conditions. This remarkable adaptation, cryptobiosis, has made tardigrades famous and known to a wider public as ‘the toughest creatures on the planet’ that were able to survive exposure to outer space, five mass extinctions, and are likely to live through the current biodiversity loss (e.g. Ceballos *et al.* 2020).

The number of formally described tardigrade species is nearing 1500 (Degma *et al.* 2021), and Zhang (2011) ranked tardigrades as the 17<sup>th</sup> most speciose of the 40 phyla in the kingdom Animalia. However, their actual diversity could be an order of magnitude larger. Despite the public interest in these charismatic creatures, tardigrades are still a poorly studied group, particularly the marine fauna. Yet, *Zootaxa* has provided a platform that has a significant share in uncovering tardigrade diversity. Instigated in 2001, the first description of a new water bear species in *Zootaxa* was in 2002, *Echiniscus barbarae* Kaczmarek & Michalczyk (now classified in the genus *Claxtonia*). Until the end of 2020, a total of 187 tardigrade papers, authored by 160 researchers from across the world, have been published in *Zootaxa*. These include the descriptions of 193 new tardigrade taxa, including 1 subspecies, 184 species (= ca. 13% of all known species), 2 genera, 2 families, and 4 superfamilies, as well as the redescrptions of further 9 species. Among these papers are the descriptions of two widely used laboratory models, *Hypsibius exemplaris* Gąsiorek *et al.* and *Milnesium inceptum* Morek *et al.* Several new species descriptions have been dedicated to famous people, for example, *Doryphoribius dawkinsi* Michalczyk & Kaczmarek named in honour of the scientist Richard Dawkins and *Echiniscus madonnae* Michalczyk & Kaczmarek (now classified in the genus *Barbaria*) in tribute to the artist Madonna Ciccone. Alongside papers describing new species, *Zootaxa* has also published articles on tardigrade phylogeny, zoogeography, and faunistics. Moreover, widely used taxonomic and biogeographic checklists have found their place on the journal’s pages.

**TABLE 1.** Most prolific tardigrade authors up to the end of 2020

Author	Affiliation country	Number of <i>Zootaxa</i> papers
Lukasz Kaczmarek	Poland	52
Giovanni Pilato	Italy	48
Lukasz Michalczyk	Poland & UK	42
Oscar Lisi	Italy	39
Paulo Fontoura	Portugal	18
Daniel Stec	Poland	14
Roberto Bertolani	Italy	13

Metrics for papers published in *Zootaxa* on tardigrades show an average of 3 researchers, but the number of authors has ranged between 1 and 10. There are four most prolific authors averaging about 45 papers each (Table 1), with another dozen who have contributed about 9 papers each over the last 20 years. Among those authors are early career scientists and *Zootaxa* has a very good record for providing these ‘next generation’ scientist with a platform for their studies and experience in writing and reviewing.

The first tardigrade papers submitted to *Zootaxa* were accepted by the Editor-in-Chief, Zhi-Qiang Zhang, and in 2004, Clark W. Beasley (McMurry University, USA) accepted the position of the first Associate Editor dedicated to tardigrade-related manuscripts. When Clark retired in 2010, having overseen 65 papers published in *Zootaxa*, Sandra McInnes (British Antarctic Survey, UK) took up the baton. However, with the constantly growing number of tardigrade manuscripts being submitted to *Zootaxa*, two new Associate Editors, Aslak Jørgensen (University of Copenhagen, Denmark) and Łukasz Michalczyk (Jagiellonian University, Poland), joined the team in 2014 and 2018, respectively.

*Zootaxa* has provided a significant contribution to the process of uncovering tardigrade diversity. Some of this certainly stems from the fact that the journal publishes free of charge and imposes no page limits (the low proportion of open access tardigrade papers published in *Zootaxa*, less than 10%, shows that the great majority of authors do not have funds for publishing in journals with page charges). This has helped encourage research in developing countries and provided a welcoming space for monographs such as extensive taxonomic revisions and checklists. With the advent of integrative taxonomy, which allows for an efficient exposure of cryptic diversity, and in the face of climate change entailing global loss of diversity, *Zootaxa* is more essential than ever before.

## References

- Ceballos, G., Ehrlich, P.R. & Raven, P.H. (2020) Vertebrates on the brink as indicators of biological annihilation and the sixth mass extinction. *Proceedings of the National Academy of Sciences*, 117 (24), 13596–13602.  
<https://doi.org/10.1073/pnas.1922686117>
- Degma, P., Bertolani, R. & Guidetti, R. (2009–2020) *Actual checklist of Tardigrada species*. 38<sup>th</sup> Edition.  
[https://doi.org/10.25431/11380\\_1178608](https://doi.org/10.25431/11380_1178608)
- Zhang Z-Q. (2011) Animal biodiversity: an introduction to higher-level classification and taxonomic richness. *Zootaxa*, 3148, 7–12.  
<https://doi.org/10.11646/zootaxa.3148.1.3>