

Case 3837 – *Trilobatus* Spezzaferri, Kucera, Pearson, Wade, Rappo, Poole, Morard & Stalder, 2015 (Foraminifera, GLOBIGERINIDAE): proposed conservation of the genus-group name by partial suppression of *Trilobigerina* Popescu, 1987

Paul N. Pearson*

Department of Earth Sciences, University College London, Gower Street, London WC1E 6BT, United Kingdom
(p.pearson@ucl.ac.uk)

Michal Kucera

Center for Marine Environmental Sciences (MARUM), Universität Bremen, Bremen, Germany
(mkucera@marum.de)

Silvia Spezzaferri

Department of Geosciences, University of Fribourg, Chemindu Musée 6, 1700CH-1700 Fribourg, Switzerland
(silvia.spezzaferri@unifr.ch)

Bridget S. Wade

Department of Earth Sciences, University College London, Gower Street, London WC1E 6BT, United Kingdom
(b.wade@ucl.ac.uk)

*Corresponding author

<http://zoobank.org/urn:lsid:zoobank.org:pub:4EBC4627-1316-4864-9577-B0AB0881DB27>
<http://dx.doi.org/10.21805/bzn.v80.a010>

Abstract. The purpose of this application, under Articles 23.9.3 and 81.2.2 of the Code, is to conserve the usage of the genus-group name *Trilobatus* Spezzaferri, Kucera, Pearson, Wade, Rappo, Poole, Morard & Stalder, 2015 for a genus of planktonic foraminifera from the global ocean and fossil record by partial suppression of its senior objective synonym *Trilobigerina* Popescu, 1987. Partial suppression of the little-used senior name will allow conservation of the younger name that is in very widespread use.

Keywords. Nomenclature; taxonomy; Foraminifera; Foraminiferida; GLOBIGERINIDAE; *Trilobatus*; *Trilobigerina*; planktonic foraminifera.

1. Planktonic foraminifera are highly abundant marine protists with a dense fossil record that are used very widely in oceanographic, biostratigraphic, evolutionary and palaeoclimatic studies. Among the most abundant living species in the global ocean are *Globigerina triloba* Reuss, 1850 (for which a neotype was designated by Rögl (2012)), and its close relative *Globigerina sacculifera* Brady, 1877. These species also have extensive and continuous fossil records extending back to the Miocene epoch. Although they belong to the family GLOBIGERINIDAE, it has long been accepted that they are only distantly related to the type species of *Globigerina*, namely *Globigerina bulloides* d'Orbigny, 1826. Consequently, they have usually been referred to other genera.

2. For many years these species and related forms were generally included in the genus *Globigerinoides* Cushman, 1927 because, like its type species *Globigerina rubra* d'Orbigny, 1839, they possess supplementary apertures on the spiral side of the test. A measure of the widespread employment of these taxa is that the combinations “*Globigerinoides trilobus*” and “*Globigerinoides sacculifer*” receive 16,300 and 31,800 ‘hits’ respectively on the Google search engine (Table 1; note that the species names are generally made masculine to match the genus according to Article 34.2 of the Code).

Table 1. Search engine ‘hits’ on Google according to searches on the exact terms listed [last accessed on 29 July 2020].

Search on exact term	‘Hits’
“ <i>Globigerina triloba</i> ”	1,500
“ <i>Globigerinoides trilobus</i> ”	16,300
“ <i>Trilobigerina triloba</i> ”	6
“ <i>Trilobigerina trilobus</i> ”	0
“ <i>Trilobatus trilobus</i> ”	629
“ <i>Globigerina sacculifera</i> ”	866
“ <i>Globigerinoides sacculifer</i> ”	31,800
“ <i>Trilobigerina sacculifera</i> ”	2
“ <i>Trilobigerina sacculifer</i> ”	0
“ <i>Trilobatus sacculifer</i> ”	4,400

3. This generic assignment has, nevertheless, long been in question because taxonomists have doubted that a close relationship exists between these species and *Globigerinoides ruber*. Various influential studies concluded that “*Globigerinoides*” as

normally constituted was polyphyletic and artificial (e.g., Jenkins, 1965; Keller, 1981; Kennett & Srinivasan, 1983). Nevertheless, most authors continued to use the genus in a broad sense while citing the need for more detailed work on the evolutionary relationships among the various species (e.g., Kennett & Srinivasan, 1983: 51).

4. These considerations led Popescu (1987: 156) to name a new genus, *Trilobigerina* Popescu, type species *Globigerina triloba*, to accommodate this and several other closely related fossil species. This was published in a “taxonomic notes” section of a paper on biostratigraphic correlation of the middle Miocene rocks of eastern Europe.

5. Unfortunately, Popescu’s (1987) nomenclatorial act was not widely followed. After naming the genus, the author himself reverted to using the combination *Globigerinoides trilobus* (Popescu et al., 1995; Popescu & Crihan, 2011). Evidence that the nomenclatorial act was not noticed by the wider community is that, at the time of writing, the combination “*Trilobigerina triloba*” has only six ‘hits’ on the Google search engine (Table 1), five of which are interlinked taxonomic databases. There are, however, two published exceptions that are discussed below in Paragraph 11.

6. Spezzaferri et al. (2015) reviewed the palaeontological and genetic evidence of species previously assigned to *Globigerinoides* and made the case (similar to Popescu, 1987) that the group was polyphyletic and accordingly named the genus *Trilobatus* Spezzaferri, Kucera, Pearson, Wade, Rappo, Poole, Morard & Stalder, 2015 with the same designated type species, *Globigerina triloba*. Because a wide community of researchers uses these species (see Paragraph 12 below), the nomenclatorial act included as authors specialists from the fields of marine biology, genetics and palaeontology and was the subject of a dedicated paper that was published in a highly cited open access journal.

7. Unfortunately, the work of Spezzaferri et al. (2015) and the nomenclatorial act that it contains were not originally registered with Zoobank, the online registration system for the ICZN. That was rectified in a published correction to the original paper by Spezzaferri et al. (2021). The Zoobank Life Science Identifier (LSID) for the publication is urn:lsid:zoobank.org:pub:B0ABE4D9-579F-4E40-B4B6-AB396B41F409 and for the nomenclatorial act is urn:lsid:zoobank.org:act:0D088398-B3AB-40CE-9011-0B8B7D977D2D.

8. The new combination has been widely accepted, as is evidenced by the fact that, within a few years, the combinations *Trilobatus trilobus* and *Trilobatus sacculifer* receive 629 and 4,400 ‘hits’, respectively, on the Google search engine (Table 1).

9. The authors are grateful to François Le Coze, editor of the World Register of Marine Species, who brought to our attention the existence of the genus *Trilobigerina* and noted that it appears to be an objective senior synonym of *Trilobatus*. A comment to that effect dated 9 March 2020 was added to the mikrotax discussion board (http://www.mikrotax.org/pforams/pf-recent_comments.php) [last accessed on 15 August 2020]. A misspelled *Triglobigerina* (sic) has also been listed on mikrotax.org with the comment “This genus appears to be a senior synonym of (sic) *Trilobatus*” (http://www.mikrotax.org/system/index.php?taxon=Triglobigerina&module=pf_cat) [last accessed on 15 August 2020].

10. Popescu’s (1987) reasoning behind the erection of the genus was sound and the authors would have used the name had they been aware of it. However, we are concerned that to do so now would generate instability. We attempted to contact G. Popescu for comment prior to submission but received no response.

11. We are aware of only two publications that have used *Trilobigerina* since the initial

description, both of which concern the regional stratigraphy of the Danube area. Hosu & Filipescu (1996: 109) illustrated a specimen but did not otherwise discuss its significance. Vlček et al. (2020: 54) recently used the combination *Trilobigerina triloba* in a long table of taxonomic names labelled “complete fauna list”, but the same table also includes three species of *Trilobatus*. This confusion underlines the need to resolve the case.

12. In contrast, a large number of studies in diverse disciplines have used the genus *Trilobatus*. The guidelines for preparing cases based on prevailing usage suggest that as many significant references as possible should be provided, including a diversity of different non-taxonomic disciplines. The Google Scholar website lists 197 separate ‘hits’ (publications and theses) for the combination “*Trilobatus saccifer*” and 53 for “*Trilobatus trilobus*” [last accessed on 15 August 2020]. These ‘hits’ range in age from 2015 to 2020. It seems superfluous to list them all, but an instructive selection (Appendix) includes taxonomic studies (Rillo et al., 2017; Spezzaferri et al., 2018; Poole & Wade, 2019); ecological studies (Mallo et al., 2017; Scott, 2020), biostratigraphic studies (King et al., 2020; Lam & Leckie, 2020); oceanographic studies (Wilson & Hayek, 2019); palaeoceanographic studies (Sosdian et al., 2018); evolutionary studies (Belhadji et al., 2020), geochemical studies (Bertlich et al., 2018; Wycech et al., 2018; Gray & Evans, 2019) and geological studies (Samankassou et al., 2018; Marini et al., 2020). We note also that two biostratigraphic events featuring species of *Trilobatus* feature in the latest standard geological timescale (Raffi et al., 2020), which will result in further wide dissemination of the genus.

13. The global community of researchers working with the species discussed in this contribution is very large and diverse, including many researchers who do not regularly concern themselves with taxonomy. Many of these have recently accepted the combination *Trilobatus trilobus*, which is gaining ground over the ‘traditional’ *Globigerinoides trilobus*. We contend that it would now and in the future cause significant instability to assert the priority of *Trilobigerina triloba*. We therefore propose to invoke Article 23.9.3.

14. The International Commission on Zoological Nomenclature is accordingly asked:

- (1) to use its plenary power to rule that the generic name *Trilobigerina* Popescu, 1987 be suppressed for the Purposes of the Principle of Priority but not for those of the Principle of Homonymy;
- (2) to place on the Official List of Generic Names in Zoology the name *Trilobatus* Spezzaferri, Kucera, Pearson, Wade, Rappo, Poole, Morard & Stalder, 2015 (gender: masculine), type species: *Globigerina triloba* by original designation; and
- (3) to place on the Official Index of Rejected and Unavailable Generic Names in Zoology the name *Trilobigerina* Popescu, 1987 (gender: feminine), as suppressed in (1) above.

References

Brady HB (1877) Supplementary note on the foraminifera of the Chalk (?) of the New Britain group. *Geological Magazine* 4(12): 534–536.
<https://doi.org/10.1017/S0016756800150137>

Cushman JA (1927) An outline of a re-classification of the Foraminifera. Contributions from the Cushman Laboratory for Foraminiferal Research 3: 1–105.

d'Orbigny A (1826) Tableau méthodique de la classe de Céphalopodes. *Annales des Sciences Naturelles*, Paris 7: 245–314.

Hosu A, Filipescu S (1996) Sequence stratigraphy on the Middle-Miocene deposits from Gârbova de Sus (Transylvanian Basin, Romania). *Studii și Comunicări, Muzeul Județean Bistrița* 1: 87–97.

Jenkins DG (1965) 303. The origin of the species *Globigerinoides trilobus* (Reuss) in New Zealand. *Contributions from the Cushman Foundation for Foraminiferal Research* 16(3): 116–121.

Keller G (1981) Origin and evolution of the genus *Globigerinoides* in the early Miocene of the northwestern Pacific, DSDP Site 292. *Micropaleontology* 27: 293–304. <https://doi.org/10.2307/1485239>

Kennett JP, Srinivasan MS (1983) Neogene Planktonic Foraminifera: A phylogenetic Atlas. Hutchinson Ross, Stroudsburg. xv + 265 pp.

Popescu G (1987) Marine Middle Miocene microbiostratigraphical correlation in Central Paratethys. *Dări de Seamă ale Sedintelor. Institutul de Geologie și Geofizică. 3. Paleontology* 72(3): 149–167.

Popescu G, Mărunteanu M, Filipescu S (1995) Neogene from Transylvania Depression - Guide to excursion A1 (pre-Congress) (X-th Congress RCMNS, București, 1995). *Romanian Journal of Stratigraphy* 76 (3): 1–27.

Popescu G, Crihan I (2011) Middle Miocene globigerinas of Romania. *Acta Paleontologica Romanae* 7: 291–314.

Reuss AE (1850) Neue Foraminiferen aus den Schichten des österreichischen Tertiärbeckens. *Denkschriften der Kaiserlichen Akademie der Wissenschaften* 1: 365–390.

Rögl F (2012) *Globigerina triloba* Reuss 1850 – Designation of a neotype. *Annalen des Naturhistorischen Museums in Wien, Serie A* 114: 179–191.

Spezzaferri S, Kucera M, Pearson PN, Wade BS, Rappo S, Poole CR, Morard R, Stalder, C (2015). Fossil and genetic evidence for the polyphyletic nature of the planktonic foraminifera “*Globigerinoides*”, and description of the new genus *Trilobatus*. *PLoS ONE* 10(5): e0128108. <https://doi.org/10.1371/journal.pone.0128108>

Spezzaferri S, Kucera M, Pearson PN, Wade BS, Rappo S, Poole CR, Morard R, Stalder, C (2021). Correction: Fossil and genetic evidence for the polyphyletic nature of the planktonic foraminifera “*Globigerinoides*”, and description of the new genus *Trilobatus*. *PLoS ONE* 16(11): e0259924. <https://doi.org/10.1371/journal.pone.0259924>

Vlček T, Hudáčková N, Jamrich M, Halásová E, Francú J, Nováková P, Kováčová M, Kováč M (2020) Hydrocarbon potential of the Oligocene and Miocene sediments from the Modrany-1 and Modrany-2 wells (Danube Basin, Slovakia). *Acta Geologica Slovaca* 12(1): 43–45.

Appendix

Bertlich J, Nürnberg D, Hathorne E, de Nooijer LJ, Mezger EM, Kienast M, Nordhausen S, Reichart G-J, Schönfeld J, Bijma J (2018) Salinity control on Na incorporation into calcite tests of the planktonic foraminifera *Trilobatus sacculifer* – evidence from culture experiments and surface sediments. *Biogeosciences*, 15(20): 5991–6018. <https://doi.org/10.5194/bg-15-5991-2018>

Belhadji A, Bartolini A, Rossignol L, Belkebir L, Guex J (2020) Extreme morphological plasticity within *Orbulina*–“*Praeorbulina*-like” assemblages related to environmental stress. *Morphogenesis, Environmental Stress and Reverse Evolution* 111–127. https://doi.org/10.1007/978-3-030-47279-5_7

Gray WR, Evans D (2019) Nonthermal influences on Mg/Ca in planktonic foraminifera: a review of culture studies and application to the Last Glacial Maximum. *Paleoceanography and Paleoclimatology* 34(3): 306–315. <https://doi.org/10.1029/2018PA003517>

King DJ, Wade BS, Liska RD, Miller CG (2020) A review of the importance of the Caribbean region in Oligo-Miocene low latitude planktonic foraminiferal biostratigraphy and the implications for modern biogeochronological schemes. *Earth-Science Reviews* 202: 102968. <https://doi.org/10.1016/j.earscirev.2019.102968>

Lam A, Leckie RM (2020) Subtropical to temperate late Neogene to Quaternary planktic foraminiferal biostratigraphy across the Kuroshio Current Extension, Shatsky Rise, northwest Pacific Ocean. *PLoS ONE* 15(7): e0234351.
<https://doi.org/10.1371/journal.pone.0234351>

Mallo M, Ziveri P, Mortyn PG, Schiebel R, Grelaud M (2017) Low planktic foraminiferal diversity and abundance observed in a spring 2013 west–east Mediterranean Sea plankton tow transect. *Biogeosciences* 14(9): 2245–2266.
<https://doi.org/10.5194/bg-14-2245-2017>

Marini M, Maron M, Petrizzo MR, Felletti F, Muttoni G (2020) Magnetochronology applied to assess tempo of turbidite deposition: a case study of ponded sheet-like turbidites from the lower Miocene of the northern Apennines (Italy). *Sedimentary Geology* 403: 105654.
<https://doi.org/10.1016/j.sedgeo.2020.105654>

Poole CR, Wade BS (2019) Systematic taxonomy of the *Trilobatus sacculifer* plexus and descendant *Globigerinoides sella fistulosa* (planktonic foraminifera). *Journal of Systematic Palaeontology* 17(23): 1989–2030.
<https://doi.org/10.1080/14772019.2019.1578831>

Raffi I, Wade BS, Pälike H (2020) The Neogene Period [1141–1215 pp.]. In: Gradstein F, Ogg JG, Schmitz MD, Ogg GM (Eds.), *The Geologic Time Scale 2020*. Elsevier, Amsterdam.
<https://doi.org/10.1016/B978-0-12-824360-2.00029-2>

Rillo MC, Whittaker J, Ezard THG, Purvis A, Henderson AS, Stukins S, Miller CG (2016) The unknown planktonic foraminiferal pioneer Henry A. Buckley and his collection at The Natural History Museum, London. *Journal of Micropalaeontology* 36(2): 191–194.
<https://doi.org/10.1144/jmpaleo2016-020>

Samankassou E, Mazzini A, Chiaradia M, Spezzaferri S, Moscariello A, Do Couto D (2018) Origin and age of carbonate clasts from the Lusi eruption, Java, Indonesia. *Marine and Petroleum Geology* 90: 138–148.
<https://doi.org/10.1016/j.marpetgeo.2017.11.012>

Scott GH (2020) Zooplankters in an oligotrophic ocean: contrasts in the niches of *Globigerinoides ruber* and *Trilobatus sacculifer* (Foraminifera: Globigerinida) in the South Pacific. *Écoscience* 27(4): 269–278.
<https://doi.org/10.1080/11956860.2020.1793561>

Sosdian SM, Greenop R, Hain MP, Foster GL, Pearson PN, Lear CH (2018) Constraining the evolution of Neogene ocean carbonate chemistry using the boron isotope pH proxy. *Earth and Planetary Science Letters* 498: 362–376.
<https://doi.org/10.1016/j.epsl.2018.06.017>

Spezzaferri S, Olsson RK, Hemleben C (2018) Taxonomy, biostratigraphy, and phylogeny of Oligocene to lower Miocene *Globigerinoides* and *Trilobatus* [269–306 pp.]. In: Wade BS, Olsson RK, Pearson PN, Huber BT, Berggren WA (Eds.), *Atlas of Oligocene Planktonic Foraminifera*, Cushman Foundation of Foraminiferal Research, Special Publication, 46.

Wycech JB, Kelly DC, Kitajima K, Kozdon R, Orland IJ, Valley JW (2018) Combined effects of gametogenic calcification and dissolution on $\delta^{18}\text{O}$ measurements of the planktic foraminifer *Trilobatus sacculifer*. *Geochemistry, Geophysics, Geosystems* 19(11), 4487–4501.
<https://doi.org/10.1029/2018GC007908>