

Permian radiolarian distribution: endemism of *Pseudotormentus* De Wever et Caridroit, 1984

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The Permian (ca. 300–250 Ma) is palaeogeographically characterised by the presence of superoceans, namely the Panthalassa and the Palaeotethys. The Permian planktonic distribution is not fully elucidated, in contrast to other fossil distributions of nekton and benthos. Radiolaria is a representative planktonic microfossil in the Permian palaeocean. Some researchers have discussed Permian radiolarian distributions and palaeobiogeography. Ishiga (1986) and Wonganan and Caridroit (2006) considered *Follicucullus charveti* Caridroit et De Wever, 1984 as an endemic species. Meanwhile, Wang et al. (2006) speculated that late Palaeozoic radiolarian palaeobiogeography is characterised by a single Palaeotethys planktonic faunal realm.

This study focused on occurrences of *Pseudotormentus* De Wever et Caridroit, 1984 and *Quadriremis* Nazarov et Ormiston, 1985. We compiled literature data for the Pacific Rim and used quantitative data from samples of our previous studies (Ito et al., 2013a, b). *Pseudotormentus* and *Quadriremis* co-occurred commonly in several geological units in the Panthalassa whereas some geological units in the Palaeotethys have yielded not *Pseudotormentus* but *Quadriremis*. In quantitative results, *Pseudotormentus* occurred abundantly in the Gujingling section, whereas no *Pseudotormentus* were obtained from the Liuhuang section. Both sections yielded frequent *Quadriremis*.

The results of the literature and quantitative data indicate an uneven distribution of *Pseudotormentus*, which seems to have been controlled by the differences between the oceanic areas, the Panthalassa and the Palaeotethys. A previous palaeobiogeographical study of Permian benthic organisms described faunal differences between the Panthalassa and the Palaeotethys (e.g. Shen et al., 2009). The present study shows the presence of faunal differences in Permian planktonic microorganisms. Although the cosmopolitanism of microorganisms, i.e., the hypothesis that ‘everything is everywhere’, has been believed, several researchers have highlighted endemism in recent years (e.g. Williams, 2011). According to Bass et al.

(2007), DNA analysis results ‘strongly suggest that geographic dispersal in macro-organisms and microbes is not fundamentally different: some taxa show restricted and/or patchy distributions while others are clearly cosmopolitan’. They proposed a ‘moderate endemicity model’ of microbial biogeography. Our results suggest that this model is applicable to planktonic microorganism in the Permian palaeocean. Permian radiolarians may have comprised some cosmopolitan and some endemic taxa.

References

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