Available online at www.sciencedirect.com

SCIENCE DIRECT®

ELSEVIER

Palaeogeography, Palaeoclimatology, Palaeoecology 225 (2005) 302–316

PALAEO

www.elsevier.com/locate/palaeo

Antarctic Tertiary Progonocytheridae: The last refuge of *Majungaella*, the survivor of a long lineage, a geographical and physiological migration from low to high latitudes

Robin Whatley [a], Sara Ballent [b,*], Janina Szczechura [c]

[a] *Micropalaeontology Research Group, Department of Geology, University of Wales, Aberystwyth, UK*
[b] *Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Departamento Paleozoologia Invertebrados, Museo de La Plata, La Plata (1900), Argentina*
[c] *Institute of Palaeobiology, Polish Academy of Sciences, Warsaw, Poland*

Received 12 July 2001; received in revised form 18 October 2003; accepted 25 May 2005

Abstract

Majungaella Grekoff is shown to be the only member of the once dominant ostracod family Progonocytheridae, Progonocytherinae to survive the Jurassic and also to survive the Cretaceous–Tertiary boundary event. In the Jurassic, *Majungaella* had a northeastern gondwanine distribution, occurring only in India, Africa and Madagascar. However, during the Neocomian it appears in South America where it extends to the Maastrichtian, while in Australia it first appears in the Aptian and ranges up to the Campanian. Its last records in Africa are in the Cenomanian of South Africa and the Santonian of south-western Africa. This southward shift into higher latitudes was probably due to an increasing cryophilia and, although this may have also been prompted by competitive exclusion by better adapted, newly evolved taxa, it is difficult to demonstrate this due to the universal distribution of most Late Mesozoic ostracod genera. Whatever the reason, *Majungaella* seems to have become, during the Cretaceous, increasingly adapted to living in high-latitude shallow seas and this adaptation is advanced as the prime reason why the genus, alone among the progonocytherids was able to survive both the post-Cretaceous global cooling and Antarctic palaeoenvironments into the Late Neogene. Eocene, Oligocene and Pliocene occurrences of *Majungaella* in the Antarctic are investigated and it is concluded that the genus is in situ in all instances and that, especially in the two latter cases, it lived in water temperatures very much lower than those of its Mesozoic forebears.

Keywords: *Majungaella*; Progonocytheridae; Migration; Adaptation; Cainozoic; Antarctic

1. Introduction

Whatley and Ballent (1996) reviewed the Middle and Upper Jurassic ostracod genus *Progonocythere*

* Corresponding author.
E-mail addresses: riw@aber.ac.uk (R. Whatley), sballent@museo.fcnym.unlp.edu.ar (S. Ballent), janina.s@twarda.pan.pl (J. Szczechura).

0031-0182/$ - see front matter © 2005 Elsevier B.V. All rights reserved.
doi:10.1016/j.palaeo.2005.06.016

Sylvester-Bradley, 1948 and its close allies, among them *Majungaella* Grekoff, 1963. They demonstrated the latter genus to be restricted to the southern Hemisphere (or areas such as India which subsequently migrated north of the Equator) and to range from the Callovian to the Maastrichtian. Subsequently, Ballent (1998) and Ballent et al. (1998) reconfirmed its gondwanine distribution and demonstrated that the genus, in Argentina, where it is represented by 8 species, is confined to Patagonia. The genus does not occur in the Argentinian Jurassic, but in the Cretaceous of that country it ranges from Valanginian to Maastrichtian.

Majungaella was shown by Whatley and Ballent (1996) to be the only one of the relatives of *Progonocythere* to survive the Jurassic. In their review of the genus *Lophocythere*, Sylvester-Bradley and its allies (Whatley and Ballent, 2004), which comprise the remainder of the family Progonocytheridae, all of the 14 genera that they studied, with the exception of one doubtful example from Argentina, became extinct before the end of the Jurassic.

Subsequent to these studies, we have seen photographic evidence of the existence in the Campanian–Maastrichtian of an additional two species of *Majungaella* in Argentina and a further two species from the same age in the Sergipe Basin of eastern Brazil (Viviers, 2001, pers. comm.). Also, a species described by Bertels (1975a) from the Middle Maastrichtian of northern Argentinian Patagonia as *Tumidoleberis australis*, we now consider it to be *Majungaella*. The genus *Tumidoleberis* (Deroo, 1966) is not a member of the Progonocytheridae.

Luther (1999) and Fauth et al. (2002, 2003) recorded *M. australis* from the Upper Campanian of the northern tip of the Antarctic Peninsula, probably as part of a population continuous with that of Patagonia at this time.

In the present paper, we review these new data and prior studies about the distribution of *Majungaella* species and discuss its palaeoclimatic and palaeogeographical implications.

2. Tertiary progonocytherids

In 1999, one of us (RW) was asked to review a manuscript by Szczechura on Ostracoda from the Eocene of Seymour Island, in the Antarctic Peninsula, a paper subsequently published in 2001. Szczechura described and illustrated *Majungaella antarctica* sp. n. (pl. 2, Figs. 5–8), clearly a bona fide member of the genus. *M. antarctica* was compared by the author to *Tumidoleberis australis* Bertels (which is certainly *Majungaella*), and the two species are indeed similar, although not in our opinion conspecific. This Eocene occurrence and that referred to by Dingle and Majoran (2001) as *Majungaella* sp. 4471 from Oligocene sediments in the Victoria Land Basin of the Ross Sea, East Antarctica, represents a considerable extension of the previously known range of *Majungaella* and indicates that it survived the Cretaceous/Tertiary boundary event. Perhaps even more remarkable is the occurrence of the genus, masquerading as ?*Loxocythere* sp. in the Pliocene of Cockburn Island in the Antarctic Peninsula (Szczechura and Blaszyk, 1996, p. 180, pl. 40, Figs. 3–5). This was recognised independently by Dingle and Majoran (2001, p. 376, p. 380). From these two occurrences, it seems that *Majungaella*, the sole post-Jurassic survivor of the once diverse and dominant Progonocytheridae, not only survived the K/T boundary extinctions, but lived until late in the Neogene.

3. Cainozoic autochthoneity of *Majungaella*

3.1. Eocene of Seymour Island

It is necessary to consider the possibility that this Antarctic record is of reworked Late Cretaceous material. We consider this to be highly unlikely, however, since the Palaeogene ostracod assemblage described by Szczechura (2001), comprises essentially post-Cretaceous genera and that, apart from *Majungaella*, it lacks obvious Mesozoic relicts, although one genus, *Wichmannella* Bertels, 1969, has been recorded by that author from both the Upper Cretaceous and Early Palaeogene of southern Argentina. There is also no doubt as to the Eocene age of the sediments from which the fauna is derived (Szczechura, 2001, p. 160), especially given the Sr dating of 34.2 Ma at the top of the succession (see Dingle and Lavelle (1998a), Table 1, Figs. 1, and 2).

Majoran and Widmark (1998) describe an interesting ostracod fauna from the Late Cretaceous of ODP