



Early Cenozoic radiations in the Antarctic marine realm and their evolutionary implications

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The extensive and very well exposed Late Cretaceous – Early Paleogene sedimentary succession of Seymour Island, NE Antarctic Peninsula presents a unique opportunity to examine Early Cenozoic evolutionary radiations in a variety of macrofaunal taxa. Building on the extensive pioneer studies by US and Argentinian palaeontologists, recent investigations have focused on refining litho-, bio- and chronostratigraphies, and taxonomic revisions to a number of key groups. Within the numerically dominant Mollusca, the balance of faunas changes significantly across the Cretaceous/Paleogene boundary, with gastropods becoming numerically dominant for the first time in the Early Paleocene Sobral Formation (SF). At this level seven of the 31 gastropod genera present (= 23%) can be referred to modern Southern Ocean taxa and the same figure is maintained in the Early Eocene La Meseta Formation (LMF) where 21 of 63 genera are modern.

A major reason for the rise of the gastropods in the earliest Cenozoic of Antarctica is a significant radiation of the Neogastropoda, which today forms one of the largest clades in the sea. 50% of the SF gastropod fauna and 53% of the LMF at the species level are neogastropods. This important burst of speciation is linked to a major pulse of global warming from \sim 63 – 43 Ma when warm temperate conditions prevailed for long intervals of time at 65°S. The marked Early Paleogene radiation of neogastropods in Antarctica represents a distinct pulse of southern high-latitude taxa that was coeval with similar tropical/subtropical radiations in localities such as the US Gulf Coast and NW Europe. Thus it would appear that the Early Cenozoic radiation of this major taxon was truly global in scale and not just confined to one latitudinal belt. Whereas it is possible to regard a significant proportion of the modern bivalve fauna as relicts, and thus Antarctica as an evolutionary refugium, or sink, it is much less easy to do so for the Neogastropoda. At least in the Early Cenozoic greenhouse world, evolutionary source – sink dynamics, such as Tropical Niche Conservatism and the Out of the Tropics concept, may be inappropriate for some major marine clades.