West Antarctic Rift system: a possible New Zealand-Patagonia Oligocene paleobiogeographic link

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The extant marine benthic faunas in the New Zealand region and those belonging to the Magallanes and Antarctic biogeographic provinces may share a common origin dating back as far as the Early Cretaceous (Zinsmeister, 1982; Crame, 1999). These faunas have diverged ever since but the tempo and mode of this divergence remains imperfectly understood. Studies on the biogeographical affinities among the marine benthic faunas from the Southern Hemisphere point to close paleobiogeographical relationships between New Zealand, West Antarctica and southern South America after the final break-up of Gondwana (Griffin and Hünicken, 1994; Zinsmeister and Griffin, 1995; Stilwell, 2003).

The paleobiogeographical evolution of these faunas occurred in the context of the dramatic and continuous geodynamic events that led from relatively warm, ice-free “greenhouse” conditions to an “icehouse” state (Francis et al., 2009). Crucial oceanographic modifications took place in the Southern Hemisphere during the period between 35 and 15 Ma. These included the establishment of broad zonal belts of surface-water masses separated by oceanic fronts (Nelson and Cooke, 2001; Lagabrielle et al., 2009). These belts had a paramount role in the isolation and evolution of the marine faunas in the Southern Hemisphere (Arntz, 1999). However, paleontological evidence demonstrates that during this period paleobiogeographical connections between New Zealand and Patagonia were maintained, as shown by the presence of numerous shared taxa. Twenty two mollusk genera appearing in South American Late Oligocene–Miocene rocks are recorded also in New Zealand, but making their first appearance there in older rocks (Deminucula, Notolimopsis, Glycymeris (Glycymerula), Cyclochlamys, Gonimytreia, Spissatella, Scalpomactra, Turia, Crosseola, Sigapatella, Trichosirus, Sassa zelta group, Ataxacerithium, Penium, Nassarius (Hima), Xymenella, Austromitra, Zeacuminia, Eoturris, Neoeguraleus (Fusiguraleus), Oamaruia (Oamarua), and Optimilda. At the same time, 16 taxa appear in South America in rocks older than those containing these taxa in New Zealand (Zygochlamys, Tiostrea, Aulacomya, Lucinoma, Antisolarium (from Valdesia), Xymene, ?Trophon, Provocator, Antimelatoma, Solemyarina, Anadara, Mytilus, Protothaca, Diloma, Argobuccinum, Fusitriton). At the same time (Late Oligocene–Early Miocene), eight genera appear in both areas (Neopanis, Austrovenus (from Ameghinomya), Cirsotrema (large species), Oamaruia (Zeadmete), Puyseguria, Cosa, Notolimea, Lampropodmina (Beu et al., 1997).

Bryozoans recorded from around the Oligocene–Miocene boundary in Patagonia are typically pan-Gondwanan. However, a recent record of a species belonging to Cinctiporidae (figure 1) -a distinctive family previously regarded as a New Zealand endemic (Boardman et al., 1992) - within the Monte León Formation (Early Miocene) cropping out in the Puerto Deseado area (47° 32’ 52”S, 66° 30’ 57”W), Argentina, reinforces the idea of connections between the western South Atlantic and New Zealand as late as the Early Miocene. With the exception of a doubtful occurrence in the Maastrichtian of South Africa (Boardman et al., 1992), cinctiporids were known only from the Late Paleocene–Early Eocene to Recent of New Zealand (Gordon and Taylor, 1999) before the surprising discovery of the Argentinean material.

Despite the enormous distance separating New Zealand and South America during the Oligocene (15,000 km eastward from South America to New Zealand and 9,000 km from New Zealand to South