TAXONOMY AND PALEOBIOGEOGRAPHY OF INVERTEBRATES FROM THE POLONEZ COVE FORMATION (OLIGOCENE) AT VAURÉAL PEAK, KING GEORGE ISLAND, WEST ANTARCTICA

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Introduction

Eight taxa of marine invertebrates, including two new bivalve species, are described from the Low Head Member of the Polonez Cove Formation (latest early Oligocene) cropping out in the Vauréal Peak area, King George Island, West Antarctica. The Polonez Cove Formation (PCF) preserves a diverse Cenozoic marine biota that has been subject of numerous papers dealing with coccoliths, foraminifers, ostracods, brachiopods, polychaete worms, bryozoans, gastropods, bivalves, scaphopods, and echinoderms. The Low Head Member of the PCF is a richly fossiliferous unit and crops out at various sites along the eastern coast of KGI. Although briefly described by Birkenmajer (1982), Porebski & Gradzinski (1987) and Troedson & Riding (2002), Cenozoic sediments cropping out at Vauréal Peak, on the northern margin of Admiralty Bay, had never been paleontologically studied or correlated with the PCF, perhaps due to the limited exposure at this site.

Geological setting and Paleontology

The PCF sequence cropping out at Vauréal Peak starts with diamictites up to 5m thick, which pass upwards to lenticular beds of matrix or clast-supported, massive gravel and grainy to pebbly sandstone, 6 m thick, of the Low Head Member. The facies occurring in this exposure are interpreted as products of episodic sedimentation from cohesive and non-cohesive debris flows, originated by slumping or even from the action of bottom traction currents, followed by aggradational deposition of sediments by deceleration of high-energy episodic flows, in a fan-delta setting, in high- to medium-energy, shallow marine environment. A detailed description of the stratigraphy, facies and depositional environment of the PCF appears in Porebski & Gradzinski (1987, 1990) and Troedson & Smellie (2002). Regionally, the facies association and arrangement conform to available sedimentary models of a marine transgressive phase, following a retreating grounded ice margin (Porebski & Gradzinski 1987, Birkenmajer 2001, 2003).

The fossil assemblage occurs in the lower portions of the section in Vauréal Peak, and includes representatives of Brachiopoda (genera *Neothyris* sp. and *Liothyrella* sp.), Bivalvia (*Adamussium auristriatum* sp. nov., ?*Adamussium* cf. *A. alanbeui* Jonkers, and *Limatula* (*Antarctolima*) *ferraziana* sp. nov.), Bryozoa, Polychaeta (serpulid tubes) and Echinodermata. *Liothyrella* sp., *Adamussium auristriatum* sp. nov. and *Limatula ferraziana* sp. nov. are among the oldest records for these genera in King George Island. All three taxa are representatives of ancestral lineages of Recent Antarctic groups.

Paleobiogeography

Regardless the fact that we are considering only four taxa from only one locality, the proposed dispersal pattern (Fig. 1) seems consistent with available models of oceanic circulation during fragmentation of Gondwana, when Australia/Antarctica and Antarctic Peninsula/South America separated (Lazarus & Caulet 1993, Exon et al. 2001). Fossil record of all four taxa (Fig. 1a-e) suggests a dispersal pattern that would have occurred in two steps (Fig. 1f). The first would be accomplished by *Liothyrella* and *Limatula*, following the Tasmanian Gateway opening at the Eocene/Oligocene boundary, along the eastern margin of Antarctica (Fig. 1f, arrows 1 and 4). The second would be achieved by the genera *Adamussium* and *Limatula*, during the Paleogene, following the Drake Passage opening between Antarctic Peninsula and South America, along the western margin of Antarctica (Fig. 1f, arrows 3 and 4). *Neothyris* would have dispersed through marine currents between

East and West Antarctica limit (Fig. 1f, arrow 2), in accordance to the Shackleton Seaway, a marine passage that existed until the early Oligocene, before the Antarctic cooling (Zinsmeister 1979).

Conclusions

Eight taxa were recognized for the first time from the PCF at Vaureal Peak area, including two new species. Fossil record of described bivalves and brachiopods suggests a dispersal pattern in accordance with available marine current reconstructions for the time of Circum-Antarctic Current formation and establishment. This is also indicated by the existence of modern representatives of the fossil genera in Antarctica, including *A. colbecki*, which is distributed only within the Antarctic Convergence area. The exception is *Neothyris*, which occurs in cool-temperate water of New Zealand. This suggests that at least part of the modern Antarctic faunal configuration was outlined during latest early Oligocene, even though the cool polar climate observed today was not present during that period.

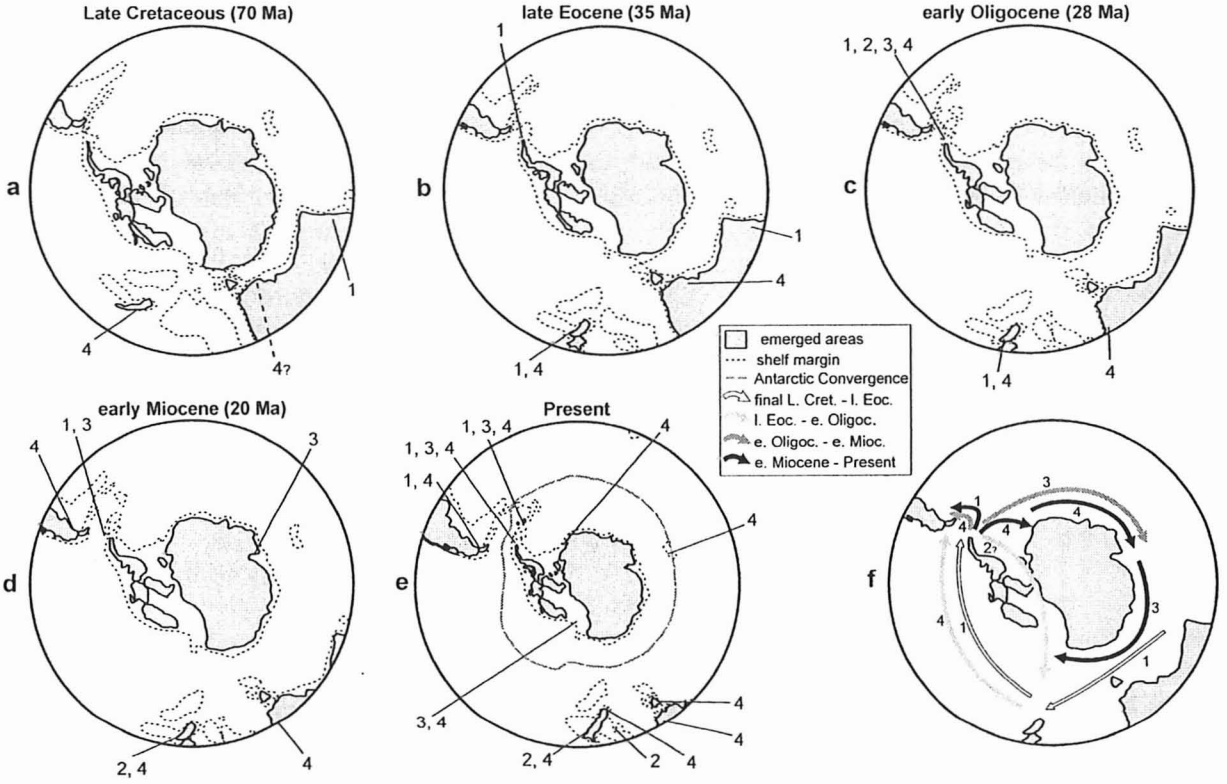

Fig. 1. Occurrences and inferred dispersal patterns of brachiopods and bivalves genera studied in this work for the interval latest Late Cretaceous to Recent. **a.** Late Cretaceous, **b.** late Eocene, **c.** early Oligocene, **d.** early Miocene, **e.** Recent, **f.** dispersal routes suggested by fossil record of *Liothyrella* (**1**), *Neothyris* (**2**), *Adamussium* (**3**) and *Limatula* (**4**) genera in a general paleogeographical base; arrows represent dispersal routes for each taxon. Note dispersal of *Liothyrella* and *Limatula* after the opening of the Tasmanian Gateway, from the end of Late Cretaceous until early Oligocene, and dispersal of *Liothyrella*, *Adamussium* and *Limatula* only after the opening of Drake Passage after the early Oligocene (Fossil record according to Ihering 1907, Neall 1972, Buonaiuto 1977, Fleming 1978, Owen 1980, Bitner & Pisera 1984, Biernat *et al.* 1985, Beu & Dell 1989, Foster 1989, Beu & Maxwell 1990, Bitner 1997, Frassinetti 1998, Craig 2000, Bitner & Crame 2002, Jonkers 1998, 2003, Quaglio *et al.* in press. Maps modified from paleogeographical reconstructions gently provided by Dr. Lisa M. Gahagan, from University of Texas, Austin).

Financial support by: CAPES and PROANTAR/CNPq.