Environmental/climatic changes during the Eocene: biotic and geochemical evidences based on the bryozoan fauna (Antarctic Peninsula)

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The Paleocene-Eocene bryozoans such as microporoideans, umbonulomorphs, lepraliomorphs as well as cerioporoidean cyclostomes are successful biota inhabited the marine and glacio-marine sequences in Antarctica. Changes in their taxonomic composition, associated faunas, colony growth-forms, biodiversity, skeletal mineralogy and geochemistry are important environmental/climatic indicators.

The earliest Cenozoic Antarctic bryozoan fossil records (late early Eocene) are well-documented from the shallow-marine–estuarine clastic succession of the lower part (Telm1-2) of the La Meseta Formation of Seymour Island, where the faunas are represented by massive multilamellar colonies, often spectacular in size and dominated by the cyclostome cerioporids and diverse ascophoran cheilostomes. The distinct free-living lunulitiforms, for the first time reported from Antarctica from the Ypresian/Lutetian of the middle part of the La Meseta Fm. (Telm4-6) are represented by the disc-shaped colonies, which are characteristic for the temperate warm, shallow-shelf environment, with the bottom temperature, which are never lower than 10 to 12°C (Hara et al., 2018). The skeletons of the Lunulites, Otionellina, and Uharella are formed by the intermediate-Mg calcite (IMC) with the 4.5 mol% MgCO$_3$. The use of the X-ray diffraction (XRD) and the Laser Raman spectroscopy (Hara et al., in preparation) shows that they build the bimineralic skeletons (with the traces of aragonite, calcite and strontium apatite), which are indicative for the temperate shelf environment, sandy and often shifting substrate. Biogeographically, the free-living lunulitiforms (Lunulites and Otionellina) are valuable climatic indicators, inhabited in the Recent the circumtropical, tropical-subtropical to warm-temperate Australasian sand environments.

Contrary to that, the bryozoans of the Telm6-7 with a scarce lepraliomorphs tentatively assigned to ?Goodonia and accompanied by crustaceans, brachiopods and gadiform fish remains are known from the temperate environments.

The isotopic analyses of the $\delta^{18}O$ of the bryozoan skeletons from the lower part of the La Meseta Fm. show the range of the temperature from 13.4°C to 14.6°C (according to the equation given by Anderson & Arthur 1983).

It is worth pointing that the middle Ypresian/early Lutetian bryozoans, which in the stratigraphical profile of the LMF document the nearly 10 MA evolutionary history of the bryozoans are well-correlated with the MECO event, what is also consisted with the isotopic data based on the macrofaunal marine fossil records (Ivany et al. 2008).

