Geophysical Research Abstracts,
Vol. 11, EGU2009-10157, 2009
EGU General Assembly 2009

Experimental growth pattern calibration of Antarctic bivalves shells to provide a biogenic archive of long-term high-resolution records of environmental and climatic change.

F. Lartaud, A. Toulot, and Y.M. Paulet

IUEM-UBO, Lab. Sciences de l'Environnement Marin, UMR CNRS 6539, Plouzané, France (franck.lartaud@univ-brest.fr).

Mollusc shells are used as an archive of climate variability in polar areas. The geochemistry (isotope and trace element) of the mineralized tissues is sensitive to the seawater physico-chemical changes (temperature, salinity, primary production ...) and the accretionary growth of the shells provide intra-annual to centennial information. However, a serious age and growth profile calibration is necessary to establish a chronological time scale in the micro-sampling strategy. This kind of investigation on biogenic carbonates from Polar Regions suffers to the difficulties of a precise field-based standardization and validation. That's why ecology and shell growth history of many molluscs from those areas still remain unknown.

In Boreal seas, bivalve metabolic activity is usually more reduced than in tropical or temperate domains, and the life span increase. For example, growth bands counting in the shells of the ocean Quahog (Arctica islandica) reveals that some of these shells are up to 250 years old (Wanamaker et al., 2008). Nevertheless in those environments, few species have highly defined growth increments calibration. The shell growth of the Antarctic scallop Adamussium colbecki is presently not well defined. Some authors attribute a growth rate close to the temperate equivalent species (Heilmayer et al., 2003) whereas others show a lower performance (Berkman et al., 2004).

During the MACARBI program, to investigate the shell growth rate and determine a sclerochronologic profile, Adamussium colbecki and Laternula elliptica shells from Terre Adélie (Antarctic) were marked in situ with calcein during 6 hours and recapture a month later, in the austral summer 2007-2008. At the same time, a control of environmental conditions (temperature, salinity and chlorophyll) was carried out.

All shells marked provide a distinct green fluorescent line, corresponding to the date of the marking. Calcein marking did not affect survivorship or growth of A. colbecki and L. elliptica. Shell size measurements show that A. colbecki have a high growth rate, at least throughout the juvenile state. The big L. elliptica bivalves exhibit a lower shell growth rate than the pectinids. The counting of growth increments additionally to the use of calcein markings helps us to establish a chronological time scale in those polar bivalves. This sclerochronologic approach can be now used for geochemistry analyses. A. colbecki shells seem more appropriate for high-resolution archive and L. elliptica will provide information on a longer time scale.

Berkman P.A., Cattaneo-Vietti R., Chiantore M.,Howard-Williams C., 2004. Polar emergence ad the influence of increased sea-ice extent on the Cenozoic biogeography of pectinid molluscs in Antarctic coastal areas. Deep-Sea Research II 51, 1839-1855.

Heilmayer O., Brey T., Chiantore M., Cattaneo-Vietti R. and Arntz W.E., 2003. Age and productivity of the Antarctic scallop, Adamussium colbecki, in Terra Nova Bay (Ross Sea, Antarctica).Journal of Experimental Marine Biology and Ecology 288, 239-256.

Wanamaker A.D., Richardson C.A., Scourse J.D. and Butler P.G., 2008. Ashell based reconstruction of environmental change on the North Icelandic shelf. EGU General Assembly.