WHY IS *TEGULA ATRA* (LESSON) (GASTROPODA) EXTINCT FROM PATAGONIA? BIOTIC RESPONSE TO LATE QUATERNARY CLIMATE CHANGES IN THE SOUTHWESTERN ATLANTIC

Marina L. Aguirre[1,2], Sebastián Richiano[1,3], Mariano Donato[1,4] and Ester A. Farinati[5]

1. CONICET, Argentina.

2. Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, Edificio Institutos, Cátedras y Laboratorios, Laboratorio 6, calle 64 No 3, 1900 La Plata, Argentina.
maguirre@fcnym.unlp.edu.ar

3. Centro de Investigaciones Geológicas, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, calle 1 N° 644, 1900 La Plata, Argentina.

4. Laboratorio de Sistemática y Biología Evolutiva (LASBE), Museo de La Plata, Paseo del Bosque S/N, 1900 La Plata, Argentina.

5. Departamento de Geología, Universidad Nacional del Sur, Bahía Blanca, Argentina.

The regional palaeobiogeographical context of *Tegula atra* (Lesson) revealed that it is a keystone endemic species within the marine Quaternary of Patagonia (Argentina, Southwestern Atlantic, SWA). A detailed systematic review together with field observations showed that it was absent from warmer than present Neogene sea-level episodes (*e.g.*, late Miocene, "Entrerriense", ca. 10 Ma) and up to the mid-Pleistocene (Marine Isotope Stage 11 (MIS), ca. 400ka B.P.). By contrast, it exhibits an excellent and abundant, Late Pleistocene fossil record (MIS9, MIS7 and especially MIS5), along more than 1000 km between Río Negro and southern Santa Cruz provinces (Patagonia). A total of 130 collected bulk samples (complete sedimentary matrix and molluscan content) containing *T. atra* from more than 30 Pleistocene fossiliferous sites in 9 wider geographical areas (San Antonio Oeste, Puerto Lobos, Bahía Vera, Cabo Raso, Camarones, Bahía Bustamante, Caleta Olivia, Puerto Mazarredo, Puerto Deseado, San Julián) analyzed through multivariate and cladistic techniques confirmed its importance as a biostratigraphical/paleoclimate/palaeoceanographical signal within dominantly cool coastal settings. Additionally, morphometric analyses of Pleistocene (Patagonian) and modern (Pacific, Southeastern Pacific, SEP) specimens and Ancestral Areas analysis showed that after its first appearance in the SEP during the late Pliocene (cooling trend) it dispersed during the late Pleistocene into the SWA by rafting on macroalgae (*Durvillaea antarctica*) along the Cabo de Hornos and Malvinas (Falkland) currents, becoming extinct in the Mar Argentino (Magellan Malacological province) after the Last Interglacial (MIS5). Its absence today represents a climate change-driven range shift following the amelioration trend after the Last Glacial Maximum (LGM) and an independent evidence for palaeoceanographical changes at the Pleistocene/Holocene transition: changes in sea surface temperature (SST)(ca. 2°C higher), wind velocities (less), light (less), nutrient availability (less), extension and intensity of cold (less) and warm (increased) shallow water currents altering water masses, productivity and biogeographical boundaries. Disadvantageous Holocene scenarios must have caused direct effects on its physiology and survival and prevented the occurrence of *D.antarctica* and a successful dispersal along the SWA, while its retraction to the cold Humboldt System was impossible (northwards direction of SWA cold currents). Dispersalist models explain the origin of key taxa such as *T. atra* and taxonomic differences along the SWA and SEP margins of South America with implications for future coastal scenarios. The distribution of *T. atra* across time reinforces strong linkages between earth history-climatic cycles-atmospheric-oceanic circulation patterns and biotic responses, showing future climate change consequences expected on nearshore communities.