Probable routes of colonization of the islands of the Azores: patterns and processes of dispersion and colonization of the littoral marine molluscs

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THE recent marine fauna of the Northeast Atlantic archipelagos of Macaronesia has very different biogeographical affinities (ÁVILA, 2000a; MALAQUIAS, 2001; ÁVILA & ALBERGARIA, 2002; ÁVILA & MALAQUIAS, 2003). Due to its geographical location, the archipelago of the Azores is of crucial importance to understand the patterns and processes of dispersion, colonization and speciation that happened in these islands.

In the Azores, Santa Maria Island is the only place where both marine and terrestrial fossils are found. Although most of the studies have focused on the Miocene-Pliocene taxa that are abundant in several outcrops (see ÁVILA *et al.* (2002) for a review), the Pleistocene marine molluscs of Santa Maria were recently studied (GARCÍA-TALAVERA, 1990; CALLAPEZ & SOARES, 2000; ÁVILA *et al.*, 2002).

The location of the Azores in the middle of the north Atlantic makes this archipelago suitable to be colonized by species from both sides of the Atlantic. ÁVILA (2000a) reached to the conclusion that, notwithstanding the prevailing set of currents in the region of the Azores is from America, most of the Azorean littoral marine molluscs are biogeographically related with the eastern Atlantic. Except for the thermophilous species that presumably reached the Azores during the transition from isotopic stage 6 to 5e or shortly after that (ÁVILA, in prep) due to the higher sea-surface palæotemperatures that occurred during that period, the molluscan assemblages found at Lagoinhas and Prainha (Santa Maria Island) (ÁVILA *et al.*, 2002) are very similar to those described by ÁVILA (2000a) for the recent littoral marine molluscs of the Azores, with a high number of Azorean species that presently occur also at the Mediterranean, Portugal, Madeira and the Canary Islands. Even considering the endemic species of the Azores, where the Rissoidæ account for almost half of them (ÁVILA, 2000b; ÁVILA, 2005), the present benthic littoral malacofauna of the Azores is clearly of European and/or Madeira and Canary Islands origin.

Similarly, the Pleistocene malacofauna found at both Lagoinhas and Prainha deposits shows a pattern of biogeographical relationships that seems to be rather similar to nowadays (ÁVILA, in prep). In fact, of the 299 species presently reported to the Azores (ÁVILA, 2005), 31 (10.4%) occur at the western Atlantic, whereas of the 100 taxa reported to the Pleistocene of Santa Maria, 11 species were present in the western Atlantic (11.0%) (ÁVILA, in prep).

ÁVILA (2005) discusses the influence of the glaciations on the littoral molluscs of the Azores and, besides the well understood dispersal of the western Atlantic species, suggests two main routes of dispersal for the eastern Atlantic species towards the Azores:

a) a direct route from Portugal-Gulf of Cadiz--Mediterranean origin;
b) a «stepping-stones» route towards Madeira (with similar origins) and a sweepstake route from Madeira to the Azores.

In this presentation, these hypotheses will be discussed and new data as well as the best methodologies will be provided, in order to choose (if possible) between the two most probable routes.

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