



Regional consequences of a biotic interchange: insights from the Lessepsian invasion

Rafal Nawrot (1), Paolo G. Albano (1), Devapriya Chattopadhyay (2), and Martin Zuschin (1)

(1) University of Vienna, Department of Palaeontology, Vienna, Austria (rafal.nawrot@univie.ac.at), (2) Indian Institute of Science Education and Research (IISER) Kolkata, Department of Earth Sciences, Mohanpur, India

The fossil record provides ample evidence of large-scale biotic interchanges and their pervasive effects on regional biotas, but mechanisms controlling such events are difficult to decipher in deep time. Massive invasion of Indo-Pacific species into the Mediterranean Sea triggered by the opening of the Suez Canal offers a unique opportunity to examine the ecological consequences of breaking down biogeographic barriers. We developed an extensive database of taxonomic composition, body size and ecological characteristics of the Red Sea and Mediterranean bivalve fauna in order to link biotic selectivity of the invasion process with its effects on the recipient biota. Shallow-water occurrence and presence outside the tropical zone in other regions are the strongest predictors of the successful transition through the Suez Canal. Subsequent establishment of alien species in the Mediterranean Sea correlates with early arrival and preference for hard substrates. Finally, large-bodied species and hard-bottom dwellers are over-represented among the invasive aliens that have reached the spread stage and impose a strong impact on native communities. Although body size is important only at the last invasion stage, alien species are significantly larger compared to native Mediterranean bivalves. This reflects biogeographic difference in the body-size distributions of the source and recipient species pools related to the recent geological history of the Mediterranean Sea. Contrary to the general expectations on the effects of temperature on average body size, continued warming of the Mediterranean Sea accelerates the entry of tropical aliens and thus indirectly leads to increase in the proportion of large-bodied species in local communities and the regional biota. Invasion-driven shifts in species composition are stronger in hard-substrate communities, which host a smaller pool of incumbent species and are more susceptible to the establishment of newcomers. Analogous differences between habitats and body-size classes in the invasion levels have been observed in some marine biotic interchanges documented in the fossil record. Further quantitative studies of past invasion events are necessary to test generality of these patterns.