MONITORING THE CHANGING MEDITERRANEAN FISH DIVERSITY: THE PROMISE OF COMMUNITY-BASED ACTIONS

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The Mediterranean biodiversity is rapidly changing under the increasing pressure of climate change and biological invasions. The opening of the Suez Canal in 1869, allowed the passage of hundreds of tropical species from the Red Sea (Zenetos et al., 2012), starting a new episode in the Mediterranean history. Other tropical species arrive by natural means, expanding their distribution from the Atlantic Ocean trough the Straits of Gibraltar. These two major biotic fluxes act on very different time-scales, but both are thought to have enormously accelerated in the last two decades, resulting in a rapid 'tropicalization' (Bianchi, 2007) or even 'demediterraneization' (Quignard and Tomasini, 2000) of the Mediterranean fauna and flora. Changes in geographic distribution are also evident for a variety of native species that are now expanding northwards, conquering the coldest sectors of the basin (CIESM, 2008).

What is the speed of these changes? Are there natural barriers to the dispersal of tropical biota? What can we predict for the future?

Species occurrence records are a unique source of information to answer these questions and today this kind of data is being increasingly used for mapping and predicting biodiversity changes (e.g. Albouy et al., 2012). Moreover, records of species found out of their distribution limits, appear almost weekly to the point that new scientific journals have been created with the sole scope to publish these occurrences.

Here we compiled the historical sighting of exotic fish species in the Mediterranean Sea. A dynamic reconstruction of these records is given and some important bio-geographical implications are highlighted. Data were extracted from a total of 457 published sources, spanning from 1896 to 2013. Presence records were geo-referenced using ArcGIS 9.3 as Geographical Information System (GIS). Documentation of biological, ecological, taxonomic information, introduction pathways and other relevant data for each species was also considered. This database was here explored to: 1) reconstruct the chronology of exotic fish occurrences in the Mediterranean Sea and 2) provide insights on the methods we have used so far to detect these species.

Results show as the boundaries of the 'Lessepsian Province' (Por, 1990) are vanishing, whilst an increasing number of Indo-Pacific species rapidly progress towards the Western Mediterranean and towards the Adriatic and northern Aegean Seas. The Sicily strait and the 38th parallel of Aegean are no longer insurmountable barriers to the dispersion of tropical fishes and the whole Mediterranean is rapidly loosing its biotic identity, in a sort of 'crossroad' between the Atlantic and the Indo-Pacific worlds.

Our findings also illustrate a striking aspect of the study of Mediterranean fish invasions, that is the lack of survey methodologies. We are certainly witnessing changes of geological proportions in our lifetime, but at the same time we are loosing most of the information, because of the limited and non-continuous nature of scientific monitoring. The discovery of exotic fishes is usually an empiric, not planned episode and appropriate monitoring procedures are lacking for the Mediterranean region. The reasons why the process is inadequately and unequally followed are related to the massive efforts that would be needed to monitor and survey changes in species distribution over large spatial and temporal scales. To overcome this gap, new methodological approaches and reliable solutions are urgently needed. Toward this end,

community-based actions are expected to have a role for Mediterranean research (CIESM, 2008) and in the last few years it starts to be tested, with some encouraging results (e.g. Azzurro et al., 2011). These emerging participatory approaches are here illustrated, with emphasis on the recent upsurge of Local Ecological Knowledge and Citizen Science networks.

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