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THE SICILY STRAIT: A TRANSNATIONAL OBSERVATORY FOR MONITORING THE ADVANCE OF NON INDIGENOUS SPECIES

LO STRETTO DI SICILIA: UN OSSERVATORIO TRANSNAZIONALE PER IL MONITORAGGIO DELLE SPECIE NON INDIGENE

Abstract - The Strait of Sicily is a major hydrodynamic, biogeographical and geological transition zone within the Mediterranean Sea, considered as the boundary between the Western and Eastern sub-basins. During the last few decades, an increasing number of marine species native of either the Atlantic or the Indo-Pacific Oceans have been recorded in this area by researchers from Malta, Italy and Tunisia. Here we list recently recorded fish from the Strait of Sicily, illustrating suitable methodologies for their detection, and advocating the need of transnational monitoring networks.

Key-words: introduced species, Strait of Sicily, monitoring, Mediterranean Sea.

Introduction - The Strait of Sicily represents the major West-East transition zone within the Mediterranean, both from a hydrodynamic and biogeographical perspective. This area is considered as a strategic observation outpost within the Central Mediterranean for the monitoring of marine non-indigenous species (NIS) and the range extension of those entering the Mediterranean through the Gibraltar Strait. The objective of this study is to present the development of recent protocols which have spearheaded the observation, collection and identification of a number of non-indigenous species (NIS) of fish within the Strait of Sicily. The potential for the consolidation of transboundary collaboration between the Mediterranean countries participating in such joint monitoring - Italy, Tunisia and Malta - is also discussed.

Materials and methods - Occurrence records of both NIS and range expanding species were extracted from recently published notes, articles in press and other unpublished sightings. All together these observations were based on a variety of different sources such as: spontaneous reports by local fishermen, scientific field surveys, awareness campaigns (Andaloro *et al.*, 2012) and citizen science web-based networks (<http://www.seawatchers.org>). Complementary information on the abundance and distribution of these species were obtained through interviews with local fishermen. This approach, which goes under the name of Local Ecological Knowledge (LEK) (Azzurro *et al.*, 2011), capitalizes on the information that a group of people have about local ecosystems.

Results - New fishes from the Strait of Sicily include species known from the Eastern Atlantic coasts that might have extended their range through Gibraltar such as *Cephalopholis taeniops* (Valenciennes, 1828), *Pontinus kuhli* (Bowdich, 1825) and *Abudefduf* cfr. *saxatilis* (Linnaeus, 1758); likely human translocations: *Epinephelus malabaricus* (Bloch and Schneider, 1804), *Scatophagus argus* (Linnaeus, 1766); and fishes that entered the Mediterranean through the Suez Canal: *Acanthopagrus bifasciatus* (Forsskål, 1775) (Ben Souissi *et al.*, 2014), *Hemiramphus far* (Forsskål,

1775) (Falautano *et al.*, 2014) and *Lagocephalus sceleratus* (Gmelin, 1789). This latter was recorded for the first time in Italian waters, being recorded in October 2013 off Lampedusa island (Azzurro *et al.*, 2014). *E. malabaricus*, *S. argus* and *P. kuhlii* have been reported by our network of local fishermen, whilst other species such as *C. taeniops* came from sightings made by SCUBA divers and later published as scientific reports. Fishermen reports and geo-referenced underwater photographs which have been taxonomically identified and validated by the website www.seawatchers.org have furnished further insight on the distribution and abundance of species already established within the same area, including *Siganus luridus* Rüppel, 1828 and *Fistularia commersonii* Rüppel, 1835. Fishermen feedback through LEK approach has highlighted fluctuating abundances of *F. commersonii* in the Pelagian Islands and an increase of *S. luridus*, even if no major outbreaks of this species have occurred yet. Informative and awareness campaigns within coastal communities have allowed the early detection and recording of detailed information on the occurrence of the toxic *L. sceleratus* along the entire length of the Tunisian coast, from the island of Djerba to the region of Tabarka (Ben Souissi *et al.*, 2014).

Conclusions - The recent reports of fish species from the Strait of Sicily underscore the growing importance of an active monitoring system for all NIS in this part of the Mediterranean. The species list results from different sources and observation networks, still in an early phase of organization. A transboundary monitoring approach is essential, given the signs of a true biogeographic revolution, which straddles across different national jurisdictions. An effective early warning system (as happened in the case of *L. sceleratus*) along the North African coasts (Ben Souissi *et al.*, 2014) could constitute an effective alert system for contiguous northern areas (Maltese Islands, Pelagian Islands, Pantelleria, Sicily) within the same Strait. A coordinated monitoring approach alone can forecast the range expansion of new arrivals across the Strait of Sicily towards the Western and Eastern Basins. As a result, the spontaneous inter-researcher collaboration within the Strait of Sicily within the ambit of transboundary collaboration funding programs and the application of novel methodologies (such as the LEK approach and a coordinated screening and validation of reports received from local communities) represent a promising framework for the monitoring and management of such a far-ranging phenomenon.

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