

ALIENS AND VISITORS IN THE SOUTHERN ADRIATIC SEA: EFFECTS OF TROPICALIZATION

Giambattista Bello *, Nicola Casavola and Ermenegilda Rizzi

Servizio Ittico Ambientale, Provincia di Bari, Italia - gflca@tin.it

Abstract

The tropicalization of the Adriatic Sea is confirmed by the population expansion northward along its south-western coast of some resident species (the bony fishes *Thalassoma pavo* and *Sparisoma cretense*, the gastropod *Stramonita haemastoma*, the cephalopod *Octopus macropus*, and the short-term resident *Caulerpa racemosa*, a chlorophyte) and the settlement in the province of Bari of three tropical dinoflagellates (*Ostreopsis lenticularis*, *Coolia monotis*, and *Prorocentrum mexicanum*).

Key words: tropicalization, Adriatic Sea, Osteichthyes, Mollusca, algae

Much has been written about the phenomena collectively named "tropicalization of the Mediterranean" that have introduced changes in the biodiversity and biogeography of this sea (1). Such phenomena have also involved the Adriatic Sea, a well-delimited basin the biodiversity of which is generally deemed lower than the Mediterranean average (2). In the past years significant changes in the Adriatic physical conditions have been recorded (3) that may have in turn favoured the ingression of thermophilic species.

In this paper we report and discuss data that are further evidence of the tropicalization of the Adriatic Sea. They are based on information collected and observations carried out in the province of Bari (south-western Adriatic Sea) and concern examples of both "visitors", i.e. Mediterranean species whose populations expanded northward along the Apulian coast, and "aliens", i.e. extra-Mediterranean species.

In the summer of 1999 the occurrence in the province of Bari of "exotic" bony fishes was repeatedly reported by both professional and sport-fishermen. Indeed those fishes, viz. the ornate wrasse, *Thalassoma pavo* Linnaeus, 1758 (Osteichthyes: Labridae) and the parrotfish *Sparisoma cretense* (Linnaeus, 1758) (Osteichthyes: Scaridae), were not at all exotic *sensu strictu*, since they are common members of the Atlanto-Mediterranean ichthyofauna.

As far as the western side of the Adriatic Sea is concerned, until 1999 the population of *T. pavo* was well established in its southernmost part, that is little north of the Otranto Cape, which indicates the southern limit of the Adriatic Sea; few specimens were sporadically found north of Otranto up to Brindisi (the distribution given in the "FAO Fiches d'identification" for this fish embraces the whole South Adriatic Sea (4), probably because it includes the records of stray specimens). In 1999 the ornate wrasse population spread out northward along the coast from Otranto to Bari and many specimens were also caught or spotted in the following three years; in particular schools of juveniles were observed off Palese (north of Bari) in 1999 and 2000. The ornate wrasse seemingly disappeared from the waters of our province in 2003.

Very few specimens of the parrotfish *S. cretense* have been either caught by fishermen or observed by divers since 1999 and up to the summer 2003; its occurrence was also recorded in August 2000 in the southern part of Apulia, just outside the Adriatic Sea (5). The parrotfish is not considered an Adriatic species (4), although it has been occasionally collected here (6). Both *T. pavo* and *S. cretense* are members of the Mediterranean ichthyofauna of Mauretanian affinity and live in the southernmost and warmest part of the basin.

In about the same years we recorded a significant density increase of the red-mouth purpura *Stramonita haemastoma* (Linnaeus, 1767) (Gastropoda: Muricidae) in the posidonia grass beds off the harbour of Bari, in addition to *Hexaplex trunculus* (Linnaeus, 1758) that used to be the only muricid gastropod in those grass beds. *Stramonita haemastoma* too is a thermophilic species of Mauretanian affinity.

To complete the list of "visitors", we report the sudden occurrence in the south-western Adriatic Sea of a sub-population of the cephalopod *Octopus macropus* Risso, 1826 (Cephalopoda: Octopodidae). In the summer and autumn of 2003 many subadult and adult specimens of this species have been caught by fishermen trawling off Mola di Bari. Despite the fact that this octopus is reported as an Adriatic species in all cephalopod lists (7), it is indeed a fairly rare species there as well as in the whole Mediterranean (8). *Octopus macropus* is a cosmopolitan cephalopod that lives in warm temperate waters (8) and reproduces by planktonic paralarvae that can passively travel in the sea.

In 1999 we also received information on and afterwards checked for the presence of the exotic green alga *Caulerpa racemosa* var. *occidentalis* (J. Agardh) Børgesen, 1907 (Chlorophytes: Caulerpaceae) along the coast of Bari province, especially in sheltered areas off Monopoli. The history of the Mediterranean invasion by this pantropical chlorophyte is well known: first recorded in Tunisia in the '20s, it began to spread out quite rapidly in the early '90s and reached the south-western Adriatic in 1999 (present results) and the Croatian coast in 2000 (9).

Lastly we report the occurrence of three exotic dinoflagellates the presence of which became evident because of their harmful effects on people. HAB (Harmful Algal Bloom) phenomena were recorded for the first time in our province in August 2001 (10); unfortunately they showed again in the following two years, in late summer. The three microalgae identified in our waters are exotic and pantropical: *Ostreopsis lenticularis* Fukuyo, 1981 and *Coolia monotis* Meunier, 1919 (Ostreopsidaceae), and *Prorocentrum mexicanum* Tafall, 1942 (Prorocentraceae). The fact that HABs occurred for three years in a row indicates that these toxic dinoflagellates have become stable resident of the province of Bari coast.

The tropicalization of the Adriatic Sea is confirmed by two orders of events, namely the population expansion of some resident species – i.e. *T. pavo*, *S. cretense*, *S. haemastoma*, *O. macropus*, and *C. racemosa* – and the occurrence and establishment of three tropical species – i.e. *O. lenticularis*, *C. monotis*, and *P. mexicanum*.

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