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Conservation issues, biodiversity, exotic & invasive species

The Influence Of Rapana On The Ecology Of Black Sea

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The Karadag Nature Reserve is located in the south-eastern part of the Crimean peninsula. Its water area is an open sea along the Karadag rocky massif. It is bordered by Koktebel and Kurortnoe resorts so the water, rich in organic matter (OM), flows into the protected area of the sea. Our observations in 2005-2012 of the narrow coastal zone of the Karadag Reserve show the destructive effect of the predatory gastropod-invader Rapana venosa (Valenciennes, 1846) on the ecology of the coastal waters resulting in the reduction of the number of brine rock mussels Mytilus galloprovincialis Lamarck, 1819. The mollusc R. venosa from the Sea of Japan successfully adapted in the Black Sea in the years of 1950s of the last century and destroyed the rare settlements of oysters Ostrea edulis (Linnaeus, 1758). The researchers noted that the mussel and scallops Flexopecten glaber ponticus have also disappeared there and that the biocenosis did not recover in 10 years. In the years of 1960-1970 the shelly belt at the depth of 25-30 m along the coast of the Caucasus and Crimea was destroyed. The disappearance of mussels along with oysters and scallops was accompanied by the silting of the sea bottom. We believe that those clams were eaten by R. venosa. We calculated that during the summer season at the minimum population density of 0.1 specimen per m2 R. venosa can eat at least 20 tons of aquatic biomass per 1 sq. km of the sea area. The disappearance of bivalve molluscs, the biofilters, from the shelly zone significantly worsened the ecology of the Black Sea. In the early 2000s R. venosa began to attack mytilids on the cliffs of the Crimean coast. It destroyed the mussels and then Mytilaster lineatus (Gmelin, 1791). In 2002 the mature mussels were covering of the Karadag cliffs from the surface of the water down to the depth of 9 m. In 2006 the mussels were found on the cliffs only up to 6 m depth. The concentration of R. venosa in the mussels settlements was 8 - 10 specimen per sq.m. In the summer of 2010 we have seen many empty cliffs without of mytilids and cystoseira (Cystoseira barbata C.) even at the water's edge. The concentration of the organic matter and heterotrophic bacteria in water of the narrow coastal zone increased every year and was very high in the summer of 2010. We have shown that the disappearance of cystoseira is caused by increase of concentration of the organic matter and bacteria in water. R. venosa destroyed almost all of its food sources and in 2011 - 2012 its amount decreased significantly. At the same time we found that mussels population on rocks at the depth of 1-2 m was restored and concentration of bacteria and

organic matter in the water decreased to the level of 2007. However, in the summer of 2012 we observed R. venosa were living among mussels. They were eating mytilids and growing rapidly. Conclusion: The attempts of the recultivation of cystoseira and improvement of the ecology of the sea will only be successful if the many healthy populations of mussels will filter up to 90 % of bacteria from the sea water. We have developed a project to restore the population of mussels. Preliminary experiments with artifical reef modules are being conducted and we invite you to cooperate in this program.
Key words: Black Sea, ecology, mussels, invader Rapana venosa, cystoseira