

POSSIBLE CONSEQUENCES OF THE INVASION OF THE ALIEN MOLLUSK *ARCUATULA SENHOUSIA* (BIVALVIA, MYTILIDAE) IN THE BLACK SEA

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Recently, due to the development of commercial navigation, an intensive process of invasive penetration of alien species from various regions of the World Ocean into the Black Sea is taking place. Most of these organisms enter the sea at the larval stage of development together with the ballast water of ships. Likewise, in the XX century, representatives of bivalve mollusks *Mya arenaria* Linnaeus, 1758, and *Anadara kagoshimensis* (Tokunaga, 1906), as well as gastropods *Rapana thomasi* Crosse, 1861, settled in the Black Sea. The first two species successfully passed the adaptation period and widely spread in benthic communities. *M. arenaria* has taken its niche among the burrowing shellfish, having no competitors in the Black Sea. *A. kagoshimensis* has adapted to living together with the native species *Cerastoderma glaucum* (Bruguere, 1789). However, predatory *R. thomasi*, which feeds on bivalve mollusks, significantly disrupted the structure of some benthic communities. In the XXI century the alien bivalve mollusk *Arcuatula senhousia* (Benson, 1842) was found in the Black Sea. The consequences of its introduction for the development of native species have yet to be assessed.

The material for the study was samples of fouling of solid substrates collected in 2017–2019 in the coastal zones of the northwestern part of the Black Sea, located in the Odessa region between the mouths of the Dnieper-Bug and the Sukhoi Limans. Samples were taken at a depth of 3 meters. The selected animals were identified to species, counted and weighed.

As a result of the research of the collected fouling samples, several living specimens of the invasive marine bivalve mollusk *Arcuatula senhousia* were found. One specimen of the mollusk was found on April 4, 2017, in the area located south of the mouth of the Grigorievsky Liman (near Yuzhny seaport) among a fouling community formed by the Black Sea mussel *Mytilus galloprovincialis* Lamarck, 1819. Two more living specimens were found in the same place on June 21, 2019. In the first case, the water temperature was 8.0 °C and the salinity was 14.7 ‰, and in the second case it was 25.6 °C and 13.7 ‰, respectively.

The bivalve mollusk *A. senhousia* or, as it is also called, the Asian date mussel belongs to the family Mytilidae, representatives of which are very common in seas and oceans. The native area of this Pacific Asiatic subtropical-low-boreal species is ranged in the South China Sea, the Yellow Sea and the Sea of Japan, as well as in the southern part of the Sea of Okhotsk. At the end of the XX century, with the oyster culture, this species was unintentionally introduced into the marine waters of New Zealand, Australia, the Pacific coast of North America and Europe (Mistri, 2002). This species then spread across the Mediterranean Sea.

In the Black Sea, it was first found at the beginning of the XXI century on hard substrate in the coastal waters of Romania near Constanta seaport (Micu, 2004). Then, in 2015, this species was found on the coast of the Crimea (Kovalev et al., 2017). In addition, in 2018, *A. senhousia* was found in the water area of the Sukhoi Liman, Odessa surroundings, where a large seaport is located (personal communication with Dr. Mikhail Son from the Institute of Marine Biology, Odessa).

The discovered bivalve mollusk *A. senhousia* has all the qualities of the opportunistic species. This relatively small invertebrate (the shell length of adults is about 30 mm) has a short life cycle (life-span is approximately 2 years). It is very fertile, has a long larval stage, during which the mollusk spreads over considerable distances. In addition, it grows rapidly, forming numerous settlements. This species can reach a high abundance and builds dense extensive mats of clams that are fastened together (Mistri, 2004). These properties help *A. senhousia* to capture new habitats quickly and successfully compete with native species.

These ecological features of the considered invasive mollusk pose a certain danger to native sedentary invertebrate species. Such characteristic features of *A. senhousia* as rapid growth and the ability to cover the substrate with a continuous carpet, under conditions of the Black Sea fouling community, can lead to complete isolation of edificator of this community bivalve mollusks *M. galloprovincialis*, as well as their subdominant *Mytilaster lineatus* (Gmelin, 1791) from the surrounding aquatic environment. A similar phenomenon has been reported for benthic species in San Diego Bay, California. In this water area relatively large organisms such as suspension-feeding bivalves can be inhibited by dense mats of *A. senhousia* (Crooks, 2002).

At present, the main obstacle for the wide distribution of this invasive species in the studied water area is relatively low salinity of the Black Sea. It is especially evident in its shallow northwestern part, which is influenced by the runoff of such large rivers as the Danube, Dnieper and Dniester. In this region, the salinity of water is half that in the native habitat of *A. senhousia*. This invertebrate needs a certain time to adapt to low salinity. So, for the predatory gastropod mollusk *R. thomasi* that entered the Black Sea in the middle of the XX century, the period of adaptation to new conditions was about 50 years. About 20 years have passed since the first finding of *A. senhousia* in the Black Sea. During this period, the mollusk has not yet formed a stable Black Sea population. All its settlements have a local character.

As follows from the data presented, all individuals of the alien mollusk *A. senhousia* were found in the Black Sea near large ports, which indicates that possible routes of invasion of this species were associated with the development of navigation. Thus, at present, the invaded mollusk is undergoing the stage of adaptation to new conditions. If this stage is successfully completed, it can pose a serious threat to the representatives of the aboriginal Black Sea fauna.

References

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