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Current State of the Mollusks Fauna in the North Part of the Sea of Azov and the Utlyuk Estuary

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Abstract/ Eng.
The fauna and some ecological features of the mollusks of the North part of the Sea of Azov and Utyuk Lyman were investigated. Also there are some records about regular quantity and biocenosis structure of this water area. It is obvious that the most eurybiontic species penetrate into the Sea of Azov from the Black Sea. It proves that the "pontisation" process is still continuing. Apparently over the years the number of newly-immigrated species of mollusks could increase the local biodiversity.
Key words: Ukraine, the Sea of Azov, Utlyuk estuary, mollusks fauna, ecological factors.

The Sea of Azov is the important area of the entirely Azov-Black Sea Basin, where the process of the species penetration from the Black Sea is continuing and changes the biodiversity as well as relations within the ecosystem. Fauna monitoring of the northwestern part of the Sea of Azov reveals certain ecological preferring in some mollusks species which inhabit certain areas and are usually represented in relatively low density of populations.

The key role of mollusks in the Sea of Azov benthos community is obvious which causes the scientists' interest to the malacofauna of the basin.

Mollusks is a common group of invertebrates in all communities inhabiting on- and in-bottom biotopes of the Sea of Azov and adjacent lymans (Utlyuk and Molochnyi). They play a role as large aquatic flora and organic detritus consumers, which accumulated in the sea by mainland runoff and by rivers flows. Additionally, mollusks play a key role in the substances circulation and energy transformation, maintaining the balance of the Sea of Azov ecosystems.

flitrating organisms, mollusks of the *Bivalvia* class accumulate radionuclides and salt of heavy metals in their body and serve as natural indicators of the water pollution. Some bivalves are the intermediate hosts of trematods, which are causing human, domestic and wildlife diseases. Moreover, mollusks form a large group of benthic invertebrate animals, which are the main forage base for a big variety of industrial fishes: haarder, gloss flounder, gobies, herring and others. Mollusks play an important role as the main components in the overgrowing the submarine parts of

ships, various structures and water transport systems.

The common factors of growth, development, reproduction and distribution of the molluscs depend on the conditions they live in. Changes in the environmental conditions lead to the changes in age number of the mollusk populations and to their placement in biotopes and other.

Researching reservoirs conditions, the main task is to study the physical and chemical phenomena of the biological processes and to clarify industrial issues. Hydrological and hydrochemical researches are also take an important place, because studying the chemical and physical phenomena we better understand the processes occurring in different reservoirs.

Environmental factors directly or indirectly affect the migration of organisms. The most part of researchers think that external factors are the main in the migration. They caused photokinesis (phototaxis) and thermotaxis in the organisms. Hydrological regime determines the degree of favorable or unfavorable conditions of the reservoir for its inhabitants. In the shallow and closed Sea of Azov the meteorological conditions of the year determine the hydrological regime of the sea. They are especially marked in the pseudolittoral and upper sublittoral areas.

The aim of the present investigation is: i) to overview a composition of bottom biocenoses in the outlined region; ii) to discover the general peculiarities of the distribution of different taxa of mollusks and iii) to re-assess the prospects for benthic biocenoses in the basin in regard to the alien species, that introduce from the Black Sea.

Materials and methods

Qualitative and quantitative samples of molluscs collected in 2006-2017. As well as the publications available also are used for analysis. Material was collected in 21 stations located in the northwestern coast of the Sea of Azov between the Stepanivka village to the end of the Biriuchi island bay bar (Yakimivsky district, Zaporozhzhia region) and on the coast of Utlyuk Lyman. Clams were collected from fresh coastal emissions, as well as in the sea from clay plateaus at a distance of 500-1500 meters from the coast at a depth of 0.5-4.5 meters.

Traditional methods of conchological analysis were used for mollusk species identification with taking into account all available updating in the systematics of certain groups (Anistratenko et al., 2011).

Results and discussion

Despite the large number of the works about the gastropod fauna in the Azov and Black seas, drills of the marine reservoirs are actively studied. Gastropods determine the bioavailability of reservoirs and their ability to self-purify, as they act as environmental indicators of the habitat. Most of the mollusks, mostly drills, are actively used in food for fish, birds and mammals. It determines the close attention to the fauna of mollusks in the reservoirs of Ukraine [3].

The northern coast of the Sea of Azov is characterized by the presence of a number of bay bars. It is narrow sand-shell bands which stand out into the open sea at considerable distances (Fedotova sand bar- up to 50 km.).

In the intervals between the sand bars, the coast is blurring and it forms broadly open bays. The material of these bars is quartz sand with a significant impurity of cardium with the sand on the edge of the bars. Soils are muddy or sandy-muddy with a bite shell almost to the very edge water. The vegetation cover hides almost the entire surface of the soil [7].

For such areas the presence of two groups of organisms is specific:

– forms which live on plants;

– forms which live on the soil surface or buried in it.

Specific mollusks of the first group are: *Rissoa venusta, Rissoa euxinica,*

Mytilaster lineatus, Theodoxus pallasi, Hydrobia ventrosa, Bittium reticulatum.
Specific mollusks of the second group are: *Cardium edule lamarki, Abra ovata, Retusa truncatella* [1, 2].
Water temperature regime of the Utlyuk Lyman significantly differs from the open sea and Molochnyi Lyman regime. Meteorological conditions here are strongly influenced by air temperature decreasing and increasing, wind direction and its speed, the amount of precipitation, and so on. Water masses in the shallow waters warmed better than the open sea waters in the summer. In the winter the sea along the coast freezes. The temperature conditions on the Sea of Azov littoral are exceptionally unstable. The temperature difference of opposite coasts in the area of the Fedotova bay bar reaches 8ºC on the northern coast of the Sea of Azov.
The difference in water temperature and salinity on the opposite shores is quite significant especially in the summer, when the shallow waters of the southern coast warm up to 20-30°C, while in the west and north the water temperature does not rise above 25 ° C. The water temperature influences the metabolic processes of the mollusks and the level of their activity and distribution in the reservoir.
In Autumn, while air temperature is lowering, the water temperature is decreasing unevenly. It is faster from the northwestern part of the Utlyuk Lyman and at the Arabatskaya Arrow. Here, strong and cold north-eastern and eastern winds are prevailing. They drive together in this area the cold superficial water from the whole water area of the Sea of Azov.
By the end of autumn, at temperatures up to 5°C, most gastropods burrow in the bottom sediments at different depths (up to 15 cm.). Bivalves migrate to the deeper parts of the sea and firth. Clams rarely freeze in the ice. Sometimes it happens when all the water freezes. The thickness of the ice can reach 35-70 cm for 20-70 days.
Utlyuk Lyman is really special in hydrological and biological characteristics. It is deep enough (in some places up to 13 meters), with a great diversity of benthic vegetation. It has a high biomass and density of mollusks settlements [4, 8].
The Venerida order is the most numerous groups of the Bivalvia class on the studied area. It includes 9 families and 17 species that live in areas of the sea and firths with different salinity. In addition to the species previously mentioned, fresh leaves *Solen vagina Linnaeus*, 1758 (*gen. Solenidae*) are often found.
The hells *Ostrea lamellosa Brocchi,* 1814, the *Ostreidae Rafinesque family*, 1815, were discovered from the shore emissions in the area of the Biriuchiy Island. Numerous findings from the same area of the shells *Flexopecten ponticus* (Bucquoy, Dautzenberg and Dollfus, 1889), gen. *Pectinidae Rafinesque*. 1815, an order of *Pectinidae*, can testify the presence of these two species in the studied area of the Sea of Azov.
Numerous populations of the species *Licinella divaricata (*Linne, 1758) and *Loripes licunalis (*Lamarck, 1818), gen. *Lucinidae Fleming*, 1828, were found on the Utlyuk Lyman and Sea of Azov area where they are uniting. These areas are characterized by high salinity.
Compared to the *Bivalvia* class, the *Gastropoda* class is more numerous. In the area of the bay bar Biriuchyi, we discovered the shells of *Gibbula albida (*Gmelin, 1791) gen. *Trochidae* (*Rafinesque*, 1815). The only single record of these shells was reported by A. Ostorumov in 1893. Here we found the fresh shells of *Steromphala divaricata (*Linneaus, 1758) of the same family.
On the west of Kirillovka village we collected a lot of fresh shells *Cerithium vulgatum (*Bruguire, 1789), the family *Cerithium (*Bruguire, 1789). The number of species of *Cerithiiformes* is 3, contained *C. pussilum (*Jeffreys, 1856) and *B. reticulatum (*Da Costa, 1778).

The family *Littoridinidae* is represented by 3 species of the genus *Thalassobia* Bourguignat in Mabilli, 1877: *Th. moitessier* (Bourguignat, 1876); *Th. contagne* (Bourguignat in Contagne, 1881).

The order of Neritopsiformes is represented by the small number of species in the studied part of the Sea of Azov. There only three species from the family *Neritidae Rafinesque,* 1815 are known: *Th. danasteri* (Lindholm, 1908); *Th. fluviatilis* (Linnaeus, 1758); *Th. pallasi Lindholm*, 1924.

Subclasses of *Sinistrobranchia, Opistobranchia and Pulmonata* are represented in the Sea of Azov by the 4, 3, and 1 species [1, 2, 3, 4, 6].

Thus, the penetration into the Sea of Azov from the Black Sea of the most eurybiontic species is obvious. This suggests that the process of "pontisation" of the Sea of Azov is continuing.

The features of the hydrological regime of the Sea of Azov and the surrounding lymans are mainly determined by a small inflow of the fresh water and by shallow water of the basin.

High salinity of the water is observed in the area between the Biriuchyi peninsula and part of the Arabatskaya Arrow, where the salt waters of Sivash are flowing in. The distribution dissimilarity of salinity is noted mainly in the spring after the ice melting.

The hydrologic regime of the Utlyuk Lymanis formed under the influence of the fresh water of the Big and the Small Utlyuk River, mainland runoff and the system of currents caused by winds (mainly northern, north-eastern and eastern directions). Due to these factors exist a set of water-currents mixing the water of different salinity and temperature of the entirely liman.

The special hydrological regime of the Sea of Azov, reduced salinity, sharp seasonal temperature fluctuations, long winter periods and shallow water – everything determines a certain forms selection from the richer Black Sea fauna, which represents the already selected fauna of the Mediterranean Sea. Some Mediterranean forms find exceptional conditions for their development in the Sea of Azov and form large clusters [2, 4, 5, 8].

The perspective of the further research is monitoring the transformation of the ecological system of the Sea of Azov according with certain changes in the fauna of molluscs.

Conclusions

The process of penetration of the most eurybiontic species from the Black sea is continuing and changes the biodiversity as well as relations within the ecosystem. It is obvious that the process of "pontisation" of the Sea of Azov is still continuing.

Our studies allow us to claim that the existence of these species in the north-western part of the Sea of Azov and in the Utlyuk Lyman is evident.

The process of the penetration of both species from the Mediterranean and the Black Sea in the Sea of Azov is still continuing. Apparently over the years the number of newly-immigrated species of mollusks could increase the local biodiversity.

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