

THE BENTHIC PONTO-CASPIAN FAUNA OF THE KUCHURGAN STORAGE RESERVOIR OF THE MOLDAVIAN CENTRAL STEAM POWER STATION

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Abstract: The article discusses data about the Ponto-Caspian relics of the Kuchurgan storage reservoir. There are observed the most numerous species as well as a dynamics of the polychaetes and amphipods population for the period of the years 1997-2013. The appearance of *Dreissena bugensis* in the reservoir is remarked.

Keywords: crustaceans, firth, molluscs, polychaetes, Ponto-Caspian fauna, storage reservoir, zoobenthos

Introduction:

The Ponto-Caspian fauna or «Caspian fauna» according to Morduchai-Boltovskoi (1960) represents a specific complex of species, characteristic of the Caspian Sea, consisting of crustaceans (amphipods, mysids, cumaceans etc.), bivalve and gastropod molluscs, fish (goby, herring, sturgeon etc.) and some other groups and is considered autochthonous to the Caspian Sea.

The Caspian fauna is considered to be ancient, which during a long period developed in a total isolation from the ocean. It is known as endemic for the Pontic-Caspian basin because it exists outside its borders, with the exception of the invasive species (*Dreissena polymorpha* etc.) which infiltrated themselves farther than the limits

of the basin as far as the Great Lakes of the Northern American continent.

At the end of the XIXth century A.A. Ostroumov defined the Ponto-Caspian fauna as a relict one, spreading itself mainly in firths and the most fresh water portions of the basin, preserving the conditions most close to those of the ancient Tertiary (Sarmatian) Sea.

From all the water basins of Moldova the Kuchurgan storage reservoir is the richest of the Ponto-Caspian representatives and in this respect it could be considered a nucleus for disseminating this relict group of aquatic organisms. In different periods of its existence the storage reservoir numbered more than 30 species of ponto-caspian polychaetes, molluscs, cumaceans, mysids and amphipods (Yaroshenko 1957). The genesis of the reservoir contributed to the maintaining the species diversity of zoobenthos, as particular genetic group of aquatic organisms.

The Kuchurgan storage reservoir – in the past river firth – is included in the estuary system of the Dniester river and before its regulation and transformation in 1946 into

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the cooling pond of the Moldavian central steam power station it represented the preserved remains of the former larger Dniester liman (firth) (Yaroshenko 1973).

The flowing of the Dniester river into the Dniester estuary formed no delta, but it is formed by the river Turunchuk, both being a part of the lower course up to the Tiraspol-Bendery district, covered with marshland reed beds and lakes and representing an ancient fluvial sedimentary (Morduhai-Boltovskoi 1960). The remains of this bay is the Kuchurgan storage reservoir (liman), situated 50 km to the north of the Dniester estuary.

Materials and methods:

The materials for the articles are based on the results of the studies of the Kuchurgan reservoir, conducted in the research Biomonitoring laboratory of the Transdniestrian State University.

Results and discussion:

The Kuchurgan storage reservoir performing the function of the cooling pond of the Moldavian central steam power station is subjected to a forceful thermal effect, which has led to the impoverishment of its benthic fauna. As a result of the changing ecological factors, by the end of the XXth century the species diversity of the zoobenthos had been reduced with 70 types of species. The composition of macrozoobenthos was recorded a depletion of the stenobiotic, coldwater forms with a weak adaptive capacity to changing habitat conditions. To a lesser extent this has affected the Caspian fauna, which is distinguished by its eurythermic capacity. Thanks to the thermostability many of the Caspian species of zoobenthos resist high heat input to which the cooling storage pond is subjected. The greatest resistance to thermofication was exhibited by *Dreissena polymorpha*, *D. bugensis*, *Dikerogammarus haemobaphes*,

Pontogammarus robustoides, *P. crassus*, *Corophium maeoticum*, *Pseudocuma cercarioides*, *Pterocuma pectinata*, *Limnomysis benedeni*, *Paramysis lacustris*, *Hypania invalida* (Vladimirov 1986).

The polychaete of the Ponto-Caspian fauna complex of the Kuchurgan storage reservoir are poor in species diversity and are represented by only two species: *Hypaniola kowalewskyi* and *Hypania invalida*, of which the latter is more numerous (Philipenko 1999a).

Among the Ponto-Caspian species of the zoobenthos of Kuchurgan storage reservoir the species diversity is dominated by higher crustaceans, namely amphipods. At different periods of its formation (operation) it was inhabited by 15 Ponto-Caspian species of amphipods. Since the late 1990s, we have noted in the reservoir 8 species. Among the amphipods of the Kuchurgan reservoir in large quantities the representatives of only two families are widespread: Gammaridae and Corophiidae. The reservoir of Moldavian central steam power station is a habitat for some Gammaridae - *Dikerogammarus haemobaphes*, *D. villosus*, *Pontogammarus robustoides*, *P. crassus* - and *Corophium maeoticum* from the Corophiidae. The number of the amphipods is determined mainly by the Corophiidae and the biomass by the Gammaridae (Philipenko 2003).

The maximum population of the *Dikerogammarus haemobaphes* was observed in places where *D. polymorpha* develops most intensely. In Kuchurgan reservoir among these types of aquatic benthic there is a biotic relationship of commensalism, where the role of commensals is played by the amphipods. An analogical inhabiting situation of the massive development of the Gammaridae and the zebra mussel is observed in the cooling ponds of the Chernobyl atomic power station, Hmel'nitsk atomic power station (Protasov and Silaeva 2010) and Lukolmsc central steam power station (Karataev and Lyakhnovich 1990).

A relatively high density of amphipods in the Kuchurgan reservoir indicates the existence of favorable conditions for the development of this group of higher crustaceans. The amphipods, in our opinion, is one of the most eurythermic groups of zoobenthos reservoir, as evidenced by the comparative results of benthic surveys of the water area and diversion warm channel of the wastewater of the Moldavian central steam power station where the average seasonal water temperature is by 5.3 °C higher than in the reservoir. For example the average seasonal population and biomass of the amphipods in the reservoir in 1997 constituted 761 units/sq. m with a biomass of 5.94 gr/sq. m., but in the warm channel of the wastewater these were considerably higher – 1840 units/sq.m., 9.55 gr/sq. m. (Philipenko 1999b).

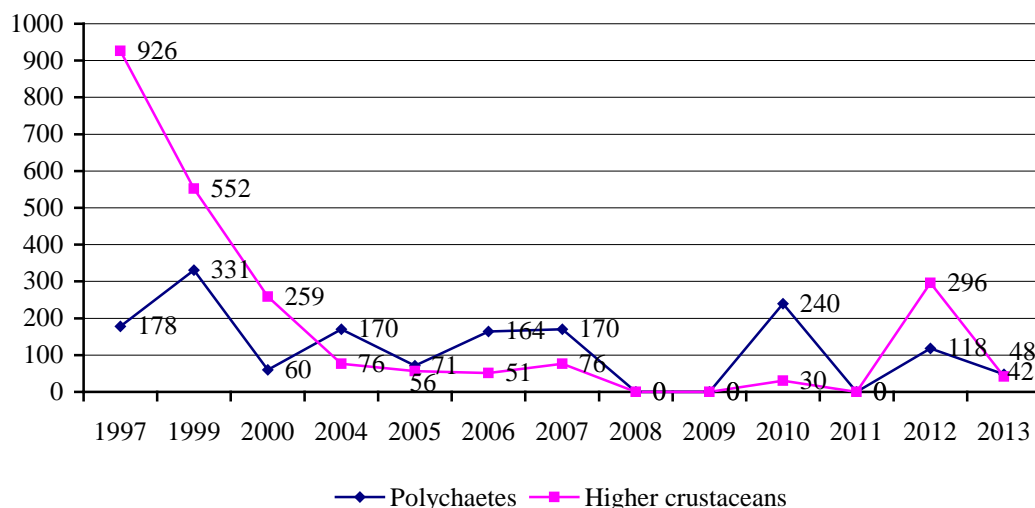
The fauna of the cumaceas was represented by 6 species, out of which we highlighted four species: *Caspiocuma*

campylaspoides, *Schizorhynchus scabriusculus*, *Pseudocuma cercarioides* and *Pterocuma pectinata*, among them the most widespread being the latter two species (Philipenko 2003).

The Kuchurgan reservoir is inhabited by three species of mysid shrimp: *Limnomysis benedeni*, *Paramysis lacustris* and *Katamysis warpachowskyi*, the latter of which is rarer than others. Incidence of mysids shrimps in the bottom grab samplers is not significant if compared to other higher crustaceans benthic fauna of the cooling reservoir, because the bulk of these inhabit among the macrophytes in the littoral zone of the reservoir and in the open areas of the cooling pond it is very rarely recorded.

The dynamics of the changing population of the Ponto-Caspian polychaetes and higher crustaceans of the zoobenthos of Kuchurgan reservoir for the period of 1997-2013 is presented in Figure 1.

Figure no. 1 The dynamics of changes in abundance (ex/m²) of the Polychaetes and higher crustaceans of the Kuchurgan reservoir in 1997-2013



Among the molluscs of the Ponto-Caspian fauna complex of the Kuchurgan reservoir we recorded *Theodoxus fluviatilis*

and *Hypanis pontica*. The most massive component of Ponto-Caspian malacofauna of the Kuchurgan reservoir is *Dreissena*

polymorpha. Over the past decades after the recession of the abundance and biomass of the molluscs in the period of maximum level of thermophication of cooling pond in 1981-1984, an increase in the number of the population quantitative indicators of *D. polymorpha* has been observed. The reduction of the thermal load in recent years, was accompanied by increased biomass of the zebra mussel, which has grown since the mid-1980s by 1.5-2 times (Philipenko 2008).

In 2004, in the Kuchurgan reservoir it was identified for the first time in samples isolated instances of *Dreissena bugensis*, which previously had not been noted in the reservoir (Philipenko and Leiderman 2006; Philipenko 2010). According to some opinions (Mitchell et al. 1996), the settled representation of *D. polymorpha* as a shallow water and warm water inhabitant, and about *D. bugensis* – as a deepwater and cold water inhabitant - are erroneous. Probably this explains the possibility of the zebra mussel settling in the reservoir. We supposed that *D. bugensis* could appear in the reservoir in the form of pelagic larval stages during water exchange with the sleeve of the Dniester – Turunchuk rivers.

According to the opinion of Starobogatov (1994), the current registering of presence of *Dreissena bugensis* into fresh water is a repeated return to fresh water mass and must be accompanied by a process of speciation, if oligohaline water masses in the Black Sea region will be more stable over time and space.

Rezumat:

FAUNA BENTONICĂ PONTO-CASPIANĂ DIN BAZINUL DE ACUMULARE KUCHURGAN DE LA STAȚIA TERMoeLECTRICĂ CENTRALĂ A MOLDOVEI

Articolul prezintă date despre relictele bentonice Ponto-Caspiene din bazinul de acumulare Kuchurgan. Au fost semnalate numeroase specii bentonice și s-a urmărit

dinamica populațiilor de polichete și amfipode pentru perioada 1997-2013. Deasemenea, a fost confirmată prezența speciei *Dreissena bugensis* în bazin.

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