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FEATURES OF FORMATION OF BOTTOM SEDIMENTS IN THE FLOODLAND WATER BODIES OF LOWER REACHES OF THE DNIEPER

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Abstract. The article shows the distribution of bottom sediments in typical water bodies of the lower reaches of the Dnieper in the modern period. Analysis of data for the period from the 80s of the last century to the present time showed that the processes of sedimentation and silt accumulation in all types of water bodies intensified in the research region during this period. The main causes and genesis of the processes of significant accumulation of silt in water bodies of the research region in the modern period have been established.

Keywords: bottom sediments; sedimentation; reservoirs; channel network; estuary of the Dnieper

The bottom sediments below the Dnipro are formed in conditions of a slight inclination of the water surface. This determines the nature of sedimentation, its type and granulometric composition.

The bottom of the channel network below the Dnieper is represented by sands

and silty sands. Near the Kakhovska HEPS, the largest sediment fractions are sedimented. Downstream, the share of large fractions decreases, while that of small fractions increases. Along the width of the stream, the share of large fractions of sand decreases from the line of maximum depths to the shores. There are silts in places, mainly in rivers with low flow (Kamenikha, Verkhnia Konka, Pidpilnya, Borshchevka) and in areas with significant anthropogenic load (Ingulets, Viryovchyna, Koshova).

Depending on the substances that form them, bottom sediments in anthropogenically affected areas of water bodies have properties different from background ones, in particular, a characteristic smell and color. Water areas under anthropogenic influence, as a result of changes in the chemical composition of water, are subject to greater siltation than natural water bodies [2, 9, 14].

In reservoirs below the Dnieper, the conditions for the formation of bottom sediments directly depend on the intensity of external water exchange and the distance from the Kakhovska HEPS [8].

The most flowing in the lower reaches are the reservoirs of the Dnipro delta section. Due to this, the bottom sediments in them are mainly sand and silty sand. An example of such reservoirs is the Nizhnii Sabetskyi, Kaznachiivskyi estuaries and the Frolovo lake, located in the floodplain of the Dnipro delta near the Kakhovska HEPS (at a distance of 11, 18 and 20 km, respectively).

The high fluidity of these reservoirs contributes to the rapid change of water masses (the period of external water exchange is 2–4 days). The bottom sediments in them are presented in the form of sand of various sizes. There is a tendency to increase the areas of these water bodies covered with vegetation, but the type of bottom sediments was practically not affected by such changes.

Reservoirs located below 60 km from the Kakhovska HEPS have a slightly weaker external water exchange. The daily amplitude of water level fluctuations in this area is almost half as much as in the lower bay of the Kakhovska HEPS. Under the condition of such insignificant daily fluctuations of the water level, the period of external water exchange of delta reservoirs is on average 13–15, and in some it

exceeds 25 days [6, 15-17]. In this regard, silt accumulation processes are actively taking place in the water bodies of the delta, located below Kherson, and the largest volume of silt deposits is noted and other biological processes occur, contributing to the accumulation of organic substances and sediments [7, 10, 18, 20]. Accumulation of silt in this area occurs even in flowing reservoirs that are large in area. An example of such reservoirs is the Stebliivskyi and Kardashinskyi estuaries.

The Stebliivskyi estuary is located in the flood plain below the Dnieper on the island of Karantinnyi. The water area of the Stebliivskyi estuary is dominated by bottom sediments represented by silty sand and mud (34.5 and 34.3% of the bottom area). A slightly smaller area is occupied by sand dunes – 27.1% of the area. Clay silt and sand account for the smallest share of the reservoir – 3.9 and 0.2% of the area, respectively. The soils of the Stebliivskyi estuary consist mainly of medium–sized fractions. The smallest share falls on sandy soils, which do not occur at all in the bottom deposits of the upper (anthropogenically modified) part [13].

The Kardashyn estuary is located on the left–bank floodplain of the Dnipro delta in the area of the Kardashynka village. Bottom deposits in the form of silt and silty sand prevail in the estuary (37.2 and 32.5% of the area). A smaller area is occupied by sand dunes – 20.5%. Sandy soils account for the smallest share of the water area of the estuary – 9.8%. The greatest thickness of muddy sediments is noted in the central part of the upper part of the estuary and is 0.6 m [1, 4].

Bottom sediments in natural reservoirs are characterized by depth zoning. Sands and silty sands prevail in shallow water. With increasing depth, muddy fractions begin to dominate their composition. As a result of insignificant external water exchange and sufficiently high biological productivity of reservoirs below the Dnieper, bottom sediments in them consist mainly of organic substances and biogenic elements (by 60–70%) [1, 4, 13].

In delta reservoirs with a period of external water exchange longer than 15–20 days, processes of silt accumulation occur more intensively. An example of such water bodies is Lake Skadovsk-Pohorile and Oleksiivskyi estuary [11, 19].

Lake Skadovsk-Pohorile is located in the west of the island. Quarantine. With

an average depth of the reservoir of 0.5 m, the silt thickness in its basin is 0.8–1.2 m. The Oleksiivskyi estuary is located on the left bank floodplain above the highway bridge over the Dnipro in the area of the city of Oleshki. Bottom sediments are represented by a significant layer of viscous clay silt (up to 1.3 m).

In these and other weakly flowing reservoirs of the Dnipro delta, the main component of bottom sediments is organic matter. In the seasonal distribution, the processes of silt accumulation are the least pronounced in winter and become more active in the summer–autumn period. This is explained by a number of reasons, the most important of which is the overgrowth of canals and creeks with higher aquatic vegetation. During this period, the maximum development of hydrobionts, which supply material for the formation of bottom sediments, is observed.

The bottom sediments of the sea edge of the Dnipro delta are of particular interest. Comparing the data of modern on–site studies with literary sources of the late 70s of the last century, it is possible to note the steady change of sandy soils to silty sands and silts. The silt thickness here, depending on the characteristics of a separate water body, is 0.15–0.25 m [3, 5, 12].

The soils of the water bodies of the sea edge of the delta and many reservoirs below the Dnipro are everywhere characterized by the release of hydrogen sulfide, which indicates a significant proportion of organic substances in their composition. The insignificant share of the mineral component of the bottom sediments of the mouth of the Dnieper is explained by the fact that the flow of suspended sediments in the lower reaches is small. Since most of the suspended matter settles in the reservoirs of the Dnipro cascade of the HPP, the waters of the lower reaches of the Dnipro are very bright. According to our regular observations, the average amount of suspended matter in the water near Kherson is 15–20 g/m^3. Its maximum values in the channel network are recorded during the spring irrigation period and do not exceed 45–50 g/m^3.

We associate such changes in the bottom sediments of the sea edge of the delta with the mode of operation of the Kakhovska hydraulic system, which does not ensure the spring washing of the bays with Dnieper water, and with the decrease in

the natural water content of the Dnieper in recent decades.

The above–mentioned features of bottom sediment formation indicate that the active accumulation of silt in water bodies below the Dnipro during the last 40 years occurs mainly as a result of the accumulation of organic compounds produced by the biotic component of its own water ecosystem.

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