

## EKOLOGIA

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### **THE ENVIRONMENT CONDITION OF MEDIUM AND SMALL ARTIFICIAL RESERVOIRS USING MACROPHYTES**

The ecological state of small and medium artificial reservoirs for macrophytes is assessed. The role of these reservoirs in preserving the vegetation diversity and supporting the sustainability of the river basin ecosystem is shown. Determined trophic status of reservoirs and water quality by macrophytes.

**Keywords:** reservoirs, macrophytes, bioindication, water quality classes, trophic status of the reservoir.

#### **Introduction**

Nowadays an active study is made of the possibilities of using bioindicators of different types of macrophytes, fish, and also microscopic inhabitants of the water column – phytoplankton and zooplankton [1–4].

The most accurate results of the bioindication of reservoirs are the study of organisms that, in the case of changes in the complex environment, are unable to quickly and completely leave the biotope. These include, first of all, rooted aquatic plants – macrophytes.

The development of an assessment of the ecological status of reservoirs for aquatic macrophytes was started relatively recently. The vegetative cover is plastic and sensitive to changes in the environment, reflects the hydrological regime of the reservoir, its trophic status, the stage of development, the specificity of the chemistry of water, etc. Even a preliminary survey of the vegetation of the reservoir allows for an express assessment of its ecological status. Good results of bioindication for

macrophytes can be obtained in the case of studying the aquatic vegetation of an artificial reservoir with a well-developed shallow zone (waters of a water depth of up to 2 m).

Bioindication of the ecological state of the reservoir for macrophytes is carried out by means of assessment:

- species composition of macrophytes;
- degree of development of certain species or groups of macrophytes;
- availability of specific types of indicators and indicator groups;
- spatial distribution of thickets in the reservoir.

Previous studies on the assessment of the ecological status of reservoirs by macrophytes were carried out mainly at large reservoirs of the main river basins of Ukraine, in particular, the Dnipro, the Dnicster, and the Southern Bug (Yatsyk A.V., Chernyavska A.P., Basyuk T.O., Makrushin A.V., Abakumov V.A. and others). The issue of the same issue with regard to artificial reservoirs of the basins of the middle and small rivers was not elucidated.

### **Task definition**

Therefore the purpose is an assessment of the ecological state of medium and small artificial reservoirs of the basins of the Ros River and the middle course of the Southern Bug according to macrophyte species indicators of the environment.

### **Results**

Field studies were carried out in the most regulated river basins in Ukraine [5, 6] – the Ros and the Southern Bug (middle current). The study of macrophytes was carried out on medium and small reservoirs and ponds of the Ros river basin and 19 reservoirs and ponds of the average flow of the basin of the Southern Bug River. In artificial reservoirs, the reophylic group of macrophytes inferior to the limnophilic site. They are represented by thickets of *Phragmites australis*, *Typha angustifolia*, *Nymphaea alba* L., *Potamogeton pectinatus* L. Indicators of limnophilic conditions are

characteristic for reservoirs of bulk and flood types such as Nove, Staroprylutske (Lower), Staroprylutske (Upper), Pykivske (Southern Bug Basin).

In shallow water reservoirs and ponds, swamping processes are usually observed. In such conditions, a specific macrophyte complex develops and dominates: *Typha latifolia* L., *Ceratophyllum demersum*, *Lemna minor* and *Spirodela polyrrhiza*.

In determining the trophic status of reservoirs it was found that most of the studied reservoirs are mesotrophic, meso-eutrophic and eutrophic. Increase of the trophic status of the reservoir is observed due to the intensification of agricultural land use, in particular the plowing of coastal areas.

The mesotrophic type of reservoirs was installed according to macrophytes such as *Potamogetyn compressus*, *Potamogetyn perfoliatus*, *Nuphar lutea*, *Ceratophyllum submersum*.

Meso-eutrophic status has reservoirs with the following macrophytes-indicators: *Scirpus lacustris*, *Batrachium fluitans* L., *Potamogeton crispus* L., *Lemna trisulka*.

The eutrophic type of reservoirs is determined by macrophytes indicating *Ceratophyllum demersum* L., *Myriophyllum spicatum* L., *Potamogeton pectinatus* L., *Nymphaea alba* L., *Lemna minor* L., *Spirodela polyrrhiza* (L.) Schleid.

In conducting research on the species diversity of macrophytes of reservoirs, it was established that the Staroprylutsk (lower) reservoir, which is located on the river Desna (left tributary of the Southern Bug River), is the most overgrown among the reservoirs. The total share of overgrown water plants is more than 50% of the area of the reservoir. In the upper reaches of the reservoir, air-water groups of water plants consisting of *Typha latifolia* L., *Typha angustifolia* and *Phragmites australis* prevail. They form a solid lane along the shores.

The composition of the thickets of the Staroprylutsk (bottom) reservoir is characterized by a peculiar location. The first zone (with a depth of 1 m) forms the cenoses of the air-water plants *Phragmites australis* and *Typha latifolia*, *T. angustifolia*. In waterlogged floodplains, flood plains form *Glyceria maxima*

(*C.Hartm.*) *Holm* and *Carex appropinquata* Schum, *Carex acuta* L, *Carex pilosa* Scop, *Carex distucha*), *Carex Hartmanii*. Aero-aquatic plants, developing and unevenly going out to the main plaice, form peculiar semi-isolated gulf bays, on which, forming the following zones, abundantly grow water macrophytes.

The second zone (with depth from 0,5 to 1,5 m) – a zone of immersed plants. The reservoir is a complex variable-dominant complex formed by *Potamogeton crispus* L., *Potamogeton pectinatus* L. and *Myriophyllum spicatum* L. Such thickets extend almost completely along the coast of the reservoir.

The third zone (with a depth of 0.8 to 2.0 m) forms the *Nuphar lutea* group (this species is listed in the Green Book of Ukraine Phytocoenoses) [7], in which *Potamogeton perfoliatus*, *Potamogeton crispus* is also constantly growing. Also during the process we noted such species of plants as *Epilobium hirsutum* L. and *Virgatum* L.

Voronivetske (channel) reservoir, which is located on the river Snyvoda (left tributary of the Southern Bug River) overgrown with water vegetation is slightly less that only 20% of its area is occupied by thickets of macrophytes. The upper part of the reservoir overgrown more, here the area of thickets occupies 40%. The main vegetation massifs in the reservoir are concentrated in the upper and middle sections in the form of a ribbon along the shores. They are formed by *Phragmites australis* (Sav.) Trin.ex Steud., less often – *Typha latifolia* L., *T. angustifolia* L. and *Carex appropinquata* Schu), *Carex acuta* L, *Carex pilosa* Scop., *Carex distucha*, forming a peculiar swamp massif . In reservoirs of various levels of isolation (straits, lakes of the bays), the grouping of macrophytes forms a peculiar mosaic composed of cenoses with domination of *Nuphar lutea* L. Among these groups also grow *Lemna minor*, *Spirodela polyrrhiza* *Ceratophyllum demersum*. It is also worth noting that on the Voronivetskyk reservoir there are *Nymphaea alba* L massifs, which are included in the phytocoenoses of the Green Book of Ukraine.

Pond with Shepiivka up to 36% overgrown with aquatic vegetation (open wetlands). The shallow area is 14% of the total area of the water mirror 50.3 km<sup>2</sup>. Under conditions of waterlogging, a complex of macrophytes such as *Carex acuta* L., *Phragmites australis* L., *Typha angustifolia* L., *Ceratophyllum demersum* L., *Lemna minor* L. and *Spirodela polyrrhiza* L. It is worth noting that large ponds are occupied

by *Nuphar lutea* L., which are listed in the Green Book of Ukraine as phytocenoses and are one of the indicators of quality water [7]. *Potamogeton crispus* also grows in the groups *Nuphar lutea* L., *Lemna minor* L., *Spirodela polyrrhiza* (L.) Schleid, *Batrachium fluitans* L., *Scirpus lacustris* and *Ceratophyllum demersum* L. Also involved in the formation of this "mosaic", often enough to wedge in the middle of thickets of air and water plants.

#### IV. Conclusions and perspectives of further studies

Thus, our bioindication of the ecological state of these reservoirs for macrophytes has revealed that vegetation groups of the Staroprylusk (lower) reservoir are represented by plants by indicators of rheophilic conditions, which are indicators of a clean aquatic environment – II class water quality; Voronivetsk reservoir – macrophytes of limnophilic conditions, according to which water bodies are also classified as Class II water quality; for a pond with Shepiivka is characterized by processes of waterlogging, where water is polluted, which corresponds to the III class water quality. The investigated water objects are grouped into two groups: medium-thickened (Voronivetsk reservoir, it was in the Shepiivka village) and strongly overgrown (the Staropryluk (lower) reservoir). The area of overgrown reservoirs, stakes macrophytes varied from 6 to 95% and increased with a decrease in the average depth of reservoirs.

Almost 30% of investigated artificial reservoirs deserve inclusion in the basin ecosystem, because there are, besides massive, ecologically important and rare species requiring protection. In their presence, 28% of the surveyed reservoirs and 25% of the ponds represent a significant environmental interest.

In order to ensure the conservation of biodiversity of artificial reservoirs, it is necessary to implement monitoring of populations, their protection, to develop a program for the conservation of populations and their reproduction under natural conditions. Make maps of areas of distribution of green leafy and reddish plants of artificial reservoirs in order to identify their natural reserves.

To develop proposals for the formation of a representative ecological network of artificial reservoirs of the basins of the most regulated rivers of Ukraine, in

particular, the Ros, the Southern Bug, the Dniester for the preservation of rare and endangered plants.

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