UDC 574/2: 502.5 **V. V. Khomych**

SPECIES DIVERSITY OF HYDROBIONTS COMMUNITIES IN STEBLIVSKE RESERVOIR AT THE ROSS RIVER

Introduction. *Korsun-Shevchenkivskyi reservoir is the lower in reservoir cascade at the Ros river. It gets water around the upper watercourse of the river and, of course, carry the stream of the surface, industrial and domestic waste water. On the other side of the upper river sections a significant number of fish and other hydrobionts organisms come to the said reservoir during spring and autumn river bed washes.*

The purpose *of the study was to determine the species composition of hydrobionts of reservoir and its ecological state, such as hydrological, hydrochemical and hydrobiological regimes.*

Methods. *Research at Korsun-Shevchenkivskyi reservoir at Ros river was held in September 2013. Herewith the hydrochemical regime (16 indicators) and quality of the water environment, species composition, number and biomass of major groups of hydrobionts (phytoplankton, zooplankton, ichtiofauna and macrozoobenthos) have been reviewed. Sampling was done by 8 points.*

Results. *As result of studies it was found that a significant impact on the hydrological and hydrochemical regimes is made by surface and ground water, the main components of which are hydrocarbons (329,4 mg / l). There are 53 species from six departments recorded in phytoplankton. Centric diatoms dominated by biomass – Stephanodiscus hantzschii and Aulacoseira granulata. Zooplankton includes 40 taxons out of three major taxonomic groups belonging to 35 taxons of the first order. Among them 25 taxons were rotifers (Rotatoria), 9 taxons – copepods (Copepoda) and 6 species – cladoceran (Cladocera). In macrozoobenthos species composition was found 39 species, including: flat (Turbellaria), round (Nematodes) and annelid worms (Oligochaeta, Hirudinea); crustaceans (Cladocera, Isopoda, Mysidacea) insects (Odonata, Ephemeroptera, Coleoptera, Diptera), mollusks (Gastropoda, Bivalvia). In ichtiofauna there were found 22 species of fish from 7 families. Maximum number of fish represented introduced by carp family Cyprinidae – 12 species (Leuciscus leuciscus, Rutilus rutilus, Scardinius erythrophthalmus, Alburnus alburnus, Leucaspius delineatus, Blissa bjoerkna, Abramis brama, Rhodeus amarus, Pseudorasbora parva, Gobio gobio, Carassius auratus, Tinca tinca). Perch Percidae contain 3 types of fish (Sander lucioperca, Perca fluviatilis, Gymnocephalus cernuus). For two species of fish have sharplings Gasterosteidae (Pungitius platygaster, Gasterosteus aculeatus) and gobiid Gobiidae (Neogobius fluviatilis, Proterorhinus marmoratus). One species – loaches Cobitidae (Cobitis taenia), pickerel Esocidae (Esox lucius) and loachgobies Odontobutidae (Perccottus glenii).*

Conclusion. *As a result of comprehensive research conducted at Korsun-Shevchenkivskyi reservoir at the Ros river in September 2013 it was found that the water quality meets the fisheries regulations. There were 53 species of six divisions recorded in phytoplankton, zooplankton includs 40 taxons of three major taxonomic groups, 39 species of invertebrate were found in species composition of macrozoobenthos, ichtiofauna is represented by 22 species of fish from 7 families.*

Key words: *hydrochemical regime, phytoplankton, zooplankton, macrozoobenthos, ichtiofauna, Koropetskiy reservoir, Korsun-Shevchenkivskyi reservoir.*

Topicality of Research. The Ross River is right, one of the biggest tributaries of the Dnieper River, its length is 378.3 km, the basin area – 12,616 km^2, the average slope 0.55%. Ross is one of the most regulated rivers in Ukraine. There are 66 reservoirs with total area of 8,612.73 hectares built in the basin on the river there are 10 impounding reservoirs on the Ros river [1]. Steblivske reservoir is second largest and is located in the middle reach of the river. He get water around the upper watercourse of the river and, of course, carry the totality of the surface, industrial and domestic waste. On the other side of the upper river sections a significant number of fish and other hydrobionts come to the said reservoir during spring and autumn river bed washes. Due to this fact **the purpose of our study** was to determine the present species composition, density and biomass of hydrobionts of Steblivske reservoir on the Ros river.

Materials and methods

Research was held in September 2013 on eight points at Steblivske reservoir, located on the Ross river (Dnipro basin) near uts. Stebliv, Cherkasy oblast (Fig. 1).

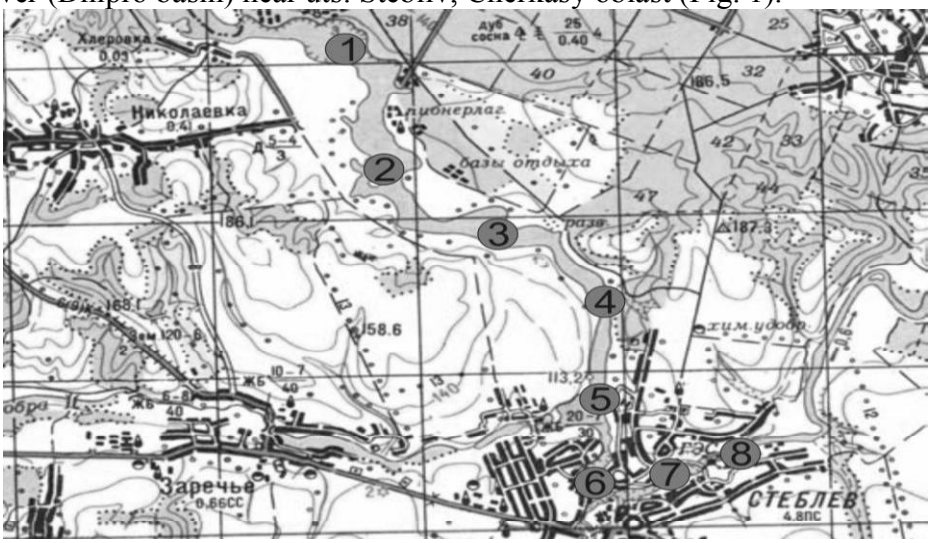

Fig. 1. Researches points

Hydrochemical state of the aquatic environment indicators studied in accordance with conventional methods [2]. Chemical analysis of water held in the laboratory of hydrochemistry department at the Ukrainian Research Hydrometeorological Institute. Samples collection of phytoplankton was carried out by standard methods [3, 4]. Determination of species composition, abundance and biomass conducted by employee of the Institute of Hydrobiology of the NAS of Ukraine O.V. Manturova. Zooplankton samples were taken with Apstein net (sieve No. 72), having percolated 100 dm^3 of water [4]. Macrozoobenthos samples were taken with sectional bottom sampler with gripping area of 10 cm*2* capture [4-6]. The processing of samples carried out by the staff of General Zoology and Ichthyology Department L.I. Demchenko and O.V. Degtyarenko. The author express his sincere gratitude to above-mentioned persons.

Ichthyofauna analysis made under results conducted with hatchling small dragnet portage by standard methods [7, 8]. Additional information received from the local residents and fisherman amateur. The fish species identification was defined in accordance with determinants [8, 9]. Desk and statistical processing of material is conducted by standard ichthyological methods [7, 10, 11].

Results and discussion

Steblivske reservoir by volume and area is the second largest on the Ross river: Area – 6.56 km^2, volume – 15.7 million m^3, length – 37 km. The average depth is 2,2-2,5 m, shallow zone (depth up to 2 m) occupied one third of Steblivske reservoir area [12]. The existence period of this reservoir is long enough. The first time Steblivske reservoir was commissioned in 1931, in 1952 dam was rebuilt. It helped stabilization of hydro ecosystem at this stage [13].

The chemical composition of water in Steblivske reservoir on the Ros river in September 2013 was as follows: water mineralization is 535,17-540,3 mg/l. The hardness of water is 5,4-6,1 mEq/l. The content of calcium ions - 56,0-58,0 mg/l, magnesium – 31,2-39,6 mg/l, sulphate 34,0-40,0 mg/l, chloride – 39,1-42,6 mg/l. Hydrocarbonate water. Predominating ions: HCO^3 – 323,3-341,6 mg/dm^3. The content of ammonia nitrogen was within existing MPC – 0,112-0,205 mg N/l. The average content of NO^2 ions – in September 2013 amounted to 0,0009-0,0143 mg N/l. The maximum concentration of nitrates in water is 0,606-1,238 mg N/l. The mineral forms of nitrogen prevail – 0,72-1,402mg N/l. The content of mineral phosphorus ranges 0,47-0,645 mg P/l. Sodium – 15,7-33,0, manganese – not

found, potassium-sodium – 23,5-49,5 mg/dm^3, potassium – 7,8-16,5mg/dm^3, iron – was not found. The content of dissolved in water oxygen 7.9 – 10.7 mg O_2/l. Hydrogen concentration pH of 7,52-8,28 which is the norm [14].

Phytoplankton of Steblivske reservoir is represented by 56 species of algae from 7 divisions. The most abundant species were green, mostly from Chlorococcales – registered 26, diatoms (12) and blue-green algae (8). The number of species in the samples ranged from 24 to 35. Common species, that met in significant amounts in all samples were the following: *Stephanodiscus hantzschii, Aphanizomenon flos-aquae, Chlamydomonas sp., Oocystis borgei, Monoraphidium contortum, Scenedesmus quadricauda* and others. It should be noted that Euglena, a significant number of which might be expected, met only by single cells.

In terms of biomass diatoms dominated in all samples. It should be noted that among them centric class dominated, including *Stephanodiscus hantzschii,* which was the main dominant in all samples except № 1. It should be noted that the prevalence of centric diatom is considered an indicator of eutrophication of reservoirs and the ratio of centric and pennate classes used as one of the indicators for water quality. Except mentioned kind in the given kind, dominant complex included *Aulacoseira granulata* and *Synedra ulna*, and of the other – *Gymnodinium sp.* and *Chlamydomonas sp.* Parts of other divisions were insignificant. Saprobity indices in the Steblivske reservoir stayed within β-mesosaprobic zone. The high species richness, especially of Chlorococcales and diversity (under Shannon indices) is the basis for the full regeneration of phytoplankton in the new season.

Zooplankton of Steblivske reservoir represented by 46 taxons of three major systematic groups belonging to 40 senior taxons. Among them, 29 species composed of rotifers (Rotatoria), 11 species – crustaceans copepods (Copepoda) and 6 – cladocera crustaceans (Cladocera). The most diverse group represented by rotifers. Common species, that met in significant amounts in all samples were the following: rotifers *Euchlanis dilatata*, representatives of the family Brachionidae – *Brachionus diversicornis, B. angularis, B.* quadridentatus, and cladocera *Chydorus sphaericus*, *Daphnia longispina* and copepods *Thermocyclops oithonoides*. The number of species in the samples ranged from 23 to 28.

The dominating group by number were rotifers and copepods crustaceans, and by biomass – copepods by means of larvae and young cladocera and crustaceans (Table 1). Among individual species in dominating complex included shell-less rotifers *Synchaeta sp., Asplanchna priodonta, Brachionus diversicornis* and representatives of pond complex *Daphnia longispina, Diaphanosoma brachyurum, Chydorus sphaericus.*

Table 1

Abundance and biomass of main groups of zooplankton in Steblivske reservoir

Samples	Rotatoria	Copepoda	Cladocera	Total
1	15,22 0,01	1,33 0,01	0,36 0,02	16,91 0,04
3	78,07 0,29	34,70 0,45	1,96 0,12	114,73 0,56
5	93,05 0,20	102,14 0,30	0,59 0,16	195,78 0,66
8	2,38 0,01	2,90 0,03	4,98 0,14	10,26 0,17

Note: above line – abundance, th. specimens/m^3, under line – biomass, g/m^3

Describing the structural and integral indicators of zooplankton at Steblivske reservoir it can be argued that at all stations the overall picture was similar. In terms of number rotifers and copepods nauplii usually dominated and by biomass larger hydrobionts - asplanchna,

daphnia, chydorus. In terms of biomass at all stations, this reservoir is characterized as mesotrophic.

The Shannon index values indicate oligo dominant character, i.e. balanced zooplankton group (Table 2). Saprobity indices at stations №1 and №5 (1,21 and 1,43) meet oligosaprobic area, i.e. belongs to the category of clean water class "clean" water, and at stations No.3 and No.8 meet β-mezosaprobic area, indicating a moderate organic pollution and categorized as enough clean water class "clean" water.

Table 2

Integrated indexes of zooplankton in Steblivske reservoir

Samples	Saprobity index, *S*	Saprobity area	Shannon index, H/N	Shannon index, H/B
1	1,21	o	2,28	3,00
3	1,74	β-m	3,08	2,99
5	1,43	o–β-m	2,17	2,37
8	1,68	β-m	2,59	2,11

Macrozoobenthos in Steblivske reservoir is characterized by sufficiently large qualitative composition and high quantitative characteristics. In macrozoobenthos species composition was found 42 taxon of species and superspecies rank, including: flatworms (Turbellaria) and roundworms (Nematodes) were represented by one type of each; 3 species of oligochaetes (Oligochaeta); 3 types of leeches (Hirudinea); isopoda crustaceans (Isopoda) 1 species was counted; class of insects composed of dragonflies (Odonata), stoneflies (Plecoptera) and hemipterans or bugs (Heteroptera) had 1 for each type; larvae of beetles (Coleoptera) counted 3 types; 2 species of chironomids (Diptera), 25 species of mollusks (Mollusca), 20 of which belong to gastropods (Gastropoda) and 5 - to bivalve (Bivalvia).

Among taxonomic groups in the grouping in general a leading role played by mollusks and chironomids oligochaetes complex forming 64% of species total amount, other groups percent was within 3-5% of the total. The dominant complex of species at all stations formed by 8 species, among which by density in the reservoir in general most were oligochaetes and chironomids and mollusks - less, while by the biomass mollusks were the dominant group (Table 3).

Table 3

Abundance and biomass of main groups of macrozoobenthos in Steblivske reservoir

Taxons	№ 1	№ 2	№ 3	№ 4	№ 5	№ 6	№ 7	№ 8
Oligochaetes	76 0,069	144 0,153	184 0,191	136 0,128	110 0,096	203 0,215	181 0,178	216 0,211
Dragonflies and stoneflies larvas	52 0,709	21 0,415	28 0,633	72 1,109	69 1,084	84 1,214	78 1,152	46 0,688
Chironomids	160 0,954	67 0,371	228 1,544	541 5,238	506 4,534	560 5,254	488 4,370	510 4,853
Mollusks	81 24,950	112 31,153	61 19,323	427 24,950	674 58,153	881 58,950	694 61,153	908 74,950
Total	369 26,682	344 32,092	501 20,147	1176 31,425	1359 63,867	1728 65,633	1441 66,853	1680 80,702

Note: above line – abundance, specimens/m^2, under line – biomass, g/m^2

Among all variety of benthic invertebrates at Steblivske reservoir the most species are observed among shellfish types, which are an important part of hydroecosystem. On the one

hand, they are Consumers of different levels, on the other – this group of invertebrates is able to build up a substantial biomass, which is used by various animals, including fish. In addition, the shellfish are very sensitive to environmental change and in this aspect act as indicators of reservoir state.

Mollusks groups in studied reservoir composed of both bivalves and gastropods. Due to the high filtration properties bivalves are involved in the purification of natural water from suspended in them particles of mineral and organic origin. These mollusks absorb from the environment various chemical compounds, in particular, heavy metals ions, pesticides, microelements, radionuclides and accumulate them in their body [5, 6]. In addition, freshwater mollusks are important objects for fish nourishment. Therefore, an important characteristic of the reservoir state is the presence in it of bivalves and its proportion with gastropods. In terms of Steblivske reservoir these indicators are within normal limits (Fig. 2).

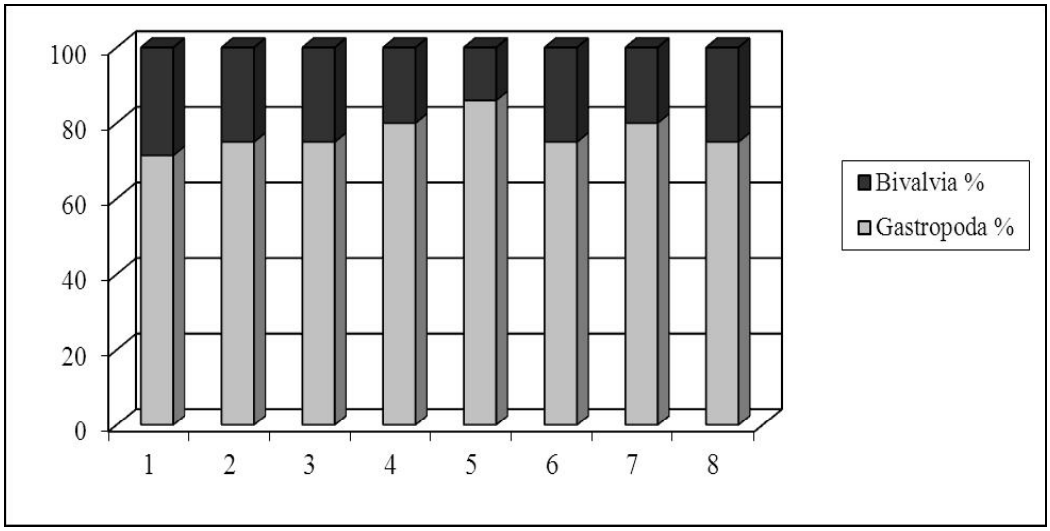

Fig. 2. Ratio (under species abundance) bivalves and gastropods mollusks on different areas in Steblivske reservoir

The above materials on species composition, abundance and biomass of major groups of hydrobionts indicate their optimum number as fodder for fish in Steblivske reservoir.

Ichthyofauna. Ichthyofauna occupies the top of the food pyramid in reservoir and is its most sensitive element which responds instantly to environmental changes. Reservoirs, as artificial ponds, are often exposed to various negative impacts related with human activities [14]. These include abrupt changes in water level, the accumulation of harmful substances as a result of surface, industrial and domestic waste water and a number of other factors that directly or indirectly influence on fish.

Steblivske reservoir located in the middle reaches of the Ros river. It is the second largest (15.7 million km³) after Bilotserkivskyi reservoir (16.96 million. km³). In all respects it comes to the influence of the top part of the Ross river, in which basin there are 1,450 ponds and 42 reservoirs with total area of 5315.6 hectares [1, 12]. This is key fact in the formation of ichthyofauna species, which is represented on the one hand with aboriginal species, on the other with introducing, that appeared in the pond by means of fish farming.

During our research in 2013 in Steblivske reservoir it was found 30 fish species from 8 families. The basis of ichthyofauna consists of the fish of carp family Cyprinidae – 17 species *(Leuciscus leuciscus, Leuciscus cephalus, Leuciscus idus, Rutilus rutilus, Scardinius erythrophthalmus, Alburnus alburnus, Leucaspius delineatus, Blissa bjoerkna, Abramis brama, Hypophthalmichthys molitrix, Pelecus cultratus, Rhodeus amarus, Pseudorasbora parva, gobio gobio, Cyprinus carpio, Carassius gibelio, tinca tinca)*. Perch Percidae counted

with 4 fish species *(Sander lucioperca, Perca fluviatilis, Gymnocephalus cernuus, Gymnocephalus acerinus)*. Three species of fish belonging to the gobiid family Gobiidae *(Neogobius kessleri, Neogobius fluviatilis, Proterorhinus marmoratus)*. Two fish species has sharplings family Gasterosteidae *(Pungitius platygaster, Gasterosteus aculeatus)*. One species – the loaches Cobitidae *(Cobitis taenia)*, catfishes Siluridae *(Silurus glanis)*, pickerel Esocidae *(Esox lucius)* and loachgobies Odontobutidae *(Perccottus glenii)* (Tabl. 4).

Table 4

Fish species diversity in Steblivske reservoir

Specie	Kutsokon, 2007	Our research clauses							
		1	2	3	4	5	6	7	8
Cyprinidae									
Leuciscus leuciscus (Linnaeus, 1758)	+	*	*	*	+	*	*	*	*
Leuciscus cephalus (Linnaeus, 1758)	+	*	*	*	*	*	*	*	*
Leuciscus idus (Linnaeus, 1758)	+	*	*	*	*	*	*	*	*
Rutilus rutilus (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+
Scardinius erythrophthalmus (Linnaeus, 1758)	+	+	+	+	–	+	+	+	+
Alburnus alburnus (Linnaeus, 1758)	+	+	+	+	–	+	–	–	+
Leucaspius delineatus (Heckel, 1843)	+	+	+	–	+	+	+	+	+
Blicca bjoerkna (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+
Abramis brama (Linnaeus, 1758)	+	+	+	–	–	–	+	–	–
Aspius aspius (Linnaeus, 1758)	+	–	–	–	–	–	–	–	–
Hypophthalmichthys molitrix (Valenciennes, 1844)	+	*	*	*	*	*	*	*	*
Pelecus cultratus (Linnaeus, 1758)	+	*	*	*	*	*	*	*	*
Rhodeus amarus (Bloch, 1782)	+	+	+	+	–	+	+	–	+
Pseudorasbora parva (Temminck & Schlegel, 1846)	+	+	+	+	+	+	+	+	+
Gobio gobio (Linnaeus, 1758)	+	–	+	+	–	+	–	–	+
Cyprinus carpio Linnaeus, 1758	+	*	*	*	*	*	*	*	*
Carassius gibelio (Bloch, 1782)	+	+	+	+	+	+	+	+	+
Tinca tinca (Linnaeus, 1758)	+	*	*	+	*	*	+	*	*
Cobitidae									
Cobitis taenia Linnaeus, 1758	+	+	+	+	–	+	+	+	+
Balitoridae									
Barbatula barbatula (Linnaeus, 1758)	+	–	–	–	–	–	–	–	–
Siluridae									
Silurus glanis Linnaeus, 1758	+	*	*	*	*	*	*	*	*
Esocidae									
Esox lucius Linnaeus, 1758	+	+	+	+	+	+	+	+	+
Gasterosteidae									
Pungitius platygaster (Kessler, 1859)	+	+	+	+	+	+	+	+	+
Gasterosteus aculeatus Linnaeus, 1758	+	+	+	+	+	+	+	+	+
Percidae									
Sander lucioperca (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+
Perca fluviatilis Linnaeus, 1758	+	+	+	+	+	+	+	+	+
Gymnocephalus cernuus (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+
Gymnocephalus acerinus (Güldenstädt, 1774)	+	*	*	*	*	*	*	*	*
Odontobutidae									
Perccottus glenii Dybowski, 1877	+	+	+	+	+	+	+	+	+
Gobiidae									
Neogobius kessleri (Günther, 1861)	+	*	+	*	*	+	*	*	*
Neogobius gymnotrachelus (Kessler, 1857)	+	–	–	–	–	–	–	–	–
Neogobius fluviatilis (Pallas, 1814)	+	+	+	+	+	+	+	–	+
Proterorhinus marmoratus (Pallas, 1814)	+	*	*	*	*	*	*	*	*
Total	33	28	30	28	24	29	27	25	29

Note: * – according to information of fishermen ad local residents

Received data we compared with the available literature data on the species of fish in the Ross River and in Steblivske reservoir. So in her study Yu. K. Kutsokon [15] observed that at the beginning of XXI century ichthyofauna of Ros river basin contains of 33 species of 9 families. It turned out that during our research there were not registered members of 1st family hillstream loaches Balitoridae (*Barbatula barbatula*). Among others not found the following two types of fish: *Aspius aspius* and *Neogobius gymnotrachelus*.

Out of listed 30 species of fish nearly a third - 8 types were indicated according to local residents information and were not fixed during our research (Tabl. 4).

Conclusions

As a result of comprehensive research conducted on Steblivske reservoir on the Ros river in September 2013 it was found that water quality is at acceptable MAC. In phytoplankton algae it was recorded 56 species of 7 divisions; zooplankton includes 46 taxons of three major taxonomic groups; in the species composition of macrozoobenthos were found 42 species of invertebrates. The high species richness, especially of Chlorococcales and diversity (under Shannon indices) is the basis for the full regeneration of phytoplankton in the new season. Indicators of species diversity of zooplankton indicate oligo dominant character, i.e. studied zooplankton group is balanced. Ichthyofauna in Steblivske reservoir represented by 30 fish species from 8 families. The largest is the carp family Cyprinidae – 17 species, perch Percidae comprise 4 fish, 3 species of fish belonging to the gobiid family, 2 fish species has sharplings family Gasterosteidae. 1 species - the loaches family Cobitidae, catfishes Siluridae, pickerel Esocidae and loachgobies Odontobutidae.

For 85 years of its existence stable hydrochemical and hydrobiological regimes established in the reservoir, as evidenced by high rates of hydrobionts species. Steblivske reservoir is very promising for future research.

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Анотація. Хомич В. В. Видове різноманіття угруповань гідробіонтів Стеблівського водосховища річки Рось.

Корсунь-Шевченківське водосховище є найнижнім в каскаді водосховищ річки Рось. В нього потрапляють води з усього верхнього водотоку річки і, безумовно, несуть з собою всю сукупність поверхневих, промислових та побутових стоків. З іншої сторони, з верхніх ділянок річки в згадане водосховище потрапляє значна кількість риб та інших гідробіонтів підчас весняних та осінніх промивок русла. В зв'язку з цим, метою дослідження було з'ясування видового складу гідробіонтів водосховища та екологічного стану водойми, а саме гідрологічного, гідрохімічного та гідробіологічного режимів. В результаті досліджень було встановлено, що значний вплив на гідрологічний та гідрохімічного режими здійснюють поверхневі та підземні води, основними компонентами яких є гідрокарбонати (329,4 мг/л). У фітопланктоні зареєстровано 53 види з шести відділів. За біомасою домінували центричні діатомові – Stephanodiscus hantzschii та Aulacoseira granulata. Зоопланктон включає 40 таксонів з трьох основних систематичних груп, що відносяться до 35 таксонів вищого рангу. У видовому складі макрозообентосу було виявлено 39 видів, в тому числі: плоскі (Turbellaria), круглі (Nematodes) та кільчасті черви (Oligochaeta, Hirudinea); ракоподібні (Cladocera, Isopoda, Mysidacea) комахи (Odonata, Ephemeroptera, Coleoptera, Diptera), молюски (Gastropoda, Bivalvia). У складі іхтіофауни було виявлено 22 види риб з 7 родин.

Ключові слова: *гідрохімічний режим, фітопланктон, зоопланктон, макрозообентос, іхтіофауна, Корсунь-Шевченківське водосховище.*

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