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**PHYTOPLANKTON OF THE PLAIN RIVER USA
(THE KUIBYSHEV RESERVOIR BASIN)**

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Data on the status of summer phytoplankton of the Usa river and its tributaries are given. 184 taxa of algae with a rank lower than the genus from 7 divisions were recorded in algoflora, with Bacillariophyta (43–57% of the composition) and Chlorophyta (23–47%) predominating in the rivers. The abundance range in algocenoses was 0.02 – 5.2 mln cells/L, that of biomass was 0.01 – 1.8 mg/L; the content of chlorophyll-*a* was 0.01 – 3.1 µg/L. The ecological heterogeneity along the watercourse causes a significant dynamics of the taxonomic composition, which is characterized by mosaic distribution in different areas, and changes in the quantitative structure of plankton communities. An increase in the specific diversity, abundance, biomass, and chlorophyll-*a* concentration from the source to the mouth of rivers is noted. The ecotone effect in the zone of mixing and transformation of the waters of the lower reaches of the watercourses and the Usinsky Bay of the Kuibyshev Reservoir is expressed in an increase in the diversity and amount of algae, an increase in the coenotic role of Cyanoprokaryota and planktonic green algae of the Chlorococcales order, which are dominant in the Usinsky Bay. The influence of hydrological conditions, the content of biogens, and anthropogenic impact on the formation of algocenoses is considered. Taxonomic composition, distribution, structural characteristics of algocenoses in the absence of biogenic limiting depend on hydrological factors, biotopic heterogeneity of natural and anthropogenic origin, whereas their relation with the content of biogens in eutrophy conditions has not been revealed. The Shannon species diversity index varied from 0.5 to 2.7 bits/specimen in river algocenoses. The minimum values were noted on the upstream sections of the rivers; the complexity of the structure is typical for the algocenoses of the mixing zones of the waters of the upper part of the Usinsky Bay and the mouths of the Muranka and Tisherek rivers, as well as for the communities of the sections of rivers with anthropogenic impact.

Key words: phytoplankton, algocenoses, Usa river, Kuibyshev reservoir, Middle Volga river basin.

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REFERENCES

- Bioindikatsiya ekologicheskogo sostoyaniya ravninnykh rek* [Bioindication of the Ecological State of Lowland Rivers]. O. V. Bukharin, G. S. Rozenberg, eds. Moscow, Nauka Publ., 2007. 403 p. (in Russian).
- Bouillon V. V. Pervichnaya produktsiya i troficheskaya klassifikatsiya vodoyemov [Primary Production and Trophic Classification of Reservoirs]. In: *Metodicheskiye voprosy izucheniya pervichnoy produktsii planktona vnutrennikh vodoyemov* [Methodical Issues of Studying the Primary Production of Plankton of Internal Waters]. Saint Petersburg, Gidrometeoizdat, 1993, pp. 147–157 (in Russian).
- Gorokhova O. G. The Composition and Structure of Phytoplankton Communities of the Usinski Bay Kuibyshev Reservoir During the “Flowering” of Water. *Izvestia of Samara Scientific Center of the Russian Academy of Sciences*, 2016, vol. 18, no. 5-1, pp. 122–130 (in Russian).
- Zinchenko T. D., Shitikov V. K., Golovatyuk L. V. Spatial Distribution Features of Bottom Communities of a Plain River in the Middle Volga River Basin. *Vestnik Tomskogo Gosudarstvennogo Universiteta. Biologiya*, 2017, no. 40, pp. 163–180 (in Russian).
- Korneva L. G. *Phytoplankton of Volga River basin reservoirs*. Kostroma, Kostromskoy pechatnyy dom, 2015. 284 p. (in Russian).
- Malye reki Volzhskogo basseyna* [Small Rivers of the Volga Basin]. N. I. Alekseevskii, ed. Moscow, Izdatelstvo MGU, 1998. 234 p. (in Russian).
- Method of Studying Biogeocenoses in Inland Water Bodies*. Moscow, Nauka Publ., 1975. 240 p. (in Russian).
- Osobennosti presnovodnykh ekosistem malyykh rek Volzhskogo basseyna* [Features of Freshwater Ecosystems of the Small Rivers of the Volga Basin]. G. S. Rosenberg, T. D. Zinchenko, eds. Togliatti, Kassandra Publ., 2011. 322 p. (in Russian).
- Okhupkin A. G. *Struktura i suksessii fitoplanktona pri zaregulirovanii rechnogo stoka (na primere r. Volgi i eye pritokov)* [The Structure and Succession of Phytoplankton in the Regulation of River flow (on the example of the Volga River and its tributaries)]. Thesis Diss. Dr. Sci. (Biol.). Saint Petersburg, 1997. 48 p. (in Russian).
- Okhupkin A. G. Dynamics of the Species Structure of Potamophytoplankton in Watercourses of Various Types. *Inland Water Biology*, 2000, no. 1, pp. 53–61 (in Russian).
- Okhupkin A. G., Genkal S. I. Ecology of Mass Species of Diatoms in the Plankton of the Watercourses of the Middle Volga Basin: Genera Species *Aulacosira* Thw., *Melosira* Ag., *Cyclotella* Kutz., *Cyclostephanos* Round, *Sceletonema* Grev., Pennate diatoms. *Inland Water Biology*, 2001, no. 1, pp. 27–25 (in Russian).
- Okhupkin A. G., Gorokhova O. G., Genkal S. I., Pautova V. N. On the Algal Flora of the Oka River Lower Reaches. *Botanicheskii Zhurnal*, 2010, vol. 95, iss. 10, pp. 1422–1436 (in Russian).
- Fedorov V. D. *O metodakh izucheniya fitoplanktona i ego aktivnosti* [Methods for Studying Phytoplankton and its Activity]. Moscow, Izdatelstvo MGU, 1979. 167 p. (in Russian).
- Ecological Bulletin*. Samara region, July 2017. Samara, FGBU “Privolzhskoye UGMS”, 2017. Available at: www.pogoda-sv.ru/docs/ecology.../sam_jul_2017 (accessed 12 May 2018) (in Russian).
- Abonyi A., Leitão M., Lançon A. M., Padišák J. Phytoplankton functional groups as indicators of human impacts along the River Loire (France). *Hydrobiologia*, 2012, vol. 698, iss. 5, pp. 233–249.
- Mischke U., Venohr M., Behrendt H. Using phytoplankton to assess the trophic status of German rivers. *International Review of Hydrobiology*, 2011, vol. 96, iss. 5, pp. 578 – 598.
- SCOR-UNESCO Working group 17. Determination of photosynthetic pigments in Seawater. *Monographs on Oceanographic Methodology*. Paris, UNESCO, 1966, pp. 9–18.