

DIATOM ALGAE (BACILLARIOPHYTA) OF THE RIVERS FLOWING INTO LAKE ELTON

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This electron microscopy study of phytoplankton from the rivers (Bolshaya Smoroda, Lantsug, Solyanka, Chernavka and Khara) flowing into a hyperhalinic lake Elton (Volgograd Region) has revealed 93 species, varieties and forms of diatom algae from 40 genera. Forty five of them proved to be new for the studied rivers, including 3 new taxa for the flora of Russia (*Amphora hassiaca*, *Halamphora* cf. *luciae*, *Nitzschia frustulum* var. *bulnheimiana*), and 10 forms were identified to the genus only. The genera *Halamphora* and *Nitzschia* (6 taxa in each genus) and *Navicula* (16) have the highest species richness. The greatest number of species and varieties is recorded in the mouth of the Khara (40) and Bolshaya Smoroda rivers (68). The following species are the most widespread in the watercourses under study: *Conticribra weissflogii*, *Fallacia pygmaea*, *Navicula capitatoradiata*, *N. lanceolata*, *N. salinarum*, *N. trivialis*, *Nitzschia frustulum*, *Tryblionella hungarica*. The taxonomic position of 30 taxa from the earlier published species lists has been specified. Summarizing the published and our data, the composition of Bacillariophyta in the studied rivers has significantly increased at the level of species (from 124 to 168 taxa) and genera (from 33 to 53 ones).

Keywords: Bacillariophyta, phytoplankton, Lake Elton, tributaries, electron microscopy, revision

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REFERENCES

- Alekin O.A. 1970. Osnovy gidrokhimii [Basics of hydrochemistry]. Leningrad. 444 p. (In Russ.).
- Balonov I.M. 1975. Podgotovka vodorosley k elektronnoy mikroskopii [Preparation of algae for electron microscopy]. – In: Methods for the study of biocenoses. Moscow. P. 87–89 (In Russ.).
- Burkova T.N. 2012. Taxonomic structure algaeflora plankton river Hara with high-mineral waters. – Samarskaya Luka: problemy regionalnoy i globalnoy ekologii. 21 (3): 25–35 (In Russ.).
- Genkal S.I., Yarushina M.I. 2017. On the morphology and taxonomy of *Paralibellus crucicula* (Bacillariophyta). – Inland Water Biology. 10 (4): 355–359. <https://doi.org/10.1134/S1995082917040058>
- Gorokhova O.G., Zinchenko T.D. 2016. The diversity and community structure of phytoplankton of highly min-

- eralized rivers of Elton lake Basin. — Voda: khimiya i ekologiya. 11: 58–65 (In Russ.).
- Houk V., Klee R., Tanaka H. 2010. Atlas of freshwater centric diatoms with a brief key and descriptions. Part 3. Stephanodiscaceae. A. *Cyclotella*, *Tertiarius*, *Discostella*. — Fottea. 10 (Supplement): 1–498.
- Krammer K. 1997a. Die cymbelloiden Diatomeen. Teil 1. *Allgemeines* und *Encyonema* part. — Bibliotheca Diatomologica. 36: 1–382.
- Krammer K. 1997b. Die cymbelloiden Diatomeen. Teil 2. *Encyonema* part., *Encyonopsis* und *Cymbellopsis*. — Bibliotheca Diatomologica. 7: 1–469.
- Krammer K. 2000. *Pinnularia*. — In: Diatoms of Europe. Vol. 1. P. 1–703.
- Krammer K. 2002. *Cymbella*. — In: Diatoms of Europe. Vol. 3. P. 1–584.
- Krammer K. 2003. *Cymbopleura*, *Delicata*, *Navicymbula*, *Gomphocymbellopsis*, *Afrocymbella*. — In: Diatoms of Europe. Vol. 4. P. 1–530.
- Krammer K., Lange-Bertalot H. 1986. Bacillariophyceae. Teil 1. Naviculaceae. — In: Die Süßwasserflora von Mitteleuropa. Bd 2/1. Stuttgart. S. 1–876.
- Krammer K., Lange-Bertalot H. 1988. Bacillariophyceae. Teil 2. Epithemiaceae, Bacillariaceae, Surirellaceae. Bd. 2/2. — In: Die Süßwasserflora von Mitteleuropa. Stuttgart. S. 1–536.
- Krammer K., Lange-Bertalot H. 1991. Bacillariophyceae. Teil. 4. Achnanthaceae, Kritische Ergänzungen zu Navicula (Lineolatae) und Gomphonema. Bd. 2/4. — In: Die Süßwasserflora von Mitteleuropa. Stuttgart. P. 1–437.
- Kulikovskiy M.S., Glushchenko A.M., Genkal S.I., Kuznetsova I.V. 2016. Identification book of diatoms from Russia. Yaroslavl. 804 p. (In Russ.).
- Lange-Bertalot H. 2001. *Navicula* sensu stricto, 10 genera separated from *Navicula* sensu lato Frustulia. — In: Diatoms of Europe. Vol. 2. P. 1–526.
- Lange-Bertalot H., Hofmann G., Werum M., Cantonati M. 2017. Freshwater benthic diatoms of Central Europe. Schmitten-Oberreifenberg. 942 p.
- Levkov Z. 2009. *Amphora* sensu lato. — In: Diatoms of Europe. Vol. 5. P. 1–916.
- Levkov Z., Danijela Mitić-Kopanja, Erwin Reichardt. 2016. The diatom genus *Gomphonema* from the Republic of Macedonia. — In: Diatoms of Europe. Vol. 8. P. 1–552.
- Levkov Z., Metzeltin D., Pavlov A. 2013. *Luticola*, *Luticolopsis*. — In: Diatoms of Europe. Vol. 7. P. 1–697.
- Nomokonova V.I., Zinchenko T.D., Popchenko T.V. 2013. Trophic state of saline rivers of the lake Elton basin. — Izvestia Samarskogo Scientific Center of the Russian Academy of Sciences. 3: 476–483 (In Russ.).
- Opredelitel' presnovodnykh vodorosley SSSR. Vyp.4. Diatomovye vodorosli [Key to freshwater algae of the USSR. Iss. 4. Diatom algae]. 1951. Moscow. 619 p. (In Russ.).
- Poulin M., Bérard-Therriault L., Cardinal A., Hamilton P.B. 1990. Les diatomées (Bacillariophyta) benthiques de substrats durs des eaux marines et saumâtres du Québec. 9. Bacillariaceae. — Le Naturaliste Canadien. 117 (2): 73–101.
- Reichardt E. 1999. Zur revision der gattung *Gomphonema*. — Iconographia Diatomologica. 8: 1–203.
- Stachura-Suchoples K., Williams D.M. 2009. Description of *Conticribra tricircularis*, new genus and species of Thalassiosirales, with a discussion on its relationship to other continuous cribra species of *Thalassiosira* Cleve (Bacillariophyta) and its freshwater origin. — Eur. J. Phycol. 44 (4): 477–486.
<https://doi.org/10.1080/09670260903225431>
- Vodno-bolotnye ugodya Prieltonya. 2005. [Wetlands of the Elton Region]. Volgograd. 27 p. (In Russ.).
- Yatsenko-Stepanova T.N., Ignatenko M.E., Nemtseva N.V., Gorokhova O.G. 2015. Autotrophic Microorganisms in River Outfalls of Lake Elton. — Arid Ecosystems. 5 (2): 83–87.
<https://doi.org/10.1134/S2079096115020109>
- Zinchenko T.D., Golovatyuk L.V., Abrosimova E.V., Popchenko T.V. 2017. Macrozoobenthos in Saline Rivers in the Lake Elton Basin: Spatial and Temporal Dynamics. — Inland Water Biology. 10 (4): 384–398.
<https://doi.org/10.1134/S1995082917040125>
- Zinchenko T.D., Golovatyuk L.V., Vykhrstjuk L.A., Shitikov V.K. 2011. Diversity and Structure of Macrozoobenthic Communities in the Highly Mineralized Khara River (Territory adjacent to Lake Elton). — Biology Bulletin. 38 (10): 1056–1066.
<https://doi.org/10.1134/S1062359011100190>