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# DEVELOPMENT DYNAMICS OF PHYTOPLANKTON COMMUNITY OF AKHPARA RESERVOIR

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Seasonal investigations of quantitative and qualitative parameters of phytoplankton symbiosis of the Akhpara reservoir was carried out in 2015. It was revealed that more than 45% of recorded algae were indicator species of organic pollution. According to surface waters classifications by trophic and saprobic (eco-sanitary) indices, the water of the Akhpara reservoir was changed from $\beta$-oligosaprob level (spring) to $\beta$-mesosaprob level (summer, autumn), which indicated that in summer and autumn the level of organic pollution increased. As a result of the study, has been revealed that the number of large single-celled and colonial species in phytoplankton community in 2015 increased compared with previous years.

***Keywords*:** phytoplankton community, quantity, biomass, saprobity level.

**Introduction.** The 141 *km* stretched Hrazdan River originates from Lake Sevan. Area of catchment basin without the Sevan Lake is 2560 $km^2$ [1]. There are two artificial reservoirs along the river: the Akhpara reservoir near to the Hrazdan City and Yerevanyan lich ("Yerevan Lake") reservoir in the Yerevan City.

The Akhpara reservoir was built in 1953 for hydroenergetic purposes and has 5.6 mln $m^3$ water volume. By accumulating river waters, the Akhpara reservoir is also used for irrigation purposes, thus contributing the rational use of Lake Sevan waters [2]. Due to the absence of treatment plants and failure of sewage systems, wastewater flows into the reservoir, which leads to ecological disbalance and deterioration of water quality of the Akhpara reservoir. This directly affects on the ecosystem of the Hrazdan River.

Algae as primary producers of a food chain, responding rapidly to the changes of water quality, and have high ecological importance in the evaluation of water monitoring [3].

The aim of the current study was seasonal investigations of quantitative (biomass, quantity) and qualitative (species composition) parameters of phytoplankton community of the Akhpara reservoir as well as the assessment of water saprobity level.

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**Materials and Methods.** The water samples were collected from an observation site located in the costal area of the Akhpara reservoir in May, July and September of 2015.

The analyses of phytoplankton parameters were done by standard methods accepted in hydrobiological studies. For the phytoplankton study, 1 *L* water sample taken from each site, then fixed with 40% formaldehyde solution (0.4% final concentration) immediately and stored dark. Further analyses were carried out under laboratory conditions [4, 5].

The qualitative and quantitative analyses of phytoplankton were executed by a XSZ-107 BN microscope in Nageotte chamber ($V = 0.1$ *mL*).

The species identification of planktonic algae was done by the keys and the guides of freshwater systems [6–10]. Saprobity index of algae was calculated [11].

**Results and Discussion.** Three groups of algae such as *Bacillaryophyta* (diatoms), *Chlorophyta* (green algae) and *Cyanophyta* (blue-green algae) were registered during the study of phytoplankton community in the Akhpara reservoir. Diatoms were dominating by quality and quantity (Fig. 1).

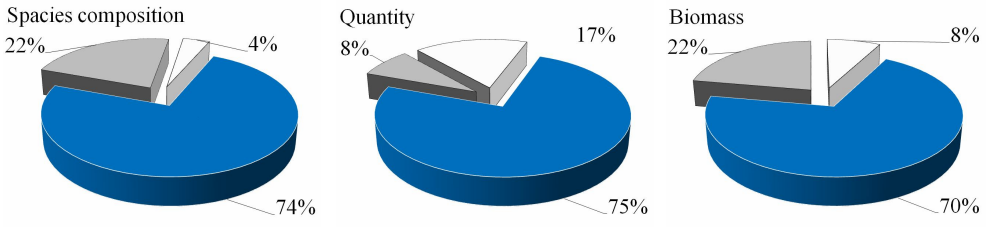


Fig. 1. Percentage of major groups of phytoplankton community of the Akhpara reservoir in terms of species composition, quantity and biomass in 2015.

Investigations carried out by Gevorgyan G. et al showed that diatom algae in Yerevanyan lich reservoir in April, 2015 previaled quantitatively, however, due to the algal bloom registered in the reservoir in June, 2015, green algae became a quantitatively dominant group in the phyoplankton community of the reservoir [12].

Totally 68 species of algae have been registered in the Akhpara reservoir, where 50 species were *Bacillariophyta*, 15 species were *Chlorophyta* and 3 species were *Cyanophyta*. *Navicula Bory* (7 species), *Nitzchia Hass*. (5 species), *Fragilaria Lyngb.* (4 species) generas of *Peantophyceae* class from diatoms have been the most abundant by species composition.

The maximum quantity and biomass of *Bacilariophyta* – 800000 cell/*L* and 4.8 $g/m^3$ were registered in autumn (Fig. 2). The dominant species from the class of *Centrophyceae* were *Melosira varians* (180000 cell/*L* and 0.9 $g/m^3$) and *Stephanodiscus astraea* (85000 cell/*L* and 0.4 $g/m^3$).

During the study large single-cell species such as *Surirella robusta, S. angustata, Cymatopleura solea, Gyrosigma attenuatum* were registered in the reservoir. Even though they have small quantity, but due to large volume of the cells the biomass of mentioned diatomic algae in the reservoir was high. In the previous studies these species were not registered [2].

The lowest quantity (469000 cell/*L*) and biomass (2.45 $g/m^3$) of diatomic algae in the reservoir was registered in summer (Fig. 2). Dominant species were *Stephanodiscus astraea* and *Nitzchia dissipata*.

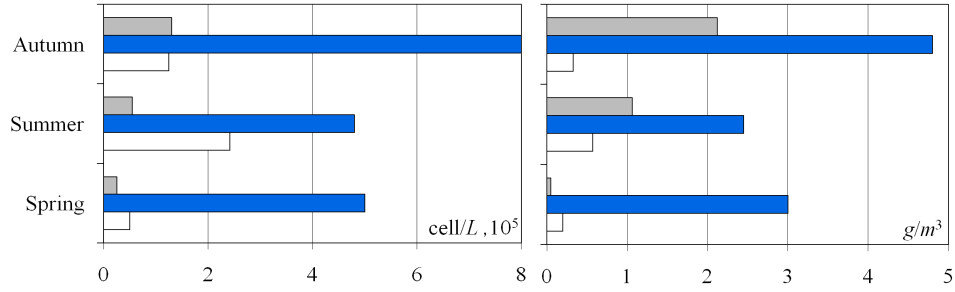


Fig. 2. Seasonal dynamics of algae quantity and biomass in the Akhpara reservoir in 2015.

*Aphanothece clathrata* and *Microcystis aeruginosa* were the main species from *Cyanophyta* group in the Akhpara reservoir in 2015. *Anabaena flos-aquae* species also was registered in summer season, but with lower quantity. The maximum quantity (237500 cell/*L*) and biomass (0.6 $g/m^3$) of blue-green algae was registered in summer. The dominant specimen was *Aphanothece clathrata*. The lowest qauntity (46670 cell/*L*) and biomass (0.16 $g/m^3$) of *Cyanophyta* was registered in spring (Fig. 2).

*Chlorophytas* had the lowest quantity in Akhpara reservoir, but by biomass they dominated *Cyanopytas*. This is the result of developement of big colonial species *Dictyosphaerium pulchellum*, *Volvox aureus* and *Pandorina morum*. Moreover, these species were not registered during previous studies [2]. The quantitative parameteres of green algae increased from spring to autumn, and in autumn their quantity became 125000 cell/*L* and biomass became 2.1 $g/m^3$ (Fig. 2).

During the study of the reservoir 31 algae from investigated species (more than 45%) were indicators of organic pollution [11].

The values of saprobic indices in the reservoir were fluctuated from 0.9 to 1.7, and the saprobity level in the reservoir was changed from $\beta$-oligosaprob level (spring) to $\beta$-mesosaprob level (summer, autumn) [11].

According to the investigations of Hayrapetyan A. et al. [13], the water of Yerevanyan lich reservoir during the investigation period corresponded to $\beta$-mesosaprob state (moderately polluted water), however the saprobic index values before (in April) and at the beginning (in June) of the period of the reservoir algae bloom were very close to the upper borderline of $\alpha$-oligosaprob state (clean water).

**Conclusion.** The investigations carried out in 2015 revealed that in the Akhpara reservoir diatomic algae were dominant by quantity and quality. The species belonging to the class of *Pennatophyceae* have been dominant by species diversity. The species belonging to the class of *Centrophyceae* have been dominant by quantity.

As a result of studies, changes in species composition of *Cyanophyta* have not been revealed compared with previous years. Large single-cell and colonial

species from *Chlorophyta* and *Bacillaryophyta* groups were registered in 2015, which were not registered during previous years.

This investigation shows, that the values of saprobic index in Akhpara reservoir were fluctuated from 0.9 ($\beta$-oligosaprob level) to 1.7 ($\beta$-mesosaprob level). The values of saprobic index in Yerevanyan lich reservoir were fluctuated from 1.5 ($\alpha$-oligosaprob level) to 1.7 ($\beta$-mesosaprob level). All of these allows to conclude that anthropogenic pressure on Akhpara reservoir was higher than on Yerevanyan lich reservoir.

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