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GENERAL BIOLOGY

System of Principles for Conservation of the Biogeocenotic Function and the Biodiversity of Filter-Feeders

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An ecologically substantiated system of protected terrestrial and water areas is an essential component of biodiversity conservation [1].

Studies by many authors [2–4] and our own works [6, 7] showed that filter-feeders play an important role in elimination of suspended particles from water and its purification. Therefore, filter-feeders provide habitats for other species in aquatic ecosystems. This implies that the problem of conservation of the filtration function in the population of hydrobionts should be properly taken into account when developing the system of conservation of terrestrial and aquatic areas.

The goal of this work was to formulate and substantiate the suggestion that the system of protected terrestrial and aquatic areas should be supplemented by sites intended to conserve the filtration function of filter-feeding hydrobionts (filter-feeders of zoobenthos, in particular). An additional goal of this work was to formulate and substantiate the system of basic principles and conditions of their protection.

Emphasis should be placed on the following aspects of this problem: the state of the population of filter-feeders (bivalve mollusks, in particular); the factors making it necessary to protect populations of filter-feeders; and basic requirements for the conditions of their protection.

The state of the populations of filter-feeders (as exemplified by bivalve mollusks).

Some species of bivalve mollusks are included in the Red Data Books of Russian Federation (34 taxa, in 2000) [8] and some other states of the former Soviet Union. In the North America and Western Europe, many populations of bivalve mollusks are also endangered and included in the IUCN Invertebrate Red Data Book [9].

In many aquatic ecosystems, there is a trend toward a decrease in the populations and biomass of bivalve mollusks at polluted sites. This concerns both freshwater [7] and marine [4] ecosystems.

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The state of filter-feeding hydrobionts should be taken into account in the context of the general state of aquatic ecosystems. Even in some reserves, the state of many aquatic ecosystems is far from satisfactory. Using the methods based on the morphometric characteristics of aquatic organisms such as the roach (*Rutilus rutilus*) and the lake frog (*Rana ridibunda*), it has been shown that the state of aquatic ecosystems in the Voronezhskii State Natural Reserve is unsatisfactory [10]. The state of aquatic ecosystems was also found to be unsatisfactory in many places outside state natural reserves: the town of Voronezh, Lake Kostomukshinskoe (Karelia), a lake in the Zheleznogorsk raion of the Kursk oblast, etc. [10].

Factors making it necessary to protect populations of filter-feeders. There are several factors making it necessary to protect populations of filter-feeders (including bivalve mollusks), including:

conservation of the gene pool as a part of biodiversity;

conservation of the gene pool as a resource and a reserve for aquaculture; and

conservation of water self-purification in natural water bodies.

Various aspects of conservation of the gene pool were considered in the preceding works on the general problems of conservation of biodiversity [11, 12] and more specific problems of conservation of invertebrates [9].

Let us consider the third factor in more detail. The role of invertebrates in self-purification of water bodies was studied by many researchers (for review, see [2–7, 13–15]). The whole volume of water in many large aquatic ecosystems can be filtrated by bivalve mollusks within the time interval from 0.7 (South San Francisco Bay) to 25 days (Narragansett Bay) [5]. Within one year, marine bivalve mollusks are capable of eliminating, from water column above 1 m^2 of bottom surface, the amount of carbon ranging from 4.9 to 263 g [5]. The importance of the general filtration activity of mollusk populations is illustrated by the data shown in Table 1.

Filter-feeders contribute to regulation of plankton populations, purification of water, and reduction in the concentration of suspended particles in water. There-

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