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**RESEARCH OF TRANSFORMATION OF BIOGENOUS ELEMENTS
IN WATER ECOSYSTEMS OF THE SOUTHERN ARAL SEA AREA**

Abstract. The mathematical imitating model which considers spatial transfer of biogenic elements for water ecosystems is presented. The model can be used for forecasting and the solution of problems of protection and rational use of natural water resources of Southern Aral Sea Area. The used mathematical simulation model also considers spatial transfer of components of phosphorus a water flow and with its help it is possible to estimate correctly the main components of receipt and account balance of phosphorus for the studied water ecosystem. The role of internal and external flows in forming of balances of separate forms of phosphorus is various. In small reservoirs intake of phosphorus from ground deposits makes direct impact on a reservoir eutrophication. It is established that intraspecific distribution of speeds of biochemical transformation P is determined in no small measure by temperature and transparency of water, and also illumination of a surface of the water.

Key words: water ecosystems, Southern Aral Sea Area, imitating model, biogenic elements, component, balance, phosphorus, eutrophication.

Introduction. One of the most important indicators of degradation in Southern Aral Sea Area is the deterioration of the water used by the population in the drinking purposes, arising owing to considerable anthropogenous impact on water resources. Considering deficiency of fresh water in Southern Aral Sea Area and universal pollution of water in the Amu Darya River, on all her extent, the Government of the Republic of Uzbekistan has developed a complex of actions for protection of water resources, to increase in water content of some lake systems and transformation of some lakes into lake and pond farms.

Change of the water mode due to natural interannual climatic changes, and also through expected large-scale water management actions can lead to violations of the balances which have developed in reservoirs between receipt and carrying out of biogenous elements and organic substances and from here to such undesirable consequences as process of an eutrophication of reservoirs and deterioration of water resources in general [1].

In recent years because of sharp increase in dumping of nitrogen and phosphorus in reservoirs and waterways, and also as a result of control of a drain of many flat rivers, in them there were peculiar violations of the hydrochemical and hydrobiological mode of reservoirs. Formation of organic substance at intensive development of phytoplankton has increased, for example, and the trophication of reservoirs [11, 5, 6, 2]. Accumulation of the biogenous elements coming to water ecosystems with an agricultural drain promotes accumulation of biogenous elements that leads to formation of a certain mode inherent in eutrophication lakes [2].

Objects and methods. Biotic components of water ecosystems reflect the trophic status of a water object which, in turn, depends on amount of the organic substances dissolved in water. According to it populations, types and communities of organisms have a certain level of tolerance at this conjuncture. There is a set of methods of assessment of a condition of water ecosystems in various parameters. At the same time most of them is applicable not to all categories of water objects and factors of influence. Some

developed methods of the integrated estimates allowing to apply them on any water objects and to assessment of the majority of factors of influence are known [3]. So, for example, the amount of the biogenous substances dissolved in water is an integrated indicator of a condition of waters and water ecosystems in general as it consists of the organic substances which have arisen in the course of activity of the organisms at all trophic levels and also brought from the pool of a reservoir as a result of natural and anthropogenous processes.

Discussion. Eutrophication of many reservoirs first of all it is caused by increase in phosphoric loading. In this regard, we have made an attempt to track regularities of distribution of forms of phosphorus in water, his balance, definition of characteristics of phosphoric loading and streams of his forms in ecosystems by means of imitating model of phosphoric system in the lakes Dautkul and Shegekul – important objects of economic value. The model is based on the principles and methodology of the system analysis: in her variety of forms of finding of substances of a different origin in the water environment, various interactions of components of the chemical and biological nature and influence on them physical, chemical and biological processes are considered. The model, on the one hand, reproduces development of processes of biotransformation and circulation of forms of phosphorus, and with another reflects variability of content of oxygen (an integrated indicator of a condition of the water environment) [7, 12].

The used mathematical simulation model also considers spatial transfer of components of phosphorus a water flow and with its help it is possible to estimate correctly the main components of receipt and account balance of phosphorus for the studied water ecosystem. The role of internal and external flows in forming of balances of separate forms of phosphorus is various. In small reservoirs intake of phosphorus from ground deposits makes direct impact on a reservoir eutrophication. It is established that intraspecific distribution of speeds of biochemical transformation P is determined in no small measure by temperature and transparency of water, and also illumination of a surface of the water. The maximum speed of consumption of DIP phytoplankton constitutes 0,39 mg of R_1 year, and allocations – 0,097 mg R_1 year. The interactions of the specified forms of phosphorus (R) considered in model constitute a basis of biochemical processes, create a certain mode of functioning of an ecosystem and a general orientation of transformation of phosphorus in a reservoir [9, 10].

Analyzing the received values P, it is possible to note that the main role in external phosphoric loading of the lake belongs to external inflow which arrives in the form of DIP (its receipt with a river drain constitutes 0,197 mg P / (l year), or 70,7% of intake of phosphorus of general. 21,2 and 2,1% are the share of a share of DP and DOP. It is established that among forms of phosphorus DIP (76,4%) dominates. The greatest carrying out of phosphorus a water flow is the share of DIP (50,6%) and of the amount of phytoplankton and bacteria of F+B (23,4%), and also phosphorus in PD detrital (17,3%) and phosphorus of organic DOP (8,7%). Possibly, it is caused by the fact that the above-named part of forms of phosphorus is connected with phytoplankton and bacteria, and a part is taken out with a drain. Especially it should be noted that the main accumulating of forms of phosphorus happens in ground deposits in the form of DIP (94,2%) where its inventories are quite big that the of processes can't but affect nature. Under certain conditions (especially anaerobic, in lack of oxygen) a part of phosphorus is released, thereby, stimulating development of autotrophic organisms, changing the level of production processes that leads to a reservoir eutrophication, that is phosphorus is a material basis of secondary pollution of reservoirs, and ground deposits – the eutrophication microcenters. At the same time, the more phosphorus arrives in the researched reservoir, the more actively in it there are processes of its transformation. Partially it is caused by influence of activity of the community of hydrobionts reacting definitely to fluctuations of external conditions. Change of a ratio of forms of phosphorus in the water arriving in a reservoir and following from it is explained, apparently, by change of conditions of transformation of phosphorus in a reservoir.

Conclusion. Thus, in recent years influence of human activities on water resources sharply amplified. To the main types of economic activity exerting the greatest impact on water resources of the region water consumption for agricultural, industrial and municipal needs, and also dumping's into reservoirs of sewage is. Forming of quality of water in water objects – process difficult, many-sided, depending on a complex of the various factors connected with functioning of water ecosystems and with conditions of a surrounding landscape and a bed of a reservoir [8, 11]. It is established that the existing economic mechanisms of conservation are inefficient first of all because don't create incentives of application of resource- and energy-saving technologies and don't provide sufficient means from payments for emissions and

dumping's, placement of waste and use of natural resources for financing of nature protection activities in required scales. The problem of rational use of water resources of the region of Southern Aral Sea Area purchases the increasing sharpness every year and determines need of holding big organizational and technical actions. Of which can be one such as:

- monitoring system recovery limnic of ecosystems of the region Aral Sea Area;
- creation of the regional inventory of hydrobionts development and deployment of new methods of data collection and processing about a biodiversity, the structurally functional organization and main types of anthropogenous impact on ecosystems of reservoirs;
- implementation of modern GIS of technologies;

Results of the conducted researches allow explaining observed features of functioning of water ecosystems and specificity of dynamics of phosphorus where he acts as one of parts of the trigger in the course of an eutrophication of reservoirs. The model can be used for forecasting and the solution of tasks of protection and rational use of natural water resources of Southern Aral Sea Area.

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ОҢТҮСТІК АРАЛ ӨНІРІНІҢ СУ ЭКОЖҮЙЕСІНДЕГІ БИОГЕНДІ ЭЛЕМЕНТТЕРДІҢ ТРАНСФОРМАЦИЯСЫН ЗЕРТТЕУ

Аннотация. Мақалада Оңтүстік Арал өңіріндегі су экожүйелерін эвтрофикациялау процестерін зерттеу нәтижелері келтірілген. Фосфор формаларының судағы негізгі таралуы, оның балансы, Оңтүстік Арал өңірінің су экожүйелеріндегі фосфор жүктемесінің сипаттамаларын анықтау есептелді. Қолданылатын математикалық имитациялық модель де фосфор құрауыштарының су ағынына кеңістіктік тасымалдануын ескереді және оның көмегімен зерттелетін су экожүйесі үшін фосфордың түсуінің негізгі құрауыштарын және есептік балансын дұрыс бағалауға болады. Фосфордың жекелеген түрлерінің баланстарын қалыптастырудағы ішкі және сыртқы ағындардың рөлі әртүрлі. Шағын су қоймаларында топырақ шөгінділерінен фосфор алу су айдынының эвтрофикациясына тікелей әсер етеді. Фосфордың биохимиялық айналу жылдамдығының түрішілік бөлінуі судың температурасы мен мөлдірлігімен, сондай-ақ су бетінің мөлдірлігімен анықталады.

Түйін сөздер: су экожүйелері, Оңтүстік Арал өңірі, имитациялық моделдеу, биогенді элементтер, құрауыш, баланс, фосфор, эвтрофикация.

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ИССЛЕДОВАНИЕ ТРАНСФОРМАЦИИ БИОГЕННЫХ ЭЛЕМЕНТОВ В ВОДНЫХ ЭКОСИСТЕМАХ ЮЖНОГО ПРИАРАЛЬЯ

Аннотация. В статье приводятся результаты по исследованию процессов эвтрофикации водных экосистем в Южном Приаралье. Были рассчитаны основные распределения форм фосфора в воде, его баланса, определение характеристик фосфорной нагрузки в водных экосистемах Южного Приаралья. Используемая математическая имитационная модель также учитывает пространственный перенос компонентов фосфора в водный поток и с ее помощью можно правильно оценить основные компоненты поступления и учетного баланса фосфора для исследуемой водной экосистемы. Роль внутренних и внешних потоков в формировании балансов отдельных форм фосфора различны. В небольших водоемах забор фосфора из грунтовых отложений оказывает непосредственное влияние на эвтрофикацию водоема. Установлено, что внутривидовое распределение скоростей биохимического превращения фосфора определяется в немалой степени температурой и прозрачностью воды, а также прозрачностью поверхности воды.

Ключевые слова: водные экосистемы, Южное Приаралье, имитационное моделирование, биогенные элементы, компонент, баланс, фосфор, эвтрофикация.

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