THE IMPORTANCE OF CHANGING THE QUALITATIVE INDICATORS OF THE WATER RESOURCES OF THE AIDAR-ARNASAI LAKE SYSTEM IN THE USE OF NATURAL RESOURCES OF THE LAKE SYSTEM

ЗНАЧЕНИЕ ИЗМЕНЕНИЯ КАЧЕСТВЕННЫХ ПОКАЗАТЕЛЕЙ ВОДНЫХ РЕСУРСОВ СИСТЕМЫ АЙДАР-АРНАСАЙСКОГО ОЗЕРА В ИСПОЛЬЗОВАНИИ ПРИРОДНЫХ РЕСУРСОВ СИСТЕМЫ ОЗЕРА

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Аннотация. Изучение вариации ААОС в течение многих лет на основе программ статистических и географических информационных систем играет важную роль в использовании природных ресурсов в регионе. В настоящее время ААОС оказывает значительное влияние на окружающую среду, гидрологию, гидрогеологию, социальную и экономическую ситуацию и имеет стратегическое значение для Узбекистана и Казахстана.

Ключевые слова: озерные системы, уровень воды, гидрохимия, показатели качества, природные ресурсы

Annotation. The study of AALS variations for many years based on programs of statistical and geographical information systems plays an important role in the use of natural resources in the region. At present, the AALS has a significant impact on the environment, hydrology, hydrogeology, social and economic situation and is of strategic importance for Uzbekistan and Kazakhstan.

Key words: lake systems, water level, hydrochemistry, quality indicators, natural resources

Aydar-Arnasay Lake System (AALS) The Aydar-Arnasay Lake System (AALS) is the largest artificial water body in the Aral Sea basin. AALS consists of the merging of three lakes: Arnasay, Aydarkul, and Tuzkan. It is located on the saline lands of the Arnasay plain of the Kyzylkum desert in the southeast of Uzbekistan.

Since 1969, when the outflow of Aydarkul Lake exceeded the capacity of the Chardarya Reservoir, it has regularly received water from the Syrdarya River. This gradually filled the natural depression of the Arnasay lowland, creating the second largest closed water body in the region.

In the newly formed hydro-ecosystem, very favorable conditions for the rapid development of flora and fauna were created. However, in subsequent years, due to the absence of river water inflows and a complete transition to feeding mainly from collector-drainage waters (Central Golodnostep Collector (CGC), Arnasay collector, Kly, Akbulak, etc.), salinization and pollution of AALS waters occurred. The main inflow in the water balance of the Arnasay lake system from 1973 to 1993 was collector-drainage discharge of about 2.5 km³/year [1].

Water mineralization. The mineralization of AALS fluctuates depending on the hydrological regime. By 1978, the water level had dropped by 5 m, and mineralization increased to 7–8 g/l. It was then decided to reconstruct the lake system. A dam and a regulating water passage between Tuzkan and Aydar Lakes were built, along with a bridge over the Arnasay channel and a feeder canal. After the formation of a single system, practically until 1993, no fresh water entered the lakes, only collector-drainage water. As a result, mineralization rose significantly and by the early 1990s reached 10–11 g/l in Tuzkan Lake and 14–15 g/l in Aydar Lake (the final water body) [2, 3].

If the lake system does not receive annually a strictly defined amount of fresh water, mineralization will soon rise, and the reservoir may turn into a “second Aral.” According to estimates by Uzhydromet, water inflows exceeding

1.5 km³ will flood new pasture areas; each additional cubic kilometer will raise the level by 0.2–0.3 m and flood 50–70 km². Inflows of more than 3.0 km³ will raise the level by at least 0.5 m, flooding up to 200 km². The main flooding areas are the northeastern parts of Tuzkan and Aydar Lakes [4].

Oxygen content ranged between 7.8–9.1 mg/l. Depending on temperature, oxygen saturation varied between 74.8–102%, with the lowest values observed in August, which is considered ecologically acceptable.

Fish species composition and its formation. The ichthyofauna of AALS formed on the basis of Syrdarya River fauna. Later, with the establishment of fish-farming enterprises, it was enriched with cultivated species such as silver and bighead carps, grass carp, common carp, and crucian carp.

It is also necessary to strengthen the food base of the Aydar-Arnasay system by introducing brackish-water crustaceans and mollusks. This could significantly increase the overall fish productivity of the reservoir. For example, while fish productivity in such mesotrophic (medium-nourished) water bodies as AALS is usually around 0.2–0.3 centners/ha, in ponds it reaches 50–100 centners/ha, and in cage farming – up to 10,000 centners/ha.

Results obtained. Observations have shown that in most of the lake system, water mineralization exceeded the threshold level of 10 g/l. According to chemical analyses carried out in the certified ANIDI laboratory, in the summer–autumn period of 2021, mineralization in the central part of Aydarkul Lake was 10.2 g/l. In the western part it rose to 10.5 g/l, while in the eastern part it was about 10 g/l.

In the Arnasay Lakes, at the border with Aydarkul, salinity was 9.8 g/l; in the center of Tuzkan Lake – 9.5 g/l; and in its eastern part near the influence zone of the Kly and Akbulak collectors – 8.8 g/l. The lowest mineralization was observed in the Arnasay Reservoir (1.5 g/l), although in the southern bays added to the reservoir in 2010, mineralization reached 5 g/l.

In Aydarkul and Tuzkan Lakes, during summer in shallow coastal waters and isolated ponds, mineralization was 15–20% higher than in deep-water areas, reaching 11–15 g/l (measured in August–September 2021). Coastal ponds that lost connection with the main lake system showed salinity of 15–20 g/l.

In groundwater-fed water bodies, salinity in summer rose to 50 g/l, and in salt marsh samples taken near AALS, it exceeded 200 g/l.

Conclusions. The low volume of commercial fish catch is caused by uncontrolled, unregulated fishing by dozens of private enterprises renting sections of the water area, in violation of all fishing rules. These tenants fail to fulfill requirements on preserving and reproducing fish resources, annual restocking, and fishery reclamation measures. As a result, fish catches have dropped significantly, and now mainly low-value roach and other small fish are being harvested.

In this situation, it is urgently necessary to establish an association of lessees, and possibly government participation, in the management of the biological resources of the Aydar-Arnasay system. Only such an association could ensure fish restocking, introduction of new species, and reclamation works. The closed hydrological regime of AALS will eventually lead to further salinization, which may play a limiting role in the development of freshwater aquatic species.

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