

Mixing regime of the residual water basins of the Aral Sea

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The Aral Sea, a terminal salt lake in western Central Asia situated at the border between Uzbekistan and Kazakhstan, was ranked as the fourth largest inland water body in the mid-20th century. However, in the early 1960s, the lake's volume started to decrease rapidly due to severe changes in the Aral's water balance. Thus, the present-day Aral Sea can be considered as a system of separate water bodies with a common origin but very different physical, chemical and biological features.

Our previous studies showed that the Large Aral Sea and Lake Tshchebas transformed into hyperhaline water bodies, while the Small Aral Sea was a brackish basin with rather similar to the pre-desiccation environment. On the other hand, the Small Aral Sea and Lake Tshchebas exhibited a mixed vertical structure, whereas the Western Large Aral Sea (especially the Chernyshev Bay) was strongly stratified. The presented study is focused on the seasonal mixing regimes of the residual basins. Isolation of deep waters from the atmosphere together with low rates of photosynthesis produce deep anoxia observed in the Chernyshev Bay and in the Large Aral. The high amount of organic matter provides a rich source of nutrients for anoxic microorganisms favoring methanogenesis in the bottom layer of the basins. In the Small Aral, the water column remains well-oxygenated down to the bottom throughout most of the year and development of anoxia is unlikely. The mixing regimes of the recently formed residual lakes of the former Aral Sea will provide manifold effect on the ongoing development of the aquatic system in the following decades.

The study is based on a field data collected during two surveys of Shirshov Institute of Oceanology to the Aral Sea, which took place in October, 2015 and June, 2016. In situ measurements including CTD profiling and water sampling were carried out in the northern extremity of the western Large Aral (the Chernyshev Bay), in Lake Tshchebas, and in the Small Aral Sea. Moreover, two thermistor chains equipped with the dissolved oxygen loggers and bottom current meters were installed in the Chernyshev Bay for the period between two surveys.