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EXPEDITIONAL HYDROCHEMICAL RESEARCHES OF BLACK SEA COASTAL ZONES AND KERCH STRAIT IN 2007-2008

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Analysis results, obtained during the expeditionary researches along the Russian Black Sea coast in 2007-2008, showed that significant increase of the biogenic matters in the coastal zone in comparison with the sea zone is usually observed at the confluence of rivers, in cities and in the ports. The main critical zones of ecological risk in the Black Sea are formed in the places of river runoff influence. With the recreational load on beaches and coast the increase of biogenic matters in the sea waters of littoral zones occurs, the cases of unfavorable treatment on dissolved oxygen are observed, the contamination level tendency stabilization of sea inshore waters is preserved.

Key words: Black sea, Kerch Strait, littoral zones, outshore zones, biogenic matters.

[Филатова Т.Б. Экспедиционные гидрохимические исследования черноморских прибрежных зон и керченского пролива в 2007-2008 гг.]

Анализ результатов, полученных во время экспедиционных исследований вдоль российского побережья Черного моря в 2007-2008 гг., показал, что значительное увеличение содержания биогенных веществ в прибрежной зоне по сравнению с мористой наблюдается обычно в местах впадения рек, у городов и в районах портов. Основные критические зоны экологического риска в Черном море образуются в местах влияния речного стока. С возрастанием рекреационной нагрузки на пляжи и побережье происходит увеличение содержания биогенных веществ в водах морских прибрежных зон, наблюдаются случаи неблагоприятного режима по растворенному кислороду, сохраняется тенденция стабилизации уровня загрязненности прибрежных вод моря.

Ключевые слова: Черное море, Керченский пролив, прибрежные зоны, мористые зоны, биогенные вещества.

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Water content evaluation of the of biogenic matters and dissolved oxygen gives an idea of the internal biotransformation of organic substances in marine ecosystems, and therefore hydrochemical studies of the southern seas are relevant, their main goal is to control water quality, restore or maintain the productivity of the seas, realization of their ecosystems management. During the complex expeditions of the Southern scientific centre RAS in 2007-2008, in littoral (from Kerch Strait to Adler) and the outshore part of Black sea at SRS "Deneb" the water samples were selected and analyzed directly on the board, where the water temperature, active (pH) reaction, dissolved oxygen concentration, nitrites content, nitrates, phosphates were determined. In 2008, special attention was paid to the quality of the Kerch Strait waters in connection with the ship crash that occurred on November 11, 2007.

Water samples were taken by the bathometers of Molchanov and Niskin. The water temperature and the dissolved oxygen concentration were determined using a portable analyzer of dissolved oxygen MARK-302E, the hydrogen index – using a portable pH-meter HANNA. The concentrations of dissolved nutrients were determined after measuring the temperature, pH, concentration of dissolved oxygen, after filtering the samples: phosphates – by the method of Morphy and Riley [2]; nitrites – by the method of Bandschneider and Robinson [1]; nitrates – by the method of Morris and Riley (in the modification of Grasshoff, Strickland and Parsons, Sapozhnikov, Gusarova, Lukashev) [1]. In April 2007, in the coastal zone of the Black Sea, the phosphate content in the area of Anapa (Vityazevovo), in the area of Tuapse and in the Sochi region (Dagomys) exceeded the maximum allowable concentration for fisheries (MAC) in 1.4, 3.5 and 2.4 times accordingly. Nitrites and nitrates did not exceed the MAC. In the waters of the surveyed section of the Black Sea, the content of dissolved oxygen ranged from 64 to 118% in the surface layer. In the near-bottom layer, at some stations the concentration of dissolved oxygen was below 50% (opposite to Tuapse – 30%, opposite to Adler – 49%) or slightly higher (at a station in the Arkhipo-Osipovka area – 56%). During water sampling, the smell of hydrogen sulfide was felt, there were signs of overseas phenomena in the samples of benthos.

In the summer of 2007, in water samples, collected at coastal stations in the Black Sea, the pH value in the surficial unit changed in the range 8.1-8.6, the content of dissolved oxygen was determined from 42 to 106%. In spring of 2008, the content of phosphates in water samples collected near the village of Lazarevskoe, in the surficial unit was 5 times higher in comparison with the corresponding offshore area. In the coastal region in the Adler area, the phosphate concentration in the surficial unit was 24 times higher and in the benthal horizon 38 times higher than at the corresponding offshore station. The increase of phosphates content (in 2 times) and nitrates (in 5 times) in surficial unit in littoral zone in comparison with offshore one was observed in the researched water area in front of Novorossiysk in the summer of 2008. In comparison with coastal stations, both the reduction in nutrient concentrations and the increase in nutrient concentrations were observed in the fall of 2008, in coastal areas, mainly due to hydrometeorological factors (primarily wind direction). There was an increase in the phosphate content (2.5 times), nitrites (20 times) and nitrates (1.5 times) in the surficial unit in the coastal zone in front of Tuapse city in comparison with the moraine one. Decrease of biogenic matters concentrations with the coast recession was observed on the cut (phosphates from 5 to 0 mcg/l, nitrites – from 2 to 0 mcg/l, nitrates – from 7 to 3 mcg/l). The biogenic matters content was the same in the water samples, collected from the surface layer during the calm and analyzed with the interval in 1 hour at the stations in front of Anapa city. At the same time, the content of nitrates and phosphates in the sea station in front of Adler city was 2 times higher than at the coast (due to the northeasterly wind) [5, p. 48].

Water samples were taken from the surficial unit in the zone of river and sea waters mixing, on the traverse of the Mzymta River, in order to study the effect of river runoff on the nutrient regime in coastal marine areas. In the water of the Mzymta River flowing into the Black Sea near Adler, in June the phosphate content was 3 times higher, nitrites were also 3 times higher, nitrates were 20 times higher than in the surrounding seawater. As in June, in October 2008, water samples, which the Mzymta River carries into the Black Sea, were analyzed. The content of phosphates and nitrites was higher than in surrounding seawater, but insignificantly in comparison with June 2008 [3]. When analyzing water samples, collected in the Kerch Strait, it is noteworthy that in April 2007 nitrites and nitrates in this water area were observed by us in concentrations close to zero, and in April 2008 the content of nitrites varied from 2 mcg / l to 4 mcg / l, and nitrates from 0 mcg / l to 7 mcg / l, at one station the phosphate content was close to the MAC, at the two other stations, the MAC was exceeded in phosphates. There was no registration of the MAC bio-

genic matters exceedance in the waters of Kerch Strait in June 2008. In water samples taken directly from the sunken ship "Volgoneft-139", the increase in biogenic matters content was also not observed in June 2008 [4].

The analysis of results, obtained during expeditionary researches along the Russian coast of the Black sea and in the water area of Kerch Strait, makes it possible to draw the following conclusions. Significant increase of the biogenic matters content in the littoral zone in comparison with offshore zone is usually observed at the rivers confluence, near the cities and ports regions. The main critical zones of ecological risk in the Black Sea are formed in the places of river flow confluence. With increasing of recreational load on beaches and the coast, there is an increase of biogenic matters content in the waters of marine coastal zones, there are cases of unfavorable regime for dissolved oxygen, which is often a consequence of the high content of readily oxidizable organics in water. Comparison of the obtained data with the previous one gives the ground to believe that the stabilization tendency of the marine pollution level remains, while one should bear in mind not the reservoir as a whole, but its coastal waters. The ecological status of the Caucasus Black Sea coast currently can be in general estimated as quite satisfactory. This is essential for the further development of the resort business on these shores, grounded ecologically and economically. The increase, though insignificant of the determined biogenic matters content in the waters of Kerch Strait in April 2008 in comparison with April 2007, is probably explained by anthropogenic reasons and it is possible to suppose that it was connected with the occurred accident. The analysis results of hydrochemical samples, selected in June 2008, make it possible to draw a conclusion about that the given water ecosystem restored, overcoming the consequences of anthropogenic stress, the indice of researched hydrochemical parameters returned to the former level.

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