

Impact of man on Black Sea ecosystem

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Acting as depository for anthropogenic wastes, the semi-enclosed seas of the World Ocean are subjected to man's greatest impact, particularly in highly industrialized coastal areas. Most of the pollution accumulates there, bringing about dramatical transformations in ecosystems, as evidenced by a variety of available data on ecological conditions. This paper compares the impact of man on the Black Sea ecosystem with that on the Mediterranean, Baltic and Azov Seas.

Based on the analysis of geomorphological, hydrological and hydrochemical indices of ecological capacity we conclude that the Black Sea is specifically susceptible to impacts. Very low rate of water exchange, nutrient- and H₂S-contaminated water masses amounting to 90 % of the total sea volume, huge drainage area and dominance of river run-off over precipitation account for this phenomenon.

The comparative analysis between the four seas involved nutrient loading, pollution by persistent organic substances, heavy metals and oil. Obtained results were the gravest for the Black Sea. Since available data on microbiological contamination in the coastal waters of the Black Sea are scarce, further studies should be conducted.

The most pronounced transformations were found in the Black and Azov Seas ; they have been caused by anthropogenic pollution and suddenly reduced river run-off. The transformations include replacements in dominant and subdominant species, reduced number of species in all trophic groups, reduced average life in most populations, anomalous density outbreaks in several species including invasive species .

These changes were observed in all communities. The phytoplankton and phytobenthic communities were the first to undergo transformations as a result of high nutrient loading. The zooplankton and zoobenthic communities were subjected to secondary change and decline because of the disturbed typical energy and matter fluxes at the autotrophic level. Plankton blooms have become more frequent, bringing about transient anoxic and hypoxic conditions that are fatal to most benthic communities. Transformation of nekton communities follows, caused by persistent organic substances, heavy metals, oil and other pollutants supplied to the Black Sea. The above transformations and the destroyed coastal spawning areas produce in turn a harmful reduction of fish and dolphin's numbers.

An illustrative example of outbreak of species abundance is provided by the medusa *Aurelia aurita* , which in some years yielded raw biomass of 400 - 600 000 000 t/yr. These outbreaks affect all trophic levels and, primarily, fish. Fish larvae become prey, other age-classes and adults are short of fodder zooplankton. Later, an immigrated species *Mnemiopsis leidyi* did replace *Aurelia aurita*, owing to a more rapid sexual maturation, a greater number of generations per year and to the absence of predators. At present, density of this dominant amounts to 1 - 1.5 kg/m² in the Black Sea. *M. leidyi* is extensively grazing on fodder zooplankton, larvae of molluscs and fish, which causes a substantial reduction in fish numbers, for instance in anchovy.

Thus, a substantial anthropogenic load and a lesser ecological resistance are responsible for the gravest transformations of ecosystems in the Black and Azov Seas, compared to the Baltic and Mediterranean Seas.

