Nutritional status and primary production in the Black Sea: Emphasis on the changes in the last decades

Yilmaz, Aysen Tugrul, Suleyman Coban Yildiz, Yesim Yayla, Mehmet
Middle East Technical University, Institute of Marine Sciences/METU, Erdemli-Icel, Turkey

The Black Sea is a unique marine environment representing the largest land-locked and deep anoxic basin in the world. It has a very large catchment area, receiving extraordinary amount of nutrients, pollutants as well as fresh water from the rivers draining half of the Europe and some parts of Asia. According to estimates based on the data prior to 1990's, reduction in the Danube water discharge since the early 1970s due to river management has been accompanied by an increase in the nitrogen and phosphorus delivery to the Black Sea. A total inorganic nitrogen input of $1.4X10^5$ t/y by the Danube, a phosphate load of 0.12 $X10^5$ t/y and a silicate discharge of $7.9X10^5$ t/y were reported for 1960s. The total inorganic nitrogen input from Danube was estimated as $6\text{-}8X10^5$t/y while the phosphate and silicate loads were 0.23-0.32 $X10^5$ t/y and $1.5\text{-}3X10^5$ t/y respectively for 1988-1992 period. At the same period, silica decreased significantly due to the reduced solid flow after dam constration. Increase in eutrophication resulted an explosion of phytoplankton production in the last decades which was accompanied by the changes in specie composition of phytoplankton, seasonal patterns and the frequencies of blooming. Primary production in the Black Sea generally results in two phytoplankton maxima throughout the year; the major one occurs in early spring while a secondary peak appears in autumn but recently, additional summer blooms have frequently been observed in both the coastal and open waters. Primary production is relatively low in the open sea, compared to the northwestern shelf area where there is significant amount of nutrient input. Input of nutrients from the anoxic layer through the permanent pycnocline is limited both by denitrification and by oxidation-reduction processes occurring in the oxic/anoxic transition layer, since the major nutrient source for the open system is the input from the nutricline. New production in the open waters of the Black Sea is therefore dominated by the input from the nutricline, riverine input via surface circulations and atmospheric transport probably being of secondary importance; consequently the rates of new production in the Black Sea are low. The main purpose of the present study is to understand the key biochemical processes in the upper water column related to the primary production in the Black Sea. Interactions between the physical, optical, chemical, and biological processes of the upper water column involving the nutrient transportation, the uptake mechanisms of nutrients by primary producers and the determination of the growth capacity of phytoplankton populations living in the Black Sea were investigated.