

The Seto Inland Sea, Japan -Eutrophic or Oligotrophic?

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In the Seto Inland Sea, Japan, artificial eutrophication was accelerated with increase of industrial activities since 1960s. As a measure to this issue, the Law Concerning Special Measures for Conservation of the Environment of the Seto Inland Sea (Seto Inland Sea Law) was enacted. In the law, the directive of reduction of phosphorus discharge from the land to the sea was incorporated along with reduction of organic matter discharge in terms of chemical oxygen demand (COD). As a result, occurrence of red-tides decreased to about 100 cases per year nowadays from about 300 cases per year at the peak in 1976, indicating the improvement of seawater quality. In our field observations carried out in 1993-1994 showed deficiency of dissolved inorganic phosphorus (DIP) in the seawater to support growth of phytoplankton. On the other hand, fishery production in the Seto Inland Sea shows a decreasing tendency coincided with the decrease of material discharge by the Seto Inland Sea Law. This implies that the reduction of phosphorus discharge could have lowered primary production then caused the decrease of fishery production. Phytoplankton species which formed red-tides have changed from non-harmful ones such as diatoms to harmful/toxic ones such as dinoflagellates. It has been known that dinoflagellates preferentially utilize dissolved organic phosphorus (DOP) rather than DIP. The growth rate of dinoflagellates is generally low and some harmful/toxic species are definitely inappropriate as food for secondary producers. This suggests that the DIP deficiency has promoted the species succession then decreased the fishery production. Another directive to incorporate reduction of nitrogen discharge was issued in 1995. However, no considerations were made for keeping the ratio of nitrogen to phosphorus appropriate for the growth of non-harmful algae. It is important in a viewpoint of food production to sustain the fishery production along with preserving the environment. It would be necessary to maintain the ecosystem of the Seto Inland Sea by controlling the biophilic elements composition in the discharging water not by reducing the material discharge with no scientific perspectives.