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Ago Bay is located in Ise-Shima National Park, Mie prefecture, Central Japan. This bay is famous for cradle of the pearl culture and it has been continued for more than 100 years. However, harmful algal blooms and infectious diseases make the pearl oyster culture for whole year difficult. Furthermore, sediment eutrophication and frequent occurrence of oxygen-deficient water has caused the deterioration of benthic ecosystem and decrease of biological productivity in recent years. It is considered that one of the major causes of these phenomena is stagnation of the material circulation by reclamation of shallow coastal area including a tidal flat, sea glass and sea weed beds. The reclaimed coastal areas were made clear by the multi-spectrum aerial picture analysis. In detail, more than 50 years ago approximately 70% of tidal flats and shallow area were reclaimed for constructing rice fields in Ago Bay. But now these reclaimed areas are given up cultivation and changing the unused wetland. Therefore, for environmental restoration of Ago Bay, it is necessary to enhance the biological productivity and natural purification capacity which these areas provided, and to recover a smooth material circulation around the shallow area. Then in this study, attempts were made to enhance the biological productivity, by promoting water exchange between unused reclaimed area and outer sea using pumps, pipeline system was set up in an experimental reclaimed wetland. Improvements were evaluated by monitoring sediment quality, benthic abundance and species diversity every season.

1) Present state in unused reclaimed area

The total reclaimed areas are about 185 ha, however almost of these areas were given up cultivation and changed hypertrophic unused wetland in Ago Bay. Such areas add up to about 153 ha. The sediment of unused wetlands are too muddy and contain high organic matter, because the dykes which were constructing for reclamation, lead to accumulation of the nutrient and organic matter run off from the land. In these wetlands, the abundance and diversity of benthos are quite poor.

2) Seasonal changes of the sediment quality, abundance and species diversity of benthos in experimental field by promoting the water exchange

The sediment samples from experimental field with promoting water exchange and natural tidal flat in front of the reclaimed areas were measured for COD, TOC, TN, IL, AVS, particle size, chl.a and benthic abundance and species were counted every season for 2 years. Now these monitoring are continuing. Before water exchange, sediment was hypertrophic and anaerobic state. *Capitella sp.* and *Chironomidae* were dominant species, because wetland was brackish. And more both wet weight and diversity were quite small. After water exchange, the macrobenthos were changed from brackish to sea water. The diversity and wet weight were gradually increased and after two years they became same level of the natural tidal flat in front of the reclaimed area. The COD and AVS in sediment were decreased too. These results indicate that the sediment statuses in wetland were gradually changed to the aerobic condition by promoting the decomposition of the hypertrophic sediment under the water exchange. Continuous water exchange would provide enhancement of the biological productivity. This method would lead to wise use of the coastal environment and enhance the biological productivity around the unused reclaimed areas.

Restoration of Elgrass (*Zostera marina* L.) bed by filling up a borrow pit with natural sediment

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The objective of this study is to evaluate restoration technology of eelgrass (*Zostera marina* L.) bed by filling up borrow pit by the coast of Iwakuni, the Seto Inland Sea, Japan. We constructed eelgrass habitat at the edge of a

previous borrow pit within eelgrass bed by filling up with natural sediment. We monitored sand movement, underwater irradiance and eelgrass shoot density at the constructed and natural habitats. Sand movement at the constructed habitat was from -8 cm to 9 cm showing little difference from that of natural habitats. The daily averaged underwater irradiance at the constructed habitat was more than 3 mol photonsm • $^{-2}$ • day^{-1} necessary for eelgrass. Eelgrass disappeared after typhoon attacks in 2004-2006, whereas seedlings of eelgrass appeared both at the constructed and natural habitats every winter. These results suggest that restoration of eelgrass habitat by filling up borrow pit is a useful technique for eelgrass bed restoration

Possible bottom-up control of fisheries production in the Seto Inland Sea, Japan

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In recent decades, anthropogenic nutrient discharges into the Seto Inland Sea of Japan have reduced as a result of a set of measures for environmental conservation. On the other hand, several fish catches and/or stocks have collapsed in this area. Shifts in seawater quality and fisheries landings were accompanied by modifications in structure of marine communities. Alteration of resource availability represents a "bottom-up" effect on marine ecosystems, whereas removal of consumer biomass through fishing represents a "top-down" effect. Therefore, an understanding of how bottom-up and top-down processes influence the structure and dynamics of marine communities is necessary for effective management of fisheries production and marine ecosystems in the face of environmental variability and human impacts. In this study, we addressed the question of bottom-up versus top-down control of marine ecosystem trophic interactions by using long-term nutrients and phytoplankton biomass data and annual fish catch data (1973 – 2005) in Harima-Nada, located in the eastern part of the Seto Inland Sea of Japan. Linear regression model showed a significant relationship between dissolved inorganic nitrogen concentration and phytoplankton biomass (chlorophyll a concentration) for the period 1991 to 2005. A positive relationship was also found between mean annual phytoplankton biomass and annual yield of pelagic plankton feeders for the same period. These results demonstrate close linkages between nutrients (especially dissolved inorganic nitrogen), phytoplankton, and pelagic plankton-feeding fishes, suggesting that bottom-up control regulates fisheries production in Harima-Nada during recent decades. Our findings have also an important bearing for ecosystem approaches to fisheries, particularly for the estimation of the carrying capacity with regard to sustainable exploitation.

Evaluation on Pb contamination in algae in Osaka Bay, Japan

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Heavy metal concentrations of the brown alga *Undaria pinnatifida* and the green alga *Ulva* sp. collected at 15 and 6 locations, respectively, from Osaka Bay are measured with inductively coupled plasma mass spectrometry (ICP-MS). The data are compared in order to evaluate the usefulness of a biomonitoring system for assessing the geographic distribution of heavy metals in coastal seawaters.

The ports of Osaka Bay are located on the N side coast (e.g., Kobe Port, Osaka Port) and the SE side coast (fishing ports). In contrast, Awaji Island, on the SW side of the bay has a natural coast. We believe the port areas receive contamination from anthropogenic sources such as shipping activities. *Undaria* from Kobe Port, a major industrial port, show extremely high Pb concentrations (3.5± 0.27 ppm, dry weight) and those from the SE area are relatively high (0.43—1.4 ppm, dry weight), while those from the SW area are low (0.14—0.36 ppm, dry weight).