

Evaluation of Tidal Flat Restoration Effect in the Coastal Unused Reclaimed Area by Promoting Tidal Exchange with Public Involvement in Ago Bay, Mie Prefecture, Japan

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Ago Bay is located in Ise-Shima National Park, Mie prefecture, Japan. This bay is famous for cradle of pearl culture and it has been continued for more than 100 years. However, recently in Ago Bay, nutrient loads increased due to domestic loads and pearl culture. At the same time, natural purification capacities also decreased due to the land reclamation. Accordingly, excess nutrient loads accumulated into the bay bottom, causing red tides and hypoxia to occur every year. It is considered that one of the major causes of these phenomena is a stagnation of the material circulation between sea and land by reclamation of coastal shallow area including tidal flats and sea glass beds. The reclaimed coastal areas were estimated by the multi-spectrum aerial picture analysis. In detail, for more than 50 years ago, approximately 70% of tidal flats and shallow areas were reclaimed for constructing rice fields around the Bay. But now these reclaimed areas were given up cultivation and changed to fallow fields and unused wetlands. Therefore, for the 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. In this study, attempts were made to enhance the biological productivity, by promoting tidal exchange between an unused reclaimed area and outer sea through the open of the floodgate on a dyke with public involvement.

1) Present State of Unused Reclaimed Area

More than 100 years ago, there were about 269 ha of tidal flats in Ago Bay occupying about 10% of the sea surface area. The total reclaimed areas are about 185ha, however most of these areas were given up cultivation and changed the hypertrophic unused wetland. Such areas are up to about 154ha. The sediments of unused wetlands are too muddy and contain high organic matters, because the dykes which were constructed 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) Effects of Tidal Flat Restoration

Tidal flat restoration was carried out from Apr. 2010 by opening the floodgates on the concrete dike, which was constructed for reclamation. The restoration site is about 2ha and located in the inner part of the bay (Ishibuchi in Shima city). Clam stocking, seagrass planting, and environmental education were carried out with public involvement. Improvements were evaluated by monitoring sediment quality, benthic abundance and species diversity every season. Before the restoration, only 6 species of macro faunas (*Chironomidae*, *Hediste diadroma*), which lives in brackish water, were found. After the opening of the floodgate, the macro faunas was changed from brackish to saltwater and the number of species gradually increased. After 6 months, 22 kinds of juvenile fish (*Goby*, *Lateolabrax japonicus* and *Mugil cephalus*), migratory macro faunas (*Hemigrapsus penicillatus*, *Batillaria zonalis*) and small clams were found in the restoration tidal flat. At the same time, the COD and AVS in sediment decreased too. These results indicate that the sediment status in the restoration site were gradually changed to the aerobic condition by promoting the decomposition of the hypertrophic sediment through the tidal exchange. Further enhancement of the biological productivity will be expected through continuous tidal exchange near the future. This method would lead to wise use of the coastal environment and to enhance the biological productivity around the unused reclaimed areas.

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