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Development and Assessment of a Fine Particle Acquisition Technique Using the Sodagarami Method in Field Tests

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ABSTRACT

The decreased runoff from rivers, combined with alterations to sea currents and tidal flow velocities associated with civil construction activities in the Ariake Bay, has resulted in increased sedimentation and decreased sediment transport. In this study, a traditional reclamation technique referred to as the Sodagarami method was used to obtain fine sediments in a tidal flat. Upon completing civil engineering projects, fine sediments accumulation was observed inside the Sodagarami area. Seabed level suddenly decreased at the time of the rainy season in June and a typhoon in September. In particular, erosion of approximately 10 cm was observed inside the Sodagarami area. However, except during stormy weather, SS (Suspended Solids) accumulates on the inside of the Sodagarami structure. We estimated both SS flux in the seawater and the amount of deposition during two weeks. It was revealed that the Sodagarami method to accelerate the sedimentation of fine particles.

KEY WORDS: Mud transport, Sediment environment, Tidal mudflat, Ariake Bay

INTRODUCTION

The Ariake Sea is an inland sea located on Kyushu Island of Japan. It has the area of 1,700 km^2, with a length of 96 km along the bay axis, an average width of 18 km, and the average depth of 20 m. The maximum tidal range in the Ariake Sea is approximately 6 m, making it the largest in Japan. Numerous rivers flow into the Ariake Sea, and tidal flats covering a total area of approximately 180 km^2 extend along the coastline. The Ariake Sea was previously regarded as a highly diverse coastal ecosystem and was well known for its abundance of fish (Matsumiya *et al.*, 1982). Although the Ariake Sea is enclosed sea, the uniqueness and diversity ecosystems, as well as the material cycling associated with the vast tidal flats and strong tidal motion, all contributed to ensuring that the water quality of Ariake Sea was

Fig. 1 *Agemaki* cultivation system

suitable for maintaining the various populations of flora and fauna. The Ariake Sea, long known for its high productivity of marine products, has recently been characterized by several environmental problems, including reduced tidal flow, the deterioration of the seabed environment (Ohkuma *et al.* 2001), the presence of a hypoxic water mass in the summer (Tsutsumi *et al.* 2003, Koriyama *et. al.* 2007), and reductions in the harvests of valuable fish and shellfish products (Hayashi and Du 2006). There is an ongoing effort to develop technologies for restoring the health and productivity of the Ariake Sea (Hayashi et al. 2006). This paper is a research based on the ancient technology of *Sodagarami*; which is structured by bundled twigs are placed on a tidal flat in order to improve the deep-water sediment environment. Also, since the inside of the structures can be expected to be more quiescent environments, they are expected to provide good locations for settlement of the floating larva of *Sinonovacula constricta*, a species whose numbers have decreased drastically in recent years. In this study, surveys of bed elevation and sediment transport, and a numerical simulation of a model of sediment transport are presented in order to clarify the effect of the catchment of fine sediments by