

Bioremediation of the organically enriched sediment deposited below the fish farm with artificially mass-cultured colonies of a deposit-feeding polychaete, *Capitella* sp. I.

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In this study, we focus on extremely high potential for population growth of a deposit-feeding small polychaete, *Capitella* sp. I, in the organically enriched sediment and the impact of its explosive population growth on decomposition of organic matter in the sediment. *Capitella* sp. I and its closely related sibling species are common members of the organically enriched sediment in the coastal areas throughout the world. In the past two decades, we have studied the biological activities of the rapidly increasing *Capitella* population to apply to the bioremediation of the organically enriched sediment deposited just below the net pens of the fish farms and the innermost areas of the enclosed bays.

To realize the bioremediation of the organically enriched sediment with *Capitella*, we first developed a mass-culturing technique of this species. Now, we are able to establish the colonies of more than 15 millions individuals of the worms from the small seed colonies in a tank with 10 m² in bottom area within three months. We conducted the bioremediation experiments of the organically enriched sediment deposited just below the net pens in a fish farm of red sea bream, in Kusuura Bay, Amakusa, Kyushu, the western Japan in 2003 to 2005. Naturally, *Capitella* increases in the organically enriched sediment below the fish farm in Amakusa from the autumn to the winter in water temperature conditions of 12 to 22 °C. In our experiments, we tried to induce further rapid population growth in the organically enriched sediment by spreading the artificially mass-cultured colonies of the worms to treat the organically enriched sediment until the next early spring when *Capitella* is able to physiologically maintain high density colonies.

We put approximately 1.7 million individuals of the cultured worms on the sediment just below one net pen in December 2003 and 9.2 million individuals at two net pens each in November 2004. After spreading the worms on the sediment, they rapidly increased during the winter and reached the highest densities, approximately 132 thousand indi./m² in February 2004 and 550 thousand indi./m² in March 2005. In the process of the rapid population growth, the decomposition of the organic matter of the sediment was markedly enhanced, and the organic matter content of the surface sediment up to 4 cm in depth decreased to the levels lower than those outside the fish farm. The levels of reduced sulfides in the sediment also markedly decreased to those outside the fish farm. Thus, the bioremediation technique spreading the *Capitella* colonies is effective to treat the organically enriched sediment deposited just below the net pens within a short period.

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