

Collapse of Dominant Bivalve Populations on the Tidal Flats in Kumamoto Ariake Area and its Negative Influence on the Water Quality of Ariake

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In the coasts of Kumamoto Ariake area in Kumamoto prefecture, Kyushu, Japan, approximately 7,000 ha of the sandy tidal flats remain. The macro-benthic communities on the tidal flats are characterized by abundant suspension feeding bivalves, including *Ruditapes philippinarum*, *Macra veneriformis*, *Musculista senhousia*. Among these bivalves, *Ruditapes* is one of the most popular edible clam. In 1977, approximately 66,000 tons of this clam were harvested from the tidal flats. However, the dense clam populations on the tidal flats have collapsed with other two dominant bivalves since mid-1980s. In the past few years, less than 3,000 tons of the clams have been harvested per year. None of other macro-benthic animals have been replaced with these bivalves as dominant species in the macro-benthic communities. Therefore, on the tidal flats, macro-benthic animals occur extremely sparsely.

The reasons of the collapse of the bivalve populations still remain unclear. However, I found a common characteristic in the population structure of these three dominant species. In the breeding seasons from spring to summer, these bivalves release planktonic larvae. Several weeks later, they settle on the tidal flats, and normally metamorphose to young juveniles, but almost all of the individuals soon die. Thousands of dead individuals with only two shells and without flesh inside the shells are found per one square meter of the tidal flats. I also found an exceptional in this phenomenon. Prolific macrobenthic communities of over 370gWW/m² were established only at the place on the tidal flats, where the clean sand collected from the sea floor of the offshore areas of Ariake Sea was put with 20 to 50 cm in thickness. There, new recruits of the bivalves had low mortality after settling on the new sands and grew normally. These healthy communities provide a strong contrast to populations on nearby pre-existing sediments. I could not identify the causes that brought about a high mortality to the juveniles on the tidal flats through the analysis of particle size composition and organic matter content of the sediments. Now, I suspect negative influence from the contaminants of the sediments on the tidal flats to the early development of the macro-benthic animals after settlement.

The suspension feeding bivalves are potentially able to contribute to controlling the density of phytoplankton in the surface layer of the water through filtering water and excreting mucus to the water. The collapse of the dense bivalve populations on the tidal flats indicates marked decline of the bio-filtering activities of the water. In the recent one decade, red tide has occurred more frequently year to year in Ariake Sea. Furthermore, last summer, hypoxic water was formed in the layers deeper than 10 m in the inner part of this sea. Since limited information on the impact of the filtering activities of the water by the suspension feeding bivalves is available, I suspect that the decline of the filtering function of the water by the suspension feeding bivalves on the tidal flats may result in the frequent occurrence of the red tide in the offshore areas and formation of hypoxic water through the increase of organic matter loaded from the tidal flats to the sea floor of Ariake Sea.