

Vertical profiles of carbon, nitrogen and phosphorus in sediment of highly eutrophic inner bay

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Dokai Bay became highly eutrophic environment with development of coastal industrial from the 20th century. Therefore, there are no fish catches in 1940s and no *Escherichia coli* bacterium in 1960s. At that time, Dokai Bay was called dead sea. After 1960s, although it was attempted to improve the water quality, nutrient concentrations were still high and occurred hypoxia in every summer by 2000. Recently, it is considered that both water column and surface sediment environment in Dokai Bay are improved due to no hypoxia in the bay from 2011. In this research, we investigated the sediments in Dokai Bay and temporal changes of organic elements in highly eutrophic sediment, and considered the relationship with sediment environments and improving hypoxia.

Sediment samples were obtained from inner part of Dokai Bay in May, 2015. We analyzed total organic carbon (TOC), total nitrogen (TN), total phosphorus (TP) and acid volatile sulfides (AVS) from the samples. From application of environmental standard in 1997, TN and TP loadings to Dokai Bay decreased to 1/3 and 1/5, respectively. TN and TP concentrations in the water column also decreased to 1/3 than those in 1980s (Hamada et al., 2014). Due to resolving of hypoxia and decreasing TN and TP concentrations in water column, we can consider that the environment of Dokai Bay is completely improved. AVS in surface sediment decrease to 1/10 comparison with 1994, suggesting the sediment also improved. However, both TOC and TN contents were not changed from surface to 30 cm depth in the sediment. TP content was 0.87 mg/g in 0-1 cm depth sediment and decreased gradually with depth. From 10 cm depth, TP content was stable as 0.7 mg/g. Mean value of carbon to nitrogen ratio (C/N) in the sediment was 26.6. It was considered that particulate matters and settling particles in Dokai Bay consist of phytoplankton and their C/N ratio (6.4; Hamada et al., 2014) was close to Redfield ratio (6.6). High C/N ratio in the sediment suggested that contribution of phytoplankton to sediments were relatively low, and high C/N ratio particles such as detritus from terrestrial plants highly contributed to the sediment. Moreover, comparison with improving of both water column environment and AVS in the sediments, no vertical changes of TOC and TN suggested that phytoplankton or easily decomposable organic matters scarcely contributed to the sediments, and high C/N refractory particles contributed to the sediments.

AVS in the sediment was decreased, suggesting easily decomposable organic matters were decreased although TOC and TN contents were not changed. We considered that decrease of oxygen consumption in surface sediment due to decrease easily decomposable organic matter resolve hypoxia in Dokai Bay.

Keywords: Dokai Bay, Hypoxia, Sediment, Nutrient