

## **The dynamics of particulate organic matter and implications for sustainable oyster aquaculture in Shizugawa Bay**

**Takashi Sakamaki<sup>1\*</sup>, Tatsuya Kawahata<sup>1</sup>, Youhei Yugami<sup>1</sup>, Megumu Fujibayashi<sup>2</sup> and Osamu Nishimura<sup>1</sup>**

<sup>1</sup>Department of Civil Engineering, School of Engineering, Tohoku University, Sendai 982-8579 Japan

<sup>2</sup>Department of Biological Environment, Faculty of Bioresource Sciences, Akita Prefectural University, Akita, 010-0195 Japan

To achieve sound environmental management and sustainable use of coastal marine ecosystems, it is necessary to enhance understanding of material dynamics in those systems. We examined the dynamics of particulate organic matter (POM) in Shizugawa Bay of northeastern Japan. In particular, we analyzed POM as well as macro-organisms including aquacultured oysters for carbon and nitrogen stable isotopes and fatty acids to estimate the relative contributions of organic matter with various spatial and biological origins to POM pools and diets of consumers. Our results showed seasonal and spatial variations of POM compositions and basal resources for the food webs in the bay. Particularly at locations near river mouths, we found higher POM concentration and faster growth of aquacultured oysters. These may be due to enhanced primary production by riverine nutrient inputs. Furthermore, the oyster growth was faster in areas with relatively lower, local density of farming facilities. Meanwhile, we found that oyster farms alter the concentration and chemical properties of suspended POM possibly due to filter feeding and excretion by oysters and exfoliation of sessile algal materials from oyster clusters and facilities. The POM deposition flux was several times greater in farms than outsides, suggesting substantial impacts of oyster aquacultures on the bottom environment. Our results highlight that the oyster growth is dependent on both locations and local densities of farming facilities in the bay. Furthermore, the reductions of the density of farming facilities can facilitate oyster production and also significantly reduce environmental impacts of oyster aquaculture.

**Keywords:** estuary, phytoplankton, oyster-POM interaction, oxygen depletion, aquaculture management

\*Presenter: E-mail: takashi.sakamaki.a5@tohoku.ac.jp