外部発表業績

○海洋と生物

仙台湾の栄養塩環境とノリ養殖

181, 165-167, 2009

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Abstract: In Miyagi Prefecture, nori is mainly cultured in Sendai Bay, which is open to the ocean. Nutrient level is lower than that in other enclosed coastal seas, and discoloration of nori occurs almost every year. It seems that the discoloration of nori in Sendai Bay is caused by other mechanisms than those in enclosed coastal seas.

○海洋と生物

宮城県における養殖ノリの病害

185, 631-633, 2009

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Abstract: In Miyagi Prefecture, cultured nori is affected by white rot syndrome in raising period, and red rot disease in production period. The weather and oceanographic condition also influence the production of nori, and the disease control is indispensable.

○Plankton & Benthos Research

Seasonal Variations in abundance and biomass of picoplankton in an oyster-farming area of northern Japan.

4(2), 62-71, 2009

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Abstract: We investigated seasonal variations in abundance and cell volume of picoplankton (heterotrophic bacteria and phycoerythrin-rich cyanobacteria) along with environmental conditions at a coastal site in an oyster-farming area in northern Japan. Samples were collected once or twice a month from July 2002 to July 2004 and analyzed using epifluorescence microscope methods. Abundances of bacteria and cyanobacteria both increased from summer (June–August) to autumn (September–November) and decreased from winter (December–February) to spring (March–May). The range of seasonal abundances of bacteria was within one order of magnitude, but that of cyanobacteria extended over almost three orders of magnitude. Bacterial and cyanobacterial abundances were both positively correlated with temperature. However, the abundance of cyanobacteria decreased at high temperatures when salinity was below 31 psu. Cell volumes of bacteria and cyanobacteria varied inversely with seasonal patterns of abundance. Cell volumes of cyanobacteria were negatively correlated with temperature, whereas those of bacteria showed no significant correlation with temperature. Mean water-column carbon biomass ranged from 23.4 to 174.3 μg-C L^{-1} for bacteria and from 0.1 to 18.4 μg-C L^{-1} for cyanobacteria. Maximum values of mean water-column

biomass of bacteria reached 179% of the estimated biomass of phytoplankton carbon, whereas that of cyanobacteria was 58% of picophytoplankton biomass and 22% of phytoplankton biomass. Bacterial biomass levels similar to those of phytoplankton and the high contribution of cyanobacteria to picophytoplankton in summer imply that the picoplankton assemblage plays an essential role in planktonic food webs in the bivalve-farming area.

○Journal of Water and Environment Technology

Undaria pinnatifida Habitat Loss in Relation to Sea Urchin Grazing and Water Flow Conditions, and Their Restoration Effort in Ogatsu Bay, Japan

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Abstract: This study investigated the mechanism of the loss of *Undaria pinnatifida* beds in Ogatsu Bay, Japan. Wave heights at the outside of the bay were 1 to 2 m over the course of study. In the outer areas of the bay with high water velocities, more than 14.5 ± 3.4 cm sec $^{-1}$, *U. pinnatifida* grew densely and sea urchins were scarce. However, in some outer areas with lower velocities, less than 7.8 ± 2.3 cm sec $^{-1}$, *U. pinnatifida* grew sparsely where the aggregation of sea urchin was found. In contrast, in the inner areas of the bay with calm water having velocities of 2.4 to 4.6 cm sec^{-1}, the density of sea urchin was high and the *U. pinnatifida* beds disappeared. These results indicated high water velocities in the outer bay areas prevent the grazing by sea urchins. Disappearance of *U. pinnatifida* in the inner bay areas seemed to be caused by the high grazing pressure of sea urchins in calm water velocity conditions.
We also performed a *U. pinnatifida* restoration effort to reduce the effects of the grazing pressure by sea urchins in the barren grounds in the inner areas of the bay. Artificial buoyed reefs were designed to prevent the migration of sea urchins by being detached from the bottom and allowed the recovery of *U. pinnatifida* and other non-encrusting macroalgae. Although there were some losses of transplanted *U. pinnatifida* partly caused by the withering after the reproductive maturation period, *Saccharina japonica* and other macroalgae were naturally recruited and increased due to the inhibition of migration by sea urchins using the buoyed reefs. In contrast, the formation of barren community remained at the area grounded to the bottom allowing the migration of urchin in the inner bay. Overall, our restoration efforts using the artificial buoyed reef, although not ideal, resulted in the success of the recovery of macrolagal habitats in the sea urchin - dominated barren grounds by the reduction of grazing pressure of sea urchins.

○ICES Journal of Marinę Science

Application of a generalized additive model (GAM) to reveal relationships between environmental factors and distributions of pelagic fish and krill: a case study in Sendai Bay, Japan

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Abstract: A generalized additive model (GAM) was applied to fishery-survey data to reveal the influences of environmental factors on the distribution patterns of Japanese anchovy (*Engraulis japonicus*), sand lance (*Ammodytes personatus*), and krill (*Euphausia pacifica*). Echosounder and physical-oceanographic data were collected in Sendai Bay, Japan, in spring 2005. A hierarchical model was used with two spatial strata: (i) presence and absence of each species; and (ii) biomass density of each species, given its presence; and six environmental covariates (surface water temperature, salinity, and chlorophyll, and near-seabed water temperature, salinity, and depth). The results indicate non-linear responses of the two indices to the environmental covariates. In addition, the biomasses estimated by the GAMs were comparable with estimates based on conventional, stratified-random sampling for each species. GAMs are very useful for (i) investigating the effects of environmental factors on the distributions of biological organisms, and (ii) predicting the distributions of animal densities in unsurveyed areas.