Component 3 (Environmental): Thailand

Coastal environment and human activity in Thailand

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In Thailand, we have been conducting environmental research in coastal area of Rayong and Bandon Bay. In coastal area of Rayong, in order to evaluate possible impacts of the set-net operation (1) Status of the seawater and bottom sediment conditions in and around the set nets and (2) trophic levels and feeding habits of the set net catch and other gears (2) have been investigated as collaborative activities with C6 (Set-net component) and other components. In Bandon Bay, in order to describe interactions between shellfish culture and environments conditions, (1) Seawater conditions and primary productivity, (2) Bottom sediment conditions, and (3) Food web structure have been investigated being supported by C4 (Social component) and other components.

[Coastal area of Rayong]

In coastal area of Rayong, potential impacts of the set-net operation and other fishery activities on natural biological resources and environments have been investigated. The survey on the seawater and bottom conditions were conducted within and around the set-nets just beginning of set-net installation (October, 2013), midterm of installation (January, 2014) and end of set-net installations (April, 2014). Transparency measurement, CTD cast, water sampling for analysis of suspended solids (SS), chlorophyll *a* and nutrients, and bottom sediment sampling by a grab sampler for acid volatile sulfide (AVS), ignition loss (IL) and water content were conducted. Until now no significant influences of the set-net installations were observed. However, in order to make concluding remarks, it is better to conduct one more year monitoring for checking year to year variation.

The survey on the trophic levels of the set-net catch and other gears was conducted mainly by the set-net groups during n Dec 2012-Mar 2013, Oct-Nov 2013 and March 2014, in total of

379 samples from 36 fish species were collected for later analysis of carbon and nitrogen stable isotope ratios by a mass spectrometer fitted with an elemental analyzer (Delta V advantage and Flash EA 1112, Thermo Fisher Scientific Inc.) at RIHN. Several environmental samples including mangrove leaves and particulate organic matter (POM) and sedimentary organic matter (SOM) were also collected. Stomach contents of the fish were sorted into taxonomic groups at the EMDEC and some of them were used for analysis of stable isotopes. Analysis of the interpretation of the set-net catch samples has been almost completed. Sampling of the catch by other gears will be completed in this month, October, 2014, and analysis of those samples will be completed by the end of this fiscal year.

[Bandon Bay]

In Bandon Bay, interactions between shellfish culture, environments, and local society are ones of the main research interests. Phytoplankton samples were collected in rainy season (August 2013) and summer (March 2014) at 12 stations along the coast in Bandon Bay. Stations 1, 2and 3represented the east coast of the Tapi river (Kanchanadit district), stations 4, 5and 6set at the Tapi estuary (Mueang Surat District) and station 7, 8, 9, 10, 11and 12were located on the west coast (Chaiya and Tha Chang District). The water salinity in the west coast was higher than in the east during the rainy season, whereas, the east coast salinity showed the higher than the west side in summer. Water salinity around the mouth of the Tapi River was quite low (less than 13 ppt) due to the flow from the rivers into the Bay. Dissolved oxygen of the water in the west side of the bay was higher than the east coast and estuaries both in summer and rainy seasons. Phytoplankton samples were collected by towing vertically a plankton net of mesh size 20 *u*m dragged. The results showed a total of 79 phytoplankton species in three divisions; Cyanophyta (3 species), Chlorophyta (4 species) and Chromophyta (72 species). Richness index, Evenness index and Diversity index of phytoplankton were in the range of 1.416 -1.718, 0.415- 0.591 and 0.849-1.928 in rainy season and 0.780-2.509, 0.229-0.760 and 1.585-3.185 in summer, respectively. Photosynthetic rate was measured by *in situ* incubation for 24 hrs and uptake of ^{13}C labeled HCO_3^- at three vertical layers (surface, middle, and near bottom) at 8 stations in August-September 2012 (rainy season) and at 9 stations in March 2013 (dry season). In rainy season, values of chlorophyll *a* and primary production at the surface (0.8–19.1 μ g L^{-1} and 411–2732 mgC m^{-3} d^{-1}) were comparable to those reported from Hiroshima Bay and Oginohama Bay in Japan, where intensive oyster culture was conducted.

The study of organic matter content and dehydrogenase activity of the sediment in cockle farm during rainy season (June 2013 and August 2013) and summer (March 2014) was investigated in Bandon Bay. In Kanchanadit district (the east coast), the sediment was shown as loamy soil, sandy loam soil and loamy sand, while at Chaiya district (west coast) consisted of

sandy soil and sandy loam crumbly. The amount of organic matter accumulated in each layer of the depth (depth 1-7 cm) was not significantly different in summer and rainy seasons. Sediment organic matter in the east coast where the cockles has been cultured for a long time, showed distinctively high amount comparing to the west coast during the rainy season. Dehydrogenase activity on the surface layer (epipelagic) was quite lower than the deep layer, hence physical, chemical and biological processes seemed contribute to nutrient cycling in sediments.

The basic features of Bandon bay related to the bivalves production, and its food-web were investigated based on carbon and nitrogen stable isotope analysis. Bivalves were collected in 6 sites in 3 seasons, March 2013, September 2013, and February 2014. Particular organic matter (POM), and sediment organic matter (SOM) were also collected. The result of the analysis of variance shows clear differences by bivalve species. This result suggests the difference of food habit by species. There is a difference in size of shell with $\delta^{13}C$ and $\delta^{15}N$ on *Geloina* sp. at station 21. However, correlation between the size of shell and$\delta^{15}N$ are commonly seen in bivalves such as *Ostrea* sp. and *Perna viridis*. The results suggest $\delta^{13}C$ has not caused the differed by except *Geloina* sp.. Bivalves in Bandon bay were mostly nonselective filter feeder, and each bivalve tends to be preying on different foods. In the ordinary concept, single species in the same bay is regarded as same food habit to share, or not to be considered carefully about the differences of food source in the same bay. However, there is diversity on food source in different area in the same bay due to the characteristics/environment of each area.