previous borrow pit within eelgrass bed by filling up with natural sediment. We monitored sand movement, underwater irradiance and eelgrass shoot density at the constructed and natural habitats. Sand movement at the constructed habitat was from -8 cm to 9 cm showing little difference from that of natural habitats. The daily averaged underwater irradiance at the constructed habitat was more than 3 mol photonsm • $^{-2}$ • day^{-1} necessary for eelgrass. Eelgrass disappeared after typhoon attacks in 2004-2006, whereas seedlings of eelgrass appeared both at the constructed and natural habitats every winter. These results suggest that restoration of eelgrass habitat by filling up borrow pit is a useful technique for eelgrass bed restoration

Possible bottom-up control of fisheries production in the Seto Inland Sea, Japan

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In recent decades, anthropogenic nutrient discharges into the Seto Inland Sea of Japan have reduced as a result of a set of measures for environmental conservation. On the other hand, several fish catches and/or stocks have collapsed in this area. Shifts in seawater quality and fisheries landings were accompanied by modifications in structure of marine communities. Alteration of resource availability represents a "bottom-up" effect on marine ecosystems, whereas removal of consumer biomass through fishing represents a "top-down" effect. Therefore, an understanding of how bottom-up and top-down processes influence the structure and dynamics of marine communities is necessary for effective management of fisheries production and marine ecosystems in the face of environmental variability and human impacts. In this study, we addressed the question of bottom-up versus top-down control of marine ecosystem trophic interactions by using long-term nutrients and phytoplankton biomass data and annual fish catch data (1973 – 2005) in Harima-Nada, located in the eastern part of the Seto Inland Sea of Japan. Linear regression model showed a significant relationship between dissolved inorganic nitrogen concentration and phytoplankton biomass (chlorophyll a concentration) for the period 1991 to 2005. A positive relationship was also found between mean annual phytoplankton biomass and annual yield of pelagic plankton feeders for the same period. These results demonstrate close linkages between nutrients (especially dissolved inorganic nitrogen), phytoplankton, and pelagic plankton-feeding fishes, suggesting that bottom-up control regulates fisheries production in Harima-Nada during recent decades. Our findings have also an important bearing for ecosystem approaches to fisheries, particularly for the estimation of the carrying capacity with regard to sustainable exploitation.

Evaluation on Pb contamination in algae in Osaka Bay, Japan

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Heavy metal concentrations of the brown alga *Undaria pinnatifida* and the green alga *Ulva* sp. collected at 15 and 6 locations, respectively, from Osaka Bay are measured with inductively coupled plasma mass spectrometry (ICP-MS). The data are compared in order to evaluate the usefulness of a biomonitoring system for assessing the geographic distribution of heavy metals in coastal seawaters.

The ports of Osaka Bay are located on the N side coast (e.g., Kobe Port, Osaka Port) and the SE side coast (fishing ports). In contrast, Awaji Island, on the SW side of the bay has a natural coast. We believe the port areas receive contamination from anthropogenic sources such as shipping activities. *Undaria* from Kobe Port, a major industrial port, show extremely high Pb concentrations (3.5± 0.27 ppm, dry weight) and those from the SE area are relatively high (0.43—1.4 ppm, dry weight), while those from the SW area are low (0.14—0.36 ppm, dry weight).

Geographical variation in Pb concentrations of *Ulva* in the bay is different from that of *Undaria*. The Pb concentrations in *Ulva* from the SE area show a variance of between 0.29 and 1.71 ppm (dry weight). These concentrations are lower than those in the SW area (2.28-2.69 ppm, dry weight), although shipping activity in the latter is much less extensive. The sources of Pb contaminations in *Undaria* and *Ulva* are further investigated by Pb isotopic data and a factor analysis for heavy metal components (Cr, Mn, Cu, Zn, Cd, Pb) in *Undaria*.

Lead isotopic data for *Undaria* from two port localities, and two non-port localities and *Ulva* from one port locality and one non-port locality are acquired by thermal ionization mass spectrometry (TIMS). $^{206}Pb/^{207}Pb$ values in *Undaria* from non-port areas (Yura and Ikuho) are 1.1576 and 1.1638, respectively. These values are very similar to those in *Ulva* from port (Tarui) and non-port (Yura) areas: 1.1574 and 1.1649, respectively. However, *Undaria* from port areas (Kobe Port and Tarui) show $^{206}Pb/^{207}Pb$ ratios from 1.1372 to 1.1522, which are much lower ratios than those from non-port areas, suggesting that *Undaria* from port areas and non- port areas receive Pb from various sources and that *Ulva* and *Undaria* can maintain different Pb isotopic ratios in the same habitat. With the exception of one sample from Tarui, $^{206}Pb/^{207}Pb$ values in *Undaria* and *Ulva* (1.1486-1.1696) were similar to the ratios in the coastal seawater in Japan (Miyazaki and Reimer, 1993); however $^{208}Pb/^{204}Pb$ ratios in the latter are much lower (34.85-37.57) compared with the current report. Plots of $^{208}Pb/^{206}Pb$ versus $^{207}Pb/^{206}Pb$ ratios appeared to overlap with the field of airborne particulate in Osaka City (Osaka City, 2007) and those ratios in most specimens overlap with the field of road runoff in Osaka City (Osaka City, 2007).

Two significant factors accounting for about 77% of the variance were distinguished for the analyzed data. The first factor was characterized by high levels of Pb and Cu and the second factor was high level of Mn. Those scores of river water contaminated from road runoff (Osaka Pref, 2004) in the first and second factors differ greatly from those of *Undaria*. Those scores of *Undaria* from Amagasaki, where is near an abandoned industrial area and a sewage plant, corresponded closely to those from the SE area.

These observations suggest that $^{208}Pb/^{206}Pb$ and $^{207}Pb/^{206}Pb$ ratios in the algae from the areas affected by human activities in Osaka Bay are lower than those from the natural area and are controlled by mixing processes involving various components including sewage water and seawater rather than one source such as road runoff.

Durability of sand capping effect in the inner area of Ariake Bay

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The sand capping method appears to be useful for improving the environment of bottom sediment in the inner area of the Ariake Sea. It is usually thought that its effect becomes dull in only a few years. The present study investigates the secular change of the bottom sediment environment in sand capped sections, which were constructed by Saga Prefecture from 2001 to 2003. The relation between the habitation of benthos and the grain size distribution was investigated.

Sediment sampling was conducted in nine sand capped sections for evaluating the profile of sediment environment in 2005 and 2006 and in three sections for investigating benthos in 2007. Sediment column was taken with an acryl pipe. Three column samples were taken from each section, two samples were taken inside and one sample was taken outside a section. A sediment column was divided into pieces of 5 cm thick. The grain size distribution of each piece was examined with sieves. A surface sediment sample was taken using an Ekman-Birge type bottom sampler and put through a screen of 1mm meshes. The residue was fixed with 10 % formalin solution and benthic organisms were sorted, identified and weighed.

The ratio of fine sand (0.075-0.25 mm) of the surface sediment (0-0.05 m) increased from 2005 to 2006 at most of sections. The apparent change in grain size distribution might be occurred owing to huge disturbance of sea water caused by the typhoon (T0514) which crossed the Ariake Sea on September 6 in 2005. The effect of sand capping on grain size distribution was recognized except for section SW01, in which the ratio of sand ranged 0.075-2 mm was larger from the surface to deeper layer for capped and non-capped point, i.e. outside the section. Species, population and weight of benthos at sand capped point were obviously larger than non-capped point in NE02 and Ne03.