VARIATION IN HEAVY METAL CONCENTRATIONS IN THE BROWN ALGA Undaria pinnatifida IN OSAKA BAY, JAPAN

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In order to establish a novel bio-monitoring system for assessing the long term changes and geographical distributions of heavy metal ions in coastal waters, we investigated the heavy metal concentrations in the sporophytes of an annual kelp, *Undaria pinnatifida*, in Osaka Bay, Japan. In addition, to assess experimentally the relationship between the heavy metal ion concentrations in seawater and algal tissue, we grew *Undaria* in artificial seawater medium of different selected ion (Zn and Cd) concentrations and compared the metal concentrations in the tissues. We consider *U. pinnatifida* to be suitable as a model organism for bio-monitoring in this region because of the following features: 1) *Undaria* has a relatively long lifespan (5-6 months); 2) it is easily found and identified; 3) it is relatively easily maintained and grown in laboratory cultures, using artificial seawater medium to control heavy metal concentrations 4) it is commonly distributed in temperate regions of Japan; 5) primary producers are less influenced by the food chain concentration effects compared with animals. Osaka Bay, surrounded by Honshu (the "mainland") and Awaji Island, shows a clear gradient in water quality. The NE part (Honshu side) is highly eutrophicated due to the large inflow from eutrophicated rivers, and the SW part (Awaji Island side) is less eutrophicated because of less industry, less inflow of river water, and more frequent water exchange by tides.

We collected *U. pinnatifida* sporophytes from 15 sites along the bay in March 2005. About 160 cm² of the blade was cut out from the central part of clean sporophytes, rinsed in filtered seawater using a ultrasonic cleaning bath, and dried. The metal concentrations in the samples were determined by ICP-MS. Although the concentrations of most of the elements examined (Cr, Mn, Ni, Cu, Zn, As, Se and Pb) were in the range of ppm, Mg and Fe were as high as 10-30 and 1.0-9.0 ‰ dw, respectively. The concentrations of Co, Cd and Sn were as low as 50-600, 10-550, and 100-1200 ppb dw, respectively. Comparison of metal compositions of samples from different sites revealed the following features: 1) Mg and As concentrations were similar irrespective of locality; 2) Ni concentrations were considerably higher on the Honshu side than on the Awaji Island side; 3) Cr, Fe, Zn, Se, and Sn concentrations were higher on the southeastern Honshu side, and lower on the northwestern Honshu side. This pattern did not show the expected positive correlation with the concentration gradient of nutrient salts (N and P) in the area.