(学位第３号様式)

学 位 論 文 要 旨

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題　目	Bioaccumulation of organotin compounds in marine sediment through the food web (海域環境底質中有機スズ化合物の食物網を通した蓄積に関する研究)

Organotin compounds (OTs) had been used worldwide as an effective antifouling biocide. However, in the year 2008, the International Maritime Organization adopted the International Convention on the Control of Harmful Antifouling Systems, which prohibits the use of OTs as active ingredients in antifouling systems on ships because of the persistence of OTs and their ecotoxicological impacts on marine organisms. Unfortunately, OTs persistence in sediment for a long time, may become source of OTs in water and are transferred to benthic organisms. It is therefore important to monitor the status of recovery from OTs contamination in coastal water after the global ban.

In the present study it is suggested that regardless their sizes, vertical habitats and to season, blue mussels, *Mytilus galloprovincialis*, can be applied to monitor OTs pollution. It is also suggested that the total butyltin compounds (ΣBTs) concentrations in blue mussels and green mussels, *Perna viridis*, are comparable and that these species can serve as biomonitors of recovery status from tributyltin (TBT) contamination in various regions of the Asian waters after the global ban.

In the present study the OTs concentration in the benthic organisms implies that OTs can be transferred to benthic organisms from bottom sediments and that the sediments can act as a secondary contamination source of OTs. Triphenyltin (TPT) concentration becomes higher as the trophic level increases, suggesting the bioaccumulation of TPT through the food web. However, no such trend was observed for TBT because of the differences in bioaccumulation among species.

A laboratory experiment was conducted to investigate the transfer of OTs from environmental relevantly contaminated marine sediment to an infaunal surface deposit-feeding polychaete, *Perinereis nuntia*. The dietary bioaccumulation of OTs from their prey organisms was also studied in a laboratory experiment using marbled flounder (*Pleuronectes yokohamae*). The kinetic parameters that affect the bioaccumulation such as the sediment uptake rate coefficients (k_s), the uptake (k_1) and elimination (k_2) rate constants, the biota-sediment accumulation factors (BSAFs), and the biomagnification factors (BMFs) were determined for OTs. These results suggest that OTs can be transferred from sediment to polychaetes and TPT is more easily accumulated than TBT because TPT is less easily excreted than TBT. The marbled flounder accumulated OTs from their main prey, polychaetes that had accumulated OTs from environmental relevantly contaminated marine sediment. In the marbled flounder TBT is more easily accumulated than TPT because TBT is less easily excreted than TPT, however the differences in bioaccumulation between TBT and TPT were smaller than those in the polychaetes.

To clarify the differences in bioaccumulation between OTs and Persistent Organic Pollutants (POPs) in sediments, their kinetic parameters that affect the bioaccumulation were compared. These results suggest that OTs can be transferred to benthic organisms from sediments and then accumulate through the food web as the same extent as POPs. More attention should be paid to OTs in sediments as a secondary source, where OTs will remain even if their use in antifouling paints for ships is banned worldwide.