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学位論文審査の要旨

博士の専攻分野の名称 博士(食資源学) 氏名 楊 柳

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学位論文題名

Research on Microplastics in Marine Life in the Coastal Areas of Japan
(日本近海におけるマリンライフ中のマイクロプラスチックの研究)

Microplastics derived from anthropogenic pollution have become a major issue today. Available data points to their presence in all terrestrial and marine ecosystems. The body of literature documenting their presence in many organisms is growing, including humans, where they may cause health problems. These microplastics are from multiple sources, from trash dumped in rivers and lakes and travelling to the ocean, fishing tools such as nets, ropes, and baskets, to various chemicals dumped in water sources.

Marine organisms often absorb microplastics through food or directly from the water, especially in filter-feeding species. Particles are then deposited in the respiratory organs, guts, pallial cavity, and other organs. When these species are used as food, these particles are transferred to the consuming organisms, where they accumulate. Oysters are an important component of Japan's fisheries industry, as locally consumed or exported. Their quality is of utmost importance for the industry.

In addition, as apex predators, cetaceans are critical in regulating the food web and maintaining ecosystem balance. Cetaceans consume lower trophic-level organisms that have ingested microplastics. At present, studies are not enough on microplastics in cetaceans. Further research on the prevalence and effects of microplastics in these animals is needed to help conservation efforts and shed light on the larger issue of plastic pollution in the oceans. Studying the levels of microplastics in cetaceans can indicate the level of microplastic contamination in the larger marine food web, including seafood that humans consume.

The main purpose of this thesis was to study the presence and accumulation of microplastics in marine-life, such as oysters and cetaceans, for better understanding their

potential impacts on these species and the marine environment. In the case of oysters, the possible relationship between microplastics and food safety was discussed. The research involved analyzing the presence of fibres and their quantification in oysters and cetaceans from different locations and comparing the results to determine trends or patterns.

The study detected microplastics in cultured oysters, mainly in fibres and fragments, with red and green being the most common colours. Fibres were the most common type, with an average of 3.14 ± 4.00 particles per individual. Microplastics were found in oyster gills and digestive systems, and the Raman spectra analysis showed they were nylon 6, high-density polyethylene and polypropylene. Furthermore, Microplastics were detected in 13 out of 17 samples of cetacean intestines. The observed microplastics showed variations in length, size, and colour, most of which were fibres. Raman spectroscopy analysis identified Nylon 6,6 as the polymer present in the microplastics.

The thesis investigated the presence and accumulation of microplastics in oysters and cetaceans. The potential impacts on these species and the marine environment were discussed. The research also examined the potential relationship between microplastics and seafood safety in oysters. Additionally, the thesis analyzed the potential effects of microplastics on human health based on existing literature and discussed possible measures to reduce the impact of microplastic pollution from a political and societal perspective.

The results of the study will contribute to the current knowledge of the impact of microplastics on marine life and ecosystems and can aid in developing strategies to mitigate and manage this environmental issue. Therefore, we acknowledge that the author is qualified to be granted the Degree of Doctor of Philosophy in Food Resources from Hokkaido University.