Title of Research:

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Development of a conceptual model for environmental risk assessment of microplastics and a trial risk assessment in Tokyo Bay

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Summary of Research:

The purpose of this study project is to review the existing domestic and international literature for environmental risk assessment of microplastics (MPs), to develop a conceptual model that concretely shows the risk assessment procedure of MPs, and to conduct a trial risk assessment for Tokyo Bay. In FY2022, we established methods for estimating MP loadings from major sources, which is indispensable for considering priorities for source control measures, etc. We estimated loadings for product-containing MP (PCP), laundry-derived fiber, and tire-wear particles (TWP) entering Tokyo Bay, and showed the range of possible values for the estimates. We investigated to understand the MP monitoring levels along the Japanese coast (especially in Tokyo Bay) and a method for estimating the distribution of MP concentrations in the unmeasured range and estimated the distribution of the number of unmeasured MP concentrations from available data. We derived an SSD based on hierarchical Bayes using toxicity values listed in the new MP ecotoxicity database. Furthermore, as a trial ecological risk assessment in Tokyo Bay, we compared the corrected MP particle concentrations in Tokyo Bay with threshold values using Food Dilution as an effect index. Through the environmental load estimation, analysis of the monitoring data, consideration of data correction methods, and trial risk assessment in Tokyo Bay, we were able to clarify items with large uncertainties and future research issues. In the future, we plan to establish an assessment framework that enables us to predict the future environmental burden and risk of MP by improving the accuracy of the estimation method and understanding the particle size distribution of environmental MP that matches the actual situation.

Timeline:

March 2020-

Topics:

JCIA-LRI Annual Workshop “Development of a conceptual model for environmental risk assessment of

microplastics and a trial risk assessment in Tokyo Bay", August 2022 (Online)

Publications:

1. Naito W "Risk Assessment in Practice : Opportunities, Challenges and Evolving Roles for Complex Environmental Issues" SETAC AP 2022, Plenary Speech, Sep. 2022（Virtual Meeting）
2. Naito W "Development of a conceptual model for environmental risk assessment of microplastics and a trial risk assessment in Tokyo Bay" MARII Workshop on "Advancements and steps towards a holistic, quantitative risk assessment on microplastics" Oral presentation、 Oct. 2022、Barcelona, Spain
3. Ueda K, Iwasaki Y, Uesaka M, Naito W "Which concentration unit should be used for environmental risk assessment of microplastics?" 57th Annual Meeting of Japanese Society of Water Environment, Poster Presentation, March 2023, (Univ. Ehime, Japan)
4. Naito W, Iwasaki Y, Ono K, Ogura I "Framework of environmental risk assessment for microplastics and an illustrative example" 57th Annual Meeting of Japanese Society of Water Environment, Oral Presentation, March 2023, (Univ. Ehime, Japan)