

Title of Research: 23-5-06

Ecotoxicological risk assessment of microplastics –as a model case of Osaka Bay-

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Summary of Research:

We investigated microplastic residues in the sea surface water of Osaka Bay area, in order to set the microplastic exposure conditions. As a results, plastic particles accounted for only 22.4% of particles. Microplastic pollution values in the Osaka Bay (range abundance of 7.6 – 61.4 particles/L) is consistent with previous reports in other semi-enclosed bays. Fragments appeared in the size less than 100 µm, fibers had much smaller sizes in the range 10–30 µm, films appeared in the size range 34–409 µm, and beads appeared in the size around 30µm. Atmospheric transport plays a critical role in the deposition and accumulation of microplastics in marine environments. Therefore, we aimed to investigate the abundance of microplastics in rainwater outfalls from five prefectures (Hokkaido, Akita, Fukuoka, Hiroshima, and Hyogo) across Japan. The overall microplastics concentrations ranged from 379 to 1,790 particles/L.

Fish are thought to employ color vision to detect microplastics, prompting our investigation into microplastic ingestion patterns in three marine fish species, *Chrysiptera cyanea*, *Hypoatherina tsurugae*, and *Plotosus japonicus*, and three freshwater fish species, *Rhodeus ocellatus*, *Pseudorasbora parva*, and *Misgurnus anguillicaudatus*. Notably, *C. cyanea*, *P. japonicus*, and *R. ocellatus* exhibited color preferences in microplastic ingestion, with *C. cyanea* favoring red, *P. japonicus* preferring blue and gray, and *R. ocellatus* favoring red and yellow.

Finally, using *D. magna* (crustacean) and zebrafish (fish), we investigated whether the time required to expel microplastics varies when ingestion occurs through a food-chain. As a results, we found that microplastics excretion occurs within 48 h and 24 h for direct ingestion and ingestion through food chain (via *D. magna*), respectively.

Timeline:

March 1, 2023

Topics:

2023 年度 日化協 LRI 研究報告会にて発表「閉鎖性海域 大阪湾をモデルケースにした MP の生態リスク評価」

セタックジャパン ミニシンポジウムにて発表「Abundance of microplastics in a semi-enclosed Osaka Bay area –Ecotoxicological risk assessment of microplastics–」

Publications:

第 26 回日本水環境学会シンポジウムにて発表「閉鎖性海域 大阪湾をモデルケースにした MP の生態リスク評価」

令和 5 年度 海洋プラスチックごみ学術シンポジウムにて発表「「食う-食われる」過程を介した マイクロプラスチックの排出時間の変化」

Horie Y, Mitsunaga K, Yamaji K, Hirokawa S, Uaciquete D, Ríos JM, Yap CK, Okamura H. Variability in microplastic color preference and intake among selected marine and freshwater fish and crustaceans, *Discover Ocean*, 1(5), 2024.

Horie Y, Uaciquete D, Mitsunaga K, Akkajit P, Ríos JM, Naija A. Food chain-mediated variation in excretion times of microplastics: Unraveling the interactions with plasticizers. *Regional Studies in Marine Science*. 69, 103343, 2024.