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TITLE: Mercury (Hg) isotopic variations of fishes from coastal, marginal, and pelagic marine ecosystems within exclusive economic zone (EEZ) of Japan
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ABSTRACT BODY: Mercury (Hg), a potent harmful trace metal, is a global pollutant and present in all environmental compartment. A large amount of Hg presents in the global ocean, and methylated form of mercury (MeHg), a highly toxic compound, can be bioaccumulated and biomagnified in marine food chains. Fishes are important protein sources in human and wildlife diets worldwide, and consumption of them can pose human and ecological health risks. In this study, Hg isotopic compositions of various fishes within exclusive economic zone of Japan were measured to distinguish different biogeochemical processes and sources of bioaccumulating Hg in different marine environmental settings. Fish samples were from a coastal ecosystem of Minamata Bay, a marginal marine ecosystem from Genkai sea, and pelagic ecosystem in Northwest Pacific Ocean. The determined $d^{202}Hg$ and $D^{199}Hg$ of pelagic fishes ($d^{202}Hg$: 0.4 – 1.0‰, $D^{199}Hg$: 1.6 – 3.0‰) indicate their relatively higher isotopic ratios than those of fishes from marginal sea ($d^{202}Hg$: 0.2 – 1.25‰, $D^{199}Hg$: 0.8 – 1.5‰) and coastal environment ($d^{202}Hg$: -0.7 – 0.4‰, $D^{199}Hg$: 0.1 – 0.7‰). The determined $d^{202}Hg$ variations can be explained by biotic and abiotic demethylating processes, and the $D^{199}Hg$ variations can be attribute to different magnitude of photo-reduction. Also, the $D^{199}Hg$ variations are related to water depth of their sampling locations. Water depth of the pelagic environment exceeds 1,000 m, and the water depth of the marginal marine ecosystem ranges from 100 to 200 m. The $D^{199}Hg$ values of pelagic fishes were approximately 0.1 to 3.5‰ higher than those from marginal marine ecosystem. The $D^{199}Hg$ values of fishes from Minamata Bay were the lowest where its water depth is less than 30 m. It has been known that sediment is a major component where MeHg is produced, and the determined $d^{202}Hg$ and $D^{199}Hg$ values of coastal and pelagic sediments ranged from -1.3 to -0.5‰ in $d^{202}Hg$ and 0 to 0.2‰ in $D^{199}Hg$. The Hg isotope compositions of coastal fishes were nearly identical to the sediment Hg isotopic values. Hg isotope compositions of fishes are useful proxies to investigate the aquatic Hg biogeochemical and bioaccumulating processes. Also, the fish Hg

isotope compositions can be used to indicate different habitat related to their water depth and characterize exposure route of MeHg to human and wildlife.

KEYWORDS: Bioaccumulation, Ecotoxicology, Metals