

Biodiversity indicators of trophic structure measured by stable isotope ratios

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The term "biodiversity" is considered as multi-level diversity, ranging from genetic, species, to ecosystem level. However, it is difficult to measure arbitrary level of biodiversity, therefore, biodiversity assessment at species level is often applied to an ecosystem. Biodiversity assessment at species cannot directly be related to ecosystem function, thus, a grouping method, such as functional feeding group (FFG), is often used in stream ecology.

Our project, funded by the Environment Research and Technology Development Fund (4D-1102), aimed at developing a method to evaluate functions of biodiversity in watershed ecology, especially streams. Stable isotope tools have been used to study watershed ecology, which covers researches on nutrient cycling and food web structure among forest, river, lake and coastal ecosystems. Recently, nitrogen isotope ratios of individual amino acids have been measured to estimate trophic positions of animals. However, this technique has not been applied to complex food web analysis, such as freshwater systems, which are based on both autochthonous and allochthonous productions. We have proved that this method is applicable to various freshwater food webs, including the system to which the bulk-isotope method could not be applied. Application of the method to archived biological specimen allows us to study long-term trophic changes in the ecosystem. Natural abundance of radiocarbon is another signature that separates carbon sources in freshwater ecosystems.

We suggest that a trophic structure estimated by various isotope signatures, together with estimated biomass of each taxonomic group, is an alternative index of describing biodiversity in watershed ecosystems.

Keywords: Stable isotope ratios, Food web, Trophic position