

河川への人為起源窒素の負荷が水棲生物の食物網構造に与える影響 How does anthropogenic nitrogen input affect the nutrient dynamics and food web structures?

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In last five decades, impacts of anthropogenic nutrient inputs on river ecosystems have continuously been a major concern for the governments and residents of the catchments in Japan. Major sources of anthropogenic nitrogen (N) include leachate from forest ecosystem, surplus fertilizers and sewage. Impacts of anthropogenic N inputs on nutrient dynamics and food web structures were investigated using stable N isotope techniques in the Arida river catchment, Japan. Riverine survey utilizing 5 regular sampling points showed that $\delta^{15}\text{N}$ of nitrate (NO_3^-) increased from forested upstream ($\sim 2\text{‰}$) to the downstream ($\sim 7\text{‰}$) due to the sewage loads and fertilizer effluents from agricultural area. Correspondingly the $\delta^{15}\text{N}$ of benthic algae and aquatic insects increased toward the downstream. This indicates that primary producers of each reach strongly relied on the local N sources and it was utilized effectively in their food web. Simulation using a GIS based mixing model considering the spatial distributions of human population density and fertilizer effluents revealed that strongest impacts of N inputs was originated from organic fertilizers applied to orchards in the middle to lower parts of catchment. Differences in $\delta^{15}\text{N}$ between primary producers and predators were $\sim 6\text{-}7\text{‰}$ similarly at all sampling points. Food web structural analysis using food network unfolding technique based on observed $\delta^{15}\text{N}$ suggested that the structure of nutrient pyramid did not differ significantly along the riverine positions, while the members of species in each trophic level changed and the impact of anthropogenic N input was visible along the river.

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