平成３０年度　環境科学院　修士論文内容の要旨

Adult aquatic insects as indicators of water pollution in hyporheic food web
（河床間隙水域食物網への水質汚染指標としての水生昆虫成虫）

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Hyporheic zone is a dynamic active ecotone of the sub-surface area, where surface and groundwater mix, and provides functions including habitat for larvae of aquatic insects. The methodological burden of sampling hyporheic invertebrates is a major hindrance to the understanding of the hyporheic environment. This study examined the food web in the hyporheic zone by determining major basal resources for and the trophic position of invertebrates, and also examined whether adult insects can serve as a proxy of pollution effects in the hyporheic food web. The field study was conducted in a lowland segment of a gravel bed river in Hokkaido, Japan, where a longitudinal gradient in nutrient concentrations existed because of an input of dissolved solids from a point source. The hyporheic invertebrate larvae were sampled using colonization traps at 30 cm and 50 cm depth whereas hyporheic adults were collected using hand nets. Nitrogen and carbon stable isotope ratios (SIRs) were used to determine the effects of water pollution and major basal carbon sources, respectively. Epilithic biofilm and particulate organic matter were considered main food resources to the hyporheic invertebrates.

Among hyporheic taxa, Amphipoda and larvae of stoneflies (Order: Plecoptera, Family: Chloroperlidae, Species: *Alloperla ishikariana*) were considered predators and primary consumers, respectively; Chloroperlidae were consistent in terms of their trophic position regardless of variable effects of pollution. Similar water quality both in hyporheic and surface water suggested high hydrological exchanges between two domains and resulted in positive increases of the nitrogen SIRs of hyporheic Chloroperlidae larvae in proportion to nitrate level in surface water. This clearly indicated the assimilation of heavy isotopes by primary resources and then to the organisms at higher trophic levels. Furthermore, the nitrogen SIRs of Chloroperlidae larvae were highly correlated with those of their adults (R^2=0.8558) indicating that adults can provide information on the spatial variability of nitrogen isotope ratios in the hyporheic zone. Overall, our results showed that adult aquatic insects can be used as an indirect and useful indicator of water pollution in the hyporheic food web, at least in terms of the degree of assimilation of heavy nitrogen isotopes by primary consumers.