

Downstream changes in dissolved matter, suspended sediment, and carbon and nitrogen stable isotope ratio in Niyodo River

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Carbon and nitrogen is the essential element for aquatic production, however they influence aquatic production and biodiversity due to eutrophication in the case of excess amount. Objectives of this study was to clarify downstream changes in (1) concentrations of dissolved organic carbon (DOC) and dissolved total nitrogen (DTN) and suspended sediment (SS) and (2) the source of organic compounds using carbon and nitrogen stable isotope ratio. In October 2007 when water level was ordinary, we sampled water at 8 points including 1st order stream in forest area (upstream of Yasui River) and downstream river ca. 10 km distant from river mouth of Niyodo River, Kochi Prefecture. We also collected water of Niyodo river just upstream of the confluence of Niyodo and Yasui River. We analyzed water for DTN and DOC after filtration with membrane filter (0.45 μm). We collected suspended sediment (SS) by filtering water through glass fiber filter (GF/F, 0.7 μm) and weighed after drying (80 $^{\circ}\text{C}$, 24h). We also analyzed SS for carbon and nitrogen concentrations and stable isotope ratio ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$). In December 2007, we collected water in 1st to 3rd order stream and measured SS and loss on ignition (550 $^{\circ}\text{C}$, 1h). DOC and DTN concentration were 0.27-0.51 (mgC L^{-1}) and 0.27-0.50 (mgN L^{-1}), respectively without clear pattern in downstream change. SS concentration was high (1.1 mg L^{-1}) in 1st order stream in forest area and decreased downstream up to 0.1 (mg L^{-1}) in the area of middle stream, however increased to the range from 0.7 to 1.4 (mg L^{-1}) in downstream of the confluence. This might have been influenced by high value (2.8 mg L^{-1}) in Niyodo River just upstream of the confluence. Losses on ignition of SS were 47, 100 % at 1st and 2nd to 3rd order stream, respectively, suggesting that high SS in 1st order steep stream attribute to sediments such as sand, silt, and clay and majority of these sediments settled in 2nd order stream. $\delta^{13}\text{C}$ of SS ranged from -26.6 to -26.7 (permillage) in forest area (1st- 3rd order stream) and increased downstream in the middle stream area. This result shows that source of organic matter changed from forest vegetation (C3 plant) in upstream to others such as attached algae in middle stream. $\delta^{15}\text{N}$ increased up to 3.3 permillage downstream from 1st order stream to middle stream but decreased in downstream of the confluence and increased again to 3.5 permillage at the most downstream point, suggesting that there was an anthropogenic nitrogen input in the area with high population density. Decreases in $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ in downstream of the confluence might have been influenced by the value of the Niyoro River just upstream of the confluence. However it was also possible that other factors such as tributary and dam would influence these decreases in downstream river. These results show the downstream changes in SS and its source despite small changes in concentrations of DOC and DTN in Niyodo River.