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Spatial distribution and its characteristics of stable nitrogen isotopic composition of macroalgae in Nagura Bay

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This study, focusing on Nagura Bay in the west of the Ishigaki Island, conducted a field sampling and measurement of δ^{15}N values of macroalgae, *Padina* spp. and sea grass, *Thalassia hemprichii* in order to evaluate effects of land-derived nitrogen load on the coral reef ecosystem, and to discuss the reasons for the nitrogen load distribution in the bay.

In June 2013, 55 samples for each species were collected at about 50 m intervals on 7 transect lines, and their δ^{15}N and δ^{13}C values were measured in the laboratory. At the same time, water samples at stream, spring and sea were collected and their water qualities were measured. Moreover, areas for each land use in related watershed were calculated using GIS to examine the relationship between the nitrate concentration in river water samples and land use, and to identify the source of land-derived nitrogen.

As a result, most of the δ^{15}N values of macroalgae and sea grass linearly decreased from +6 to +2 ‰ with increasing distance from the shoreline. However, the transect lines around the river mouth of Nagura River relatively showed high δ^{15}N values by about 1 km away from the shoreline comparing with the other transect lines. One of the reasons is probably water flow condition around the river mouth. Some previous studies had showed that the water flow stagnates around there due to the south monsoon wind in spring and summer. Before this field sampling, the mode of wind direction for 3 months was surely south wind. This is why the land-derived nitrogen loads through Nagura River remained around river mouth due to water stagnation and lower dilution in seawater, and the plants could have higher δ^{15}N values.

On the other hand, NO_3-N concentrations have high correlations with ratios of farm land and cultivated areas. Thus, they were perhaps the main nitrogen sources in this study area. Additionally, NO_3-N flux [mg/s], which calculated by flow rate [m3/s] and NO_3-N concentration [mg/l], estimated 81.9 mg/s at the river mouth of Nagura River, and 59.4 mg/s at the upstream. Mangrove swamps and tidal flat exist between the two locations. Thus, the nitrogen source increasing the flux 22.5 mg/s could come from the swamps or their upstream.

Keywords: Padina spp., Thalassia hemprichii, Stable nitrogen isotopic composition, land-derived nitrogen, Nagura Bay, mangrove swamps and tidal flat