

## Biological nitrogen fixation sustains fishery production in the subtropical Pacific Ocean

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Nitrate below the euphotic layer has been generally considered as a primary nitrogen source to sustain new production which leads to fishery production in the sea. Recently nitrogen fixed by diazotrophs is gaining attention as another nitrogen input to fuel new production in the subtropical ecosystem. While a number of studies indicate that the nitrogen fixation contributes to secondary production, its role in the fishery production is still unknown. Here we present two attempts to prove the contribution of diazotrophic nitrogen to fishery production by means of the analysis of food-chain structure with carbon ( $\delta^{13}\text{C}$ ) and nitrogen ( $\delta^{15}\text{N}$ ) stable isotopic ratios. Firstly in the central Pacific, we determined the isotopic signatures in suspended particulate organic matter (POM), net-plankton and micronektonic fish from the epipelagic zone.  $\delta^{15}\text{N}$  of surface POM and all biotic components was low, reflecting *in situ*  $\text{N}_2$  fixation activity in the subtropical regions where the  $\text{N}_2$  fixation activity was high, with a clear contrast with high  $\delta^{15}\text{N}$  in the areas where the activity was low. Thus, a distinct food-chain to micronektonic fish sustained by diazotrophs existed in the subtropical Pacific. Secondly, we examined contribution of nitrogen fixation to predatory fish as indexed by the isotopic signatures in benthopelagic fish, *Beryx splendens* and their prey in the Kuroshio Current in which the diazotrophy was active. The signature of nitrogen fixation was evident in POM, net-plankton, micronektonic prey fish and *B. splendens*. Thus, diazotrophy is an important nitrogen source for fishery production in the subtropical ocean. The response of diazotrophy to the on-going climate change and the subsequent impact on higher trophic levels is the critical issue to be tackled to predict sustainability of subtropical fishery production.

Keywords: stable isotope, diazotroph, *Beryx splendens*