CSIA of amino acids in zooplankton for nitrogen isotopic baseline estimation in north western pacific

BOHYUNG CHOI[1], YEONJUNG LEE[2], YOSHITO CHIKARAISHI[3], NAYEON PARK[4], JAE-HOON NOH[2], WON-CHEOL LEE[4], KYUNG-HOON SHIN[5], IHN-SIL KWAK[1]

[1] Fisheries Science institute, Chonnam University, Korea
[2] Marine Ecosystem Research Center, KIOST, Korea
[3] Institute of low temperature sciences, Hokkaido University, Japan
[4] Department of Life science, Hanyang University, Korea
[5] Department of Marine Science and Convergence Engineering, Hanyang University, Korea

Nitrogen isotope ratio of phytoplankton is often used as a tool for identifying the fate and cycle of inorganic nitrogen in the open ocean. However, insufficiant biomass in where the primary productivity is low and desorted of phytoplankton for stable isotope analysis restrict to obtain nitorgen isotopic baseline from phytoplankton. An alternative method for nitorgen isotopic baseline estimation is using CSIA of amino acids (CSIA-AAs) in heterotrophic organisms, as the source amino acids experience negligible change of nitrogen isotope ratio from primary producers. Moreover, TP information obtained from CSIA of amino acids theoretically allow us to calcuate isotopic baseline via effectively removal of trophic enrichment of nitrogen isotopes in heterotrophs.

We analyzed nitrogen isotope ratios of bulk tissue and amino acids of calanus sp. sampled in the north western pacific (42°N~21°N), to estimated nitrogen isotopic baseline and contribution of N2 fixation derived nitrogen source.

Both nitrogen isotope ratios in bulk tissue (3.4‰~9.1‰) and phenylalanine (−2.2‰ to 6.0‰) of the zooplanktons were positively correlated with latitude, likely due to shift in inorganic nitrogen source which is assimilated to the primary producer. The estimated nitrogen isotope ratio of phytoplankton (baseline) based on the bulk nitrogen isotope ratio of zooplankton with their TP estimated by CSIA-AAs ranged from −2.8‰ to 3.9‰, and also showed positive relationship with latitute. Ntrogen isotope ratios of phenylalanine and baseline were effectively lower that those in bulk tissue as the trophic enrichments are eliminated. The contribution of N2 fixation derived nitrogen estimation by the simple esimation with two end-members of nitrate (5‰) and N2 fixation (−2‰), was ranged from 15% to 100% with negative relationship with latitute. Our results demonstrate importance of N2 fixation at low latitute in West pacific, particulary lower than 35°N in north Western Pacific Ocean.