



## Seasonal and spatial variation in the organic carbon and nitrogen concentration and their stable isotopic composition in *Zostera marina* (Denmark)

Papadimitriou, S., H. Kennedy, D. P. Kennedy, J. Borum

Limnol. Oceanogr., 50(4), 2005, 1084-1095 | DOI: 10.4319/lo.2005.50.4.1084

**ABSTRACT:** The spatial and seasonal variation in the concentration and stable isotopic composition of carbon and nitrogen was studied in *Zostera marina* (eelgrass) meadows in Roskilde Fjord and Øresund, Denmark. Organic carbon ( $C_{org}$ ) and nitrogen ( $N_{org}$ ) concentrations in new tissues (leaf, rhizome, roots) ranged from 11 to 40 mmol g<sup>-1</sup> C and 0.4 to 3.6 mmol g<sup>-1</sup> N, whereas their stable isotopic composition in new leaf ranged from -22‰ to -8‰ ( $\delta^{13}C_{leaf}$ ) and +7‰ to +20‰ ( $\delta^{15}N_{leaf}$ ). The  $\delta^{13}C_{leaf}$  correlated weakly ( $r^2 \sim 0.3$ ) with the  $\delta^{13}C$  of total dissolved inorganic carbon (DIC) in the surface waters ( $\delta^{13}C_{DIC}$  range: -5.4‰ to -0.3‰). The temporal change was more pronounced than the spatial change for  $N_{org}$ , the atomic C:N ratio, and  $\delta^{13}C_{leaf}$ , but was much smaller for  $C_{org}$  and  $\delta^{15}N_{leaf}$ . Eelgrass plants had higher  $N_{org}$  concentrations, lower C:N ratios, and more depleted  $\delta^{13}C_{leaf}$  in winter than summer, reflecting the temporal imbalance between inorganic nutrient supply and plant demand imposed by seasonality in the growth rate. The apparent carbon isotope enrichment factor of new leaf relative to external DIC (eelgrass-DIC range: -12.1‰ to -5.3‰) indicated that eelgrass must be reliant on direct  $HCO_3^-$  uptake, especially during the period of high growth rate (May to September). The steep spatial gradient of  $\delta^{15}N_{leaf}$  reflected changes in the isotopic composition of the source of assimilated inorganic nitrogen. The strongly positive  $\delta^{15}N_{leaf}$  values measured inside the fjord indicated an anthropogenic origin for inorganic nitrogen, which comes from riverine input (riverine  $\delta^{15}N - NO_3^- = +11.8‰ \pm 1.1‰$ ).

### Article Links

[Download Full-text PDF](#)

[Return to Table of Contents](#)

### Please Note

Articles in L&O appear in PDF format. Open access articles may be freely downloaded by anyone. Other articles are available for download to subscribers only, or may be purchased for \$10 per article. All L&O articles are moved into Open Access after three years.

