## Biogeochemical reworking of sewage discharged in the Scheldt Estuary (Belgium) influences nitrogen and carbon isotopic composition of the aquatic food chain

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Stable C and N isotope ratios were used to study food web characteristics of the brackish part of the Scheldt Estuary. The river Scheldt is a highly eutrophic system due to heavy antropogenic disturbance as indicated by high organic matter and ammonium loading. By means of stable isotope analysis, an attempt was made to detect trophic relationships of the aquatic food chain. Therefore, baseline C and N isotopic ratios were investigated monthly from May 1999 to March 2000 by measuring the isotopic composition of suspended particulate organic matter (SPOM). Also the $\delta^{15}N$ and $\delta^{13}C$ composition of species representing different trophic levels of the subtidal food web (copepods, mysids and fish) and the intertidal food web (endobenthos, shrimps and crabs) were investigated.

$\delta^{13}C_{SPOM}$ and $\delta^{15}N_{SPOM}$ values varied seasonally with $\delta^{13}C$ values ranging from –23.7 (January 2000) to –28.0‰ (June 1999) and $\delta^{15}N$ values ranging from +2.3‰ (January 2000) to +12.9‰ (June 1999). For copepods, $\delta^{13}C$ and $\delta^{15}N$ values varied from –30.7 to –26.4‰ and from +11.1 to +25.5‰ respectively. $\delta^{13}C$ and $\delta^{15}N$ values of copepods exhibited a seasonal variation and $\delta^{15}N$ co-varied with $\delta^{15}N_{SPOM}$. $\delta^{13}C$ values of two dominant mysid species varied between –29.0 and –25.5‰, $\delta^{15}N$ values varied between +11.8 and +25.0‰. Fish $\delta^{13}C$ values displayed a wide range, from –26.4 to –34.3‰ and $\delta^{15}N$ values from +15.7 to +33.5‰, depending on the trophic level. In the intertidal food web, macrocrustacea isotopic compositions ranged between –29.0 and –18.1‰ and +17.5 and +26.8‰ for $\delta^{13}C$ and $\delta^{15}N$ respectively, while endobenthic species had $\delta^{13}C$ values between –21.4 and –24.4‰ and $\delta^{15}N$ values between +19.2 and +22‰.

The $\delta^{15}N$ values were high compared to other estuarine environments. According to Hansson *et al.* (1997), such a situation reflects a high degree of pollution. However, in the present case, $^{15}N$-enrichment in the food chain is not the result of isotope composition of the waste source. Indeed, $\delta^{15}N$ of sewage SPOM from the Brussels sewer system, which is discharged untreated into the Scheldt via the Zenne and Rupel tributaries, does not exceed +3‰ (Fisseha, 2000), while $\delta^{15}N$ of riparian vegetation averaged +1.5‰ (Mariotti *et al.*, 1984). Therefore, the $^{15}N$ enrichment in the Scheldt trophic system is probably the result of organisms feeding on organic matter which has become enriched during river transport to the North Sea. Intense biogeochemical reworking of the N pools (bacterial mineralisation, followed by nitrification and denitrification) are the probable processes enriching $^{15}N$ in the nutrient pool ($NH_4^+$) utilised by bacteria decomposing detritus (Caraco *et al.*, 1998) and by phytoplankton (Mariotti *et al.*, 1984). These biogeochemical processes are probably subject to seasonal variability as indicated by seasonal variability of $\delta^{15}N$ signal in SPOM and copepods. Similarly to the pelagic food chain, $^{15}N$ enrichment of the intertidal food chain due to the incorporation of enriched DIN by phytobenthos has been mentioned by Riera *et al.*, (2000).

### References

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