

## Publication

### Benthic nutrient fluxes along the Laurentian Channel: Impacts on the N budget of the St. Lawrence marine system

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Water column concentrations and benthic fluxes of dissolved inorganic nitrogen (DIN) and oxygen (DO) were measured in the Gulf of St. Lawrence and the Upper and Lower St. Lawrence Estuary (USLE and LSLE, respectively) to assess the nitrogen (N) budget in the St. Lawrence (SL) system, as well as to elucidate the impact of bottom water hypoxia on fixed-N removal in the LSLE. A severe nitrate deficit, with respect to ambient phosphate concentrations ( $N \times 10^{-10}$  mmol L<sup>-1</sup>), was observed within and in the vicinity of the hypoxic bottom water of the LSLE. Given that DO concentrations in the water column have remained above 50 mmol L<sup>-1</sup>, nitrate reduction in suboxic sediments, rather than in the water column, is most likely responsible for the removal of fixed N from the SL system. Net nitrate fluxes into the sediments,

derived from pore water nitrate concentration gradients, ranged from 190 mmol m<sup>-2</sup> d<sup>-1</sup> in the hypoxic western LSLE to 100 mmol m<sup>-2</sup> d<sup>-1</sup> in the Gulf. The average total benthic nitrate reduction rate for the Laurentian Channel (LC) is on the order of 690 mmol m<sup>-2</sup> d<sup>-1</sup>, with coupled nitrification-nitrate reduction accounting for more than 70%. Using average nitrate reduction rates derived from the observed

water column nitrate deficit, the annual fixed-N elimination within the three main channels of the Gulf of St. Lawrence and LSLE was estimated at 411 106 t N, yielding an almost balanced N budget for the SL marine system.

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