



A seventy-two-year record of diminishing deep-water oxygen in the St. Lawrence estuary: The northwest Atlantic connection

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Limnol. Oceanogr., 50(5), 2005, 1654-1666 | DOI: 10.4319/lo.2005.50.5.1654

ABSTRACT: Oxygen concentrations in the bottom waters of the Lower St. Lawrence estuary (LSLE) decreased from 125 $\mu\text{mol L}^{-1}$ (37.7% saturation) in the 1930s to an average of 65 $\mu\text{mol L}^{-1}$ (20.7% saturation) for the 1984-2003 period. A concurrent 1.65° C warming of the bottom water from the 1930s to the 1980s suggests that changes in the relative proportions of cold, fresh, oxygen-rich Labrador Current Water (LCW) and warm, salty, oxygen-poor North Atlantic Central Water (NACW) in the water mass entering the Laurentian Channel probably played a role in the oxygen depletion. We estimate that about one half to two thirds of the oxygen loss in the bottom waters of the LSLE can be attributed to a decreased proportion of LCW. This leaves between one third and one half of the oxygen decrease to be explained by causes other than changes in water mass composition. An increase in the along-channel oxygen gradient from Cabot Strait to the LSLE over the past decades, combined with data from sediment cores, suggests that increased sediment oxygen demand may be partly responsible for the remainder of the oxygen decline. In July 2003, approximately 1,300 km² of seafloor in the LSLE was bathed in hypoxic water (<62.5 $\mu\text{mol L}^{-1}$).

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