



## THE ST. LAWRENCE IS LOW ON AIR

A serious danger is threatening the St. Lawrence River: a lack of oxygen. This phenomenon, called hypoxia, is a serious concern for the St. Lawrence Estuary, but also affects the gulf. Findings from a recent scientific cruise<sup>1</sup> confirm that a large portion of the estuary is slowly but surely suffocating.

In fact, the levels of oxygen in the deep waters of the estuary are so low that it could have serious repercussions on the marine ecosystems. Some scientists are even using the term “dead zones” to describe these areas of low oxygen that are expanding from year to year. When the concentration of oxygen in the bottom waters falls below 30% (hypoxia), many marine organisms, including fish, molluscs, and crustaceans, can no longer survive. Currently, certain parts of the estuary have oxygen levels below 15% saturation.

### The critical zone

The zone most affected by the reduction of oxygen in the St. Lawrence Estuary extends from Tadoussac, at the confluence of the Saguenay River and the St. Lawrence, to northwest of the Gulf of St. Lawrence.

Serious levels of hypoxia first appeared in the St. Lawrence Estuary in the mid-1980s. In 2003, this area covered approximately 1,300 km<sup>2</sup> of the seafloor, and has continued to grow over the last few years. In 70 years, the concentration of oxygen has decreased by half at depths greater than 250 meters.

### Caused by human activity—but only in part

Researchers have calculated that between one-third and one-half of the decrease in oxygen is the result of factors related to the river and the activities of those who live near it. Municipal wastewater, as well as fertilizer and manure used in nearby agricultural fields, results in the input of large quantities of nitrates and phosphates into the river. This creates an additional source of nutrients for the plankton, which multiply rapidly from spring through summer. When these abundant plankton die and fall to the bottom of the river, it gradually decomposes in the water, consuming the ever-decreasing supply of oxygen.



Credit: Lise Duchesne

*Entrance of the Bic Park, South shore of the St. Lawrence estuary.*

### A link to climate change

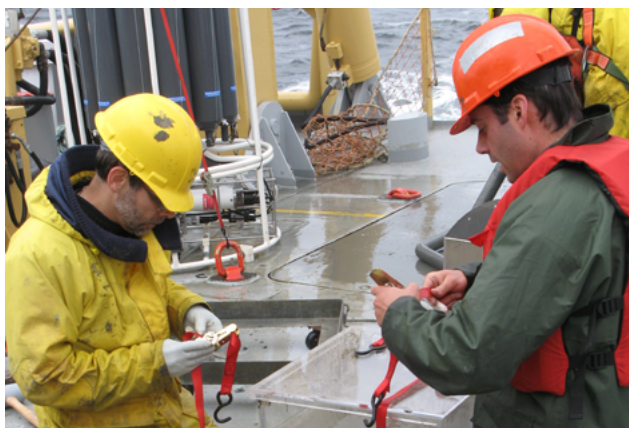
Scientists believe that changes in circulation in the Atlantic Ocean, possibly due to global warming, could contribute to the reduced oxygen in the St. Lawrence.

The water that enters the St. Lawrence is a mixture of two large water masses: the shallower Labrador Current Water is cold and oxygen-

rich, while the deeper North Atlantic Central Water, originating in the Gulf Stream, is warmer and less oxygenated. The deep water flowing into the estuary slowly loses its oxygen as it moves toward Tadoussac.

The problem is that the proportion of water coming from the Labrador Current Water has decreased, and thus more of the water entering the gulf comes from the less oxygenated Gulf Stream. This situation has contributed not only to a reduction in oxygen levels in the deep waters of the St. Lawrence Estuary, but also to an increase in water temperature of 1.65 °C.

If this trend continues, the deep waters of the estuary could, in the next fifty years, become anoxic (without oxygen). In a word, suffocation! According to that sad scenario, the deep waters of the estuary could no longer support any form of life, with the possible exception of some microorganisms.



Crédit: Bjorn Sundby

Oxygen concentration will be determined by scientists in the sediment sample and its living organisms.

## A better understanding of the phenomenon and its consequences

To better understand the causes of hypoxia, Québec-Océan researchers are pursuing their studies on the impact of low concentrations of oxygen on organisms living in the deep waters. They are also developing simulation models to predict the concentrations of oxygen in the estuary and the Gulf of St. Lawrence. These advanced models take into account not only the circulation of the water masses, but also the ex-

change of oxygen between nutrients, sediments and plankton.

<sup>1</sup> *Hypoxia 2010 Cruise, lead by Prof. Alfonso Mucci on the Coriolis II.*

## Find out more

- [Will “Dead Zones” Spread in the St. Lawrence River?](#)
- [Hypoxia 2010 Cruise](#)
- [The Deep Waters of the Estuary: A Dead Zone? \(French only\)](#)
- [Biodiversity - A quantifiable economic value \(French only\)](#)
- [Coastal water threatened with suffocation as a result of human activities \(French only\)](#)
- [The estuary is holding its breath](#)