

## Québec-Océan's 10<sup>th</sup> Anniversary Symposium

*A special invitation from all Québec oceanographers to reflect on the health of our oceans and consider solutions for the future.*

The international scientific community is rightly concerned about the health of our oceans, which cover 70% of our planet's surface, providing us with many services every day, but that situation could soon change. All of us know and appreciate some of those services:

- The oceans feed us. Each year, the oceans are responsible for half the earth's photosynthesis, thanks to phytoplankton, which is the basis of marine food chains. The oceans are the world's largest source of proteins.
- The oceans transport us. Over 90% of goods are transported by sea because seaways are more economical and safer than any other means of transport over the long distances imposed on us by globalization.
- The oceans entertain us. For many of us, "ocean" is a synonym for vacation: beaches, fishing, whale observation, etc. In recent years, we have seen rapid growth in marine ecotourism, a trend that shows no sign of running out of steam.

Other less obvious services deserve to be better known. They are the oceans' hidden face! By transporting solar heat captured in equatorial regions toward higher latitudes, the major ocean currents cause climatic adjustments that have important consequences on our living conditions. Furthermore, the oceans absorb atmospheric CO<sub>2</sub>, which contributes to climate cooling. By absorbing more than 30% of the CO<sub>2</sub> emitted into the atmosphere since the beginning of the industrial age, the oceans have greatly reduced the impacts of global warming. For how many more years will the oceans be able to provide us with all those services?

Our unrestrained use of natural resources jeopardizes several of the sea's benefits. Major fisheries are in free fall in all regions of the planet. The collapse of fish species traditionally caught, such as cod, inexorably drives fishing efforts toward the first links in the food chain, such as shrimp. To date, we have identified only a part of the organisms that live in our oceans, and we are observing with regret the rapid loss of the biodiversity of the best-known marine ecosystems. Under the effect of the intake of nitrogen and phosphorous coming from wastewater and agriculture, coastal environments produce too much biomass (eutrophication), bringing on massive proliferations of green or toxic algae. This phenomenon leads to the development of zones that are very poor in dissolved oxygen (hypoxic), resulting in a sort of underwater desert. By absorbing the excess CO<sub>2</sub> emitted into the atmosphere by industries, the oceans inevitably become acidified. Within a hundred years, acid levels will reach thresholds of harmful effects for a number of marine species, including coral, whose life cycle involves the formation of a calcium carbonate skeleton. Furthermore, global warming may lead to a reduction in the open ocean productivity. The increase in winter temperature and reduced sea ice cover will lead to the formation of large waves which could accelerate coastal erosion, by possibly combining with rising sea level. In the Arctic, the summer ice cover is decreasing

in a spectacular way and much more rapidly than predicted. This is already disrupting water movements, marine ecosystems, and the lifestyle of people living in Nordic regions. This is one of the worst disruptions brought about by human activity.

Our existence on earth is the result of a fragile and very complex balance between physical, chemical and biological processes. More and more, we are better understanding the constant interactions between the atmosphere, the oceans and the continents. But, as scientists decode the functioning of what we now call the "earth system", we realize its vulnerability. For the oceanic component, there is no escape. Marine environments are simultaneously subjected to multiple stresses that destabilize more and more the initial balance that led to the development of human societies. Only a global, multidisciplinary approach will make it possible to study this complex problem in order to find solutions.

In Québec, oceanographers have been working together for more than 40 years. In 2002, this tradition of collaboration led to the founding of the Québec-Océan strategic group. Québec-Océan brings together 64 researchers and more than 125 graduate students from Université Laval, Université du Québec à Rimouski (UQAR), McGill University, Université du Québec à Chicoutimi (UQAC), Maurice-Lamontagne Institute (Fisheries and Oceans, Canada), and Institut National de Recherche Scientifique du Québec (INRS-ETE). Québec-Océan's ambitious development plan has made it possible to substantially increase oceanographic research budgets in Québec and carry out work at the highest research levels in Québec, Canada and abroad. But much remains to be done.

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*The members of Québec-Océan want to use the group's 10th anniversary to review our oceans' state of health and raise Quebecers' awareness of the importance of the oceans in their daily life.*

The symposium will focus on the major questions that concern the health of our oceans. An internationally recognized specialist will address each question during plenary sessions, thematic sessions and the general public lecture. The symposium's three days will be completed by a roundtable discussion during which representatives from the media, the fishing industry, non-governmental organizations and the sciences will debate about their points of view on the state of our oceans' health and explore solutions to ensure the sustainability of our marine ecosystems. We are looking forward to a lively and exciting debate!

Finally, the oceanographers of Québec-Océan have drawn up two lists of priorities addressed, on the one hand, to Québec society and on the other hand, to decision-makers concerning research.

Enjoy the Symposium!

## Four Priorities for Québec Society

### 1. Communicate better

- Transmit what scientists know to the general public;
- Give scientists communication skills and journalists scientific skills;
- Inform industrialists, fishermen, aquaculturists, managers and policy makers on the potential impacts of their actions;
- Propose an “environmental information” label for all commercial products that may have a “marine footprint”.

### 2. Increase knowledge

- Increase surveillance networks for marine waters bordering on Québec;
- Support multidisciplinary and international research in marine sciences;
- Train and provide employment for the next generation of scientists;
- Develop new remote monitoring technologies.

### 3. Limit the damage

- Reduce CO<sub>2</sub> emissions; control urban, agricultural and industrial discharges, and ballast water;
- Consult scientists more to obtain environmental assessments;
- Use marine resources – mineral or living – so as to ensure the optimal preservation of ecosystems;
- Overcome catastrophes through prevention, surveillance and remediation;
- Increase the resilience of marine ecosystems by creating protected marine areas.

### 4. Adapt the way of doing things

- Think “Ecosystem” when managing marine environment;
- Apply the principle of precaution;
- Integrate science better into the management of fisheries and aquaculture;
- Facilitate the coordination of federal and provincial jurisdictions.

## Six Priorities for Québec Oceanographic Research

- 1. Maintain or develop surveillance networks and data management systems**  
Obtaining time series is essential to detecting the first signs of change in marine ecosystems and the implementation of appropriate measures. For that purpose, we must choose physicochemical indicators and key species that will play the role of sentinels while we are developing new technologies.
- 2. Support the ecosystemic approach**  
Marine resource management and its associated risks cannot be coherent without a good knowledge of the environment and the interactions among species. We recommend studies on the effects of multiple stresses (warming, acidification, hypoxia, contaminants, etc.) on trophic networks, biodiversity, invasive species, etc.
- 3. Implement a collaborative project for the Gulf of St. Lawrence and its estuary**  
The exploitation of natural resources in the Gulf of St. Lawrence, including hydrocarbons, represents significant environmental risks. It is urgent to fund a collaborative research program to identify the possible impacts of our future activities, and suggest mitigation measures.
- 4. Strengthen the leadership of Québec researchers in Arctic research**  
Québec expertise and leadership in Arctic research are nationally and internationally recognized. Because of the major and rapid changes now occurring in the Arctic and the international interest about this first victim of global warming, Québec expertise is being increasingly called upon. The creation of an Arctic institute in Québec would make it possible for us to deal with this major issue.
- 5. Contribute to finding solutions to major international challenges**  
Since the oceans are all interconnected and affected by global processes, Québec oceanographers must have the means to participate in and even take leadership of major research programs. Such collaboration will improve research results and the training of the next generation of scientists that will be required for knowledge and informed management of the oceans.
- 6. Ensure better communication between researchers and the public**  
Transmitting the knowledge of oceanographers to the general public increases collective awareness of the role played by the oceans in the equilibrium of our planet. It is essential for researchers to explain their work and for the media to increase their coverage of scientific news.