

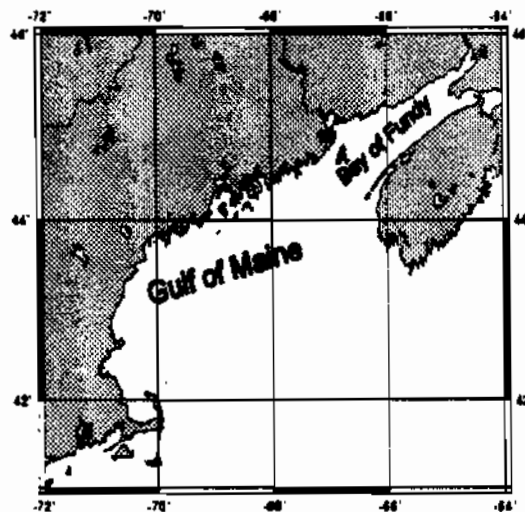
# FUNDY ISSUES

## HEEDING THE BAY'S CRY

### *The Bay of Fundy Ecosystem Project*

#### A Bay of Promise

Thrusting its 270 kilometre length between New Brunswick and Nova Scotia, the Bay of Fundy is the northern extension of the productive Gulf of Maine coastal ecosystem. The Bay's 1300 km of coastline ranges from wave-lashed rocky headlands flanking its mouth to sticky mudflats and lush saltmarshes fringing its inner reaches. It has long been a maritime region of great economic, ecological and scientific importance. Its productivity, unique ecology and scientific appeal are largely tied to its world-renowned tides that can exceed 16 metres in height. Twice each day, a volume of water equal to the flow of 2000 St. Lawrence Rivers surges in and out of the Bay. Its funnel-like shape and a gradual shallowing along its length causes an inevitable piling up of the advancing water. In addition, the Bay of



Fundy and the Gulf of Maine together form a single large basin in which seawater sloshes from end to end like waves in a bathtub. This aptly named "bathtub effect" gives an extra push to the rising water, that is nearly in unison with the tides.

Since 1910 engineers have dreamed of harnessing these powerful tidal flows for generating cheap and endlessly renewable electricity. Scientists too have been studying the links between the Bay's surging waters and its even more valuable living resources for almost a century. The tidal turbulence ceaselessly stirs the waters of the Bay, raising dissolved nutrients from its darkest depth to its sunlit surface. This "upwelling" of life-giving nutrients is particularly marked around Brier Island and Grand Manan, two rocky sentinels near the mouth. This abundance of natural fertilizer stimulates the production of tiny marine plants (phytoplankton) and the slightly larger animals (zooplankton) that feed on them. These in turn support large populations of fish, seabirds, whales and seals that flourish in these waters and are the mainstays of long-standing fisheries and rapidly expanding ecotourism in the region. In particular, these productive waters are an important nursery area for remnants of the



endangered North Atlantic Right Whale population. Generations ago these great leviathans were hunted to the brink of extinction. Almost half of the remaining 297 animals spend most summers feeding, raising young and breeding around the mouth of the Bay.

The restless circulation of Fundy's waters also stirs up the fine sediments of the upper Bay and over time has shaped them into the productive saltmarshes and seemingly endless mudflats that fringe Minas Basin, Cobequid Bay and other estuarine areas. The remnants of these once more extensive saltmarshes are home to large numbers of waterfowl and other wildlife. The mudflats too are critically important as feeding and resting grounds for millions of migrating shorebirds. Thus, large tracts of the upper Bay have been designated Hemispheric Shorebird Reserves, as part of an international conservation effort.

The rapid tidal circulation of relatively clean seawater also makes Fundy's coastal embayments ideal sites for intensive farming of fish and other marine organisms in large floating cages. The growth of salmon aquaculture in New Brunswick in the last 15 years has been explosive. The value of its production now exceeds that of all the traditional fisheries in the Bay combined. The industry is also beginning to expand rapidly in Nova Scotia. It is likely that large cage arrays will soon be moored offshore in deeper areas of the Bay as well.

These few examples clearly show that the Bay of Fundy is a dynamic, highly productive and ecologically diverse coastal ecosystem. It is rich in natural resources and promises even greater economic opportunities for those who dwell on its shores if they carefully and wisely nurture its bounty.

### A Bay at Risk

However, in recent years there have been disturbing signs that all is not well with the Bay, and that its marine life and their habitats may be in peril. A few random examples suggest that worrisome changes

may be taking place beneath its roiling waters. There have been dramatic collapses of many fish populations throughout the region, inflicting severe economic hardship on coastal communities. Other wildlife species have declined in numbers or have suddenly changed their distributions. For example, red phalaropes no longer frequent the Grand Manan area. Periodic collisions between ships and endangered right whales threaten their already uncertain future. Increasing ship traffic and booming ecotourism may also be interfering with the activities of whales and unduly disturbing seabird colonies.

In much of the upper Bay, erosion of remaining saltmarshes and mudflats threatens species that depend on these habitats. There are reports of great changes in the types and abundance of bottom dwelling and planktonic animals living in some areas. On some mudflats, for example, numbers of the burrowing, shrimp-like amphipod *Corophium volutator*, have plummeted from about 30,000 per square metre

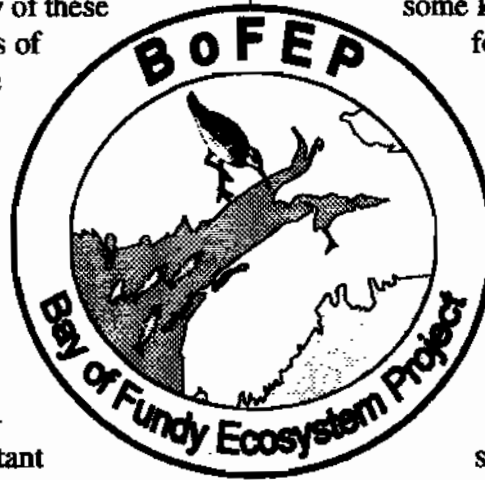
*"the Bay of Fundy is a dynamic, highly productive and ecologically diverse coastal ecosystem. It is rich in natural resources and promises even greater economic opportunities for those who dwell on its shores if they carefully and wisely nurture its bounty"*

15 years ago, to almost none today. In many parts of the Bay, sewage contamination and excessive sedimentation have forced the closure, or caused the destruction, of once productive clam flats. Ominously, scientists are finding a growing variety of toxic chemicals in the seawater, bottom sediments and tissues of some animals. Marine habitats are being degraded by intensive, highly mechanized and destructive harvesting methods. Causeways and dams now obstruct almost all rivers flowing into the Bay, and there are indications that this has altered sediment transport and other natural processes in many areas. In addition, on one of these causeways across the Annapolis River, the spinning turbines of a tidal power plant kill and maim large numbers of migrating fish each year.

### Seeking Solutions

Marine scientists familiar with the area are becoming alarmed by these signs that the ecosystem of the Bay is deteriorating. They are particularly concerned that many important wildlife populations such as shore-

birds and right whales, as well as stocks of some valuable commercial species of fish and shellfish, are dwindling. However, there has been no attempt in recent years to bring all this evidence together to see if there is any underlying pattern to what is happening. They are puzzled that many of these changes can't be explained in terms of what we presently know about the oceanography and marine biology of the Bay. Fifteen years ago scientists exhaustively reviewed our knowledge about the Bay during an environmental assessment of a proposal for a large tidal power project. They were confident then that they had an adequate understanding of most of the important oceanographic and ecological processes taking place. However, in light of the inability to explain many of the recent changes, it is clear that this complex ecosystem needs another close look.



A small group of concerned scientists met at the Acadia Centre for Estuarine Research in Wolfville, Nova Scotia in early 1995. They wanted to find ways of encouraging scientists and resource and environmental managers to take a more careful look at the existing scientific information and propose a course of action for dealing with some of the urgent environmental issues. The Fundy Marine Ecosystem Science Project (FMESP) developed from this meeting. Its goal was to encourage scientists and managers from around the Bay to expand and coordinate their activities in order to improve our understanding of the Bay, and to protect its remaining resources and habitats. An initial step was the drafting of a report summarising our present knowledge about the Bay and describing the most pressing of the environmental threats. This is supported by a computer database of most of the scientific papers on the Bay's ecosystem published during the past 15 years.

An important next step was to bring together about 60 scientists and managers from around the Bay at a Workshop in Wolfville in early 1996. Participants were asked to talk about their studies in relation to the environmental issues, and to answer some key questions. Does the available information confirm that widespread environmental changes are threatening the Bay? Do we really know enough to reach such a conclusion, or are we missing any crucial information? How can we best obtain such information? Are the environmental changes due to natural processes or to human activities?

How can we stop or reverse undesirable trends? One participant succinctly summarised the goal of the project as: "What are the problems? What are the causes? How can we fix them?". The conclusions and recommendations of the workshop, together with a revised review document, are included in an Environment Canada Technical Report entitled "Fundy Issues: Information Update and Workshop Synthesis". This also includes a proposed action plan for coordinating research and for improving management of natural resources. Several possible research projects and other worthwhile activities are also suggested.

### Cooperation for Conservation

However, restoring and maintaining a healthy ecosystem in the Bay will have to be a cooperative venture involving many more partners. All federal departments, as well as those of the provinces of Nova Scotia and New Brunswick, that share responsibility for managing the Bay and its resources will clearly have to be involved. As

well, the many research institutions on both sides of the Bay will have to contribute their extensive expertise. The active participation of resource users and residents of communities surrounding the Bay will be vitally important. The way in which

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these communities use the Bay and harvest its resources is critical to its continued well-being. Furthermore, many residents have a wealth of invaluable information about the changing environment and wildlife populations of the Bay. Increasingly too, community groups and volunteers are collecting scientific information and samples for a variety of environmental monitoring and research programs.

The Fundy Marine Ecosystem Science Project has gradually expanded into a program that is much broader in its scope and participation; namely, the Bay of Fundy Ecosystem Project (BoFEP). This name change reflects the fact that many of the problems go beyond the marine environment; developments and activities on shore can have a major impact on coastal waters. More importantly the change recognizes that conserving the Bay's ecosystem will take more than just science and scientists; all who have an interest in the Bay must participate.

Various ways of involving this wider Fundy community are being considered. A public conference on environmental issues is one possibility. Another is the present series of "Fundy Issues" fact sheets. These summarise our current scientific understanding of some of the most pressing environmental concerns in an impartial and non-technical way. They are intended to assist those who dwell on Fundy's shores in making informed decisions about developments and activities in and around their Bay. We hope that these overviews will enhance everyone's appreciation of the diversity and complexity of this special coastal area, and thereby encourage all to join in protecting and conserving it for the use and enjoyment of present and future generations. We must all heed the Bay's cry.

### Further Reading

**The production of life in the Bay of Fundy.** A.G. Huntsman. Transactions of the Royal Society of Canada. Series No. 3 Section 5, pages 15-38. 1952.

**Update on the Marine Environmental Consequences of Tidal Power Development in the Upper Reaches of the Bay of Fundy.** D.C. Gordon, Jr. and M.J. Dadswell (editors). Canadian Technical Report of Fisheries and Aquatic Sciences. No. 1256. 1984.

**Bay of Fundy Environmental and Tidal Power Bibliography.** S. Plant. Canadian Technical Report of Fisheries and Aquatic Sciences. No. 1339. 1985.

**Tidal Life, a Natural History of the Bay of Fundy.** H. Thurston. Camden House Publishing, Camden East, Ontario. 1990.

**Fundy Issues: Information Update and Workshop Synthesis.** J.A. Percy, P.G. Wells and A. Evans (editors). Fundy Marine Ecosystem Science Project. Environment Canada, Dartmouth, N.S. In press.



The Fundy Issues Series is an initiative of the Bay of Fundy Ecosystem Project. These publications describe our present scientific understanding of some of the environmental issues confronting the Bay. We hope that they will enhance your understanding of the biological richness and complexity of this unique marine area. Such awareness may encourage you to help in protecting it for the use and enjoyment of all, particularly future generations who may also come to rely on its bounty and rare beauty.

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