

Monitoring the State of the ST. LAWRENCE RIVER



BIOLOGICAL RESOURCES

WATER

SEDIMENTS

SHORELINES

USES

NORTHERN GANNET

A Sentinel Species For the Gulf

Background

The Northern Gannet is a seabird whose expansive feeding grounds and diet rich in fish can provide information on the abundance of its prey and the degree of contamination of the ecosystem. That is why it was chosen as a sentinel

species (or “bioindicator”) of the state of the Gulf of St. Lawrence. This bird can sometimes travel over 200 km in search of mackerel, herring, capelin and sand lance. There are six Northern Gannet colonies in eastern North America, including three along the east coast of Newfoundland and three others in the Quebec portion of the Gulf of St. Lawrence (Figure 1). The colonies of the eastern tip of Anticosti Island, Bird Rocks in the Magdalen Islands and Bonaventure Island together make up 75% of the North American population.

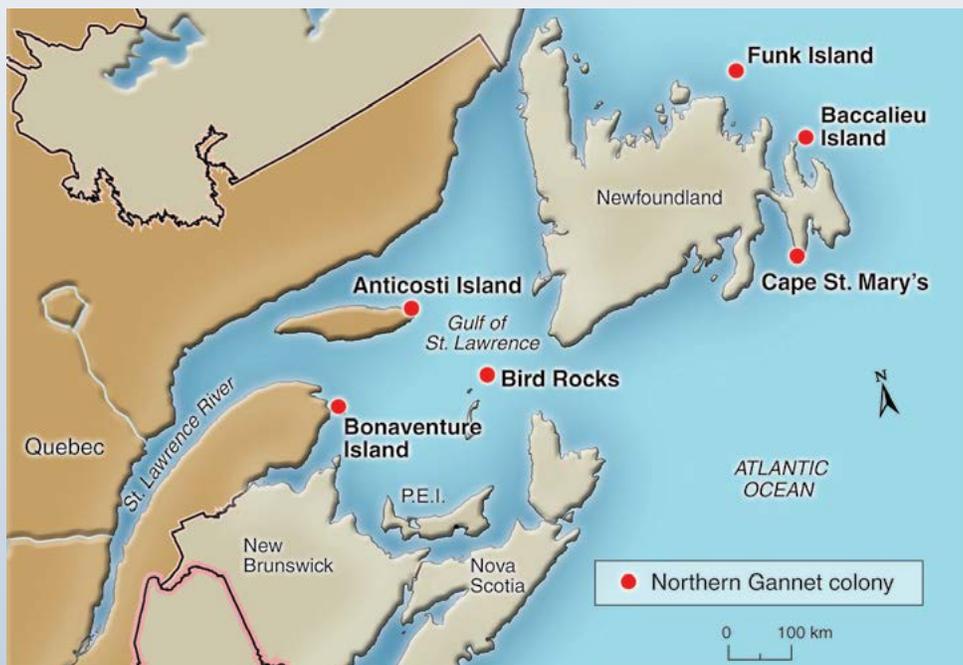


Figure 1 Location of Northern Gannet colonies

The Bonaventure Island population of Northern Gannet grew steadily from the turn of the 20th century until the mid-1960s, when its numbers fell by almost 25% in 10 years, at the same time that the Newfoundland colonies were remaining stable. Scientists discovered that high concentrations of residual organochlorine substances detected in gannet eggs, including dieldrin and DDT, were responsible for the low reproductive rate observed during this period. At high concentrations, these toxic substances interfere with the synthesis of calcium carbonate, the main component of eggshells; thin eggshells are even more vulnerable to breaking. This contamination problem, combined with the fact that the species produces only 1 egg per clutch, led to a spectacular drop in breeding success rates and the consequent reduction, equally dramatic, in the number of breeding adults. Large-scale spraying of DDT in the 1960s to control insect infestations in New Brunswick and the Gaspé Peninsula largely explains the high concentrations detected in some species in the Gulf of St. Lawrence.

Overview of the Situation

The population growth of Bonaventure Island gannets remained relatively steady between 1887 and 1966, when the number of pairs grew from 1 500 to 21 215. After the decline of the following decade, when a low of 16 400 pairs

was reached in 1976 (Figure 2), it was only in 1984 that numbers returned to near-1966 levels. After 1976, the colony expanded at a nearly constant rate up to 2009 when 59 586 pairs were counted. Since 2010, however, the population shows disturbing signs.

Figure 3 (A and B) provides a good indication of reductions in DDE (a DDT residue) concentrations in eggs, expressed here as a percentage relative to the 1968 level, which coincides with the sudden jump in the net productivity rate and in the number of pairs, after a five- to seven-year lag (corresponding with gannet breeding age). After 1976, breeding success on Bonaventure Island stayed above 67%, and the colony experienced continuous growth. In 2009, however, breeding success was down to 50%. This trend accelerated afterwards as only 22% of the breeding pairs were successful in raising a chick to fledging in 2011, and a mere 8% in 2012. Moreover, both gannet colonies on Bonaventure Island and Bird Rocks have slightly declined since 2009.

Outlook

By monitoring the number of nesting pairs, hatching success and chick fledging success rates, as well as contaminants in the eggs, we can determine the state of health of a population and identify the pressures that may be acting on

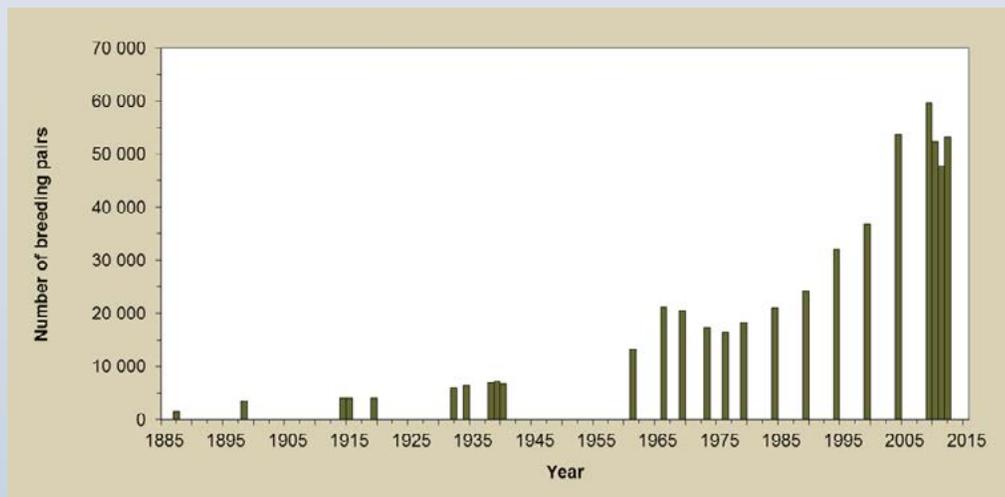
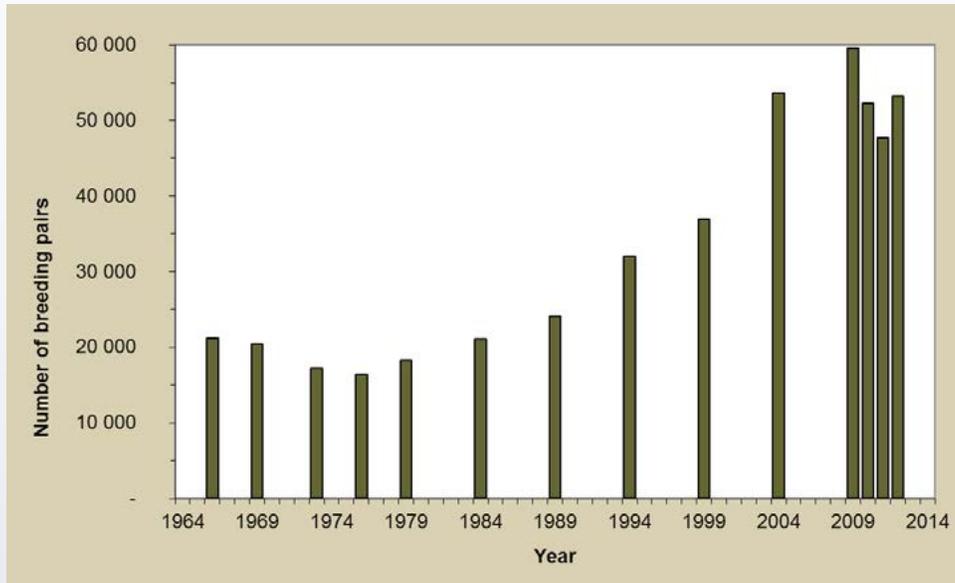
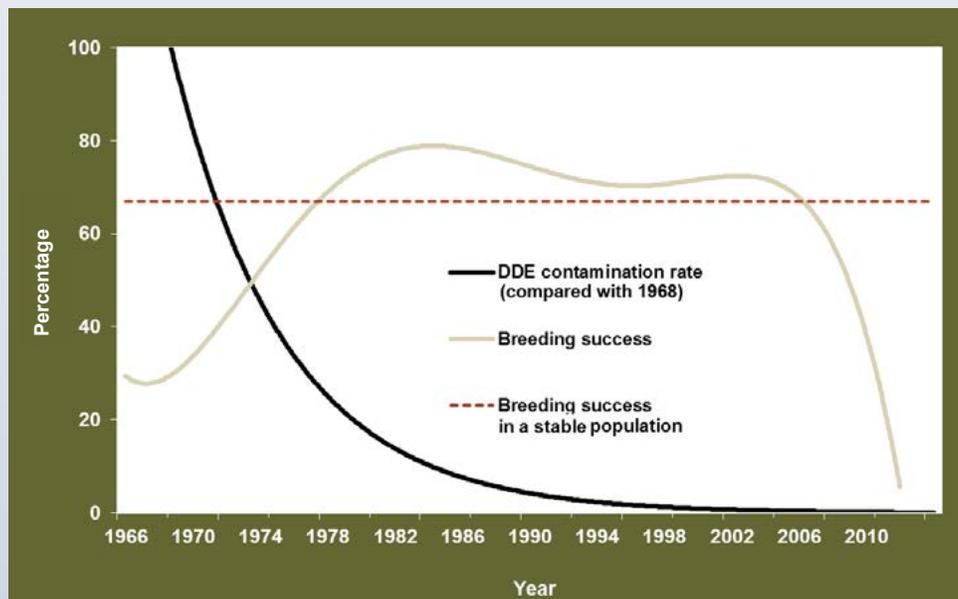


Figure 2 Northern Gannet Population trend at Bonaventure Island since 1887

Figure 3 Population, DDE contamination rate in eggs and breeding success of Bonaventure Island gannets from 1966 to 2012



A. Northern Gannet population trends on Bonaventure Island from 1966 to 2012



B. Relationship between DDE contamination rate in gannet eggs and breeding success between 1966 and 2012

its dynamics. In 2012, it appeared that Northern Gannets had a hard time finding food, and this would have affected reproduction. The pursuit of the five-year monitoring plan will provide timely information on changes affecting the structure and abundance of the gannet population.

Monitoring also contributes to identifying which pressures are being brought to bear on the species, whether in the St. Lawrence system or in its wintering grounds that extends on the East Coast of the United States down to the Gulf of Mexico.

KEY VARIABLES

A net reproductive rate (or breeding success, expressed as the percentage of fledglings relative to the number of eggs laid) below 67%, and the recent slight population declines, indicate that the Gulf of St. Lawrence Northern Gannet is not doing as well since 2009. The underlying environmental factors responsible for this seem related to food availability.

To Know More

CHARDINE, J. W., J.-F. RAIL and S. WILHELM. 2013. Population dynamics of Northern Gannets in North America, 1984–2009. *Journal of Field Ornithology* 84: 187–192.

CHAPDELAINE, G. 1995. "The Northern Gannet," pp. 224–227, in J. Gauthier and Y. Aubry (eds.), *The Breeding Birds of Québec: Atlas of the Breeding Birds of Southern Québec*. Association québécoise des groupes d'ornithologues, Quebec Society for the Protection of Birds and Canadian Wildlife Service, Environment Canada – Quebec Region. Montréal.

CHAPDELAINE, G., P. LAPORTE, and D. N. NETTLESHIP. 1987. Population, productivity and DDT contamination trends of Northern Gannet (*Sula bassanus*) at Bonaventure Island, Quebec, 1976–1984. *Canadian Journal of Zoology* 65: 2922–2926.

NETTLESHIP, D. N. and G. CHAPEDELAINE. 1988. Population size and status of the Northern Gannet *Sula bassanus* in North America, 1984. *Journal of Field Ornithology* 59: 120–127.

RAIL, J.-F., G. CHAPDELAINE, P. BROUSSEAU, and J.-P. L. SAVARD. 1996. Utilisation des oiseaux marins comme bioindicateurs de l'écosystème du Saint-Laurent. Technical Report Series No. 254, ii + 113 pp. Environment Canada – Quebec Region, Canadian Wildlife Service. Sainte-Foy.

State of the St. Lawrence Monitoring Program

Four government partners—Environment Canada, Fisheries and Oceans Canada, Parks Canada Agency, and the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques—and Stratégies Saint-Laurent, a non-governmental organization that works actively with riverside communities, are pooling their expertise and efforts to provide Canadians with information on the state of the St. Lawrence and its long-term evolution.

To this end, environmental indicators have been developed on the basis of data collected as part of each organization's ongoing environmental monitoring activities. These activities cover the main components of the environment, namely water, sediments, biological resources, uses and shorelines.

For more information on the State of the St. Lawrence Monitoring Program, please visit the program website at www.planstlaurent.qc.ca/en.

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