

Monitoring the State of the ST. LAWRENCE RIVER



St. Lawrence Estuary Beluga Whale

Indicator name: Beluga
Status: Moderate to poor
Trend: Slight deterioration since 2018-2023

Highlights

The decline in the St. Lawrence Estuary beluga population, which began around 2000, has tapered off. Recent advances in survey methods have provided a more accurate estimate of the population, which numbered between 1,530 and 2,180 individuals in 2022. However, high mortality among newborns, pregnant females and, more recently, potentially juveniles, is impeding recruitment. Recent changes in physical condition, summer distribution and diet indicate the likely influence of environmental factors, the relative importance of which remains uncertain.

Problem

The St. Lawrence Estuary population, located at the southernmost end of this Arctic species' range, is endangered and protected in Canada under the *Species at Risk Act*. Decimated by commercial hunting (1700s–1800s) and by measures aimed at reducing population size for the supposed protection of commercial fish species (1900s), this population has remained stagnant and was estimated at only 1,530 to 2,180 individuals in 2022. This population has one of the most restricted ranges among belugas; its current range covers the St. Lawrence Estuary and, on a seasonal basis, a portion of the Gulf of St. Lawrence.

Several potentially cumulative factors could hinder recovery of the species. Chronic noise and disturbance associated with marine traffic, the risk of collision with small vessels and exposure to highly toxic chemicals are a few examples. Since 2010, warmer waters and air temperatures and reduced ice cover have coincided with a decline in recruitment and the survival rate of pregnant females, as well as with changes in distribution. The relative role of these factors remains uncertain. Recent observations suggest that the protective measures in place remain insufficient for the recovery of this population. From a positive standpoint, a decline in cancer incidence over the past 15 years suggests that the ban on certain contaminants, such as polycyclic aromatic

hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs), has had a beneficial effect. However, certain organohalogen compounds may still persist at levels deleterious to the immune and endocrine systems. Furthermore, many emerging contaminants with unknown toxicity have recently been introduced into the environment, posing an additional threat to belugas.

Study area

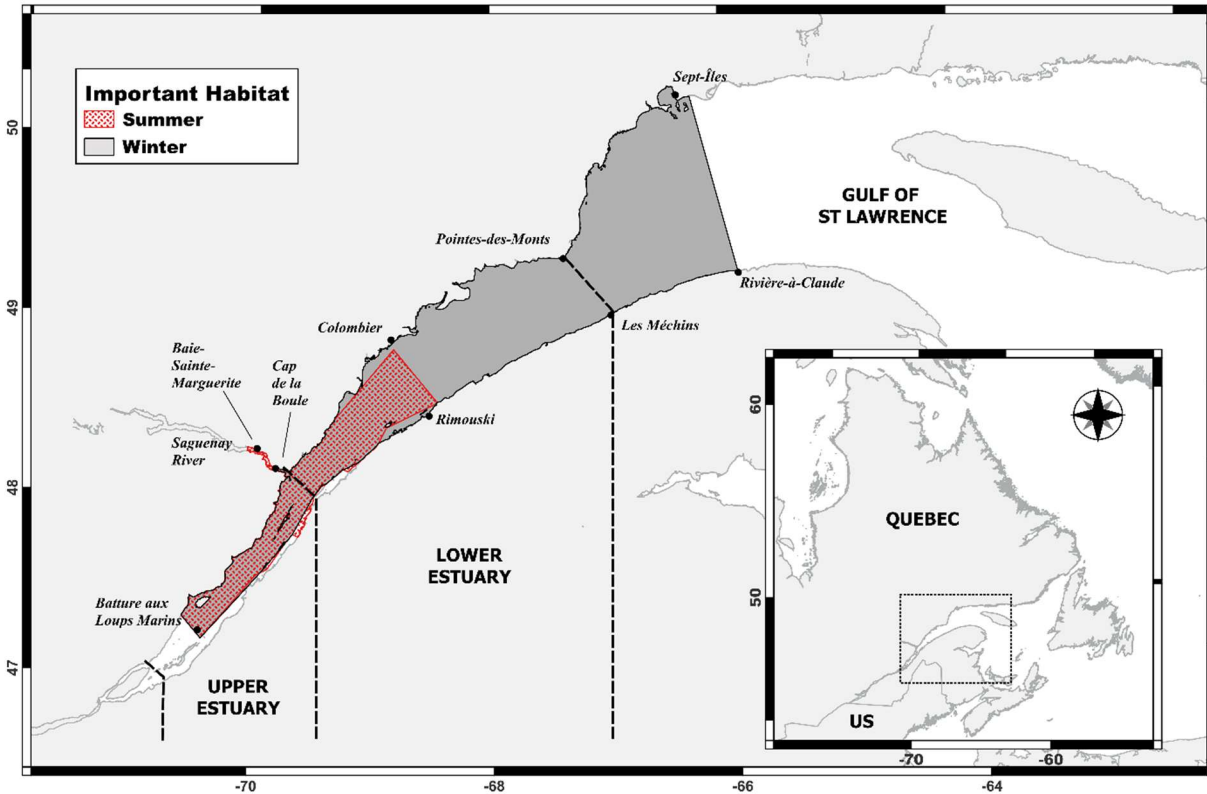


Figure 1. Habitat considered important for the St. Lawrence Estuary beluga from May to October (summer: red hatched area) and from January to March (winter: gray area). The information available for other periods did not enable important habitat for spring and fall to be identified.

Key measures

Photographic and visual aerial surveys, conducted by Fisheries and Oceans Canada, are used to estimate the size of the St. Lawrence Estuary beluga and its trends to be monitored over time. The information gathered in these surveys is also used to identify habitats important to the population and to document potential changes in distribution.

The carcass monitoring program, in place since 1983, provides mortality indices based on age structure. Depending on their degree of decomposition, carcasses are either sampled in situ or sent to the Université de Montréal's Faculty of Veterinary Medicine for a complete necropsy, during which veterinary pathologists take various samples to determine the causes of mortality (e.g., infectious disease, cancer, injuries).

Samples taken from carcasses undergo various analyses, notably to determine changes in diet using chemical tracers, the level of exposure to various toxic contaminants, and the presence of certain pathogens.

The size of the St. Lawrence Estuary beluga population is estimated using a population dynamics model that integrates a wide range of population-specific data into a biologically realistic framework for the species. These data include, in particular, abundance indices and the proportion of juveniles estimated by aerial surveys, causes of mortality estimated by the carcass monitoring program, independent data on the proportion of juveniles in the population, and certain environmental parameters.

Status and trends

Population dynamics and trends

Photographic and visual aerial surveys, conducted since 1990, are used to estimate the abundance and proportion of juveniles (0–1 year of age) in the population. Combined with other sources of information, such as age- and sex-specific mortality indices derived from a carcass monitoring program that began in 1983, these data enable population size and trends to be assessed within a biologically realistic framework for the species.

This modelling reveals a population decline that began around 2000 and continued for several years. A slight increase from 2008 to 2018, potentially linked to a decrease in cancer incidence, subsequently occurred despite increased mortality among pregnant females and newborns. Since 2018, growth has slowed and population numbers appear to have stabilized at between 1,530 and 2,180 individuals in 2022. If low recruitment and

high mortality among pregnant females persist, and if the apparent increase in mortality among juveniles is real, a new decline could occur.

An aerial survey conducted in 2025 will provide updated abundance values and model results.

Carcass monitoring and causes of mortality

An update on the leading causes of mortality since 2013 is currently underway. Necropsies of 222 carcasses recovered between 1983 and 2012 indicate that infectious diseases appear to be the leading cause of mortality, affecting primarily juveniles and approximately one-third of the carcasses examined. Cancer accounted for 20% of adult mortalities. However, no belugas born after 1971 showed evidence of cancer, coinciding with the implementation of regulations on PAHs and PCBs. Complications related to calving accounted for 19% of mortalities among adult females in 2012, frequency having increased since the 2000s and remaining high, even in recent years.

Monitoring of carcasses shows that, despite inter-annual variations, the annual number of belugas found dead remained stable from 1983 to 2025, with a median of 15 per year. Since 2008, certain trends have emerged based on age or sex. In 16 of the last 18 years, newborn mortality exceeded the highest levels observed between 1983 and 2007. Among adults, the number of males found dead has decreased, while the number of females found dead has remained stable. An unusually high number of juveniles were found dead in 2023 and 2025, prompting close monitoring of this key age class for future population recruitment.

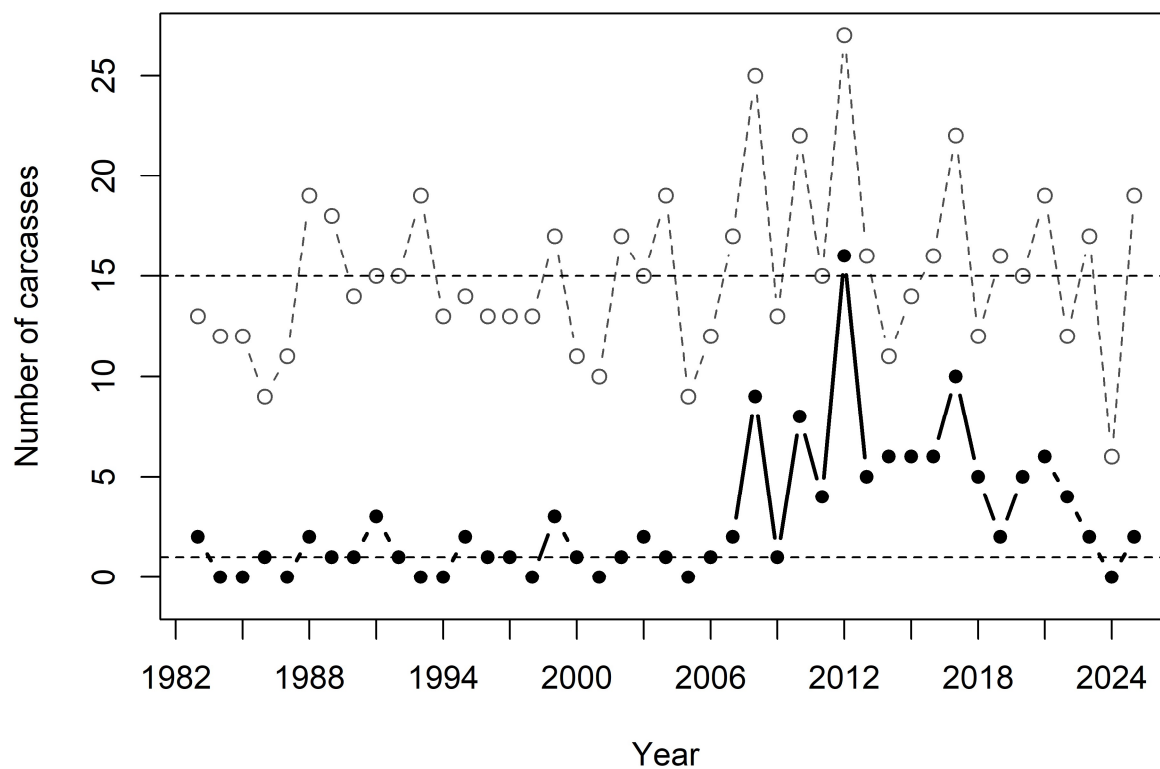


Figure 2. Number of belugas of all ages (open circles) and newborns (filled circles) found dead annually in the Estuary and Gulf of St. Lawrence from 1983 to 2025. The horizontal dashed lines represent the median for each of the two time series.

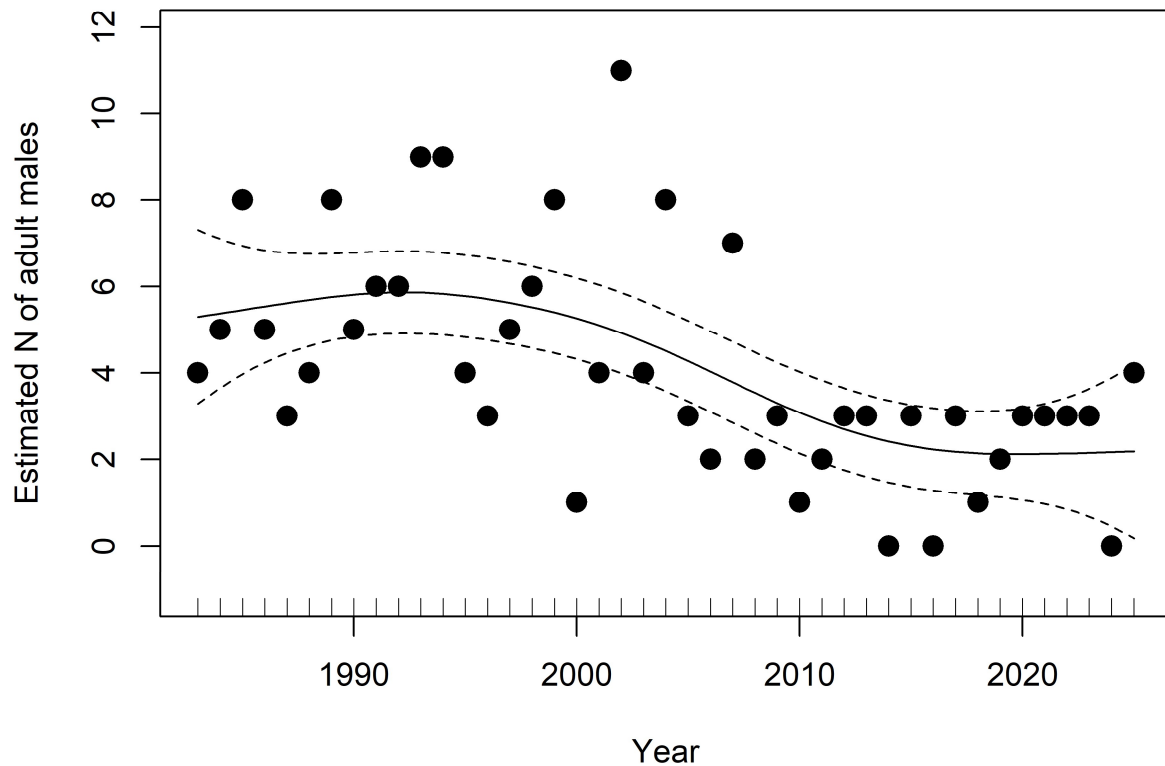


Figure 3. Number of adult male found dead annually in the Estuary and Gulf of St. Lawrence from 1983 to 2025 (solid circles), and predicted downward trend (curve with a 95% confidence interval).

Differences in mortality across demographic segments may be caused by multiple factors. Adult male carcasses may have become less detectable due to a change in distribution, or adult male abundance may have declined. Another explanation is that adult males may have recently experienced improved survival. The survival rate of adult females and males may also have improved owing, for example, to reductions in certain contaminants and in the incidence of cancer. In adult females, the recent trend of greater mortality during pregnancy may have counteracted the benefits of decreased mortality from cancer and could explain, at least in part, the increased mortality in newborns.

The decline in the physical condition of belugas in the 2000s and the dietary diversification since at least 2015 suggest difficulties in feeding adequately.

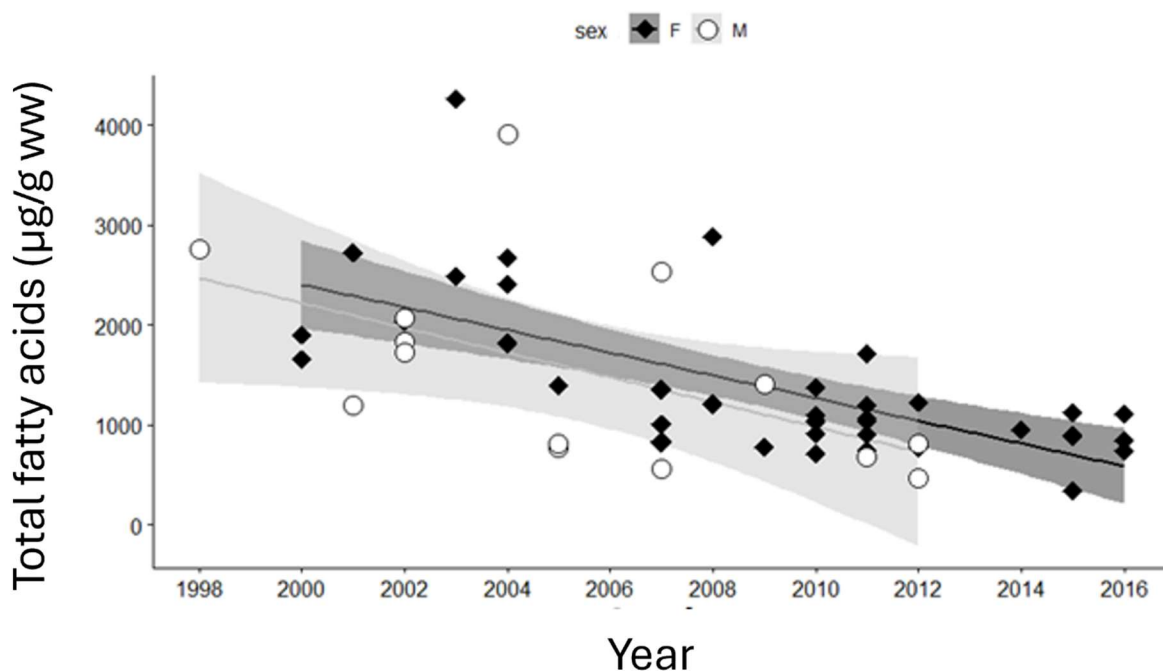


Figure 4. Index of physical condition (quantity of fatty acids in the blubber - µg/g wet weight) in adult males (solid circles) and adult females (empty circles), and predicted downward trend between 1998 and 2016 (curve with a 95% confidence interval).

Potential stressors

Several non-exclusive, potentially cumulative hypotheses have been proposed to explain the increased mortality in newborns and adult females, as well as demographic changes.

A link has recently been demonstrated between the presence of PAH-DNA adducts and the incidence of gastrointestinal cancers in belugas. However, PAHs and other organic contaminants such as PCBs and DDT have been declining in belugas and their environment over the past few decades. In contrast, other contaminants, such as PBDEs and certain PFAS, have increased in beluga tissues during the 1990s or have appeared recently. There is currently no evidence of a link between PBDEs or other contaminants and cases of hypothyroidism in St. Lawrence Estuary belugas, although PBDEs and other flame retardants are correlated with gene expression and thyroid hormone levels. However, the sudden increase in mortality among newborns and young females in the late 2000s raises questions about the potential role of organic contaminants in the recent increase in mortality. An update on the substances to which St. Lawrence Estuary belugas are exposed is necessary to better assess the risks that contaminants pose to their health.

In addition, St. Lawrence River belugas are chronically exposed to noise from commercial vessels and ferries operating in their habitat. From May to October, they are

also exposed to recreational boaters seeking to observe them, as well as a large tourism industry operating within their critical habitat. These activities disturb beluga vocalizations, reduce the space in which they can hear and communicate with each other, and can disrupt critical activities such as calving, nursing and feeding. The deterioration in beluga physical condition documented in the 2000s suggests difficulties in obtaining an adequate diet, possibly resulting from a decline in the abundance or quality of prey. Frequent interference from shipping or poor health resulting from the deleterious effects of contaminants could be aggravating factors in these circumstances.

The shift in beluga population dynamics around 2000 coincides with profound changes in the oceanographic conditions of the beluga's habitat. Previously characterized by relatively cold air and sea temperatures and harsh winters, this ecosystem has experienced warmer conditions since the 2000s. These changes occurred as stocks of certain key beluga prey collapsed, without this loss of biomass being replaced by that of other species.

High mortality rates may also occur following toxic algal blooms. This was most notably the case in 2008, when high mortality rates occurred among belugas and several other marine species.

Outlook

The inability of the St. Lawrence Estuary beluga population to recover despite the cessation of hunting suggests that anthropogenic and environmental stressors were already limiting its growth between 1980 and 1990.

Having been present in the St. Lawrence River for 10,000 years, belugas have adapted to an extreme and changing environment. However, the rapid pace of current climate warming, isolation, high levels of inbreeding and cultural traits limiting their colonization of new areas could reduce their adaptability. Large-scale modelling predicts a lack of suitable habitat for belugas in the St. Lawrence River by 2100.

Although regulations on certain contaminants appear to have successfully reduced cancer incidence, the vulnerabilities identified highlight the urgency of further action. The planned expansion of the Saguenay–St. Lawrence Marine Park will help regulate activities harmful to belugas across a larger portion of their habitat. Research and monitoring will help assess the effectiveness of the actions taken and better identify limiting factors.

For more information

AUBIN JA, MENNILL DJ, MICHAUD R, VERGARA V (2026) Beluga societies: the social and cultural lives of an enigmatic odontocete. *Behav Ecol Sociobiol* 80:14
<https://doi.org/10.1007/s00265-025-03630-3>

BARREAU E, LESAGE V, MICHAUD R, SENEAL J-F, CHION C, DUPUCH A (2025) 30 years of herd focal follows reveal the functions of important habitats identified for the endangered St. Lawrence Estuary beluga. *Endangered Species Research* 58:435-449 <https://doi.org/10.3354/esr01461>

BARRETT H, DU X, HOUDE M, LAIR S, VERREAULT J, PENG H (2021) Suspect and Nontarget Screening Revealed Class-Specific Temporal Trends (2000–2017) of Poly- and Perfluoroalkyl Substances in St. Lawrence Beluga Whales. *Environ Sci Technol* 55: 1659-1671 <https://dx.doi.org/10.1021/acs.est.0c05957>

BERNIER-GRAVELINE A, LESAGE V, CABROL J, LAIR S, MICHAUD R, ROSABAL M, VERREAULT J (2021) Lipid metabolites as predictors of energy reserves in highly contaminant-exposed belugas from the endangered St. Lawrence Estuary population. *Environ Res* 192: 110272 <https://doi.org/10.1016/j.envres.2020.110272>

BONNELL TR, MICHAUD R, DUPUCH A, LESAGE V, CHION C (2022) Extracting spatial networks from capture-recapture data reveals individual site fidelity patterns within a marine mammal's spatial range. *Ecology and Evolution* 12: e8616 <https://doi.org/10.1002/ece3.8616>

CABROL J, LESAGE V, RIOUX È (2025) Changing ecosystems promote generalism and enhanced heterogeneity in diet composition in the endangered St. Lawrence Estuary beluga. *Sci Rep* 15:6239 <https://doi.org/10.1038/s41598-025-91083-z>

GALBRAITH PS, CHASSÉ J, SHAW J-L, LEFAIVRE D, BOURASSA M-N (2025) Physical Oceanographic Conditions in the Gulf of St. Lawrence during 2024. *Can Tech Rep Hydrogr Ocean Sci* 397: v + 95 p <https://doi.org/10.60825/eznq-0815>

GERVAISE C, AULANIER F, ROY N, SIMARD Y (2012) Mapping probability of shipping sound exposure level. *J Acoust Soc Am* 137: EL429-435 <https://doi.org/10.1121/1.4921673>

HARVEY V, MOSNIER A, ST-PIERRE AP, LESAGE V, GOSSELIN, J-F (2025) [Seasonal variation in distribution and habitat use of St. Lawrence Estuary beluga \(*Delphinapterus leucas*\) estimated from systematic photographic and visual line-transect aerial surveys](https://doi.org/10.1139/cjfas-2025-0015). *DFO Can Sci Advis Sec Res Doc* 2025/075: vi + 81 p

JOLICOEUR V, HOUDE M, LOSETO L, MICHAUD R, VERREAULT J (2022) Variations in thyroid hormone levels in endangered St. Lawrence Estuary belugas: potential linkage with stress and organohalogen contaminant exposure. *Environ Int* 186: 108647 <https://doi.org/10.1016/j.envint.2024.108647>

LAIR S, MEASURES LN, MARTINEAU D (2015) Pathological findings and trends in mortality in the beluga (*Delphinapterus leucas*) population of the St. Lawrence Estuary, Québec, Canada, from 1983 to 2012. *Vet Pathol* 53: 22–36 <https://doi.org/10.1177/0300985815604726>

LARRAT S, LESAGE V, MICHAUD R, LAIR S (2024) Relationship between nutritional condition and causes of death in beluga whales (*Delphinapterus leucas*) from the St. Lawrence Estuary, Quebec, Canada. *Diseases of Aquatic Organisms* 159: 159–169
<https://doi.org/10.3354/dao03812>

LEBEUF M (2009) La contamination du béluga de l'estuaire du Saint-Laurent par les polluants organiques persistants en revue. *J Water Sci* 22: 199–233
<https://doi.org/10.7202/037482ar>

LEBEUF M, MEASURES L, NOËL M, RAACH M, TROTTIER S (2014) A twenty-one year temporal trend of persistent organic pollutants in St. Lawrence Estuary beluga, Canada. *Sci Total Environ* 485: 377-386
<http://dx.doi.org/10.1016/j.scitotenv.2014.03.097>

LESAGE V, BARRETTE C, KINGSLEY MCS, SJARE B (1999) The effect of vessel noise on the vocal behavior of belugas in the St. Lawrence River estuary, Canada. *Mar Mamm Sci* 15: 65-84
<https://doi.org/10.1111/j.1748-7692.1999.tb00782.x>

LESAGE V, MCQUINN IH, CARRIER D, GOSSELIN J-F, MOSNIER A (2014) [Exposure of the beluga \(*Delphinapterus leucas*\) to marine traffic under various scenarios of transit route diversion in the St. Lawrence Estuary](#). DFO Can Sci Advis Sec Res Doc 2013/125: iv + 28 p

LESAGE V (2021) The challenges of a small population exposed to multiple anthropogenic stressors and a changing climate: the St. Lawrence Estuary beluga. *Polar Res* 2021 40: 5523
<http://dx.doi.org/10.33265/polar.v40.5523>

LESAGE V, HARVEY V, TINKER MT, ST-PIERRE AP, AULANIER F, LAIR S, HAMMILL MO, SIMARD Y, BROWN T, MOSNIER A, RIOUX È, CABROL J, GOSSELIN J-F (2024) [Recovery Potential Assessment for the St. Lawrence Estuary Beluga \(*Delphinapterus leucas*\) Population](#). DFO Can Sci Advis Sec Res Doc 2024/062.

LESAGE V, LAIR S, TURGEON S, BÉLAND P (2020) Diet of St. Lawrence Estuary Beluga, *Delphinapterus leucas*, in a changing ecosystem. *Can Field-Nat* 134: 21-35
<https://doi.org/10.22621/cfn.v134i1.2421>

MÉNARD N, MICHAUD R, CHION C, TURGEON S (2014) [Documentation of maritime traffic and navigational interactions with St. Lawrence Estuary beluga \(*Delphinapterus leucas*\) in calving areas between 2003 and 2012](#). DFO Can Sci Advis Sec Res Doc 2014/003: v + 24 p

MONTANA L, BRINGLOE TT, BOURRET A, SAUVÉ C, MOSNIER A, FERGUSON SH, POSTMA L, LESAGE V, WATT CA, HAMMILL MO, PARENT GJ (2024) Reduced representation and whole-genome sequencing approaches highlight beluga whale populations associated to eastern Canada summer aggregations. *Evolutionary Applications* 17:e70058
<https://doi.org/10.1111/eva.70058>

DFO (2017) St. Lawrence Estuary Beluga. A science based review of recovery actions for three at-risk whale populations

https://publications.gc.ca/collections/collection_2018/mpo-dfo/Fs49-12-1-2017-eng.pdf

DF (2020) Action Plan to Reduce the Impact of Noise on the Beluga Whale and Other Marine Mammals at Risk in the St. Lawrence Estuary. Species at Risk Act action plan Series. Fisheries and Oceans Canada, Ottawa, iv + p.31

https://publications.gc.ca/collections/collection_2020/mpo-dfo/CW69-21-63-2020-eng.pdf

OUELLET J-F, MICHAUD R, MOISAN M, LESAGE V (2021) Estimating the proportion of a beluga population using specific areas from connectivity patterns and abundance indices. *Ecosphere* 12:e03560 <https://doi.org/10.1002/ecs2.3560>

PLOURDE, S, GALBRAITH P, LESAGE V, GRÉGOIRE F, BOURDAGE H, GOSSELIN J-F, MCQUINN I, SCARRATT M (2014) [Ecosystem perspective on changes and anomalies in the Gulf of St Lawrence: a context in support of the management of the St. Lawrence beluga whale population](#) DFO Can Sci Advis Sec Res Doc 2013/129: v + 29 p

POIRIER MC, LAIR S, MICHAUD R, HERNANDEZ-RAMON EE, DIVI KV, DWYER JE, ESTER CD, SI NN, ALI M, LOSETO LL, RAVERTY SA, ST LEGER JA, VAN BONN WG, COLEGROVE K, BUREK-HUNTINGTON KA, SUYDAM R, STIMMELMAYR R, PIERCE WISE J, WISE SS, BEAUCHAMP G, MARTINEAU D (2019) Intestinal polycyclic aromatic hydrocarbon-DNA adducts in a population of beluga whales with high levels of gastrointestinal cancers. *Environ Mol Mutagen* 60: 29-41

<https://doi.org/10.1002/em22251>

SCARRATT M, MICHAUD S, MEASURES L, STARR M (2014) [Phytotoxin analyses in St. Lawrence Estuary beluga](#). DFO Can Sci Advis Sec Res Doc 2013/124: v + 16 p

SIMARD Y, GIARD S, ROY N, AULANIER F, LESAGE V (2023) Mesoscale habitat use by St. Lawrence Estuary beluga over the annual cycle from an acoustic recording network. *J Acoust Soc Am* 154: 635-649 <https://doi.org/10.1121/10.0020534>

SIMOND A, HOUDE V, LESAGE V, VERREAULT J (2017) Temporal trends of PBDEs and emerging flame retardants in belugas from the St. Lawrence Estuary (Canada) and comparisons with minke whales and belugas from the Canadian Arctic. *Environ Res* 156: 494-504 <http://dx.doi.org/10.1016/j.envres.2017.03.058>

SIMOND A, HOUDE V, LESAGE V, MICHAUD R, ZBINDEN D, VERREAULT J (2019) Associations between organohalogen contaminant and thyroid- and steroid-related gene responses in St. Lawrence Estuary beluga and minke whales. *Mar Poll Bull* 145: 174-184 <https://doi.org/10.1016/j.marpolbul.2019.05.029>

SIMOND A, HOUDE M, LESAGE V, MICHAUD R, VERREAULT J (2020) Metabolomic profiles of the endangered St. Lawrence Estuary beluga population and associations

with organohalogen contaminants. *Sci Total Environ* 717:137204
<https://doi.org/10.1016/j.scitotenv.2020.137204>

SIMOND AÉ, LESAGE V, VERREAULT J, LOSETO L, HOUDE M, ELLIOTT A, NOËL M, BROWN TM (2025) Contaminant-associated disruption of the skin transcriptome in the Endangered St. Lawrence Estuary beluga. *Environ Sci Technol* 59: 2389–2399
<https://doi.org/10.1021/acs.est.4c08272>

STARR, M, LAIR S, MICHAUD S, SCARRATT M, QUILLIAM M, LEVAIVRE D, ROBERT M, WOTHERSPOON A, MICHAUD R, MÉNARD N, SAUVÉ G, LESSARD S, BÉLAND P, MEASURES L (2017) Multispecies mass mortality of marine fauna linked to a toxic dinoflagellate bloom. *PLoS ONE* 12(5): e0176299
<https://doi.org/10.1371/journal.pone.0176299>

ST-PIERRE AP, LESAGE V, MOSNIER A, TINKER MT, GOSSELIN J-F (2024) [Summer Abundance Estimates for St. Lawrence Estuary Beluga \(*Delphinapterus leucas*\) from 52 Visual Line Transect Surveys and 11 Photographic Surveys Conducted from 1990 to 2022](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2023/048. v + 82 p.

TINKER TM, MOSNIER A, LESAGE V (2024) [An Integrated Population Model for St. Lawrence Estuary Belugas \(*Delphinapterus leucas*\)](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2023/047. iv + 61 p.

VERGARA V, WOOD J, LESAGE V, AMES A, MIKUS M-A, MICHAUD R (2021) [Can you hear me? Impacts of underwater noise on communication space of adult and calf contact calls of the endangered St. Lawrence belugas \(*Delphinapterus leucas*\)](#). *Polar Res* 40: 5523 <http://dx.doi.org/10.33265/polar.v40.5523>

WILLIAMS R, LACY RC, ASHE E, HALL A, PLOURDE S, MCQUINN I, LESAGE V (2021) Climate change exacerbates the effects from anthropogenic threats including ocean noise, on the survival and recovery of St. Lawrence beluga. *Mar Poll Bull* 173B: 113096 <https://doi.org/10.1016/j.marpolbul.2021.113096>

State of the St. Lawrence Monitoring Program

Five government partners—Environment and Climate Change Canada; Fisheries and Oceans Canada; Parks Canada; the Ministère de l'Environnement et de la Lutte contre les changements climatiques du Québec; and the Ministère des Forêts, de la Faune et des Parcs du Québec—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 the long-term trends affecting it.

For more information about the State of the St. Lawrence Monitoring Program, please consult our website: <https://www.planstlaurent.qc.ca/en/developing-knowledge/state-st-lawrence-monitoring-program>.

Prepared by

Véronique Lesage
Researcher, Marine Mammal Biology and Conservation
Science Branch
Fisheries and Oceans Canada

Cat. No.: En78-6/2026E-PDF
ISBN: 978-0-660-99905-0

This publication may be reproduced for personal or internal use without permission, provided the source is fully acknowledged. However, reproduction of this publication in whole or in part for purposes of redistribution requires the prior written permission from the Canada Water Agency by contacting:

Canada Water Agency

510-234 Donald Street
Winnipeg, Manitoba
R3C 1M8
Canada
Email: water-eau@ec.gc.ca

© *His Majesty the King in Right of Canada, as represented by the President of the Canada Water Agency and the Minister of the Environment and Climate Change, 2026*

Aussi disponible en français