

METHODOLOGY AND DATA USE CONDITIONS

A Mariner's Guide to Whales in
the Northwest Atlantic
2nd EDITION



© GREMM



WWF® and ©1986 Panda Symbol are owned by WWF. All rights reserved

This document describes the datasets and analyses used to create the maps included in the 2nd edition of the *Mariner's Guide to Whales in the Northwest Atlantic*. Results from these maps are available for download on the Navigating Whale Habitat website <https://www.navigationbaleines.ca/en/home/>

The maps provide information on the **relative occurrence of sighting records**. They capture the distribution of reported sightings of species and highlight specific areas where greater vigilance is required for mariners. However, these maps should be used and interpreted with the following cautionary notes in mind:

- The data used to build these maps may not capture all areas and times animals are present. It is possible to encounter animals in areas not highlighted by these maps.
- In some areas, there is a great deal of time (effort) spent in data collection, particularly during summer months. However, in most areas, particularly offshore, there is very little such effort, and thus correspondingly limited information available. The maps do not attempt to correct for this difference, which means that areas showing low relative occurrence of sighting records may reflect low search effort rather than a low density or absence of animals. It is possible to encounter more animals in some areas than suggested by the maps.

If you wish to use these results in any publication, please carefully read the data use conditions and caveats below.

Data use conditions:

1. The following citation format should be used in all references to these data: **WWF-Canada, Marine Mammal Observer Network and the Shipping Federation of Canada. Mapping data: *Mariner's Guide to Whales in the Northwest Atlantic, 2nd Edition*. 2021. Available at <https://www.navigationbaleines.ca/en/home/>**
2. WWF-Canada and MMON personnel shall be invited to review draft publications.
3. WWF-Canada and MMON shall be informed of any publication resulting from these data. Any publication that utilizes the data must indicate the caveats regarding data accuracy.
4. Copyright and ownership of the data remain with WWF-Canada and MMON.
5. The data shall not be included in whole or in part in any commercial products without a licensing agreement with WWF-Canada.
6. The user recognizes the limitations of the data and understands that WWF-Canada and MMON do not warrant or guarantee the accuracy, completeness, or currency of the data for any specific use.

Caveats

- Sighting effort has not been quantified and varies considerably over time and space. The data represent the relative occurrence of sighting records rather than the true density or abundance of the species.
- The quality of some of the sighting data is unknown. Observations are reported by individuals with varying levels of expertise in marine mammal identification.

Data sources

A total of 14 datasets were combined to create the maps. These datasets included both scientific (e.g. systematic marine mammal surveys conducted from a ship or plane) and opportunistic marine mammal sightings collected from various sources/platforms. See Table 1 for a complete list of the datasets.

NORTH ATLANTIC RIGHT WHALE



© MMON

TABLE 1

List of scientific and opportunistic datasets used to create maps, including information on the time period covered by the dataset, number of species and number of sightings of one or more individuals available for analysis and owner of the dataset.

#	DATASET NAME	TIME SERIES	OWNERSHIP	NUMBER OF SPECIES	NUMBER OF SIGHTINGS	SCIENTIFIC (S) OR OPPORTUNISTIC (O)
1	Whitehead, Université Dalhousie	1988-2019	Dalhousie University	27	2,464	S/O
2	WWAM	2015-2019	Parks Canada	7	1,353	S
3	WWAM	2015-2019	Parks Canada	7	1,774	S
4	Predator pelagic prey	2015-2018	Parks Canada	7	816	S
5	NAISS	2016	Fisheries and Oceans Canada	39	2,508	S
6	NARW	2017	Fisheries and Oceans Canada	31	2,910	S
7	NARW	2018	Fisheries and Oceans Canada	39	7,312	S
8	WSDB	1963-2019	Whalesightings Database, Team Whale, Fisheries and Oceans Canada, Dartmouth, NS [2020/02/13]	67	24,538	O
9	TC	2018	Transport Canada	19	3,517	S
10	MICS	2014-2018	Mingan Island Cetacean Study	11	4,808	S
11	NOAA	2018-2020	National Oceanic and Atmospheric Administration	5	2,699	S
12	NARWC	2015-2019	North Atlantic Right Whale Consortium	16	18,190	S
13	AOM_MMON	2014-2019	Marine Mammal Observer Network	8	4,705	S
14	Shipping_MMON	2015-2019	Marine Mammal Observer Network	35	5,891	O

Methodology

These datasets were combined and cleansed of mistakes and duplicates. Date/time, species, number of animals (or group size), latitude and longitude fields were homogenized and subset for 2015-2020 timeseries and for the study boundaries: 40° to 55° N x -72° to -48° W. Only sightings where species identification was certain were selected for the following 10 priority species, some of which are listed under Schedule 1 of the Canadian Species at Risk Act (SARA status indicated in brackets). These species were selected due to their conservation status and/or were identified as species at higher risk of ship strikes, which is the focus of the guide.

1. St. Lawrence Estuary beluga whale (Endangered)¹
2. North Atlantic right whale (Endangered)
3. Scotian Shelf northern bottlenose whale (Endangered)²
4. Atlantic blue whale (Endangered)
5. Atlantic fin whale (Special Concern)
6. Atlantic sei whale (under consideration for addition under SARA as Endangered)
7. North Atlantic minke whale
8. Western North Atlantic humpback whale
9. Sperm whale
10. Leatherback turtle (Endangered)

The study area was split into 0.05° grid cells, which resulted in a 301x481 matrix of 0.05° latitude x 0.05° longitude grid cell using WSG84. The number of individual whales sighted in each grid cell was summed and a 0.2° gaussian smoother was applied. After smoothing, data were transformed using log(10). Final values in each cell were relativized so that the sum of the entire domain was equal to 1. Species-specific maps were plotted using ArcGIS pro.



© Fednav

¹ The majority of sighting records are from the St. Lawrence Estuary population. However, it is possible that the data included sightings of belugas belonging to any one of several Arctic populations.

² The majority of sighting records are from the Scotian Shelf population; however, it is possible that the data included sightings from the Davis Strait-Baffin Bay-Labrador Sea northern bottlenose whale population (not listed under SARA).

All-species map

Species-specific map

One all-whale species map was created using the data for all 9 priority whales by summing the number of species in each grid cell for all these species and subsequently applying the smoothing procedure described above. Leatherback turtle sightings were not included in these maps. Important ports, calling points and 200-metre isobaths were added to each species map as supplementary geographical landmarks.

Critical habitats designated under SARA and/or important habitats identified by DFO were available for the St. Lawrence Estuary beluga whale (critical habitat), North Atlantic right whale (critical habitat), Scotian Shelf northern bottlenose whale (critical habitat and important habitat³) and the Atlantic blue whale (important habitat⁴). To view the most current information on aquatic species at risk and their critical habitat, visit the Species at Risk Public Registry⁵.

We supplemented the data-driven layers with information on critical and important habitats as follows:

1. If the critical habitat and/or the important habitat were identified as an Area to be Avoided (ATBA) recognized by the International Maritime Organization (IMO) or the Government of Canada, these management guidelines were added to the maps as supplementary features. This was done for the North Atlantic right whale and Scotian Shelf northern bottlenose whale.
2. If the critical habitat was not specified as ATBA, the full extent of the critical habitat was classified as a zone of high relative occurrence of sighting records (red zone). This was done for the St. Lawrence Estuary beluga whale
3. Important habitats were added as zones of low relative occurrence of sighting records (yellow zone) if not already identified by the data. This was done for Atlantic blue whale. Note that the south and southwestern Newfoundland and Cabot Strait important habitat polygons⁶ were combined with a straight line between Nova Scotia and Newfoundland (roughly from Sydney, Nova Scotia to Placentia, Newfoundland) to facilitate geographic landmarks for mariners.

Important ports, calling points and 200-metre isobaths were added to each species map as supplementary geographical landmarks.

³ DFO. 2020. Assessment of the Distribution, Movements, and Habitat Use of Northern Bottlenose Whales on the Scotian Shelf to Support the Identification of Important Habitat. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2020/008.

⁴ DFO. 2018. Identification of habitats important to the blue whale in the western North Atlantic. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2018/003.

⁵ <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html>

⁶ DFO. 2018. Identification of habitats important to the blue whale in the western North Atlantic. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2018/003.

Sector maps

Six sector-specific maps were created using the all-species data layer (9 priority whale species). Important ports, calling points, traffic separation schemes and marine protected areas were included on the sector maps.

Dataset

The dataset includes raster layers for the 10 priority species, in addition to the all-species raster layer. All layers are available in geoTIFF format. The raster layers do not include the additional information on critical and important habitats.

HUMPBACK WHALE



© Sarah Duquette, Parks Canada

Acknowledgement

COORDINATION

Aurélie Cosandey-Godin, WWF-Canada
Miako Ushio, WWF-Canada

MAPPING

Meg Carr, Dalhousie University
Will Merritt, WWF-Canada

SCIENTIFIC COMMITTEE

Christopher Taggart, Dalhousie University
Pamela Emery, Fisheries and Oceans Canada
Jean-François Gosselin, Fisheries and Oceans Canada
Pierre Goulet, Fisheries and Oceans Canada
Jack Lawson, Fisheries and Oceans Canada
Hilary Moors-Murphy, Fisheries and Oceans Canada
Stephanie M. Ratelle, Fisheries and Oceans Canada
Richard Sears, Mingan Island Cetacean Study
Cristiane C. Albuquerque Martins, Parks Canada
Sonia Simard, Shipping Federation of Canada

DATA SOURCES

Fisheries and Oceans Canada
Marine Mammal Observation Network
Mingan Island Cetacean Study
National Oceanic and Atmospheric Administration
North Atlantic Right Whale Consortium
Parks Canada
Transport Canada
Whitehead Lab, Dalhousie University

This initiative is made possible in part by funding received through Fisheries and Oceans Canada's *Habitat Stewardship Program (HSP)* for species at risk.



For further information, please contact Aurélie Cosandey-Godin, WWF-Canada
acosandeygodin@wwfcanada.org



© Shutterstock, WWF-Canada