



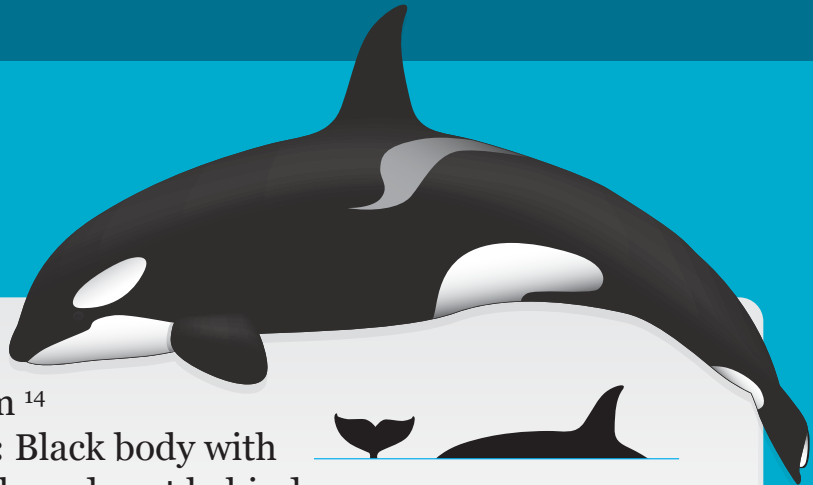
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1

The following marine mammals are common in the eastern Arctic; however, sightings of other species may also occur. It is possible for marine mammals to venture outside of their common habitat ranges and be seen elsewhere.

Killer Whale

Length: 7-9 m¹⁴
Appearance: Black body with white underside and spot behind the eyes. Tall and triangular dorsal fin in the middle of the back. Blow is tall and column-like; approximately 4 m in height.¹⁴
Behaviour: Typically form groups of 2-25.¹⁵
Sensitive months (calving and foraging activities and risk of ice entrapment): J F M A M J J A S O N D
Status: Special concern¹⁴



Minke Whale

Length: 6-10 m¹⁶
Appearance: Dark grey, black or brown back with a white spot on each pectoral fin. Large hook-shaped dorsal fin. Relatively small tail.¹⁶
Behaviour: Mainly solitary. Snout appears first when they surface to breathe. Occasionally breach out of the water.
Sensitive months (calving and foraging activities and risk of ice entrapment): Unknown
Status: Not at risk¹⁷



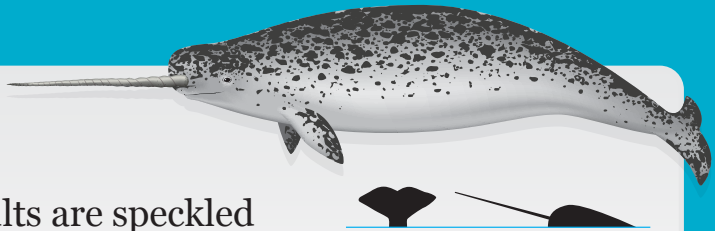
Beluga Whale

Length: 2-5 m³
Appearance: Adults are white, and young are grey. No dorsal fin, only a small portion of the body is visible out of the water. Blow is low and hardly visible.³
Behaviour: Found in small groups, but sometimes in groups of hundreds to thousands during annual migrations.
Sensitive months (calving and foraging activities and risk of ice entrapment): J F M A M J J A S O N D³
Status: Special concern³



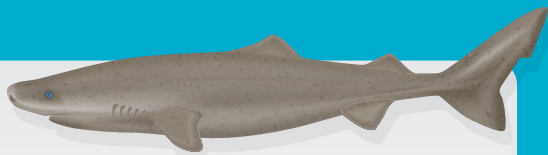
Narwhal

Length: 4-5 m⁴
Appearance: Adults are speckled grey and white while young are dark grey or black. Males have a spiraled tusk up to 3 m long. No dorsal fin. Blow is puffy. Not much of the body is visible out of the water.
Behaviour: Often in small groups in summer (<10 individuals) but may be hundreds during spring and fall migrations.⁴
Sensitive months (calving and foraging activities and risk of ice entrapment): J F M A M J J A S O N D⁴
Status: Special concern⁴



Greenland Shark

Length: 2-5 m⁵
Appearance: May be brown, black, grey or a spotted mix of all three. Two small dorsal fins and small eyes.⁶
Behaviour: Slow swimming. Usually observed near the surface during the winter and retreats to deeper waters (180-550 m) during the summer.
Sensitive months (calving and foraging activities and risk of ice entrapment): Unknown
Status: Not assessed



Walrus

Length: 2-4 m
Appearance: Brown skin. Broad flat muzzle, white whiskers and two distinctive tusks.²⁰
Behaviour: Occur in tight groups on ice floes or on land.
Sensitive months (calving and foraging activities and risk of ice entrapment): J F M A M J J A S O N D²⁰
Status: Special concern²⁰



Bowhead Whale

Length: 13-19 m
Appearance: The body is predominantly black with some white (non-pigmented) regions appearing on the chin, eyelids, flipper insertions, tail stock and flukes.¹
Behaviour: Often alone but sometimes in groups of 2-10.
Sensitive months (calving and foraging activities and risk of ice entrapment): J F M A M J J A S O N D¹
Status: Special concern²



Hooded Seal

Length: 2-3 m⁷
Appearance: Silvery-white with dark blotches. Males have a black "hood" on forehead and inflatable balloon-like nasal cavity.⁷
Behaviour: Solitary, except during pupping, mating and moulting.⁷
Sensitive months (calving and foraging activities and risk of ice entrapment): J F M A M J J A S O N D⁷
Status: Not at risk



Bearded Seal

Length: 2-3 m⁸
Appearance: Grey with brown tinge on the head and lighter colouring on the underside. Long, white whiskers and square-shaped front flippers.
Behaviour: Solitary but form small groups during mating and moulting.
Sensitive months (calving and foraging activities and risk of ice entrapment): J F M A M J J A S O N D⁸
Status: Data deficient⁹



Harp Seal

Length: Up to 2 m¹⁰
Appearance: Light grey body with black or brown head and long, black "harp-shaped" saddle on the back.
Behaviour: When migrating, the seals leap out of the water, like dolphins.
Sensitive months (calving and foraging activities and risk of ice entrapment): J F M A M J J A S O N D^{10, 11}
Status: Not assessed



Ringed Seal

Length: Up to 1.5 m¹²
Appearance: Dark grey body with light rings on the back and silver colouring on the front.
Behaviour: Associated with ice floes and pack ice. Maintain breathing holes throughout winter.
Sensitive months (calving and foraging activities and risk of ice entrapment): J F M A M J J A S O N D¹³
Status: Special concern¹²



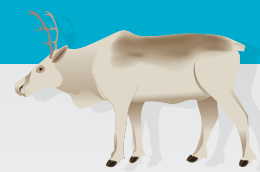
Polar Bear

Length: Up to 3 m¹⁸
Appearance: White, but can appear yellow or light brown.¹⁸
Behaviour: Solitary, except during breeding and cub rearing. Majority of time is spent on sea ice.
Sensitive months (calving and foraging activities and risk of ice entrapment): J F M A M J J A S O N D¹⁹
Status: Special concern¹⁸



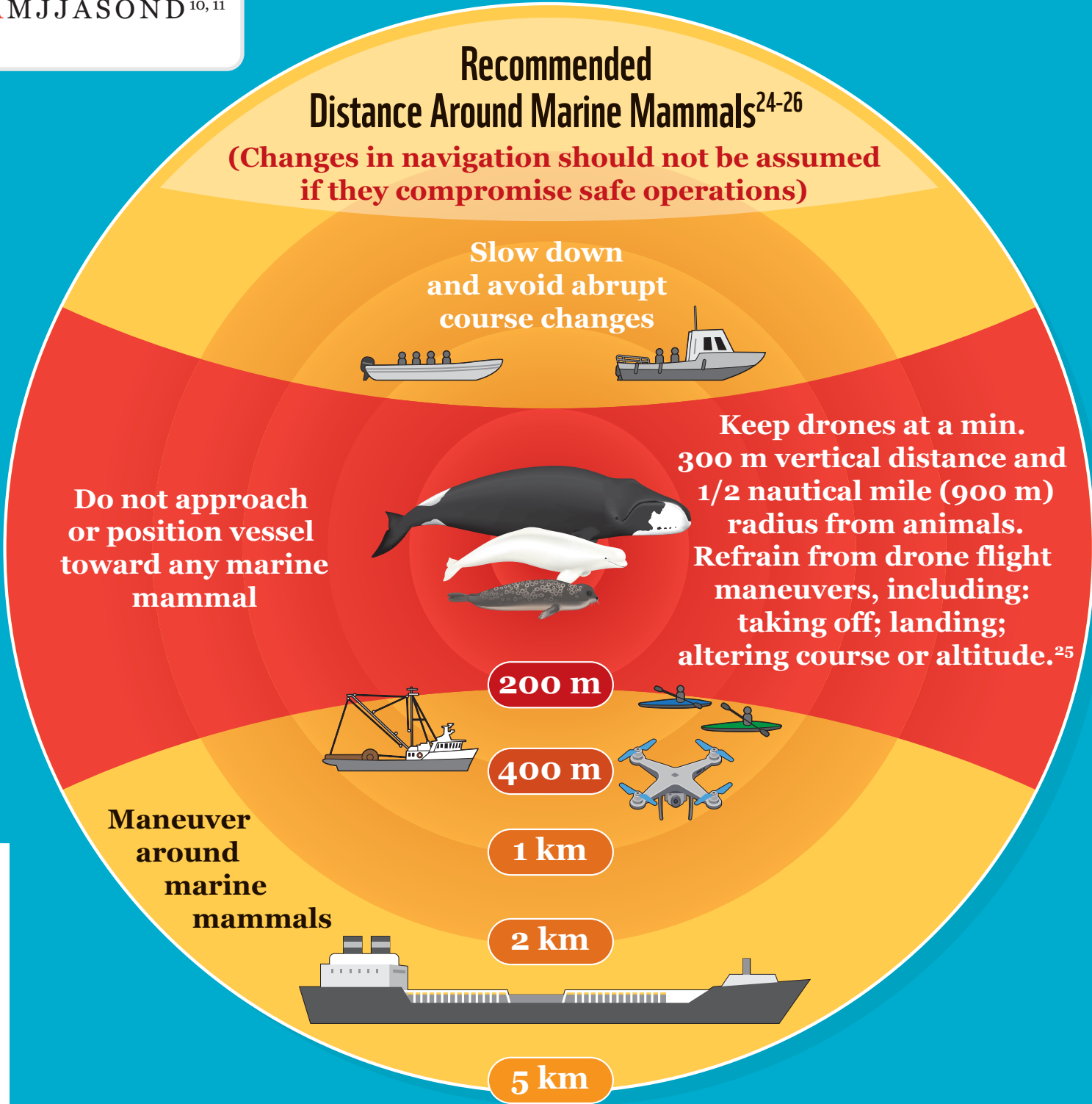
Caribou

Length: Up to 2 m
Appearance: Both males and females can have antlers. Dolphin & Union and Peary caribou are mostly white in winter and in summer appear grey with white legs;^{21, 22} Barren-ground caribou are brown and white year round.²³
Behaviour: Often seen in herds. Barren-ground caribou, and Dolphin & Union caribou follow an annual cycle, undertaking pre-calving and fall migrations between seasonal ranges.²¹
Sensitive months (calving and foraging activities and risk of ice entrapment): J F M A M J J A S O N D²¹⁻²³
Status: Endangered (Dolphin & Union population)²¹, Threatened (Barren-Ground and Peary populations)^{22, 23}



Recommended Distance Around Marine Mammals²⁴⁻²⁶

(Changes in navigation should not be assumed if they compromise safe operations)



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WWF RECOMMENDATIONS

Walrus Haulouts

- Maintain a setback of 5 km seaward of a walrus haulout, any time during the year.

Whale Sensitive Habitats

- Be cautious in whale calving, foraging and migration areas from mid-July to mid-September and follow mitigation procedures in the vicinity of marine mammals:¹⁹
 - Wildlife will be given right of way.
 - Adhere to setback distances (see chart on first page).
 - Maintain a straight course and constant speed, avoiding erratic maneuvers.
 - When marine mammals appear to be trapped or disturbed by vessel movements, implement appropriate measures to mitigate disturbance, including stopping movement until wildlife have moved away from the immediate area.

Polynyas (Ikirasaq)

- Avoid shipping and icebreaking activities, particularly through inlets, between mid-November to mid-July (Ukiaq to Upingaaq seasons).¹⁹

Floe edges (Sinaaq)

- Avoid shipping through and around floe edges during mid-March to mid-July (Upingaksaq and Upingaaq seasons).²⁷

Discharges and Dumping

- Avoid discharging operational wastes within or near protected area boundaries.²⁸

Reduce Black Carbon

- Avoid using heavy fuel oil and use distillate fuels and a particulate filter or cleaner alternative fuels.²⁸

Icebreaking

- Avoid icebreaking during ice formation and breakup.²⁹
- Avoid crossing Inuit on-ice community travel routes, unless accompanied by ice bridging plan and having consulted with municipal councils, HTOs and regional wildlife organizations within a 300 km radius of the route.¹⁹
- Avoid icebreaking through caribou sea-ice crossings.¹⁹
- Avoid icebreaking in Northwest Passage/Coronation Gulf between Victoria Island and the Mainland (Dolphin & Union caribou).¹⁹
- Avoid icebreaking in Peel Sound and Franklin Strait (Peary caribou).¹⁹
- Avoid icebreaking in narrow seaways between Bathurst Island and the Small Islands north of Bathurst Island (Peary caribou).¹⁹

Speeds

- When within 100m of a marine mammal, reduce speed to less than 7 knots. Avoid abrupt course changes.³⁰

Seabird Colonies

- When birds are present, year round:
 - 500 m setback for ships from seabird colonies.
 - 100 m setback from seabird colonies for zodiacs, kayaks and other small launch vessels.
 - 2 km setback distance from Ivory gull breeding sites.

Seal Pupping (Whelping)

- Avoid seal whelping (delivery and nursing of seal pups) areas from late-February to early-July.³¹

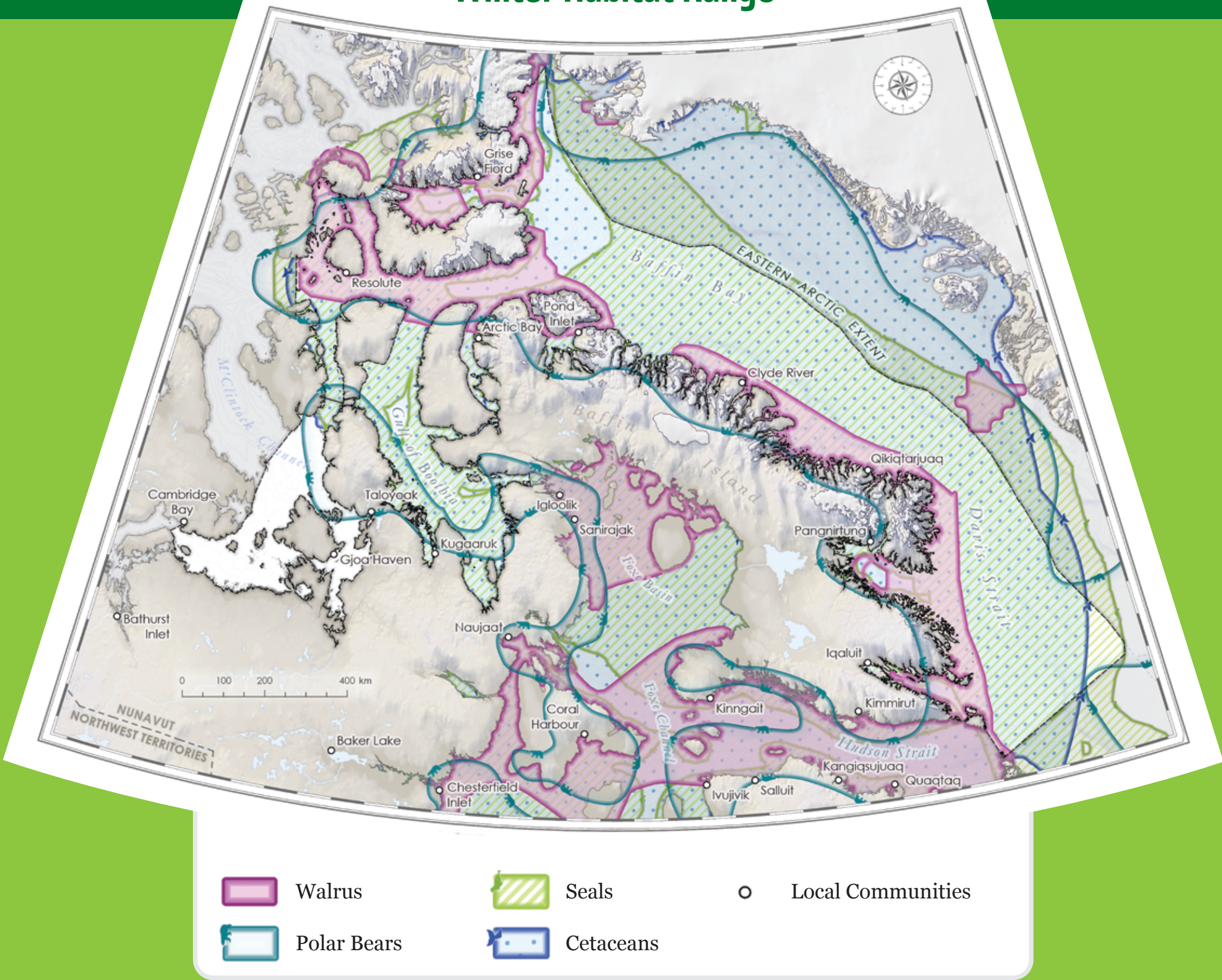
Local Community and Livelihood Areas

- Give right of way.
- Do not approach or take photographs of harvesting activities.
- Respect the "tourism exclusion zone" during the summer months.

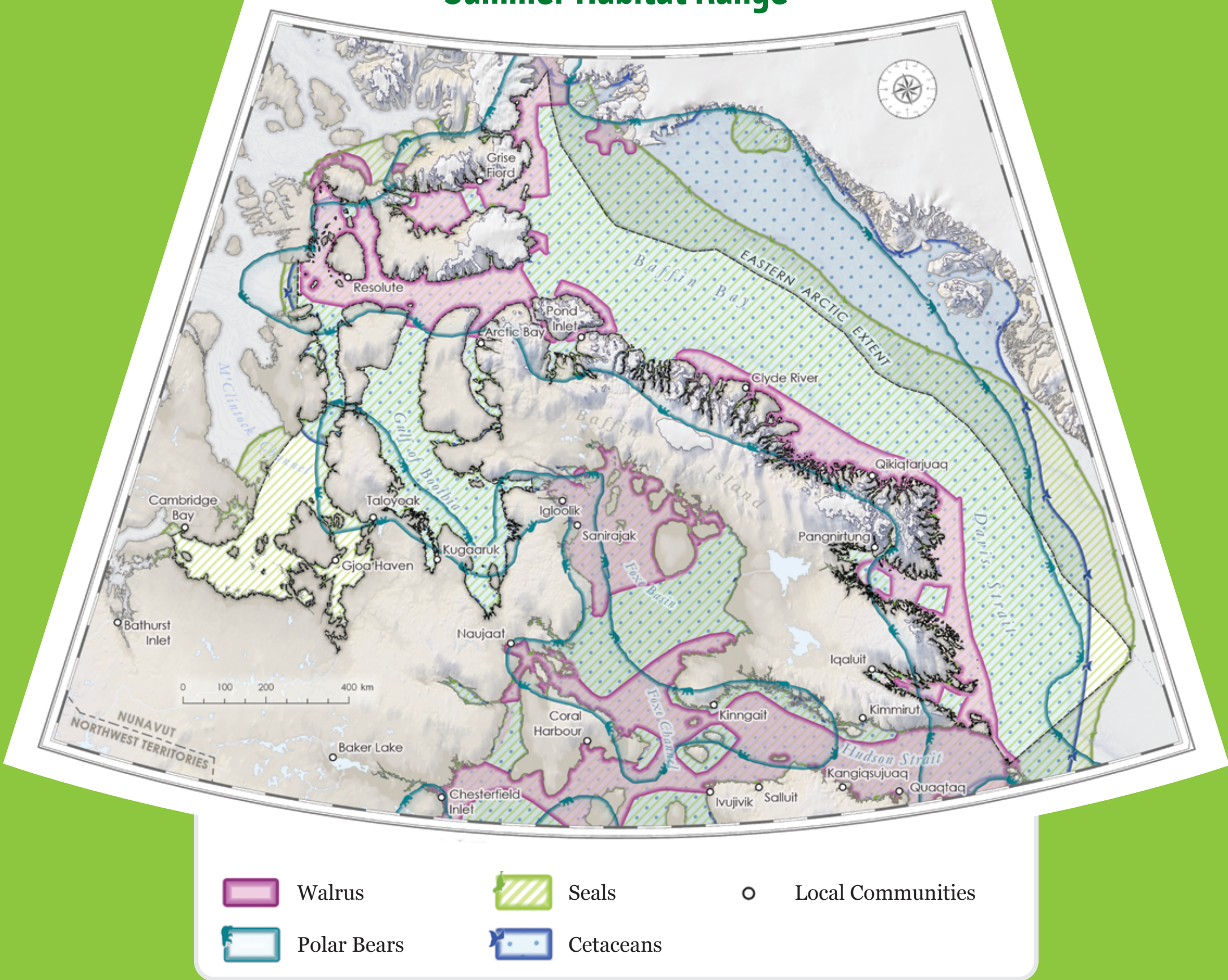


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Winter Habitat Range



Summer Habitat Range



NOTE: For navigation purposes, please use charts provided by the Canadian Hydrographic Service.



Eastern Arctic Mariners' Guide

LOCAL COMMUNITY PHONE NUMBERS & HUNTER AND TRAPPER ORGANIZATIONS:

- Contact the nearest community Hunters and Trappers Organization/Association for local knowledge of marine mammals:³²
- Aiviit Hunters & Trappers, Coral Harbour: 867-925-8622
 - Aiviq Hunters & Trappers, Kinngait: 867-897-8214
 - Amaruq Hunters & Trappers, Iqaluit: 867-979-6848
 - Aqigiq Hunters & Trappers, Chesterfield Inlet: 867-898-9063
 - Clyde River Hunters & Trappers, Clyde River: 867-924-6202
 - Ekaluktutiak Hunters & Trappers, Cambridge Bay: 867-983-2426
 - Gjoa Haven Hunters & Trappers, Gjoa Haven: 867-360-6028
 - Igloodik Hunters & Trappers, Igloodik: 867-934-8807
 - Kangisujuaq Municipality Hall: 819-338-3342
 - Mayukalik Hunters & Trappers, Kimmirut: 867-939-2355
 - Mittimatalik Hunters & Trappers, Pond Inlet: 867-899-8856
 - Nunavut Wildlife Management Board, Iqaluit, Nunavut: 867-975-7300
 - Pangnirtung Hunters & Trappers, Pangnirtung: 867-473-8751
 - Resolute Bay Hunters & Trappers, Resolute Bay: 867-252-3170

ENVIRONMENTAL EMERGENCY CONTACT

**Department of Environment and Natural Resources
Government of the Northwest Territories & Nunavut**

- Contact information to report a marine environmental emergency, such as an oil spill or oiled wildlife: 867-920-8130

CANADIAN WILDLIFE SERVICE

Canadian Wildlife Service contact information:

- Phone: 1-800-668-6767
- Email: ec.priseaccessoire-incidentaltake.ec@canada.ca

NATIONAL PARKS

Ukkusiksalik National Park:

- Phone: 867-462-4500
- Email: ukkusiksalik.info@pc.gc.ca

Auyuittuq National Park:

- Pangnirtung Office
 - Phone: 867-473-2500
 - Email: nunavut.info@pc.gc.ca
- Qikiqtarjuaq Office
 - Phone: 867-927-8834
 - Email: nunavut.info@pc.gc.ca

Sirmilik National Park:

- Phone: 867-899-8092
- Email: sirmilik.info@pc.gc.ca



Scan for a digital version with references and additional community contacts

WWF-CANADA CONTACT

Please contact for errors, omissions, comments or additions.

Sam Davin, Senior Specialist, Wildlife & Industry,
WWF-Canada: sdavin@wwfcanada.org

MARINE WILDLIFE SIGHTINGS, ENCOUNTERS & INCIDENTS

- Report to: Department of Fisheries and Oceans,
Steve Ferguson, 204-983-5057,
steve.ferguson@dfo-mpo.gc.ca
- You may be asked to provide:
- Date and time you found the animal or witnessed the incident
 - Specific location, including latitude and longitude (if available) or driving directions (if accessible by land)
 - Species or type of animal, including a description of the size, colour, features
 - Condition of the animal: alive, sick, injured, recently dead, badly rotting
 - Number of animals involved
 - Your contact information, including name and phone number

Management



Conservation



NOTE: For navigation purposes, please use charts provided by the Canadian Hydrographic Service.



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COMMUNITY CONTACTS

- Aiviit Hunters & Trappers, Coral Harbour: 867-925-8622
- Aiviq Hunters & Trappers, Kinngait: 867-897-8214
- Amaruq Hunters & Trappers, Iqaluit: 867-979-6848
- Aqigiq Hunters & Trappers, Chesterfield Inlet: 867-898-9063
- Baker Lake Hunters & Trappers, Baker Lake: 867-793-2520
- Clyde River Hunters & Trappers, Clyde River: 867-924-6202
- Ekaluktutiak Hunters & Trappers, Cambridge Bay: 867-983-2426
- Gjoa Haven Hunters & Trappers, Gjoa Haven: 867-360-6028
- Hall Beach Hunters & Trappers, Sanirajak: 867-928-8994
- Igloodik Hunters & Trappers, Igloodik: 867-934-8807
- Ikajutit Hunters & Trappers, Arctic Bay: 867-439-8483
- Iviq Hunters & Trappers, Grise Fiord: 867-980-9063
- Ivujivik Municipality Hall: 819-922-9940
- Kangisujuaq Municipality Hall: 819-338-3342
- Kurtairujuark Hunters & Trappers, Pelly Bay, Kugaaruk: 867-769-7002
- Mayukalik Hunters & Trappers, Kimmirut: 867-939-2355
- Mittimatalik Hunters & Trappers, Pond Inlet: 867-899-8856
- Nattivak Hunters & Trappers, Qikiqtarjuaq: 867-927-8836
- Naujaat Hunters & Trappers, Naujaat: 867-462-4334
- Nunavut Wildlife Management Board, Iqaluit, Nunavut: 867-975-7300
- Pangnirtung Hunters & Trappers, Pangnirtung: 867-473-8751
- Quaqtan Municipality Hall: 819-492-9912
- Resolute Bay Hunters & Trappers, Resolute Bay: 867-252-3170
- Salluit Municipality Hall: 819-255-8953
- Taloyoak Hunters & Trappers, Taloyoak: 867-561-5066



Eastern Arctic Mariners' Guide

REFERENCES

- 1 Government of Canada, "COSEWIC Assessment and Update Status Report on the Bowhead Whale in Canada," Species at Risk Act: COSEWIC assessments and status reports, Oct. 06, 2009. <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/bowhead-whale.html> (accessed Sep. 13, 2022).
- 2 Government of Canada, "Bowhead Whale (*Balaena mysticetus*), Eastern Canada-West Greenland population - Species search - Species at risk registry," Species at risk public registry>Species search, Feb. 02, 2021. <https://species-registry.canada.ca/index-en.html#/species/1054-722> (accessed Sep. 13, 2022).
- 3 COSEWIC, "COSEWIC assessment and status report on the Beluga whale, *Delphinapterus leucas*, Eastern High Arctic - Baffin Bay population, Cumberland Sound population, Ungava Bay population, Western Hudson Bay population, Eastern Hudson Bay population and James Bay population in Canada," COSEWIC, Committee on the Status of Endangered Wildlife in Canada = COSEPAC, Comité sur la situation des espèces en péril au Canada, Ottawa, ON, 2020. [Online]. Available: https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Beluga_Whale_2020_e.pdf
- 4 COSEWIC, "COSEWIC assessment and update status report on the Narwhal, *Monodon monoceros*, in Canada," COSEWIC=COSEPAC, Ottawa, Ont., 2004. [Online]. Available: https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_narwhal_e.pdf
- 5 J. Nielsen et al., "Assessing the reproductive biology of the Greenland shark (*Somniosus microcephalus*)," PLoS ONE, vol. 15, no. 10, p. e0238986, Oct. 2020, doi: 10.1371/journal.pone.0238986.
- 6 DFO, "Greenland shark," Identify a species in the Atlantic, Dec. 19, 2016. <https://www.dfo-mpo.gc.ca/species-especes/profiles-profil/greenlandshark-laimargueatlantique-eng.html> (accessed Sep. 13, 2022).
- 7 K. M. Kovacs, "Hooded Seal - an overview | Encyclopedia of Marine Mammals (Third Edition)," 2018. <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/hooded-seal> (accessed Aug. 10, 2022).
- 8 DFO, "Bearded seal," Nov. 25, 2016. <https://www.dfo-mpo.gc.ca/species-especes/profiles-profil/beardedseal-phoquebarbu-eng.html> (accessed Sep. 13, 2022).
- 9 COSEWIC, "Bearded Seal (*Erignathus barbatus*)," Species at risk public registry>Species search, Feb. 02, 2021. https://species-registry.canada.ca/index-en.html#/species/344-827#cosewic_assessment (accessed Sep. 13, 2022).
- 10 DFO, "Harp seal," Feb. 18, 2022. <https://www.dfo-mpo.gc.ca/species-especes/profiles-profil/harpseal-phoquegroenland-eng.html> (accessed Sep. 13, 2022).
- 11 DFO, "2019 Status of Northwest Atlantic Harp Seals, *Pagophilus groenlandicus*," Fisheries and Oceans Canada, Northwest Atlantic Fisheries Centre, St. John's, NL (Canada), 2019. [Online]. Available: https://polarbears-science.files.wordpress.com/2020/05/2019-harp-seal-status_dfo-2020_march-020-eng.pdf
- 12 COSEWIC, "COSEWIC assessment and status report on the Ringed Seal, *Pusa hispida*, in Canada," COSEWIC, Committee on the Status of Endangered Wildlife in Canada = COSEPAC, Comité sur la situation des espèces en péril au Canada, Ottawa, ON, 2019. [Online]. Available: https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr-PhoqueAnneleRingedSeal-v00-2020ct-Eng.pdf
- 13 O. Bengtsson, C. Lydersen, K. M. Kovacs, and U. Lindström, "Ringed seal (*Pusa hispida*) diet on the west coast of Spitsbergen, Svalbard, Norway: during a time of ecosystem change," Polar Biol, vol. 43, no. 7, pp. 773–788, Jul. 2020, doi: 10.1007/s00300-020-02684-5.



Eastern Arctic Mariners' Guide

- 14 COSEWIC, "Killer Whale (*Orcinus orca*), Northwest Atlantic / Eastern Arctic population - Species search - Species at risk registry," Feb. 02, 2021. <https://species-registry.canada.ca/index-en.html#/species/598-6> (accessed Sep. 13, 2022).
- 15 K. J. Lefort et al., "A review of Canadian Arctic killer whale (*Orcinus orca*) ecology," *Can. J. Zool.*, vol. 98, no. 4, pp. 245–253, Apr. 2020, doi: 10.1139/cjz-2019-0207.
- 16 WWF-Canada, Marine Mammal Observation Network (MMON), and M – Expertise Marine, "A Fisher's Guide to Whales on the East Coast of Canada. A guide to whales and other marine species for the fishing industry.," Marine Mammal Observation Network, Quebec, Canada, 2022. [Online]. Available: https://navigationbaleines.ca/wp-content/uploads/GUIDE-FISHERSGUIDE_EN.pdf?_ga=2.242298050.1187969218.1657205646-379494906.1657205646
- 17 COSEWIC, "Common Minke Whale North Atlantic subspecies (*Balaenoptera acutorostrata acutorostrata*)," Species at risk public registry>Species search, Feb. 02, 2021. <https://species-registry.canada.ca/index-en.html#/species/894-0> (accessed Sep. 13, 2022).
- 18 COSEWIC, "COSEWIC assessment and status report on the polar bear, *Ursus maritimus*, in Canada," Committee on the Status of Endangered Wildlife in Canada = Comité sur la situation des espèces en péril au Canada, Ottawa, ON, 2019. [Online]. Available: https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/OursBlancPolarBear-2019-Eng.pdf
- 19 NPC, "Nunavut Land Use Plan. Draft July 2021." Nunavut Planning Commission, Jul. 2021. [Online]. Available: <https://www.nunavut.ca/news/2022/latest-news-its-here-updated-2021-nunavut-draft-land-use-plan-has-been-released-draft-plan>
- 20 COSEWIC, "COSEWIC assessment and status report on the Atlantic walrus, *Odobenus rosmarus rosmarus*, high Arctic population, central-low Arctic population, Nova Scotia-Newfoundland-Gulf of St. Lawrence population, in Canada," COSEWIC, Committee on the Status of Endangered Wildlife in Canada = COSEPAC, Comité sur la situation des espèces en péril au Canada, Ottawa, 2017.
- 21 COSEWIC, "COSEWIC assessment and status report on the caribou, *Rangifer tarandus*, Dolphin and Union population, in Canada," Committee on the Status of Endangered Wildlife in Canada, Ottawa, 2017. [Online]. Available: https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/srCaribouDolphinUnion2017e1.pdf
- 22 COSEWIC, "COSEWIC assessment and status report on the Peary caribou, *Rangifer tarandus pearyi*, in Canada," Environment Canada, Canadian Wildlife Service, COSEWIC Secretariat, Ottawa, 2015. [Online]. Available: https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Peary%20Caribou_2015_e1.pdf
- 23 COSEWIC, "COSEWIC assessment and status report on the caribou, *Rangifer tarandus*, barren-ground population, in Canada," COSEWIC, Committee on the Status of Endangered Wildlife in Canada, Ottawa, 2016. [Online]. Available: https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Caribou%20Barren-ground_2016_e.pdf
- 24 Government of Canada, "Marine Mammal Regulations, SOR/93-56, Fisheries Act | Consolidated Federal Laws of Canada, Marine Mammal Regulations," Justice Laws Website, Nov. 02, 2018. <https://laws-lois.justice.gc.ca/eng/regulations/SOR-93-56/page-1.html#h-957801> (accessed Sep. 13, 2022).
- 25 DFO, "Watching Marine Wildlife," Marine mammals and sea turtles, Jun. 25, 2019. <https://www.dfo-mpo.gc.ca/species-especes/mammals-mammiferes/watching-observation/index-eng.html> (accessed Sep. 13, 2022).
- 26 Government of Canada, "Schedule VI, Subsections 7(3) to (4), Approach Distances to Marine Mammals | Consolidated federal laws of Canada, Marine Mammal Regulations," Justice Laws Website, Nov. 02, 2018. <https://laws-lois.justice.gc.ca/eng/regulations/SOR-93-56/page-9.html#h-958101> (accessed Sep. 13, 2022).
- 27 D. Currie, "Polynyas in the Canadian Arctic," Canatec Associates International Ltd., 2014. [Online]. Available: https://apiwwfarcticse.cdn.triggerfish.cloud/uploads/2022/04/08165253/research_polynya_report.pdf



Eastern Arctic Mariners' Guide

- 28 WWF-Canada, "National Vessel Dumping Assessment: Quantifying the threat of ship waste to Canada's Marine Protected Areas | Summary Report," WWF-Canada, Toronto, ON, Canada, Summary Report, Feb. 2022. Accessed: Sep. 13, 2022. [Online]. Available: <https://wwf.ca/wp-content/uploads/2022/03/2022-WWF-NO-DUMPING-SUMMARY-REPORT-EN-2.pdf>
- 29 M. Nacke, "Shipping Through Sea Ice: Impacts on marine habitats and best practices.," Apr. 2017. Accessed: Jul. 19, 2022. [Online]. Available: <https://wwf.ca/wp-content/uploads/2021/02/WWF-MPA-4-Impacts-Marine-Habitat-v4.pdf>
- 30 DFO, Notices to Mariners 1 to 46. Canadian Coast Guard Programs Aids to Navigation and Waterways Fisheries and Oceans Canada, 2022. [Online]. Available: <https://publications.gc.ca/site/eng/363763/publication.html#:~:text=Provides%20detailed%20information%20on%20navigation,plates%2C%20sketches%2C%20and%20charts.>
- 31 J. St. Paul, "Shipping and Marine Wildlife Management Plan. BAF-PH1-830-P16-0024," Baffinland Iron Mines Corporation (Baffinland), Mar. 2016. Accessed: Aug. 09, 2022. [Online]. Available: https://www.baffinland.com/_resources/document_portal/baf-ph1-830-p16-0024-r6---shipping-and-marine-wildlife-management-plan_2017-01-23-29.pdf
- 32 NPLS, "Community Directory - Hunters & Trappers Organization," Community Directory - Hunters & Trappers Organization | NPLS Website. <https://publiclibraries.nu.ca/en/hunters-trappers> (accessed Aug. 12, 2022).