A database of reported beluga whale (*Delphinapterus leucas*) and narwhal (*Monodon monoceros*) ice entrapments in the Canadian Arctic

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A database of reported beluga whale (*Delphinapterus leucas*) and narwhal (*Monodon monoceros*) ice entrapments in the Canadian Arctic

by

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Beluga whales and narwhals are widely distributed in the Canadian Arctic, where they are of socioeconomic and cultural importance to Inuit and managed under sustainable harvest limits. These ice-adapted species are susceptible to occasional mortality if they are entrapped by sea ice. Entrapments typically occur when there is a rapid freeze-up. Weather, tides, bathymetry (sills), and currents can be contributing factors. In recent years (starting in 2008) entrapments of narwhal in eastern Canada and West Greenland have occurred outside typical times and locations, suggesting that anthropogenic activities (e.g., seismic activity, shipping) may also be contributing factors. We compiled a comprehensive entrapment database to support research on the prevalence and causes of these events and their potential impacts on beluga and narwhal populations in the Canadian Arctic. Information on entrapment events was compiled from peer-reviewed articles, technical reports, sources of Inuit knowledge, and other print and online media. The database includes 83 entrapment records, including 56 for beluga only, 25 for narwhal only, and two involving both species. The quality of information on the timing, location, and size of each entrapment event varies. The information can be used to assess the influence of environmental and anthropogenic factors on entrapments and the survival rates of entrapped animals, and thereby to inform management responses.

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RÉSUMÉ

Higdon, J.W., Stewart, D.B., Heath, J., Hall, P., and Ferguson, S.H. 2023. A database of reported beluga whale (*Delphinapterus leucas*) and narwhal (*Monodon monoceros*) ice entrapments in the Canadian Arctic. Can. Tech. Rep. Fish. Aquat. Sci. 3576: vii + 47 p.

Les bélugas et les narvals sont largement répartis dans l'Arctique canadien, où ils revêtent une importance socio-économique et culturelle pour les Inuits et sont gérés selon des limites de prises durables. Ces espèces adaptées aux conditions de glace sont susceptibles à une mortalité occasionnelle si elles sont piégées par la glace de mer. Les piégeages dans les glaces se produisent généralement lorsque l'eau gèle rapidement. Les conditions météorologiques, les marées, la bathymétrie (seuils) et les courants peuvent être des facteurs contributifs. Au cours des dernières années (depuis 2008), on a observé des piégeages de narvals dans l'est du Canada et l'ouest du Groenland en dehors des périodes et des lieux habituels, ce qui indique que les activités anthropiques (p. ex. l'activité sismique et la navigation) peuvent également constituer des facteurs contributifs. Nous avons compilé une base de données exhaustive sur les piégeages pour appuyer la recherche sur la prévalence et les causes de ces événements et leurs répercussions possibles sur les populations de bélugas et de narvals dans l'Arctique canadien. On a compilé les renseignements sur les événements de piégeage tirés d'articles examinés par des pairs, de rapports techniques, de sources de connaissances inuites et d'autres médias imprimés et en ligne. La base de données contient 83 dossiers de piégeage, dont 56 pour le béluga seulement, 25 pour le narval seulement et 2 concernant les deux espèces. La qualité des renseignements sur le moment, l'emplacement et la taille de chaque événement de piégeage varie. On peut utiliser les renseignements pour évaluer l'influence des facteurs environnementaux et anthropiques sur les piégeages et le taux de survie des animaux piégés, et ainsi orienter les interventions de gestion.

1. INTRODUCTION

Beluga whales (*Delphinapterus leucas*) and narwhals (*Monodon monoceros*) are widely distributed in Arctic Canada and are of socioeconomic and cultural importance to local people (Hoover et al. 2013). Both species are closely associated with sea ice, and as such they are susceptible to mortality via ice entrapment (Siegstad and Heide-Jørgensen 1994). In some areas (e.g., the west side of Cumberland Sound), tidal actions and coastal bathymetric features can trap whales during low tides and lead to ice entrapments if conditions are suitable (Kilabuk 1998). In Greenland, entrapments are referred to as a 'sassat' (historically spelled "savssat"), which Porsild (1918) described as a situation where ''whales and birds are surprised by low temperatures [and] congregate in large herds in the remaining holes in the ice to breathe". Siegstad and Heide-Jørgensen (1994) defined an ''ice entrapment'' as an event in which ''the whales are unable or unwilling at any given instant to escape from a restricted open water reservoir that is surrounded by fast ice or pack ice". Entrapments can be major events in the lives of Arctic peoples who depend on Arctic cetaceans for subsistence, particularly in areas with a high incidence of events, such as the Disko Bay area of West Greenland (Porsild 1918; Heide-Jørgensen et al. 2013).

Most historic entrapments involving narwhals and belugas from Canadian populations and stocks occurred on West Greenland wintering grounds and were caused by rapid freeze-up during periods of stable but high atmospheric pressure (Egede 1788; Porsild 1918; Siegstad and Heide-Jørgensen 1994; Heide-Jørgensen et al 2002, 2013). However, in recent years there have been entrapments of narwhal in both eastern Canada and West Greenland that have occurred outside these "typical" times and in areas where entrapments had not previously been reported (i.e., on summer grounds) (Watt and Ferguson 2011; Laidre et al. 2012). These atypical entrapment events could be related to noise effects, e.g. from seismic surveys, on cetacean movements and migration timing (Heide-Jørgensen et al 2013).

This report and database summarize available information on beluga whale and narwhal ice entrapment history in Canadian waters. Our objective is to make this information readily available for a variety of uses, including quantifying food supplementation to predators (e.g., polar bears, *Ursus maritimus*), demographic considerations by managers responsible for sustaining Inuit hunting opportunities (e.g., determining whether sporadic entrapment mortality needs to be considered natural or of anthropogenic origin in the setting of harvest quotas), assessing possible increases in anthropogenic causes of entrapment, relationship to climate change, etc.

2. MATERIALS AND METHODS

This review includes reported Canadian entrapments only (see Discussion for sources on entrapments in adjacent jurisdictions like Alaska (USA) and Greenland that

have odontocete stocks shared with Canada). Information was compiled from peer-reviewed articles, technical reports, theses, conference proceedings and posters, Inuit knowledge compilations and summary reports, knowledgeable individuals, and print and online news media. Entrapment events are summarized by the region assigned to the various monodontid summer stocks (Richard 2010; Higdon and Ferguson 2017) (but we acknowledge that entrapments could involve migrating animals from other summering regions). Where available, information on incident response (if any) was included. Data tables maintain the original measurements as reported, which were often in Imperial, but metric measurements are also included in these cases. For Inuktitut names of locations where entrapments have been recorded, we maintained the spelling as reported in the original sources, but alternative names from the Inuit Heritage Trust (IHT 2013) database are also included where available.

There is considerable variation in how entrapment locations are reported. Some reports include latitude and longitude, others provide more reasonable detail (e.g., distance and direction from a known location), and some provide only vague references to a general location. Georeferencing techniques are necessary for records without detailed latitude and longitude data (see Rowe 2005). The entrapment records we report here lack sufficient detail to apply the typical georeferencing procedures described for museum collections (Chapman and Wieczorek 2006; Bloom et al. 2018).

For records without corresponding latitude/longitude information, we applied the guidelines established by the Mammal Networked Information System (MANIS) program (Wieczorek 2001; Wieczorek et al. 2004). This georeferencing method accounts for the various sources of uncertainty encountered when working with natural history collections or similar data. Locations are described as a circle, with a point to mark the position that most closely matches the locality description, and a radius that describes uncertainty (measured as the maximum distance from the centre point within which the true locality might occur, based on the descriptive information available) (Wieczorek et al. 2004). The size of the uncertainty radius (in km) accounts for aspects of the precision and specificity of the described locality in addition to the uncertainty associated with map scale, datum, precision and accuracy of the sources (Google Maps, etc.) used to determine the location coordinates. If specific location data (i.e., latitude/longitude, UTM coordinates) are available, uncertainty radii were associated with unknown datums and coordinate precision only.

Temporal resolution reported for each entrapment event also varies. In some cases the day of initial entrapment is known, others the day of discovery. Others have information on month or year only, and some are even missing year information. All available information on entrapment dates and event length are included in the database, but any subsequent analyses using these data will need to consider both temporal accuracy and spatial resolution.

3. RESULTS

The database currently includes 82 records in total - 55 beluga entrapment records (see Appendix Table A-1) and 25 narwhal records (see Table A-2), plus two entrapment events that included both species (in the beluga table, Table A-1). Two entrapments also included baleen whales - an entrapment of beluga whales with a bowhead whale (*Balaena mysticetus*) in 1998-1999 (Table A-1), and a 1978 extralimital entrapment of a narwhal in Newfoundland with humpback whales (*Megaptera novaeangliae*). The georeferenced locations of all records are mapped in Figure 1, with their location uncertainty radii (see below) reported in Tables A-1 and A-2. Most events were discovered and/or reported by Inuit and Inuvialuit. In total, 47 of the beluga records and 20 of the narwhal records ultimately came from local observers. Smaller numbers of events were discovered by aircraft pilots (n = 1), researchers (n = 5), and whalers (n = 2). As a result entrapment information is geographically biased to areas frequented by local harvesters and typically within ca. 50-100 km of communities.

The number of reported entrapment events per beluga stock ranged from zero to 18, assuming that Belcher Islands area records are whales from the Western Hudson Bay (or Western-Northern-Southern Hudson Bay, see Richard 2010) summer stock (Table 1). A number of beluga whale entrapments in Hudson Bay occurred in this area, where there is uncertainty with respect to stock structure (Postma et al. 2012; Parent et al. 2023, see Figure 1). These animals were provisionally assigned to the Western Hudson Bay summer stock, but with uncertainty noted ('?') (Table 1). There were also 16 entrapments recorded in the summer range of the Eastern Beaufort Sea beluga whale stock. There were no entrapments reported in James Bay (but see Discussion). Two (of 12) entrapments in the Eastern High Arctic-Baffin Bay beluga stock range includes both belugas and narwhals, one event each in the areas defined as used by the Somerset Island and Admiralty Inlet narwhal summer stocks.

For narwhal, the Somerset Island summer stock, which has the greatest numbers of narwhal (NAMMCO 2018; Hobbs et al. 2021), had the most reported events (n = 10 (possibly 11 as the location of one, near northern Bathurst Island, was just outside the mapped range of the summer stock [Figure 1], including the one noted above involving both species) (Table 2). Entrapments have also been reported for the Admiralty Inlet (n = 3, including one involving both narwhals and belugas, as noted above), Eclipse Sound (n = 7), and Northern Hudson Bay (n = 3) summer stocks. Three additional entrapments occurred in southeast Hudson Bay and Newfoundland and Labrador (Figure 1), outside the typical species range. These three are not assigned to any summer stock (Table 2).

Entrapment locations cluster in areas with known aggregations of narwhal and beluga (Figure 1), and near communities (which increases the likelihood of detection). There was a substantial gap in the central Arctic, with no reported entrapments despite a number of local communities. This area contains relatively few whales in comparison

to the Beaufort Sea and eastern Arctic waters. No beluga entrapments have been reported along the western Hudson Bay coast, despite this region supporting a large beluga whale population and being home to numerous communities that hunt the whales.

The year (or approximate year) of the entrapment was available for 60 of the 83 records (Figure 2). The earliest reports in Canadian waters are from the 1860s and 1870s (there are earlier records from West Greenland, e.g., Egede 1788). There has been an increase in reported events in recent decades (2000s, 2010s), but it is not possible to determine whether the frequency of events has increased given the anecdotal nature of the database and variable search effort (both spatially and temporally). Any future temporal analyses will be hindered by missing date info for many events, e.g., for Beaufort Sea beluga whales, data on entrapment year are available for Husky Lakes events, but for none of the other reported entrapments in the region.

The month the entrapment started was reported for 28 beluga entrapments and 17 narwhal entrapments (including the two records that reported entrapments of both species together). Beluga entrapments occurred in 8 months spanning January to December, with the highest number (n = 9) starting in October. In total, 23 of the 28 events with the start month reported occurred between October and March, which would be expected based on the seasonal cycle of ice growth across the Canadian Arctic. The other five entrapments started between April and July. Narwhal entrapments were reported to have started in February, July, August, October, November, and December, with most (11 of 17) events starting in October to December.

A total of 38 records (30 beluga, 8 narwhal) had accurate locations, with an uncertainty radius of 5 km or less (Figure 3). Most of these records are more accurate than 5 km as actual latitude and longitude were reported (generally for more recent events) and uncertainty was linked to unknown datums and coordinate precision only. A total of 51 records (37 beluga, 13 narwhal, and one involving both species) have an uncertainty radius of 25 km or less, which should be sufficient for regional-scale sea ice studies. For the most uncertain locations, the uncertainty radius was > 100 km (n = 10 records total), which will make these records difficult to use for detailed analyses of sea ice conditions and entrapment risks. Location uncertainty also varied by stock area. For Cumberland Sound beluga, five (of nine) records are highly accurate, with uncertainty of 1.5 km or less. Two other records have uncertainty ≤ 25 km, and all records are under ≤ 50 km. For the Eastern Beaufort Sea beluga stock area, 11 of 16 records have an uncertainty radius of 10 km or less (primarily Husky Lakes entrapments), but the remaining five events have large uncertainty radii (≥ 100 km). The EHA-BB beluga stock area has seven records with an uncertainty radius of 10 km or less (and one more with a radius = 12 km), and the remaining four records are much more uncertain (radius of 50-150 km). In general, locations of beluga whale entrapments are less uncertain than

narwhal locations, with 68% of the beluga records having an uncertainty radius of 25 km or less, compared to 40% of the narwhal records (excluding the two records involving both species).

The database includes information on the number of whales involved (with uncertainty information if available), management responses (if any, e.g., humane harvest, no response), and total mortality levels (Tables A-1, A-2). Information varied from event to event, but available data could be summarized to provide guidance on future management responses. We conducted a preliminary analysis of the number of entrapped whales over time, using the subset of records with data on number and year of event (n = 38 beluga, 16 narwhal). For each record, we recorded the minimum and maximum reported number, as available (often the same value, and sometimes missing for one, e.g., “more than 20”). From these values, we determined the “best” estimate, which was the median value (rounded up) when a range was reported and otherwise the most reliable number provided (e.g., “more than 20” was scored as 20 whales) (Figure 4). Beluga entrapments, while more commonly reported, include significantly fewer animals than the narwhal entrapments (beluga: median = 9, mean = 57, 95% percentile range = 1 - 177; narwhal: median = 24, mean = 319, 95% percentile range = 1 - 1,172) (unpaired t-test: t = 2.198, df = 52, P = 0.033). Most (32 of 38) beluga whale entrapments included less than 100 animals, but the maximum entrapment size was 1,000. Ten of 16 narwhal entrapments included less than 100 animals, with a maximum of 2,800.

4. DISCUSSION

We compiled 82 records of entrapments of beluga whales and narwhals in Canadian Arctic waters (including several extralimital narwhal entrapments), from a variety of sources including peer-reviewed journal articles and technical reports, newspaper articles, and Inuit knowledge compilations (Tables A-1 and A-2). Most reported entrapments involved beluga whales only (n = 56, plus two involving both species) but narwhal entrapments (n = 25, plus the two events involving both species) typically involved larger numbers of animals. In most cases knowledge of whale mortality was known, but in others the ultimate fate of entrapped individuals was not known (or not reported). The two entrapments involving large baleen whales in addition to belugas and narwhals is important information for managers, as it demonstrates that these large cetaceans are also vulnerable to entrapment by whatever combination of environmental, behavioural, and anthropogenic factors are leading to the entrapment of the smaller odontocete species.

Some Inuit elders note that beluga whales are more susceptible to ice entrapments than narwhals due to their different utilization of sea ice environments (NWMB 2016). Belugas calve in shallower waters than narwhals, in nearshore areas, which may make them more susceptible to entrapment as it is more difficult to navigate and travel through ice than in deeper waters (NWMB 2016). One key consideration for future research is the effects of changing sea ice conditions on entrapment risk for both species. For example, Inuit in Mittimatalik (Pond Inlet) have reported that the occurrence of rapidly forming ice called “sikujjivik”, when new fast ice forms quickly due to sudden changes in weather associated with high atmospheric pressure, has become more frequent, increasing ice entrapment risk (Nweeia 2020; Nweeia et al. 2017). This increase in rapid fast ice formation may be a factor in recent narwhal entrapments in the north Baffin Island region. The most recent entrapment event in the database (record 49, Table A-1) occurred in January 2022, when at least two (and possibly 3-4) belugas were observed breaking holes in a thin ice area in Coates Bay, Belcher Islands. The whales were originally observed in open water, but these patches quickly froze over (record 49, Table A-1). The fate of these whales is unknown, and they may have escaped to open water, but also might have drowned. Research on weather and sea ice patterns, including atmospheric pressure changes, may be a fruitful avenue of research on the conditions that lead to increased entrapment risk.

The database includes Canadian records only. Information on entrapments of transboundary beluga and narwhal stocks (e.g., USA [Alaska] and Greenland) is also available from the jurisdictions in which they occurred. For example, Alaskan beluga whale entrapments are reported by Lowry et al. (1987), and Russian entrapments are described in Tomilin (1957), Kleinenberg et al. (1964), Armstrong (1985), Ivashin and Shevlagin (1987), and Mymrin et al. (1999) (also see Weaver and Richard 1989). Entrapments of narwhal and/or beluga in Greenland have been reported by numerous sources, including Egede (1788), Brown (1868), Vibe (1950), Golodnoff (1956), Gad

(1973), Kapel (1977), Siegstad and Heide-Jørgensen (1994), Heide-Jørgensen et al. (2002, 2013), and Laidre et al. (2012).

Location information available for each entrapment varied considerably. This uncertainty will add difficulty to any research on sea ice and environmental conditions relating to entrapment events. Many of the entrapments reported were located near human settlements (Figure 1), so analyses of the spatial distribution of entrapment events should be also treated with caution due to this bias. Research on environmental conditions should start with sub-regions that offer better location data, including beluga whale entrapments in the Belcher Islands, Cumberland Sound, and the Husky Lakes. Beluga entrapments in the High Arctic (e.g., Jones Sound region) should be considered for additional research, as this would extend the latitudinal gradient in sea ice and weather conditions in the eastern Arctic for comparison (i.e., Belcher Islands, Cumberland Sound, and Jones Sound). The north Baffin Island region (i.e., Eclipse Sound, Admiralty Inlet, northern Foxe Basin) could be an important focal area for research on narwhal entrapments (also see Watt et al. 2019).

Information on other aspects of the entrapments, such as dates of occurrence, the initial number of whales trapped, the number caught or struck and lost, the number drowned or escaped, and entrapment duration also varied in quality. Available information is reported in the Appendix. Best estimates of these numbers could be summarized to support future management/population modelling, and management responses to past entrapments, could provide important guidance for developing response strategies (e.g., information on potential survival of whales that escape). Such research could include the extensive data available on ice entrapments in West Greenland, some involving shared populations. The database could also be used to update previous modelling on the sustainability of humane harvests with respect to current quotas (see DFO 2012; Watt et al. 2019). Any such modelling would need to consider the migratory movements of belugas and narwhals from summer ranges, as entrapments in some areas could include a mix of stocks on migration.

We made an effort to be as inclusive as possible in our compilation, and the data tables include several events where whales were trapped for a short period of time only and ultimately escaped or otherwise disappeared (e.g., records 35 and 38 in Table A-1, both involving beluga whales in Cumberland Sound, NU). Record 35 involved belugas trapped in a saltwater lake and successfully herded out by local boat owners. This wasn't an ice entrapment in the strictest definition, but these whales would have become ice entrapped had they remained in the lake. Record 38 was similar, in that a beluga was entrapped in a large bay in October at a time when ice was not yet forming. The Pangnirtung Hunters and Trappers Association (HTA) planned to monitor the whale for a couple tide cycles prior to meeting with co-management partners to consider the next steps. No additional details are reported in the available documentation, but this event would have led to an ice entrapment once freeze-up started, if the whale had not left the area beforehand (and assuming it did). We maintained these records in the

database as they may be useful for other researchers, depending on the questions being asked.

Other beluga entrapments that lack sufficient information to be included in the database have occurred in the Canadian Arctic. For example, the Inuit Land Use and Occupancy Study notes that beluga whales in James Bay (a non-migratory stock, with no records in the database) winter in “areas of open water west of Charlton Island, where they were occasionally trapped by encroaching ice” (in reference to the pre-1960 period, Schwartz 1976: 118). The database does not include any 1990s entrapments in the Belcher Islands, but local harvesters indicate that several occurred in that decade (A. Rumbolt, Sanikiluaq, NU, pers. comm.). Interviews with Nunavik (Quebec) Inuit indicated that beluga whales “were often trapped in polynyas”, and most winter TEK observations “were associated with winter entrapments” (Lewis et al. 2009: 19, 22). Inuit hunters from Clyde River, on the east Baffin coast, have reported “occasional observations of stranded beluga caught within the ice” (Remnant and Thomas 1992: 12), but no details are available. Anders (1965) described seeing “many” beluga whales in the western part of Fury and Hecla Strait from an aircraft, and noted that one group of ca. 10 animals appeared to be “caught among grounded ice floes” where they would have been easy for hunters to harvest had they had a large boat available. Additional details are unavailable, and we have not included this record in the database.

Some possible narwhal entrapments also have not been included in the Appendix. For example, a hunter from Arctic Bay “had seen a whole narwhal on the ice, but did not indicate how it came to be there” (Stewart et al. 1995: 33). Additional narwhal entrapments are likely, as during community meetings in Resolute in 2009, local residents noted “it is very common for narwhal to get trapped in rapid near shore ice formation” and that there was a “common Inuit practice (e.g., Grise Fiord, NU) of, when feasible, manually breaking a path through the ice to guide whales out of danger through a path back to open water” (Fast and Healy 2012: 13). Hunters from Grise Fiord have reported narwhal entrapments in Norwegian Bay (S.H. Ferguson, unpubl. data), but additional information is currently unavailable. Inuit in Qikiqtarjuaq have observed narwhal with scars from polar bear attacks that they attribute to whales being trapped (and subsequently escaping), and have also observed areas where narwhal were able to surface through thin ice to breathe (Oolayou 2016). Additional research and interviews with Inuit elders and harvesters could yield more records. One event in the database, a 1940s beluga entrapment in Navy Board Inlet (Freeman 1968), may actually have included both species, as during the 2008 narwhal entrapment event near Pond Inlet, a Hunters and Trappers Organization representative stated “[b]ased on our hunters’ knowledge there were trapped whales [narwhals] in 1943. And [the community] harvested them until they were all gone.” (Hume 2008). It is possible that two different entrapments occurred in this region in the 1940s, or that a single entrapment involved both species. Four Inuit hunters from Clyde River “mentioned observations of a single narwhal frozen within a fiord.” (Remnant and Thomas 1992: 10).

There are undoubtedly entrapment events known by Inuit that have not yet been compiled by researchers to allow inclusion in this database. A series of interviews and workshops with active hunters and elders could be held in a selection of Canadian Arctic communities to solicit additional observations and thereby improve the entrapment baseline for use in assessing possible changes over time in relation to environmental and human factors. Inuit in some communities have recently started to use hydrophones to locate entrapments (e.g., Watt et al. 2019), but we are unable to assess how changes in effort may have influenced the discovery of recent entrapment events. Community-based interviews could also address how search effort may have changed in recent years.

The database includes three records from the mid- to late-1800s. Two of these records were from sources related to the commercial whaling era - a narwhal entrapment in the Pond Inlet area July 1866, recorded in a whaling logbook that was subsequently published (Smith 1922), and an entrapment of beluga whales and narwhal in Prince Regent Inlet in early July 1875, discovered by a Dundee steam whaler and reported in a contemporary newspaper (Fifeshire Advertiser 1875). Other historic entrapments may be reported in similar sources (i.e., whaling logbooks), as Tomilin 1967: 707 (quoting Usov 1888) states that “[a]long the western coast of Baffin Bay, whalers sometimes encountered hundreds of carcasses of the narwhals which had found their death in the ice”. Many of these sources have been reviewed during catch history compilations (e.g., Mitchell and Reeves 1981; Stewart 2008, 2018; Stewart et al. 2014), but few entrapment records have been discovered. Other historic sources like the Hudson's Bay Company Archives (HBCA) have also been extensively reviewed in these catch history studies, with little information on entrapments discovered. Additional historical research could provide information on other historic entrapments, but documenting Inuit observations is likely a more productive research approach.

With this report and database, we have compiled available information on beluga whale and narwhal entrapments in Canadian Arctic waters. The database will provide a resource for additional research and will be updated as new information becomes available. Integrating ecological time-series data provides additional benefits to management, science, and policy beyond simply summing the separate parts (Ferguson et al. 2012). Adding our dataset to circumpolar observations can assist in developing large-scale adaptive management processes and policy necessary to respond to rapid global change

5. ACKNOWLEDGEMENTS

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Table 1. *Number of beluga whale (*Delphinapterus leucas*) entrapment events in Canadian waters, by management stock (i.e., summer stock).*

Beluga summer stock[1]	No. entrapments	Comments
Eastern Beaufort Sea	16	
Eastern High Arctic-Baffin Bay	12	Includes two events involving both belugas and narwhals.
Cumberland Sound	9	
Western Hudson Bay	1	
Western Hudson Bay (?)[2]	17	
Eastern Hudson Bay	2	
Ungava Bay	1	
Total	58	

[1] Gulf of St. Lawrence population not included in database as it is outside the Arctic region; no known entrapment events reported for James Bay (but see text) summer stock.

[2] Entrapment events in areas where stock structure is uncertain (e.g., Belcher Islands area).

*Table 2. Number of narwhal (*Monodon monoceros*) entrapment events in Canadian waters, by management stock (i.e., summer stock).*

Narwhal summer stock[1]	No. entrapments	Comments
Somerset Island	10	Includes one event involving both belugas and narwhals.
Somerset Island (?)[2]	1	
Admiralty Inlet	3	Includes one event involving both belugas and narwhals.
Eclipse Sound	7	
Northern Hudson Bay	3	
Uncertain stock[3]	3	
Total	27	

[1] No known entrapment events for Jones Sound, Smith Sound, or East Baffin Island (but see text) summer stocks.
[2] Stock identity uncertain but presumed Somerset Island.
[3] Extralimital records in NL and southeast Hudson Bay, stock identity uncertain.

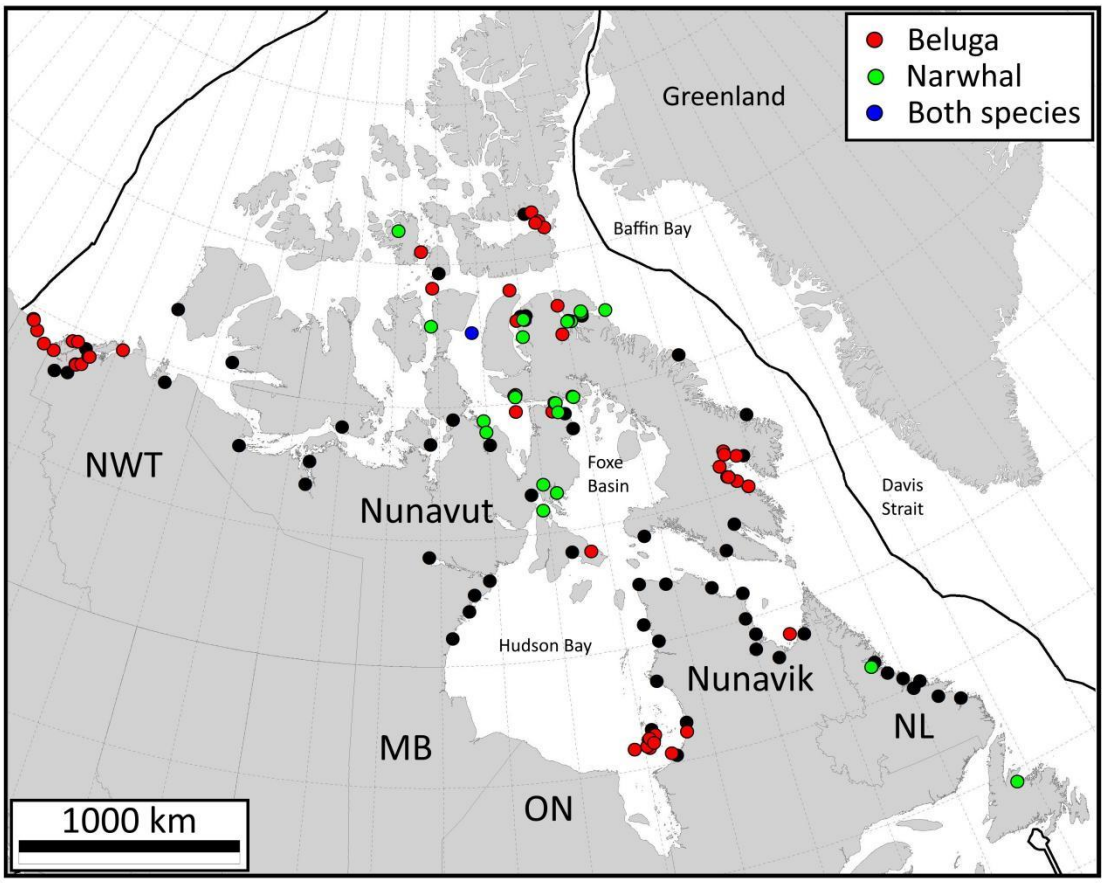

Figure 1. Locations of the beluga whale and narwhal entrapment records included in the database. Black circles are Inuit communities in Nunatsiavut (plus coastal Innu communities in Labrador), Nunavik, Nunavut, and the Inuvialuit Settlement Region, and thick black lines show Canada's EEZ boundary.

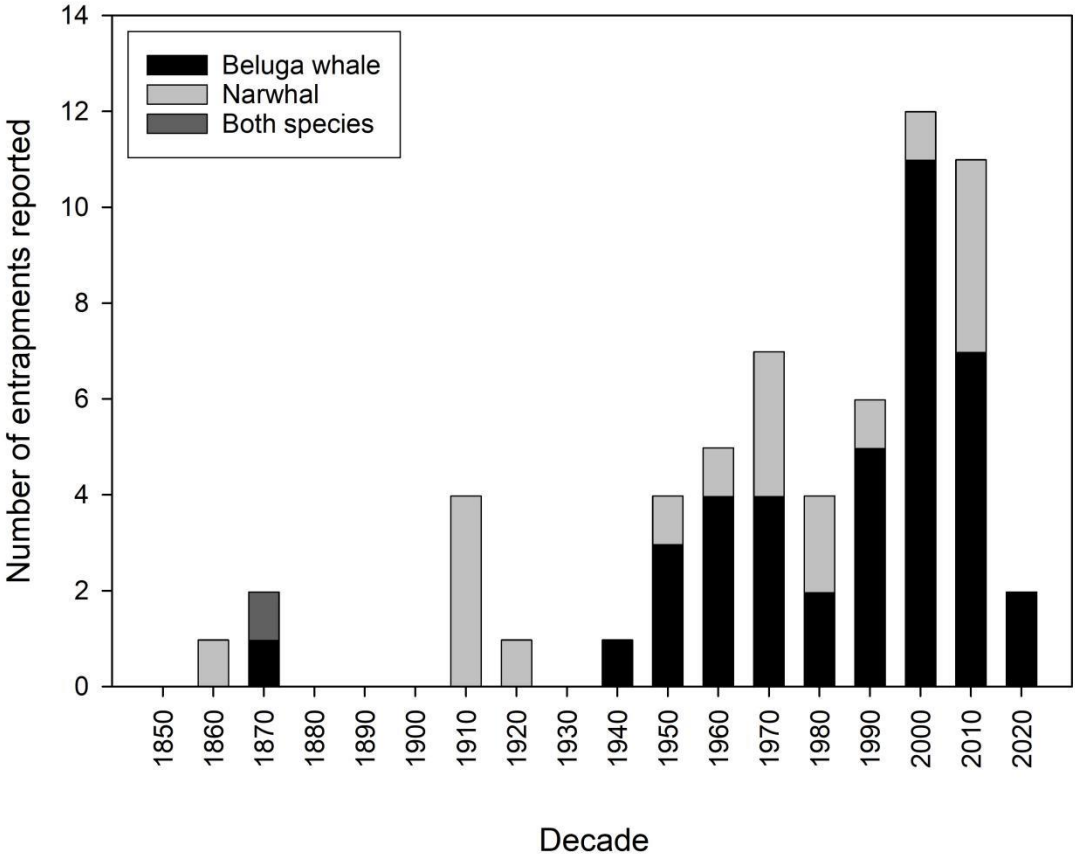

Figure 2. Decadal distribution of beluga whale and narwhal entrapment. Excludes records with no information on decade of occurrence (16 beluga entrapments, 23 narwhal entrapments, and one entrapment involving both species). Records for the most recent decade ("2020") only include records to spring 2022.

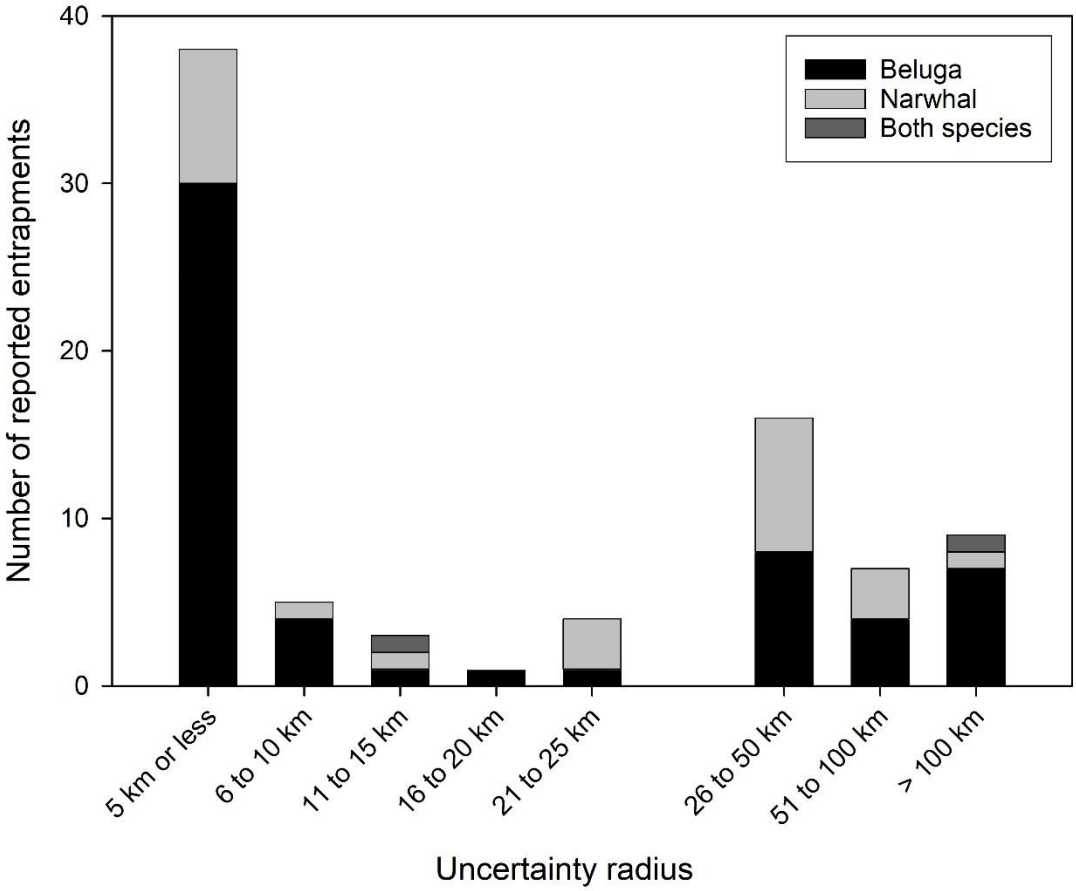

Figure 3. Uncertainty radius scores for beluga whale and narwhal entrapments. Records with an uncertainty radius of 25 km or less have suitable spatial accuracy for inclusion in regional-scale sea ice studies.

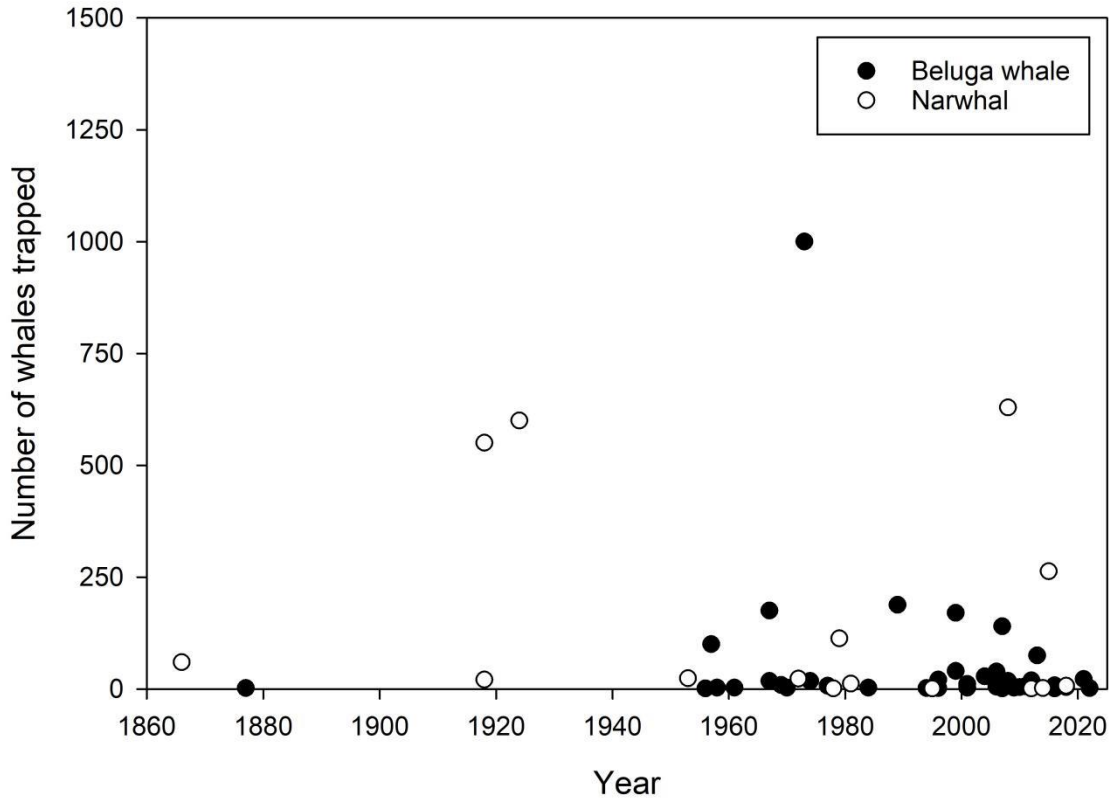

Figure 4. Number of whales involved in each entrapment event over time, for the subset of events that reported year of event and number of whales (n = 38 beluga, 16 narwhal).

7. APPENDIX

*Table A-1. Beluga whale (*Delphinapterus leucas*) entrapment records (with two entrapment records that included both beluga and narwhal - at bottom of table). Records are in chronological order with the exception of the last two entries that involved both species.*

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
1	Beluga (CS)	Kingwah Fiord (i.e., Clearwater Fiord), Cumberland Sound (NU)	66.568937	-67.38491	Estimated using MANIS procedure	ca. 40 km	Lat-long assigned to approximate centre of C. Fiord, uncertainty measured as distance of C. Fiord across longest span.	1876-1877	"In the winter of 1876-77, a couple [of belugas] got belated and froze up in the Kingwah [i.e., Clearwater Fiord] tide rifts. They were harpooned by the Eskimo in January." (Kumlien 1879: 67)	Kumlien 1879; Soper 1928; Mitchell and Reeves 1981; Stewart 2018
2	Beluga (EHA-BB)	Navy Board Inlet (NU)	73.220855	-80.626206	Estimated using MANIS procedure	ca. 125 km	Lat-long assigned to approximate centre of Navy Board Inlet (NBI), uncertainty measured as distance of NBI across longest span.	1940s	"In the 1940's, a large number of female and young beluga, together with a few old males, were trapped one winter in the Navy Board Inlet region, and in 1958 three individuals were trapped in Milne Inlet: these cases are the only ones known to experienced hunters from northern Baffin Island (Markusie and Ningyok, pers. comm.)." (Freeman 1968). Heide-Jørgensen et al. (2002) map the location as ca. 73.243140, -80.779972, but the original source (Freeman 1968) did not include this information.	Freeman 1968; Mitchell and Reeves 1981 (also see Heide-Jørgensen et al. 2002)
3	Beluga (EBS)	Husky Lakes (NWT)	69.226044	-132.364602	Estimated using MANIS procedure	ca. 130 km	Lat-long assigned to approximate centre of Husky Lakes (also see 1969 and 1974 events below).	Unknown (but pre-1960s)	Verbal accounts from local Inuvialuit, no further details available.	Hill 1967; Weaver and Richard 1989
4	Beluga (EBS)	West side of Mackenzie Delta (NWT)	68.883569	-136.004562	Estimated using MANIS procedure	ca. 160 km	Location assumed to be along west side of Shallow Bay, error estimated as length of delta as commonly defined (i.e., south to Fort McPherson).	Unknown (but pre-1960s)	Verbal accounts from local Inuvialuit, no further details available.	Hill 1967; Weaver and Richard 1989
5	Beluga (WHB?)	Belcher Islands	56.129016	-79.200331	Estimated using MANIS procedure	ca. 115 km	Location assigned as approximate centre of archipelago, error as length of archipelago is longest direction (North-South) (also see 1961, 2001 entries).	Winter 1955-56	"Beluga are sometimes trapped by winter ice in the complex fiords of the Belcher Island archipelago, in southern Hudson Bay: three were located by hunters in January 1961, and one harpooned at a breathing hole 5 years earlier." (Freeman 1968).	Freeman 1968; Mitchell and Reeves 1981
6	Beluga (EBS)	Phillips Bay (NWT)	69.260954	-138.439805	Estimated from map (polygon) in original source	ca. 7 km	Location assigned as approximate centre of map polygon in original source (Appendix Map 2)	Unknown (but pre-1990s)	"A few hunters in each community have seen beluga trapped by ice in places other than Husky (or Eskimo) Lakes ('Imaryuk'). These events occurred in Phillips	Byers and Roberts 1995 (Appendix 2, Map 2)

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
									Bay... The beluga in several of these cases were seen to be coated with a green slime."	
7	Beluga (EBS)	Trent Bay (NWT)	68.946565	-137.213331	Estimated from map (polygon) in original source	ca. 5 km	Location assigned as approximate centre of map polygon in original source (Appendix Map 3)	Unknown (but pre-1990s)	"A few hunters in each community have seen beluga trapped by ice in places other than Husky (or Eskimo) Lakes ('Imaryuk'). These events occurred in… Trent Bay (with over 20 whales below the Bar II Dew Line site)... The beluga in several of these cases were seen to be coated with a green slime."	Byers and Roberts 1995 (Appendix 2, Map 3)
8	Beluga (EBS)	near Kendall Island (Iqaqiaq (West Point)) (NWT)	69.498664	-134.640624	Estimated from map (polygon) in original source	ca. 10 km	Location assigned as approximate centre of map polygon in original source (Appendix Maps 4 and 5)	Unknown (but pre-1990s)	"A few hunters in each community have seen beluga trapped by ice in places other than Husky (or Eskimo) Lakes ('Imaryuk'). These events occurred... near Kendall Island... The beluga in several of these cases were seen to be coated with a green slime."	Byers and Roberts 1995 (Appendix 2, Maps 4 and 5)
9	Beluga (EBS)	near Kendall Island (Mason Bay) (NWT)	69.562188	-134.118471	Estimated from map (polygon) in original source	ca. 6 km	Location assigned as approximate centre of map polygon in original source (Appendix Map 5)	Unknown (but pre-1990s)	"A few hunters in each community have seen beluga trapped by ice in places other than Husky (or Eskimo) Lakes ('Imaryuk'). These events occurred... near Kendall Island... The beluga in several of these cases were seen to be coated with a green slime."	Byers and Roberts 1995 (Appendix 2, Map 5)
10	Beluga (EBS)	East side of Avadluk spit (west coast of Herschel Island) (NWT)	69.568526	-139.358877	Estimated from map (polygon) in original source	ca. 5 km	Location assigned as approximate centre of map polygon in original source (Appendix Map 2)	Unknown (but pre-1990s)	"A few hunters in each community have seen beluga trapped by ice in places other than Husky (or Eskimo) Lakes ("Imaryuk"). These events occurred... on both east and west sides of Avadluk spit (on the west coast of Herschel Island)... The beluga in several of these cases were seen to be coated with a green slime."	Byers and Roberts 1995 (Appendix 2, Map 2)
11	Beluga (EBS)	West side of Avadluk spit (east coast of Herschel Island) (NWT)	69.543485	-139.264706	Estimated from map (polygon) in original source	ca. 3 km	Location assigned as approximate centre of map polygon in original source (Appendix Map 2)	Unknown (but pre-1990s)	"A few hunters in each community have seen beluga trapped by ice in places other than Husky (or Eskimo) Lakes ('Imaryuk'). These events occurred... on both east and west sides of Avadluk spit (on the west coast of Herschel Island)... The beluga in several of these cases were seen to be coated with a green slime."	Byers and Roberts 1995 (Appendix 2, Map 2)
12	Beluga (EBS)	Liverpool Bay north of Husky Lakes (NWT)	69.925078	-129.406408	Estimated using MANIS procedure	ca. 100 km	Location assigned as approximate centre of Liverpool Bay, uncertainty ca. 100 km due to size of Liverpool Bay and uncertainty in true location (no mapped location in source)	Unknown (but pre-1990s)	"Beluga have also been trapped north of Imaryuk in Liverpool Bay. The beluga in several of these cases were seen to be coated with a green slime."	Byers and Roberts 1995
13	Beluga (CS)	Blacklead Island area, Cumberland Sound (NU)	64.98183	-66.212667	Estimated using MANIS procedure	ca. 50 km	Location of Blacklead Island used for lat-long, 50 km assumed for uncertainty (i.e., "area"	1956-1957	Over 100 belugas became trapped in fall 1956 near Blacklead Island, and 100 were caught by local hunters in spring 1957.	RCMP Game Reports for 1956-1957 cited by Mitchell and Reeves 1981 (and Freeman 1968); Kilabuk 1998; Stewart 2001; Stewart 2018

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
							assumed to mean within 25 km of island).			
14	Beluga (EHA-BB)	Milne Inlet (NU)	72.204572	-80.62374	Estimated using MANIS procedure	ca. 75 km	Location assigned as approximate centre of Milne Inlet, error as length of inlet in North-South direction.	1958	"In the 1940's, a large number of female and young beluga, together with a few old males, were trapped one winter in the Navy Board Inlet region, and in 1958 three individuals were trapped in Milne Inlet: these cases are the only ones known to experienced hunters from northern Baffin Island (Markusie and Ningyok, pers. comm.)." (Freeman 1968).	Freeman 1968; Mitchell and Reeves 1981 (Note: Heide-Jørgensen et al. (2002) map the location as ca. 72.217214, -80.648285, but the original source (Freeman 1968) did not include this information).
15	Beluga (WHB?)	Belcher Islands (NU)	56.129016	-79.200331	Estimated using MANIS procedure	ca. 115 km	Location assigned as approximate centre of archipelago, error as length of archipelago is longest direction (North-South) (also see 1955-56, 2001 and 2004 entries).	Jan. 1961	"Beluga are sometimes trapped by winter ice in the complex fiords of the Belcher Island archipelago, in southern Hudson Bay: three were located by hunters in January 1961, and one harpooned at a breathing hole 5 years earlier." (Freeman 1968).	Freeman 1968; Mitchell and Reeves 1981
16	Beluga (EBS)	Husky Lakes (NWT)	68.76666666	-133.3333333	As reported (converted to decimal degrees)	< 1 km	Uncertainty associated with unknown datum only (ca. 125 m)	1966-1967	Whales first seen in lakes on 20 August 1966, freeze-up started on 03 October 1966, event ended 20 January 1967. There were 50 whales prior to freeze-up, 15-20 on 10 November 1966. Management interventions included monitoring and some attempts to keep holes open.	Hill 1967; Inuvik Research Laboratory 1967; Kocho-Schellenberg 2010; Higdon and Ferguson 2012
17	Beluga (EHA-BB)	mouth of Starnes Fiord, Jones Sound (NU)	76.44729	-81.89831	Estimated from map in original source	< 1.5 km	Error of 1 mm assumed for map for which standards not published, translates to < 1 mile (1.6 km) in source map.	Autumn 1966-April 1967	In winter 1966-67 belugas were trapped at three holes near the mouth of Starnes Fiord in Jones Sound. They were discovered by Inuit from Grise Fiord in late November 1966 and periodically hunted through early April 1967. According to R.C.M.P. Game Condition Report by V.R. Vitt (Vitt, V.R. 1966-1967 RCMP Game Condition Report for Grise Fiord, transcribed by J.T. Strong), about 110 belugas were entrapped, with 80 taken. Freeman (1968) estimated that 150-200 belugas of all ages were trapped; with 80-100 landed, others dying or were struck-lost, and the remaining 15-20 survived and apparently attempted to reach open water 20 miles (ca. 32 km) distant in April. Jonkel (1969) reported that the whales were in poor condition.	Freeman 1968; Bruemmer 1969; Jonkel 1969; Mitchell and Reeves 1981; Stewart et al. 1995; Dick 2001: 474; Stewart 2001
18	Beluga (EBS)	Husky Lakes (NWT)	69.226044	-132.364602	Estimated using MANIS procedure	ca. 130 km	Lat-long assigned to approximate centre of Husky Lakes (also see "pre-1960s" above and 1974 event below).	1969	Nine (9) whales trapped, no management interventions.	Weaver and Richard 1989; Higdon and Ferguson 2012

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
19	Beluga (EHA-BB)	Near King Edward VII Point (NU)	76.133333	-81.133333	As reported (converted to decimal degrees)	< 1.5 km	Uncertainty due to coordinate precision and unknown datum, error estimated as < 1.5 km.	March 1970	Reported to Freeman by an Inuit hunter from Grise Fiord - "a small number" of belugas trapped in open water near a partially grounded iceberg, at some point in March a polar bear caught and removed two adult and one sub-adult belugas. Location reported as 76°08'N, 81°08'W.	Freeman 1973; Mitchell and Reeves 1981
20	Beluga (UB)	central Ungava Bay	58.875708	-67.042336	Estimated from map (polygon) in original source	ca. 5 km	Location assigned as approximate centre of map polygon in original source (Figure 6)	February 1973	Pilot Johnny May reported seeing about 1,000 beluga in a small area of open water surrounded by ice in central Ungava Bay in February 1973, while flying a Twin Otter to Killiniq. It is unknown if these whales were trapped and died, but it did not look like there was any other open water nearby, and the timing of the ice entrapment is somewhat coincidental with the timing of observed decreases in beluga abundance in the 1970s and 80s.	NMRWB 2020
21	Beluga (EBS)	Husky Lakes (NWT)	69.226044	-132.364602	Estimated using MANIS procedure	ca. 130 km	Lat-long assigned to approximate centre of Husky Lakes (also see "pre-1960s" and 1974 events above).	1974	Up to 18 whales. Management interventions included a herding attempt, with half the whales saved; unsuccessful attempts to keep holes open for others. Reported to have been trapped in same approximate area as in 1969 (but location not reported).	Weaver and Richard 1989; Higdon and Ferguson 2012
22	Beluga (EHA-BB)	Off NW Somerset Island, Barrow Strait (NU)	74.190682	-95.670088	Estimated using MANIS procedure	ca. 50 km	Lat-long assigned as ca. 25 km NW of Somerset Island, uncertainty assigned as ca. 50 km.	Early May-2 June, 1977	"A small group" of belugas, 7 still alive on 2 June when site visited by K. Finley.	Davis and Finley 1979 MS; Mitchell and Reeves 1981
23	Beluga (CS)	Cumberland Sound (NU)	65.321148	-67.0715	Estimated from map in original source	< 1 km	Error of 1 mm assumed for map for which standards not published, translates to ca. 500 m in 1:500K source map.	March 1984	Nunavut Atlas (Riewe 1992) p. 183, item 35: "Three belugas were found entrapped in the ice here in March 1984." Location shown in map on p. 73 (Cumberland Sound). Also mapped in GN (2013).	Riewe 1992; GN 2013
24	Beluga (EBS)	Husky Lakes (NWT)	68.766532	-133.358606	Estimated from map in original source (Kocho-Schellenberg 2010)	ca. 5 km	No scale provided in original map, map scale error conservatively estimated, 1 mm error = ca. 5 km (also see 1996 entry below).	1989	Involved > 125 (or > 250?) whales. Two locations near Whale Point. Management interventions - harvest, herding attempt proposed but not attempted.	Harwood 2008; DFO unpubl. data; Kocho-Schellenberg 2010; Higdon and Ferguson 2012
25	Beluga (EHB)	near Kuujjuarapik, Nunavik (harvested by Nunavik hunters, NU waters)	55.422268	-78.115649	Estimated using MANIS procedure	ca. 75 km	Canadian Ice Service chart for 01 May 1994 shows extensive landfast ice in local area. Lat-long assigned as ca. 25 km NW of community. Uncertainty assigned as 75 km given lack of	1994 (prior to June)	"The ice was late breaking up this spring and likewise, whales were not sighted until late spring... The first two (2) whales caught were in poor condition. The elders thought that they were not fit to eat as has always been the practice when such animals were caught. They looked to be starving and had what looked like blisters and had spots of muttuq missing on both of the animals. We thought that it	Brooke 1995: 73 (Kuujjuarapik community report)

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
							information on true distance and bearing.		was just a matter of time before they died. The reason why we thought that they were in this poor condition is that they had breathing holes during the winter. The elders thought that they might have been the only two survivors among many. They (elders) know for a fact that the most aged animals die before the winter ends as some have witnessed this phenomena [sic] first hand. This should be considered when setting quotas for the communities. I also think that there should be a study on just how many whales are caught on the ice every winter."	
26	Beluga (EBS)	Husky Lakes (NWT)	68.757284	-133.316591	Estimated from map in original source (Kocho-Schellenberg 2010)	ca. 5 km	No scale provided in original map, map scale error conservatively estimated, 1 mm error = ca. 5 km (also see 1989 record above).	1996	None seen in summer aerial surveys. Freeze-up started in September. Three separate holes were found near Whale Point after freeze-up. Included 21 whales. Management interventions - Harvest.	Harwood 2008; DFO unpubl. data; Kocho-Schellenberg 2010; Higdon and Ferguson 2012
27	Beluga (EHB)	Tatsuyook (mouth of Richmond Gulf) (harvested by Nunavik hunters, NU waters)	56.170157	-76.678275	Estimated using MANIS procedure	ca. 85 km	Canadian Ice Service chart for April 1996 indicates landfast ice from Richmond Gulf to the Belcher Islands, limited open water. Location of Tatsuyook uncertain ("mouth of Richmond Gulf"). Location estimated as mouth of Richmond Gulf, < 2 km from coastline. Uncertainty assigned as 85 km, approximate distance to pack ice (i.e., floe edge) from mouth of Richmond Gulf.	13 April 1996	One beluga whale harvested by an Umiujaq hunter in a possible (but unconfirmed) entrapment, another whale present: "I will start with the very first whale harvested in winter time this year on April 13th. Mr. James Kasudluak got one white whale in the open water of Tatsuyook in the mouth of the Richmond Gulf. It was a female white beluga, there were two of them and the hunters used one boat, no lost. To my knowledge the belugas have never been sighted out there in the winter time ever since we moved to Umiujaq in eleven years. Before the beluga was caught the other hunter from Great Whale have [sic] seen them during the earlier winter in the area."	Brooke 1997: 16 (Umiujaq community report)
28	Beluga (EHA-BB)	Lancaster Sound off Brodeur Peninsula (NU)	73.97525	-86.143083	As reported (converted to decimal degrees)	< 1 km	Uncertainty associated with unknown datum only (ca. 125 m)	Oct. 1998-May 1999	Entrapment discovered by polar bear researchers on 30 May, off the Brodeur Peninsula, Baffin Island (73.975250, -86.143083). Event included one bowhead whale and about 40 belugas that were being preyed upon by polar bears. There were a total of 5 small pools of open water (ca. 5 m each), each of which had whales in it, and up to 40 polar bears in the area. At least a dozen whales had been hauled out and consumed. The entrapment was gone without a trace	Savage 1999; Heide-Jørgensen et al. 2002

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
									when the site was overflown again about a month later. The ice edge was about 15 km to the east, by 10 June there were at least 20 bears in the vicinity and the ice edge was 21 km to the east; by 19 June the ice had completely broken up. The belugas were entrapped in relatively stable fast ice, far from open water, and the predation could have been going on for up to 7 months since ice consolidation occurred in late October 1998.	
29	Beluga (EHA-BB)	Jones Sound (NU)	75.891317	-80.518183	As reported (converted to decimal degrees)	< 1 km	Uncertainty associated with unknown datum only (ca. 125 m)	April 1999-June 1999	Entrapment discovered by hunters on 28 May 1999, 85 km east of Grise Fiord at 75.891317, -80.518183. Whales in a hole 20 m long by 6 m wide. Nine polar bears were at the site, with 100 beluga carcasses hauled up on the ice. Twenty live belugas, all badly mauled, were present and hunters harvested 5. The whales were believed to have been entrapped in early April since little ice had been present in mid March. On 29 May 1999, another hole measuring 340 cm by 190 cm was found ca. 700 m from the first, with 50 whales which all had fresh scars from bear attacks. After hunters enlarged the hole another 12 whales were harvested and ca. 40 of the least injured were left undisturbed. The whales immediately began using an extra hole made by the hunters about 25 m away. The site was visited again on 2 June when five more holes were made at distances of 200 to 500 m apart. The whales never used a sixth hole made 1 km away from the original hole. At that time, the ice edge, where hundreds of belugas were present, was 23 km away from the entrapment site. On 10 June, belugas were using four of the holes, with 3 whales having been killed by polar bears and three more badly injured. On 23 June, the ice had broken up opening a lead approximately 2 km from the site, enabling the whales to escape. In total, event involved at least 170 belugas, of which about 100 were killed by polar bears and 17 were taken by hunters.	Heide-Jørgensen et al. 2002
30	Beluga (CS)	Near Avataktoo, Cumberland Sound (NU)	66.241642	-66.337398	Estimated using MANIS procedure	ca. 25 km	Lat-long assigned to approximate centre of Avataktoo (Bay), uncertainty of ca. 25 km assigned to capture general area.	2001	In September 2001, DFO issued a Variation Notice allowing the harvest of 3 belugas entrapped by ice near Avataktoo; 2 were caught and 1 killed and lost.	DFO unpubl. data; P. Hall, DFO Winnipeg, pers. comm. in Stewart 2018.

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
31	Beluga (WHB?)	Near the head of Coates Bay, Belcher Islands area (NU)	56.153799	-79.578011	As reported by local harvesters.	ca. 5 km	Location provided by harvesters involved in entrapment. Uncertainty conservatively assigned as 5 km.	02 Jan. 2001 (date of video)	Video by Allan Rumbolt (18:48 in length, but only ca. first 6.5 minutes play), online at Najuqsivik daycare website. Nunavut Wildlife Harvest Study (Priest and Usher 2004) includes 11 belugas for January (also 4 in Dec.), but total number harvested at entrapment unknown, as is total number trapped. Entrapment occurred near the head of Coates Bay. The belugas were using several small holes, opened up by hunters. Adult and juvenile whales, one adult landed in (partial) video.	Video on Najuqsivik Daycare (Sanikiluaq) website: www.najuqsivik.com/gateway/movies/index.htm; Priest and Usher 2004; J. Heath, unpubl. data; A. Rumbolt, pers. comm.
32	Beluga (WHB)	East Bay (NU)	64.060732	-81.500708	Estimated from map (polygon) in original source	ca. 30 km	Lat-long reported as approximate centre of mapped polygon, uncertainty measured as total length of polygon in widest direction.	ca. 2003-2004	Coral Harbour Coastal Resource Inventory says - "Large amount were trapped by ice 10-11 years ago". No other details available (location reported as approximate centre of mapped polygon in Coastal Resource Inventory).	GN 2015a
33	Beluga (WHB?)	Coates Bay, Belcher Islands area (NU)	56.187361	-79.525498	As reported by local harvesters.	ca. 5 km	Location provided by harvesters involved in entrapment. Uncertainty conservatively assigned as 5 km.	December 2004 (incl. 17th)	Included as entrapment by L. Postma (DFO) in Powerpoint slide of beluga haplotype frequency, n = 28 samples in genetic database. Eight samples collected on 17 Dec., no date provided for rest. Local harvesters report a total of 28 whales.	L. Postma, DFO Winnipeg, pers. comm.; A. Rumbolt, pers. comm.
34	Beluga (CS)	Kangerk Fiord, Cumberland Sound (NU)	66.430404	-67.400971	Estimated using MANIS procedure	ca. 15 km	Location approximated near head of fiord, uncertainty conservatively assigned as ca. 15 km - length of fiord.	Fall 2005-Feb. 2006	In fall 2005, 5 belugas were entrapped by ice near the head of Kangerk Fiord. In February 2006, 1 was landed and 1 struck and lost.	DFO unpubl. data; P. Hall, DFO Winnipeg, pers. comm. in Stewart 2018
35	Beluga (CS)	Tajagiaq, Cumberland Sound (NU) (note: spelling above is from original DFO source material, "Tajjarriaaq" in IHT 2013)	66.052367	-68.1623	As reported (converted to decimal degrees)	< 1 km	Uncertainty associated with unknown datum only (ca. 125 m)	Oct. 2006	Belugas were trapped in a salt-water lake at Tajagiaq (GPS location 66 03.142N / 68 09.738W). A herding attempt was made on 28 Oct. 2006, with four teams/boats. Approximately 7-8 whales (mix of grey and white) were observed in the lake, and the herding attempt was deemed successful with ca. 10 whales seen outside lake afterwards. The general impression from the herding team was that the whales were still in good condition. There was no major ice formation in the lake on the day the herding was completed, but the whales would have presumably become ice entrapped with freeze-up.	DFO unpubl. data (Entrapped Beluga (Tajagiaq/Pangnirtung) Events Report), J. Young, DFO Iqaluit, pers. comm.
36	Beluga (EBS)	Husky Lakes (NWT)	68.856122	-132.844354	As reported (Harwood 2008)	< 1 km	Uncertainty associated with unknown datum only (ca. 125 m)	2006	Whales first seen in lakes in August 2006, event ended (with harvest) on 23 November 2006. Freeze-up started in September 2006. Management intervention - Harvest. Up to 400 reported by local	DFO unpubl.; Harwood 2008;Kocho-Schellenberg 2010; Kotakak and Bill 2007; Harwood 2008; Higdon and Ferguson 2012; Trana et al. 2016

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
									hunters in August, maximum of 212 at surface in aerial surveys, 39 harvested.	
37	Beluga (EBS)	Husky Lakes (NWT)	69.21361	-132.488902	As reported (Harwood 2008)	< 1 km	Uncertainty associated with unknown datum only (ca. 125 m)	2007	Whales first seen in lakes in August 2007, trapped by late October. Estimated 200 (or 80?) whales trapped in Husky Lakes narrows (Gudchiaq). No management interventions.	CBC 2007a, b, c; Kocho-Schellenberg 2010; Higdon and Ferguson 2012
38	Beluga (CS)	Tariojuq, Cumberland Sound (NU) ("Tariuja Fjord" in IHT 2013)	65.566667	-67.666667	As reported (converted to decimal degrees)	< 1.5 km	Uncertainty due to coordinate precision and unknown datum, error estimated as < 1.5 km.	2007	On 10 Oct. 2007 the Pangnirtung HTA advised DFO that a single beluga was entrapped in a large bay (Tariojuq, 65 34N, 67 40W) near Irvine Inlet, Cumberland Sound. The HTA Chairman reported that the beluga was first seen in the bay by a hunter on 31 Aug. 2007. On 06 October 2007 local hunters observed the beluga still in the bay and in poor body condition. The HTA report described the location as a large bay with a fast current flowing into and out of the bay at low and high tide, with large rocks and boulders present at the inflow area of the bay. At the time (early October) the HTA reported that weather conditions were currently good and there was no ice forming yet in Tariojuq Bay. The Action Plan for Trapped Whales recommends that entrapped whales be monitored over several high tide cycles to see if they will leave the area independently. It was recommended that the Pangnirtung HTA continue to monitor the whale until after the next series of spring tides, after which the HTA and the co-management partners would meet to consider the next steps. No additional details are available. This event would have led to an ice entrapment once freeze-up started, if the whale had not left the area beforehand.	DFO unpubl. data; DFO briefing note to NWMB; J. Young, DFO Iqaluit, pers. comm.
39	Beluga (EHA-BB)	ca. 50 km southeast of Grise Fiord (NU)	76.093889	-81.594572	Estimated using MANIS procedure	< 5 km	Lat-long estimated using distance and bearing from community, uncertainty radius estimated using uncertainty in distance and directionality precision.	May 2008	CBC article interviews Conservation Officer J. Qaunaq - earlier in the month a local hunter reported between 15-20 beluga whales trapped in sea ice about 50 km southeast of the community. Qaunaq also said "We have seen more trapped belugas closer to the floe edge, and there were about three to four holes, we've seen a couple of cracks, so we are hoping that the belugas will go to the cracks and start heading to the floe edge." The entrapment was to be monitored regularly. YouTube video shows a mix of adult (of varying lengths) and juvenile belugas.	CBC 2008a; YouTube video clip - http://www.youtube.com/watch?v=7duqXx40RdQ

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
40	Beluga (CS)	Targioyak Fiord, Cumberland Sound (NU) (Tariuja Fjord" in IHT 2013)	65.585667	-67.794833	As reported (converted to decimal degrees)	< 1 km	Uncertainty associated with unknown datum only (ca. 125 m)	2009	On 20 Aug. 2009 the Pangnirtung Conservation Officer (CO) informed DFO of 3 entrapped belugas in Targioyak Fiord. On 01 Sept. DFO conducted a surveillance flight and located the 3 belugas in the fiord. The 3 whales were again located on a second surveillance flight on 09 Sept. The whales were still present into November, and the Pangnirtung HTA conducted a humane harvest on 01 and 02 Nov. in Targioyak Fiord (GPS location - 65 35.14 N 67 47.69 W). The 2 whales (2 adults, 1 juvenile) were still present. Both adults were landed - an adult female (12 ft 9 in (3.89 m), blubber 2 in (5.1 cm) thick along back) (with 1.5 ft (0.46 m) fetus) on 01 Nov, and an adult male (13 ft 6 in (4.11 m) length, blubber 2.25 in (5.72 cm) thick along back) on 02 Nov. The stomachs of both whales were empty.	DFO unpubl. data (Timeline for 3 Entrapped Belugas at Targioyak fiord, whale sample kit data sheet); DFO 2010; J. Young, DFO Iqaluit, pers. comm.
41	Beluga (CS)	Targioyak Fiord, Cumberland Sound (NU)	65.566667	-67.7	As reported (converted to decimal degrees)	< 1 km	Uncertainty associated with unknown datum only (ca. 125 m)	2010	Pangnirtung HTO reported an entrapment of 3 beluga whales in Targioyak Fiord (65°34´N, 67°42´W) on 31 August 2010, and a later entrapment of 4 whales in Kangiqturjuarlaaq Fiord (66º25´N, 67º16´W) on 28 September 2010. For the Targioyak entrapment, DFO and the HTO agreed that the whales would be left over several high tide cycles to see if they would leave the area independently prior to any herding attempts. Interactions between DFO and the HTO were affected by staff absences at the HTO office and no herding attempts were contracted. In early October, aerial and ground surveys confirmed that one beluga still remained entrapped in Targioyak Fiord, and humane harvest was approved in late October. No harvest occurred by 09 November. For the Kangiqturjuarlaaq entrapment, in early October it was confirmed that no whales remained entrapped, and they likely escaped during a high tide event.	DFO 2010
42	Beluga (WHB?)	Wetalltok Bay, Belcher Islands (NU)	56.192321	-79.209137	As reported.	< 1.5 km	Uncertainty due to coordinate precision and unknown datum, error estimated as < 1.5 km.	March 2011	Old entrapment found near the head of Wetalltok Bay in March 2011, with a number of carcasses on the ice buried in snow. Approx. 6 whales, difficult to say how much was eaten, but foxes had been burrowing in the carcasses and there were bear claw marks and bears in the area. Some polar bear claw marks on one, but not deep and likely after they were on the ice already. Samples collected for DFO. No day of month info in DFO beluga genetic database. Samples (n = 6)	J. Heath, unpubl. data; L. Postma, DFO Winnipeg, pers. comm.

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
									collected from whales that were found dead (i.e., not harvested).	
43	Beluga (WHB?)	Coates Bay, Belcher Islands (NU)	56.233333	-79.5	As reported (converted to decimal degrees)	< 1.5 km	Uncertainty due to coordinate precision and unknown datum, error estimated as < 1.5 km.	Dec. 2011-Feb. 2012	Entrapment reported by HTO on 30 Dec. 2011, after whales were discovered and harvested. Belugas were trapped at Coats Bay (56° 14' N, 79° 30' W), and hunters landed 18 whales with one more reported present. Seven whale sampling kits were distributed and at least one sample was provided (as of 30 Dec.). Some whales harvested in 2012 as the entrapment continued.	DFO unpubl. data; L. Arragutainaq, Sanikiluaq HTO, pers. comm.
44	Beluga (WHB?)	Belcher Islands area, ca. 100 km southeast of Sanikiluaq (NU)	55.806076	-79.622988	As reported (converted to decimal degrees)	< 1.5 km	Uncertainty due to coordinate precision and unknown datum, error estimated as < 1.5 km.	Feb.-March 2013	Entrapment discovered by polar bear hunter about 100 km southeast (or 60 mi/96 km south, depending on source) of Sanikiluaq around 12 February 2013. Polar bears (at least eight present) had removed 19 whales (18 calves from the previous spring and one adult), and many of the remaining whales showed wounds. The whales were using two small holes of ca. 6 ft radius each. The condition of the holes suggested to hunters that the whales had been trapped for some time. Eight whales were landed by hunters on 13 Feb., and there were still at least 19 adults and one calf using the two openings. Hunters returned to the breathing holes every day since they were discovered, and 24 belugas had been landed by 18 February. The ice around the breathing holes was starting to get broken up by the current and the wind at that point, but harvesting continued. By 01 March all the whales had been harvested. Initial estimates of 25-30 whales were low, and there were over 70 whales in total once the harvest was completed ("approximately 75" as per DFO 2013). Samples and associated data were collected from both hunted whales and those killed by polar bears. The DFO beluga genetic database includes 12 samples, with no day of month information included.	L. Arragutainaq, Sanikiluaq HTO, pers. comm.; L. Postma, DFO Winnipeg, pers. comm.; CBC News North 2013a, b; DFO 2013; Hopper 2013; Nunatsiaq News 2013a, b; J. Heath, unpubl. data
45	Beluga (WHB?)	Quipaluq (Kipalu Inlet), Belcher Islands (NU)	56.303383	-79.054833	As reported (converted to decimal degrees)	< 1 km	Uncertainty associated with unknown datum only (ca. 125 m)	Jan. 2016	A group of 7-9 belugas were observed at a ca. 3 km diameter polynya (Quipaluq, or Kipalu Inlet, GPS location - N 56 18.203, W 79 03.290) in mid-Jan. 2016. The following day only three were observed, and none the next day. As such, local hunters suspected there was a breathing hole in the vicinity, but none were found. This was a unique event in that it was around a polynya instead of a closed floe. HTO	J. Heath, unpubl. data

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
									held board meeting re: permission to hunt whales on 18 Jan.	
46	Beluga (WHB?)	southwest side of Robertson Bay, Belcher Islands (NU)	55.897863	-79.784959	Estimated using MANIS procedure	ca. 40 km	Location estimated near southwest end of bay, uncertainty approximated as length of bay.	Feb. 2016	A local hunter found one beluga on the ice, indicative of an entrapment, near the southwest side of Robertson Bay. A sample was collected but then lost when the hunter lost his snowmobile and kamotik through the ice.	J. Heath, unpubl. data
47	Beluga (EHA-BB)	Admiralty Inlet (south of Adams Sound) (NU)	72.9075058	-85.7138638	Estimated using MANIS procedure	ca. 10 km	Uncertainty assigned as approximate distance to Adams Sound.	Oct. 2018	Initial reports via social media (Facebook, Twitter), additional details provided by C. Kines (Parks Canada, Nunavut; via Twitter DM on 30 and 31 October). Entrapment occurred near Qikiqtarkat, a little south of Adam's Sound, discovered on the weekend (27-28 October). One whale harvested on 29 October, two harvested in total (both possibly on the same day). There were four whales in total, with two harvested and two lost. The aglus (breathing holes) were frozen over like an early seal hole. All large adult whales. Location assumed to match "Qikiqtaukkat Islands" in Inuit Heritage Trust Place Names database, IHS location assigned.	DFO unpubl. data; C. Kines, Parks Canada Iqaluit, pers. comm.
48	Beluga (WHB?)	Wetalltok Bay, Belcher Islands	55.988133	-79.255847	As reported	< 1 km	Uncertainty associated with unknown datum only (ca. 125 m)	January 2021	Entrapment found by polar bear hunters on 19 January 2021, bears had discovered the entrapment and dragged the whales onto the ice. Hunters returned to the site on 21 January and collected samples from 22 carcasses.	J. Heath and Sanikiluaq HTO, unpubl. data; DFO, unpubl. data
49	Beluga (WHB?)	Coates Bay, Belcher Islands	56.197316	-79.489751	Estimated using MANIS procedure (using description provided by local observers and route data)	ca. 5 km	Uncertainty conservatively assigned as 5 km based on local geography and hunter route information.	January 2022	Beluga whales were observed in northern Coates Bay, in open water that was just starting to freeze over, on 03 January. At least two whales were found by hunters on 06 January in a thin ice area in southern Coates Bay. On 07 January they were observed making breathing holes after the small open water patches froze to thin ice. Hunters planned to leave them alone until the ice got thick enough to allow safe harvest, but they disappeared and could not be re-located or heard on a hydrophone. There were at least two whales present, possibly 3-4 total. It is unknown if they escaped to open water or died.	I. Takatak, P. Arragutainaq, A. Rumbolt, pers. comm.; J. Heath and Sanikiluaq HTO, unpubl. data
50	Beluga (WHB?)	Murray Maxwell Bay (NU)	69.951861	-80.74064	Estimated from map in original source	ca. 35 km	Location assigned as approximate centre of polygon mapped in original source, uncertainty measured as	Oct. through Feb., no year reported (pre-1990s)	Inuit in Foxe Basin report that ice entrapments of belugas occur from October through February in the Igloolik area. Entrapments have occurred in Murray Maxwell Bay, Quilliam Bay [written as "Guillium" in Stewart et al. 1995; Stewart 2001], eastern Fury and Hecla Strait, Agu Bay, and northern Committee Bay.	Stewart et al. 1995; Stewart 2001

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
							approximate distance of polygon in longest span.		Locations are mapped in Stewart et al. 1995. Entrapments in Murray Maxwell Bay were observed by interviewees. One interviewed hunter indicated that entrapments occurred less often than every decade, and only one hunter had harvested ice-entrapped belugas (lat-long location: small polygon mapped in Stewart et al. 1995, approximate centre point used here).	
51	Beluga (WHB?)	Quilliam Bay (NU)	69.528839	-83.090632	Estimated from map (polygon) in original source	ca. 5 km	Location assigned as approximate centre of polygon mapped in original source, uncertainty measured as approximate distance of polygon in longest span.	Oct. through Feb., no year reported (pre-1990s)	Inuit in Foxe Basin report that ice entrapments of belugas occur from October through February in the Igloolik area. Entrapments have occurred in Murray Maxwell Bay, Quilliam Bay [written as "Guillium" in Stewart et al. 1995; Stewart 2001], eastern Fury and Hecla Strait, Agu Bay, and northern Committee Bay. Locations are mapped in Stewart et al. 1995. Entrapments in Quilliam Bay were seen by the hunters' parents or grandparents. One interviewed hunter indicated that entrapments occurred less often than every decade, and only one hunter had harvested ice-entrapped belugas (lat-long location: small polygon mapped in Stewart et al. 1995, approximate centre point used here).	Stewart et al. 1995; Stewart 2001
52	Beluga (WHB?)	eastern Fury and Hecla Strait (NU)	69.832673	-82.713882	Estimated from map (polygon) in original source	ca. 50 km	Location assigned as approximate centre of polygon mapped in original source, uncertainty measured as approximate distance of polygon in longest span.	Oct. through Feb., no year reported (pre-1990s)	Inuit in Foxe Basin report that ice entrapments of belugas occur from October through February in the Igloolik area. Entrapments have occurred in Murray Maxwell Bay, Quilliam Bay [written as "Guillium" in Stewart et al. 1995; Stewart 2001], eastern Fury and Hecla Strait, Agu Bay, and northern Committee Bay. Locations are mapped in Stewart et al. 1995. Entrapments in Fury and Hecla Strait were observed by interviewees. One interviewed hunter indicated that entrapments occurred less often than every decade, and only one hunter had harvested ice-entrapped belugas (lat-long location: small polygon mapped in Stewart et al. 1995, approximate centre point used here).	Stewart et al. 1995; Stewart 2001
53	Beluga (WHB?)	Agu Bay (NU)	70.264626	-86.888081	Estimated from map (polygon) in original source	ca. 20 km	Location assigned as approximate centre of polygon mapped in original source, uncertainty measured as approximate distance of polygon in longest span.	Oct. through Feb., no year reported (pre-1990s)	Inuit in Foxe Basin report that ice entrapments of belugas occur from October through February in the Igloolik area. Entrapments have occurred in Murray Maxwell Bay, Quilliam Bay [written as "Guillium" in Stewart et al. 1995; Stewart 2001], eastern Fury and Hecla Strait, Agu Bay, and northern Committee Bay. Locations are mapped in Stewart et al. 1995.	Stewart et al. 1995; Stewart 2001

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
									Entrapments in Agu Bay were seen by the hunters' parents or grandparents. One interviewed hunter indicated that entrapments occurred less often than every decade, and only one hunter had harvested ice-entrapped belugas (lat-long location: small polygon mapped in Stewart et al. 1995, approximate centre point used here).	
54	Beluga (WHB?)	northern Committee Bay (NU)	69.679508	-86.895211	Estimated from map (polygon) in original source	ca. 50 km	Location assigned as approximate centre of polygon mapped in original source, uncertainty measured as approximate distance of polygon in longest span.	Oct. through Feb., no year reported (pre-1990s)	Inuit in Foxe Basin report that ice entrapments of belugas occur from October through February in the Igloolik area. Entrapments have occurred in Murray Maxwell Bay, Quilliam Bay [written as "Guillium" in Stewart et al. 1995; Stewart 2001], eastern Fury and Hecla Strait, Agu Bay, and northern Committee Bay. Locations are mapped in Stewart et al. 1995. Entrapments in northern Committee Bay were seen by the hunters' parents or grandparents. One interviewed hunter indicated that entrapments occurred less often than every decade, and only one hunter had harvested ice-entrapped belugas (lat-long location: small polygon mapped in Stewart et al. 1995, approximate centre point used here).	Stewart et al. 1995; Stewart 2001
55	Beluga (WHB?)	Belcher Islands (NU)	56.197682	-79.508806	Estimated from map (polygon) in original source	ca. 5 km	Location assigned as approximate centre of polygon mapped in original source, uncertainty measured as approximate distance of polygon in longest span.	Dec., no year reported	Sanikiluaq Coastal Resource Inventory says - "Beluga were stuck in the ice in early winter". No other details available, and may overlap with other Sanikiluaq records (location reported as approximate centre of small mapped polygon in Coastal Resource Inventory).	GN 2011
56	Beluga (EHA-BB)	Brooman Point (NU)	75.416733	-97.134876	Estimated from map in original source	ca. 1 km	Error of 1 mm assumed for map for which standards not published, translates to ca. 1 km in source map.	No information available, but pre-1990s	Nunavut Atlas p. 158, item 21: "A concentration of belugas has been reported during winter at Brooman Point. It is likely that this was a situation where the whales had been trapped by ice". Location shown in map on p. 43 (Barrow Strait West).	Riewe 1992
57	Beluga (EHA-BB) and narwhal (SI)	Prince Regent Inlet (NU)	72.619096	-91.066873	Estimated using MANIS procedure	ca. 150 km	Location assigned as approximately one-third of the way south into the inlet, as the vessel had "travelled southward some distance"; uncertainty measured as approximately one-third the total length of the inlet.	July 1875	In early July the Dundee steam whaler *Intrepid* was in Prince Regent Inlet, having travelled southward some distance, when strong winds twice drove heavy ice into the inlet trapping ships and crushing many belugas and narwhals.	Fifeshire Advertiser. 1875. 20 November (Suppl.). "The whale fishery", p. 5.

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
58	Beluga (EHA-BB) and narwhal (AI)	Adams Sound (NU)	72.90142	-84.721909	Estimated from map (polygon) in original source	ca. 12 km	Location assigned as approximate centre of polygon mapped in original source, uncertainty measured as approximate distance of polygon in longest span.	Oct., year not stated (pre-1990s)	Belugas and narwhals were observed entrapped together by ice in Adams Sound in October. The hunter did not harvest any but observed that they lost weight and their skin became ragged. He estimated that entrapments occurred about once per decade (lat/long position: small polygon mapped in Stewart et al. 1995, approximate centre point used here).	Stewart et al. 1995; Stewart 2001

[1] Stock codes - Beluga: CS = Cumberland Sound, EBS = Eastern Beaufort Sea, EHA-BB = Eastern High Arctic-Baffin Bay, EHB = Eastern Hudson Bay, WHB = Western Hudson Bay (with "?" referring to cases where stock identification is uncertain, in Foxe Basin and the Belcher Islands); Narwhal: AI = Admiralty Inlet, SI = Somerset Island

*Table A-2. Narwhal (*Monodon monoceros*) entrapment records in Canada.*

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
1	Narwhal (ES)	Pond Inlet area (NU)	72.738561	-75.182175	Estimated using MANIS procedure	ca. 150 km	Lat-long assumed to be in vicinity of primary bowhead whaling area off "Pond's Bay". Uncertainty might be significant, therefore scored as ca. 150 km. Whaling logbooks might provide information to improve location and reduce uncertainty.	July 1866	"The diary for July 27th contains the curious statement, 'Multitudes of unicorns, the sea agitated by them as though a gale were blowing.' On the following day is an entry which sounds like a veritable "tale of the sea." It runs thus: 'One of the men from the '*Wildfir*e' tells us that the unicorns were so numerous round that ship that they were compelled to thrust their heads and horns vertically out of the water, so closely were they crowded together by the ice enclosing them. The men actually seized them by their horns and dragged them upon the ice. They lanced some sixty of them.' "	Smith 1922: 40
2	Narwhal (NHB)	Lyon Inlet, southern Foxe Basin (NU)	66.490241	-83.800027	Estimated using MANIS procedure	ca. 50 km	Lat-long assigned as approximate centre of Lyon Inlet, excluding the long narrow fiords at the northern end. Uncertainty estimated as length of inlet (again excluding long narrow fiords).	About 1916	"They [Hudson Bay Inuit] are also familiar with narwhal traps [i.e., ice entrapments], one having occurred in Lyon Inlet about the year 1916."	Degerbøl and Freuchen 1935: 256; Mitchell and Reeves 1981
3	Narwhal (ES)	Eclipse Sound area (NU)	72.609155	-79.365890	Estimated using MANIS procedure	ca. 75 km	Location assigned as approximate centre of Eclipse Sound. Uncertainty assigned as 75 km given lack of information on true distance and bearing.	1917-1918	Referring to narwhal in the Eclipse Sound area, Munn (1922: 271-72) reported that "Occasionally large herds of narwhal are caught in Eclipse Sound by the early setting of the ice in the Navy Board and Ponds Inlet, and then the winter larders of the natives are full indeed. It is probable that very large herds of narwhal are sometimes wiped out completely by this cause. In 1917-18 the natives killed some 500 or 600 at blow-holes; these were, they said, only a few of the large number they believed were subsequently drowned by the closing of the ice."	Munn 1922: 271-272
4	Narwhal (ES)	Near Pond Inlet (NU)	72.810415	-77.960644	Estimated using MANIS procedure	ca. 75 km	Location assigned ca. north of Pond Inlet at approximate mid-way point between Baffin and Bylot islands. Uncertainty assigned as 75 km given lack of information on true distance and bearing. Likely conservative as approximate distance from	ca. 1918	Carcasses found by Inuit, 21 young narwhal caught and dragged onto ice by polar bears.	Munn 1932; Mitchell and Reeves 1981

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
							assigned location and mouth of Pond Inlet (approximate typical spring floe edge location) is < 65 km.			
5	Narwhal (ES)	In Eclipse Sound (NU)	72.641493	-79.676558	Estimated using MANIS procedure	ca. 50 km	Location assigned as ca. centre of Eclipse Sound, ca. 25 km from western shore and ca. 57 km from Pond Inlet. Uncertainty range of 50 km used to approximate east-west span of Eclipse Sound.	Winter 1919-1920	Entrapment of a "a large school" of narwhal, many killed by Inuit - "Food was plentiful in that vicinity for a long time, and the ivory horns... were very plentiful", "a slaughter grim and great". William Duval told Soper (1928: 76) that in a single year as many as 2,800 narwhal had been taken by whalers in and about Eclipse Sound. Reeves and Mitchell (1981: 663) considered Duval's statement about 2,800 narwhals killed in and around Eclipse Sound in one year to refer to the kill at this entrapment.	Soper 1928; Munn 1932; Mitchell and Reeves 1981
6	Narwhal (AI)	Siuraqtujuk, near Moffet Inlet in Admiralty Inlet (NU)	72.328312	-85.207886	Estimated using MANIS procedure	ca. 25 km	Described as near Moffet Inlet, so location approximated as ca. 10 km NW of inlet mouth. Uncertainty estimated as 25 km, which extends from central Admiralty Inlet to deep within Moffet Inlet.	Winter 1923-1924	An estimated 600 narwhal entrapped at a breathing hole the size of "two tents". Inuit killed many in April 1924, with 203 tusks traded in Pond Inlet and "just as many more without tusks" killed. Also, "many had been drowned and pushed aside", and others escaped when a lead formed in the ice (Degerbøl and Freuchen 1935: 255). Reeves and Mitchell (1981) suggested that a conservative harvest estimate might be 400 animals, and Freuchen (1935) indicated that almost a thousand narwhals had been killed by Inuit, presumably including those that were wounded or killed and lost. Location mapped by Heide-Jørgensen et al. (2002) as ca. 72.306859, -85.043464	Freuchen 1935; Degerbøl and Freuchen 1935; Mitchell and Reeves 1981 (also see account by Anna Atagotiak quoted in Reeves 1976)
7	Narwhal (ES)	Near Pond Inlet (NU)	72.811028	-77.992185	Estimated using MANIS procedure	ca. 75 km	See 1918 record above - location estimate shifted slightly for mapping purposes (i.e., to keep both visible). Location assigned ca. north of Pond Inlet at approximate mid-way point between Baffin and Bylot islands. Uncertainty assigned as 75 km given lack of information on true distance and bearing. Likely conservative as approximate distance from assigned location and	Winter 1952-1953	At least 24 narwhal trapped, as one hunter secured 24 narwhals "which had become frozen on [sic] the ice."	RCMP Game Report 1952-53 in Mitchell and Reeves 1981

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
							mouth of Pond Inlet (approximate typical spring floe edge location) is < 65 km.			
8	Narwhal (SI)	near Cape Coulman, Peel Sound (NU)	72.890497	-95.835495	Estimated from map in secondary source	ca. 40 km	No scale bar on map in secondary source (lines of latitude and longitude are shown), and approximate location shown with large point that spans ca. 28 km at 73 degrees North latitude. An assumed 1 mm map error = ca. 13 km, so uncertainty assigned as ca. 40 km.	Dec. 1961	R. Harrington (in litt. 27 September 1962) documented the occurrence of narwhals in a small, regularly-occurring polynya, 4 miles (ca. 6.4 km) north of Cape Coulman in Peel Sound (near Stanwell-Fletcher Lake, Somerset Island), during December 1961 (location mapped in figure by Heide-Jørgensen et al. 2002 but not in original source).	Hay 1984 (location mapped in Heide-Jørgensen et al. 2002)
9	Narwhal (SI (??))	Dundee Bight, May Inlet, Bathurst Island (NU)	76.083333	-100.25	As reported (converted to decimal degrees)	< 1.5 km	Uncertainty due to coordinate precision and unknown datum, error estimated as < 1.5 km.	Found July 1972 (or possibly 1979?)	Reported by D. Kushnir (Chevron-Standard, Ltd), found and photographed 20-25 narwhal carcasses on the ice at Dundee Bight, Bathurst Island (76°05' N, 100°15' W) in late July 1972. Photographs (ABS file 12-6-2, also see Mitchell and Reeves 1981) show carcasses of presumed adult and young narwhals, some skin covered, others scavenged by predators; most tuskless (at least one carcass in photos bore a tusk). The circumstances of this mortality are unknown, but there was no evidence of hunting by humans and the remoteness of the site makes it unlikely that human activity contributed to the mortality. Sergeant and Williams (1983) say 1979, not 1972, and suggest the entrapment likely dated to autumn of 1977 or an earlier year, based on ice conditions. Both Mitchell (1981) and Mitchell and Reeves (1981) report 1972, so this is assumed to be correct, but uncertainty remains.	Mitchell 1981; Mitchell and Reeves 1981; Sergeant and Williams 1983
10	Narwhal (??)	Hall's Bay, near Springdale (NL)	49.496278	-56.063140	Estimated using MANIS procedure and information from television episode on the event.	ca. 5 km	Land and Sea episode notes that the whales were trapped "in Springdale harbour", and were visible from local houses. Location estimated as ca. 200 m offshore of the community (based on Land and Sea episode). Uncertainty estimated as 5	Feb.-April 1978	A young (tusked) narwhal and four humpback whales (*Megaptera novaeangliae*) were trapped by ice in Hall's Bay, NL, in February 1978 (Note: a 2011 episode of the CBC television show Land and Sea states that five humpbacks were originally present). Entrapment first reported on 27 February 1978, whales present since beginning of February when the bay began to freeze over. The breathing hole close to town froze over in early February, and they were relocated further north near where a river went into	Mitchell 1979; Mitchell and Reeves 1981; 2011 episode of the CBC television show Land and Sea (https://www.cbc.ca/player/play/2175706442)

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
							km as a conservative estimate.		the ocean. A local fisherman kept a channel open and they eventually went back to the area closer to the community where they were originally trapped. Once ice got too heavy to use the schooner, local fishermen continued to try and keep the hole open using a small aluminum boat. Archival footage available in Land and Sea episode shows a mix of landfast ice and consolidated pack ice. The possibility of capturing the narwhal was discussed amongst government managers and marine mammal biologists, but eventually it was decided to not intervene. Monitored over several months, by late March the whales (now three humpbacks and the narwhal) were restricted to a breathing hole ca. 50 m by 100 m. One humpback whale (an adult female) was trapped in a separate hole near Port Anson, ca. 17 km ENE of Springdale. On 10 April the CCG icebreaker *Labrador* broke a channel into Hall's Bay, and by the 14th the ice cleared sufficiently to allow three humpbacks and the narwhal to escape. The large female that was in a separate hole died under the ice, another of the four was never found.	
11	Narwhal (SI)	Agu Bay, southern Gulf of Boothia (NU)	70.302719	-86.725481	As reported, but shifted off land (original source location on land)	ca. 40 km	Location uncertain despite having lat-long report, uncertainty conservatively estimated as ca. 40 km, distance across Agu Bay.	Oct. 1979	Event caused by extremely cold weather and high winds on or before 09 October 1979, 115 or more narwhals trapped in Agu Bay, Gulf of Boothia (70°18' N, 86°30' W [Note: location as reported in Mitchell 1981 and Sergeant and Williams 1983, but on land adjacent to Agu Bay when plotted, mapped location shifted slightly]). Between 10-13 October, Inuit took 15 females and 2 males. On 14 October the site was inspected by a Fisheries Officer who determined that the hole was 7-8 miles (ca. 11.3 to 12.9 km) from a larger hole in the ice and 10-15 miles from open water in Fury and Hecla Strait. A larger hunt was organized starting on 15 October when five breathing holes remained (largest 20 ft (6.1 m) diameter). Details on age/sex of killed animals in Mitchell 1981 and Sergeant and Williams 1983. Hunt ended on 17 October. In total, Inuit killed and landed 108, all females and juveniles except one adult male; four killed but lost. Three whales had been remaining on 16 October, one had disappeared the next day when the last two were removed. No biological samples collected.	Mitchell 1981; Mitchell and Reeves 1981; Sergeant and Williams 1983

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
12	Narwhal (SI)	Quilliam Bay (NU)	69.494262	-82.599323	Estimated from map	ca. 1 km	Error of 1 mm assumed for map for which standards not published, translates to ca. 1 km in source map.	Fall 1981	Nunavut Atlas p. 219, item 27: "Twelve narwhals were entrapped by ice in Quilliam Bay, in fall of 1981." Location shown in map on p. 73 (Melville North) and reproduced in GN 2008. Reported as 15 narwhal in Weaver and Richard (1989). Landed harvest included one by Hall Beach hunters and seven by Igloolik hunters (Anon. ca. 1985: Table 2). May overlap with other entrapments reported by Inuit (e.g., Stewart et al. 1995; Stewart 2001).	Anon. ca. 1985; Weaver and Richard 1989; Riewe 1992; GN 2008; Stewart 2008 (and possibly Stewart et al. 1995; Stewart 2001)
13	Narwhal (NHB)	Ross Bay (NU)	66.866667	-85	As reported by secondary source (and estimated there)	ca. 15 km	Uncertainty conservatively estimated as 15 km, maximum distance spanning Ross Bay.	mid 1980s	"People also remember narwhal being stranded at Ross Bay inland from Lyon Inlet in the mid 1980s." (lat/long as estimated in COSEWIC 2004).	Gonzalez 2001:19; COSEWIC 2004
14	Narwhal (??)	Belcher Islands (NU)	56.151511	-79.581988	Estimated from map (polygon) in original source	ca. 5 km	Uncertainty estimated as maximum length of polygon in source.	Dec., 1990s	Sanikiluaq Coastal Resource Inventory says - "He caught a young narwhal that was trapped in the ice here". No other details available (location reported as approximate centre of mapped polygon in Coastal Resource Inventory).	GN 2011
15	Narwhal (ES)	near Pond Inlet (NU)	72.885833	-78.0432	As reported in Watt and Ferguson 2011 (converted to decimal degrees)	< 1 km	Uncertainty associated with unknown datum only (ca. 125 m)	Nov. 2008	In early November 2008, local Inuit observed thousands of narwhals moving quickly through freezing waters near Pond Inlet, and on 15 November, once travel on the ice became possible, the entrapment was discovered along a pressure ridge 17 km from the hamlet (72º 53.15' N, 78º 02.592' W - location from Watt and Ferguson 2011). The breathing holes were about 50 km from open water, and it was decided that a humane hunt would be conducted. Initial estimates were that ca. 200 whales were trapped, using 11 small holes. As the harvest progressed more breathing holes were spotted, with as many as 20 in total. Local hunters recorded 629 narwhals harvested between 19 November and 2 December, including 68 calves, 210 juveniles and 288 adults (no data for the rest). DFO technicians attended and collected samples from hunted whales. Samples (blood, skin, and blubber) were collected from 250 animals (including 22 calves, 46 juveniles, 68 adults, 114 narwhals unknown) (female biased based on preliminary genetic analysis, in agreement with Inuit observations that only the large males and females were able to make the deep, long dives to escape the entrapment). Early November air temperatures were	Birds 2008; CBC 2008b, c, d, e; Hume 2008; Watt and Ferguson 2011; Laidre et al. 2012; Heide-Jørgensen et al. 2013; Watt et al. 2015

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
									from -23°C to -12°C at Pond Inlet, and dropped from November 13 to November 24th to -32°C with consistent south winds of 2-3 m/s.	
16	Narwhal (??)	Edward's Cove, Labrador (NL)	56.419956	-62.073975	Estimated using MANIS procedure	ca. 2 km	Location assigned as approximate centre of Edward's Bay, uncertainty of 2 km - approximate width of the bay.	Dec. 2011 - Jan. 2012	Information from webpage and linked radio interview with a local hunter (Harry Haye): A young narwhal (ca. 1 ft (ca. 0.3 m) tusk, ca. 8 ft (ca. 2.4 m) total length) was found trapped in some open water near Edward's Cove, Labrador, near the Voisey's Bay mine site. Interviewee found out about it on Saturday 31 Dec. 2011, not sure how long it had been there before that. Hunted on Monday 02 Jan. 2012, by ca. 10 hunters altogether. Narwhal muktuk and meat were distributed throughout the community	OKâlaKatiget Society 2012 (webpage - http://www.oksociety.com/rare-narwhal-harvest-near-edwards-cove-audio/)
17	Narwhal (SI)	near Harrison Islands, north of Kugaaruk (NU)	69.446099	-90.359179	Estimated from map	ca. 10 km	Location estimated as centre point of mapped polygon, uncertainty conservatively estimated as 10 km (ca. 8 km span for polygon). A second polygon is also mapped from a different interview, in the same general location, but first-hand account prioritized for location.	Nov. 2014	A Kugaaruk interviewee identified a November entrapment during a March 2015 interview - "Found 2 narwhal tusks frozen in the ice, must have been trapped and the polar bear ate them" (GN 2015b Table 3, p. 18 - map 41, interview 4; Figure 7, p. 17 - map 41 as above, interview 4). Elsewhere the same interview states "Found narwhal tusks on ice this year" (Table 42, p. 56 - Map 12, interview 4), so the entrapment was presumably discovered in November 2014. Another interviewee discussed the same event - "Where Lionel found a dead narwhal and tusk, it was stranded in the ice and polar bears ate it" (Table 42, p. 56 - Map 21, interview 6; Figure 42, p. 56 - map 12 and 21, interview 6).	GN 2015b
18	Narwhal (ES)	about 60 km from Pond Inlet (NU)	72.62174	-79.82822	As reported	< 1 km	Uncertainty associated with unknown datum only (ca. 125 m)	Nov.-Dec. 2015	The whales were first heard under the ice in mid-November, and then in late November hunters used hydrophones to start searching for them. Once found (02 Dec. 2015) about 60 km from Pond Inlet (at two small breathing holes in Eclipse Sound just north of Ragged Island/Cape Hatt at N72.62174, W79.82822), it was determined that the whales would not be able to escape and a harvest plan was developed. In total over 260 narwhals were trapped - 230 were harvested, 15 were lost and 18 were hunted by polar bears.	CBC 2015a, b; Watt et al. 2019; DFO unpubl. data; R. Moore, DFO Iqaluit, pers. comm.
19	Narwhal (SI)	near Imilik Island, north of Kugaaruk (NU)	69.02448	-90.157012	As reported	< 1 km	Uncertainty associated with unknown datum only (ca. 125 m)	Dec. 2018	Approximately 7 ice entrapped narwhals were discovered by a Kugaaruk hunter on 18 Dec. 2018 (reported to the Kitikmeot Regional Wildlife Board and DFO on 20 Dec. 2018). The whales were described as being thin (lost blubber). GPS location - 69.024480 N, -90.157012 W, described as "a polynya	DFO unpubl. data; M. Karlik Jr., Kugaaruk HTO, pers. comm.; E. Qaggutaq, Kitikmeot Regional Wildlife Board, pers. comm.

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
									type near Imilik (name of the Island about 40 miles North [of Kugaaruk])". Hunters returned to the location on 20 Dec. and two whales were landed. Unused 2018 narwhal harvest tags were available and used.	
20	Narwhal (NHB)	near White Island (NU)	65.893463	-85.300624	Estimated using MANIS procedure	ca. 50 km	Lat-long location assigned west of White Island, but highly uncertain. Uncertainty radius of ca. 50 km used to capture possibility that "true" location could be that far away, along southeast end of island.	Not reported (but prior to 2000s)	"From time to time narwhal get stranded in ice. One of the places this happens is near White Island."	Gonzalez 2001:19
21	Narwhal (AI)	Adams Sound (near Arctic Bay) (NU)	72.927711	-84.905517	Estimated from map (polygon) in Stewart 2001	ca. 25 km	Lat-long assigned as approximate centre of polygon, uncertainty measured as approximate length of polygon.	August, October, and November; no year reported (pre-1990s)	Hunters have observed narwhal entrapped by ice in the Arctic Bay area during August, October, and November. This occurs every ten years or less, a frequency said to be unchanged. Narwhals are harvested at ice entrapments when possible (location shown as small polygon in Stewart 2001, approximate centre point used here).	Remnant and Thomas 1992; Stewart et al. 1995; Stewart 2001
22	Narwhal (SI)	eastern Fury and Hecla Strait (NU)	69.819214	-82.596227	Estimated from map (polygon) in original source	ca. 25 km	Lat-long assigned as approximate centre of polygon, uncertainty measured as approximate length of polygon.	August and October through January, no year given (pre-1990s)	The hunters had observed narwhal entrapments in August in Quilliam Bay [Note: listed at "Guilliam Bay" by Stewart] and eastern Fury and Hecla Strait, and during October through January in Murray Maxwell Bay, Agu Bay, Guilliam Bay, and eastern Fury and Hecla Strait. These events were thought to occur less often than every ten years. Two of the interviewed hunters had harvested entrapped narwhals. They located the whales in January but did not hunt them until April, or catch many (lat-long location: small polygon mapped in Stewart et al. 1995, approximate centre point used here).	Stewart et al. 1995; Stewart 2001
23	Narwhal (SI)	Quilliam Bay (NU)	69.476259	-82.492351	Estimated from map (polygon) in original source	ca. 40 km	Lat-long assigned as approximate centre of polygon, uncertainty measured as approximate length of polygon.	August and October through January, no year given (pre-1990s)	The hunters had observed narwhal entrapments in August in Quilliam Bay [Note: listed at "Guilliam Bay" by Stewart] and eastern Fury and Hecla Strait, and during October through January in Murray Maxwell Bay, Agu Bay, Guilliam Bay, and eastern Fury and Hecla Strait. No explanation was given for the August entrapment. See record 22 for additional details.	Stewart et al. 1995; Stewart 2001
24	Narwhal (SI)	Murray Maxwell Bay (NU)	69.93243	-80.649704	Estimated from map	ca. 50 km	Lat-long assigned as approximate centre of	October through	The hunters had observed narwhal entrapments in August in Quilliam Bay [Note: listed at "Guilliam	Stewart et al. 1995; Stewart 2001

Record	Species (stock)[1]	Location description	Latitude	Longitude	Lat-long source	Uncertainty radius	MANIS procedure notes	Date	Details	Source(s)
					(polygon) in original source		polygon, uncertainty measured as approximate length of polygon.	January, no year given (pre-1990s)	Bay" by Stewart] and eastern Fury and Hecla Strait, and during October through January in Murray Maxwell Bay, Agu Bay, Guilliam Bay, and eastern Fury and Hecla Strait. See record 22 for additional details.	
25	Narwhal (SI)	Agu Bay (NU)	70.217914	-86.813187	Estimated from map (polygon) in original source	ca. 30 km	Lat-long assigned as approximate centre of polygon, uncertainty measured as approximate length of polygon.	October through January, no year given (pre-1990s)	The hunters had observed narwhal entrapments in August in Quilliam Bay [Note: listed at "Guilliam Bay" by Stewart] and eastern Fury and Hecla Strait, and during October through January in Murray Maxwell Bay, Agu Bay, Guilliam Bay, and eastern Fury and Hecla Strait. The Agu Bay entrapment might overlap with other events. See record 22 for additional details.	Stewart et al. 1995; Stewart 2001

[1] Stock codes: AI = Admiralty Inlet, ES = Eclipse Sound, NHB = Northern Hudson Bay, SI = Southampton Island (?? - uncertainly in stock identification), ?? = extralimital occurrence, stock uncertain

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