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UPDATES ON STOCK-SPECIFIC COMPOSITION OF BELUGA HARVEST IN EASTERN HUDSON BAY AND HUDSON STRAIT

CONTEXT

In Canada, beluga are managed on the principle that they form discrete summering aggregations, to which individuals show strong philopatry (Sergeant 1973, Finley et al. 1982; Richard et al. 1990). There are at least three beluga summering aggregations in Hudson and James Bay, which are used to define management stocks: Belcher Islands-Eastern Hudson Bay (BEL-EHB), Western Hudson Bay (WHB), and James Bay (JAM) beluga. The WHB and JAM stocks were last estimated at 54,500 (DFO 2018) and 16,000 (DFO 2025) beluga, respectively, and are assessed as not at risk (COSEWIC 2020). In contrast, the BEL-EHB stock was last estimated at 2,200 beluga and is declining (DFO 2024). The last COSEWIC assessment predates the identification of the BEL population and most recent stock assessments revealing the decline of the BEL-EHB stock. At the time the EHB population was assessed as threatened (COSEWIC 2020).

Beluga in Nunavik are managed under a management plan extending from February 1, 2021 to January 31, 2027. Existing management measures in Nunavik include a total allowable take (TAT) of 20 belugas in the Eastern Hudson Bay area, and Non-Quota Limitations (NQL) for beluga harvesting elsewhere within the Nunavik Marine Region (NMR). These management measures aim to divert the hunt towards the more abundant WHB and JAM stocks and away from the smaller BEL-EHB stock.

Certain management measures in the current plan have changed since 2021. The seasonal winter closure of Hudson Strait between December 1 and January 31 was removed in October 2022. Additionally, the northern boundary of the Eastern Hudson Bay area (under a TAT) was moved to the south of the community of Inukjuak in October 2024, based on local knowledge which challenged the assumption that all beluga in the Inukjuak area were from the BEL-EHB stock. Therefore, Inukjuak is now located in the Northeastern Hudson Bay area (not under a TAT) and the Inukjuak Voluntary Summer Closure area was created (Figure 1) in which beluga harvesting is closed from July 15 to September 30 annually.

Other measures currently in place are questioned by co-managers and Nunavik harvesters. Particularly, the management plan includes an annual seasonal closure of Hudson Strait between September 1 and October 31. Following October 31, each respective Anguvigait (Hunters and Trappers Organization) in Hudson Strait may decide when to reopen the harvest. This measure is intended to reduce the number of BEL-EHB beluga harvested during the fall migration, as there is evidence that this stock migrates earlier in the fall than most WHB beluga (e.g., Parent et al. 2023). Several hunters have suggested that applying the same closure dates to all communities in Hudson Strait is not an effective means to limit harvesting of BEL-EHB beluga given the timing of beluga migration along the Nunavik coastline.

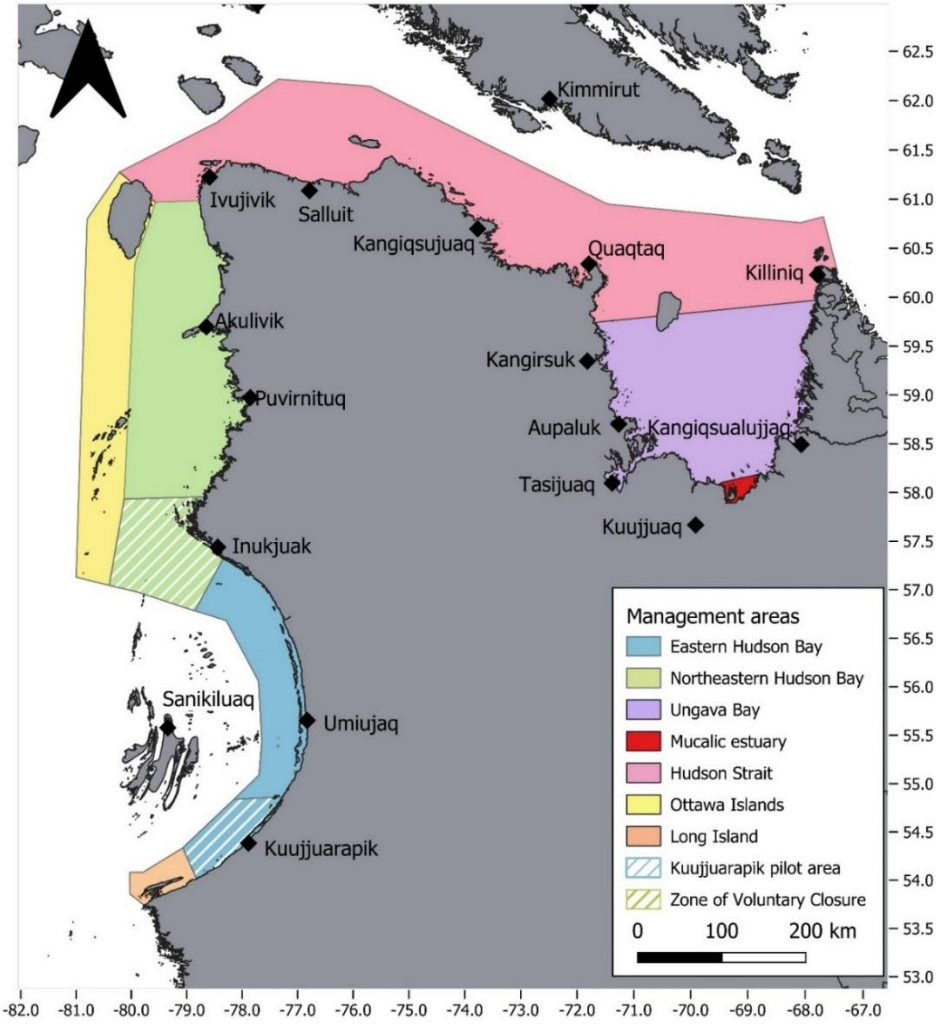

Figure 1. Map of communities (black diamonds) and management areas in Nunavik, Québec, Canada. The Zone of voluntary closure, which was initially part of the Eastern Hudson Bay management area, was created and integrated into the Northeastern Hudson Bay management area in fall 2024. The Eastern Hudson Bay management area is under a TAT from May 1 to November 30, except for the Kuujjuarapik pilot area in which beluga harvested between February 1 and June 15 do not count towards the TAT.

As part of the renewal process of the Nunavik beluga management plan, DFO Fisheries Management tasked DFO Science to review existing data to

1. update the BEL-EHB beluga stock assessment and harvest advice using harvests reported in 2025 by Sanikiluaq and Nunavik communities;
2. re-examine the timing of BEL-EHB beluga migration and temporal shifts in the genetic composition of the harvest in Hudson Strait (Parent et al. 2023); and
3. determine the stock composition of beluga harvested in the Inukjuak Voluntary Summer Closure area in spring and fall.

The Science Response produced by this Canadian Science Advisory Secretariat (CSAS) process will represent information shared during the public hearing carried out by the Nunavik Marine Region Wildlife Board (NMRWB) about potential changes to management measures and objectives for the renewal of the Nunavik beluga management plan. In addition, this Science

Response will inform co-management partners about the conservations implications of having moved the northern boundary of the Eastern Hudson Bay area to the south of Inukjuak.

The specific objectives of this review are to:

1. Update the BEL-EHB beluga stock assessment and harvest advice by including harvests reported in 2025 by Sanikiluaq and Nunavik communities.
2. Use peer-reviewed genetic analysis methods currently used for Nunavik beluga management to determine the stock composition of beluga harvested in the Inukjuak Voluntary Summer Closure area in spring and fall.
3. Review the existing data on BEL-EHB and WHB beluga spatiotemporal distribution to quantify the seasonal occurrence of beluga whales in Hudson Strait.
4. Use peer-reviewed genetic analysis methods currently used for Nunavik beluga management to explore spatiotemporal shifts in the stock composition of beluga harvested by Hudson Strait communities.
5. Provide Science Advice on the conservation implications of
    a. Having moved the northern boundary of the Eastern Hudson Bay area south of the community of Inukjuak and
    b. Introducing seasonality in the timing of the fall closure in Hudson Strait.
6. Examine and identify uncertainties in the available data, and provide recommendations for future research that would improve our understanding of the spatiotemporal stock-specific composition of the beluga harvest in eastern Hudson Bay and in Hudson Strait.

This Science Response Report results from the regional peer review of March 31, 2026, on Updates on Stock-Specific Composition of Beluga Harvest in Eastern Hudson Bay and Hudson Strait.

BACKGROUND

Historically, BEL-EHB beluga were thought to number around 12,500 animals in the 1800s. Commercial whaling during the eighteenth, nineteenth, and early twentieth centuries resulted in a sharp decline in abundance (DFO 2005; Lawson et al. 2006; Hammill et al. 2023), and continued high subsistence harvests have limited the recovery, with climate change and habitat modification being additional underlying factors. In 2001, a stock assessment estimated that if harvests were not reduced, the BEL-EHB stock would go extinct within two to three decades (Bourdages et al. 2002). A series of severe management measures to which a relatively high compliance was observed (Lesage et al. 2001) has slowed the stock decline.

The current management objective for EHB beluga is to ensure that the stock will remain at or above 3,400 beluga after five years with a 50% or greater probability. The 3,400 abundance target was established based on the best available science when the management plan was developed (DFO 2020). At that time, the stock was estimated to be slightly increasing or stable with an abundance of 3,400 individuals in 2016. The maximum recommended number of annual EHB removals to achieve the management plan objective was estimated at 58 EHB beluga across the NMR (DFO 2020). This harvest level is identified as the harvest threshold in excess of which Board decision-making processes are to be triggered.

Since the implementation of this management plan, additional aerial surveys were flown in 2021 and 2024, and new correction factors for availability and perception bias for animals missed

during surveys have been developed and applied to surface abundance estimates from past surveys (St-Pierre et al. 2024; Sauvé et al. 2025). Furthermore, a re-analysis of genetic samples concluded that beluga summering in the Eastern Hudson Bay Arc and censused during aerial surveys belonged to two rather than a single population (BEL and EHB rather than just EHB), thus representing a mixed stock (Parent et al. 2023). An integrated population model incorporating this updated information estimated that the BEL-EHB stock has been declining since 2014, with an average rate of 5.1% per year since 2021 to an estimated 2,200 individuals in 2024 (Van de Walle et al. 2025). As a consequence of those revisions, the 2016 abundance for the BEL-EHB stock was recently re-estimated at 3,000 beluga (Van de Walle et al. 2025). Therefore, the harvest threshold of 58 beluga identified in the 2021-2026 management plan is higher than the annual harvest level compatible with a 50% probability of maintaining the stock stable to its 2016 abundance.

However, regardless of how they are calculated, reported catches have considerably exceeded harvest levels identified in the management plan since its implementation in 2021, and are beyond levels that would have kept the stock stable (Figure 2). Although environmental changes and anthropogenic activities such as noise, vessel traffic and industrial development may be contributing factors, between 2021 and 2024, harvests have been estimated to account for 52% of overall BEL-EHB beluga mortality (Van de Walle et al. 2025). Therefore, the decline of BEL-EHB beluga is largely due to high harvest levels (Sauvé et al. 2024; Van de Walle et al. 2025).

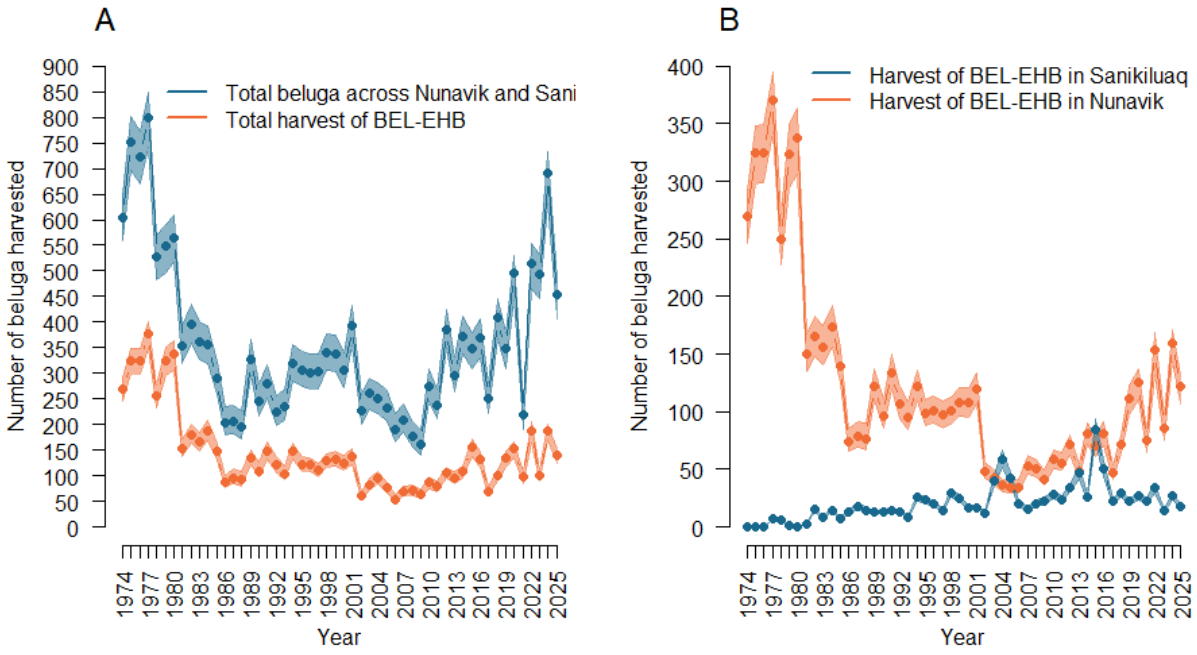

Figure 2. Temporal variation in A) the numbers of beluga harvested in total and from the BEL-EHB stock, and B) the numbers of BEL-EHB beluga harvested in Nunavik and in Sanikiluaq. In panel (A) circles represent reported harvests, while in panel (B), circles illustrate reported harvests multiplied by season- and region-specific stock composition of the harvest derived from genetic analyses. In both panels, the shaded areas are the 95% Credible Interval of the posterior distributions from the multistate Integrated Population Model for BEL-EHB beluga (see Van de Walle et al. 2025 for details).

ANALYSIS AND RESPONSE

Throughout this document, the term beluga 'population' refers to a summer aggregation displaying a distinct genetic signature, while a 'stock' refers to beluga spatially and temporally located within a management unit, and may include more than one population or a subset of individuals from a population (Parent et al. 2023; Watt et al. 2023).

Stock assessment update

In 2025, 424 and 35 beluga were harvested by Nunavik and Sanikiluaq hunters, respectively (Table 1). Based on the season- and area-specific distribution of the harvest derived from genetic analysis (Table 3 in Van de Walle et al. 2025), this represents 118 and 20 beluga from the BEL-EHB stock harvested by Nunavik and Sanikiluaq hunters in 2025, respectively (Table 1). Between 2021 and 2025, average annual BEL-EHB reported harvests were 119 ± 17 and 23 ± 4 beluga by Nunavik and Sanikiluaq hunters, respectively, for a total of 142 ± 20 BEL-EHB beluga.

Table 1. Reported harvest of beluga in four management areas in Nunavik and in Sanikiluaq, Nunavut (SAN) in 2025. All represents the total number of beluga from all stocks and BEL-EHB represents the estimated number of BEL-EHB beluga in the harvest. ARC represents the curved part of southeastern Hudson Bay and includes the Eastern Hudson Bay, Kuujjuarapik pilot project, and Northeastern Hudson Bay zone of voluntary closure management areas (Figure 1). HS represents the Hudson Strait management area, SAN represents the Sanikiluaq community, UB represents Ungava Bay and NEHB represents Northeast Hudson Bay, excluding the zone of voluntary closure. The letters FA, EF and LF stand for "fall", "early fall" and "late fall", respectively, whereas the letters SP stand for "spring".

Stock	ARC	HS_{SP}	HS_{EF}	HS_{LF}	UB_{SP}	UB_{FA}	$NEHB_{SP}$	$NEHB_{FA}$	JAM	Total Nunavik	SAN
All	35	136	95	105	20	2	0	22	9	424	35
BEL-EHB	35	19	48	5	0	0	0	11	0	118	20

Adding the 2025 harvest data into the BEL-EHB beluga integrated population model without any further modification to model priors or input data resulted in an updated 2025 abundance estimate of 2,100 beluga (95% CrI = [1,700; 2,500]). Between 2021 and 2025, the stock is estimated to have declined at an average rate of 5.0% per year (95% CrI = [3.2; 7.5]; Figure 3). Between 2024 and 2025, the stock is estimated to have declined by 5.0% (95% CrI = [1.4; 9.2]). Under the Maximum Sustainable Yield (DFO-MSY) Precautionary Approach framework, the Limit Reference Point (LRP) for the BEL-EHB stock is estimated at 1,900 beluga and the Precautionary Reference Point (PRP) at 3,900 beluga. Based on the 2025 abundance estimate, there is a 100% probability that the stock is below the PRP and a 82% probability that it is above the LRP. The stock is estimated to have been in the Cautious Zone since 1992.

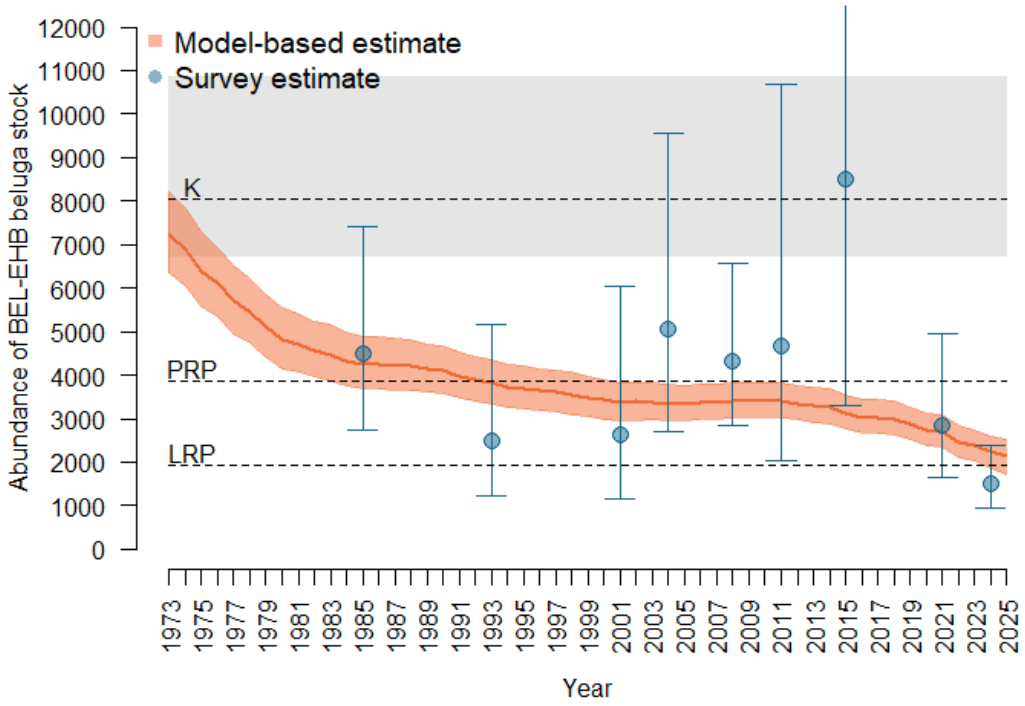

Figure 3. Demographic trend for the BEL-EHB beluga stock. Abundance (mean: dark orange line, 95% Credible Interval: light orange polygon) is estimated from an Integrated Population Model (see Van de Walle et al. 2025). The benchmarks identified under the DFO-Maximum Sustainable Yield (MSY) management framework are identified, with the Precautionary Reference Point (PRP) and Lower Reference Point (LRP) representing 48% and 24% of the carrying capacity (K), respectively. Grey shading around the estimate of K represents the 95% CrI. Blue circles and whiskers represent aerial survey estimates and their 95% confidence intervals. The upper limit of the 95% confidence from the 2015 aerial survey estimate is 21,800 and intentionally off the maximum of the y-axis to improve graphic clarity.

Harvest advice update

Figure 4 illustrates the projected BEL-EHB beluga stock abundance based on different scenarios of annual harvest levels. The maximum number of BEL-EHB beluga that could be harvested annually to ensure 50%, 80% and 95% probabilities that the stock remains stable at its 2025 abundance is 51, 44, and 35 BEL-EHB beluga, respectively. Given the currently low abundance of the BEL-EHB stock, harvests exceeding levels compatible with stock stability in any given year negatively affect future harvest levels consistent with maintaining that stability. Based on model projections, if current BEL-EHB beluga harvest levels are maintained at the average level observed between 2021 and 2025 (i.e., 142 beluga), the stock is expected to decrease to a state of quasi-extinction (i.e., less than 50 mature females) with 50% to 95% probabilities by 2038 and 2040, respectively.

Annual harvest levels not exceeding 84, 65, and 55 BEL-EHB beluga would allow the BEL-EHB stock to remain at or above the LRP with a 50% probability in 5, 10 and 25 years.

The potential biological removal (PBR) for the BEL-EHB beluga stock was estimated at 4 beluga per year.

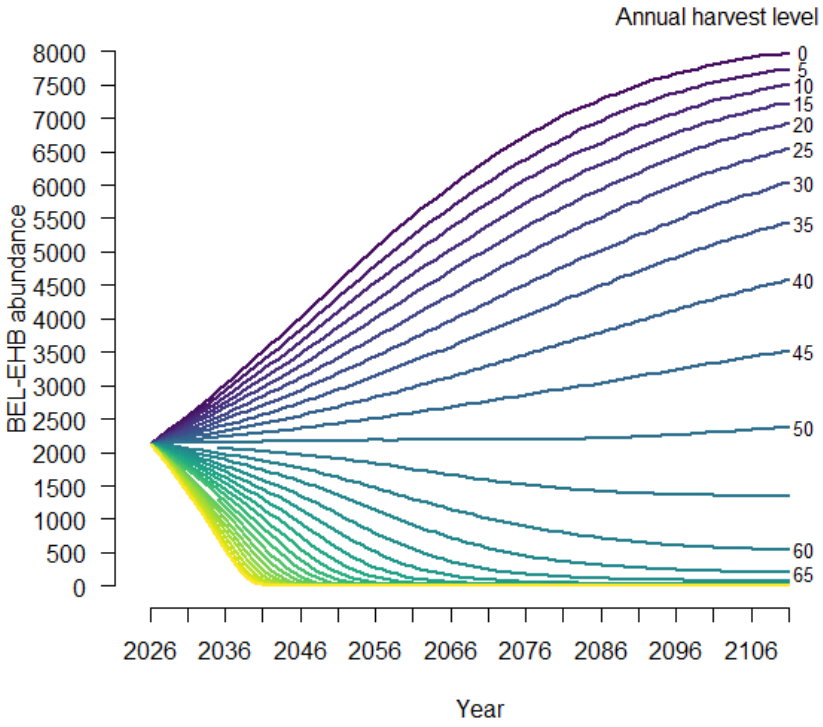

Figure 4. Projected demographic trend (over three generations) for the BEL-EHB stock considering scenarios of future harvest levels ranging from 0 to 142 BEL-EHB beluga per year (excluding struck and lost). Above 70 BEL-EHB beluga harvested per year, the population is predicted to go extinct within the next three generations.

Impacts of changing the EHB beluga management zone

Harvest numbers

Prior to the southward shift of the northern boundary of the Eastern Hudson Bay (EHB) beluga management zone in October 2024, the community of Inukjuak was included within the EHB management zone (Figure 1). As such, this community shared a TAT of 20 BEL-EHB beluga with other communities in the EHB management zone (Table 2). Since October 2024, the community of Inukjuak is no longer included in the TAT zone, and the TAT of 20 BEL-EHB beluga applies to the downsized EHB management zone.

Table 2. Annual number of beluga harvested in the Eastern Hudson Bay management area (including the Zone of Voluntary closure) during the current management plan by hunter's home community. Numbers in parenthesis represent the annual TAT, which is set to 20 in the management plan. However, this number varied annually since any harvests in excess of the TAT are deducted from the TAT for the following year, and should the TAT not be reached in a given year, up to 25% of the unused TAT may be carried forward.

Community	No. beluga landed				
	2021	2022	2023	2024	2025
Kuujjuaraapik	1	3	6	6	6
Umiujaq	4	11	6	12	10
Inukjuak	22	1+4*	4	5+18**	19**
Puvirnituq	1	0	0	0	0

Community	No. beluga landed				
	2021	2022	2023	2024	2025
Total landed (TAT)	28 (20)	15+4* (12)	16 (17)	23 (21)+18**	16 (18)+19**

*In 2023, four beluga harvested near Inukjuak in 2022 were returned to the TAT following a request for decision from the Anguvigaq which was accepted by the Board and DFO Minister.
**Not counted in the TAT due to EHB management zone boundary change. These animals were harvested outside the July 15 to September 1 voluntary closure period.

It therefore appears that the change of the EHB beluga management zone boundary resulted in an increase in the total number of beluga harvested annually in the three ARC communities (2021-2023 and 2024-2025 averages of 21 ± 4 beluga and 38 ± 3, respectively; $P = 0.02$). This increase is attributable to 18 and 19 beluga harvested in 2024 and 2025 respectively, outside the July 15 to September 30 voluntary closure period. All 18 beluga were harvested during fall in 2024. In contrast, 9 beluga were harvested during spring and 10 were harvested in fall 2025.

Genetic composition of harvested beluga

Summer aggregations of beluga within the Hudson Bay/Strait complex are genetically distinct and thus considered individual populations (Brennin et al. 1997; Brown Gladden et al. 1997, Brown Gladden et al. 1999, de March and Maiers 2001, de March et al. 2002, de March and Postma 2003; Turgeon et al. 2009, Parent et al. 2023). Stock-specific beluga harvesting-induced mortality across management areas in the eastern Canadian Arctic relies on haplotypes of the mitochondrial DNA (mtDNA) control region, which identified geographic patterns in maternally inherited loci (Parent et al. 2023; DFO 2025). While the population structure of beluga in eastern Canada is being investigated using genomic approaches based on nuclear DNA (nDNA), further characterization of the population structure and development of cost- and time-effective genomic tools need to be developed and tested before they can be used for management purposes (Montana et al. 2024).

The mtDNA haplotype compositions describing each population were used as ‘reference populations’ to estimate the population contribution to the harvest in management areas where beluga from different populations are suspected to mix, i.e., along migratory routes shared by populations. For management purposes, the analytical approach used to estimate the proportion of each reference population contributing to a group composed of individuals from all or a subset of these reference populations is a genetic mixture analysis (GMA; Turgeon et al. 2009; Parent et al. 2023). Unlike individual assignment methods, GMA does not allocate each individual from a mixed sample to one of the reference populations. Instead, it takes into account the probability of each individual sample belonging to the different reference populations. The mixed sample composition then is estimated as the mean of these probabilities among individuals. This approach is more appropriate and accurate than using an individual assignment when the latter is associated with uncertainty, for instance when some haplotypes are shared among different populations (Pella and Masuda 2005; Manel et al. 2005; Turgeon et al. 2009). Beluga population structure is are an example of this, because although samples from distinct summering grounds are genetically differentiated, there are few private haplotypes, such that individual assignment cannot be made with high confidence (Turgeon et al. 2009; Doniol-Valcroze et al. 2016; Mosnier et al. 2017; Parent et al. 2025).

To determine the BEL-EHB contribution of beluga harvested outside of summer in Inukjuak, the season-specific genetic composition of beluga sampled in the Inukjuak voluntary closure area was assessed. Since the deployment of the Nunavik beluga sampling program in 1980, 35 samples from beluga harvested in the area corresponding to the Inukjuak voluntary closure area were collected. Of these, 20 were collected during 11 spring hunting events (i.e., prior to the voluntary closure period starting July 15), and 12 were collected during seven fall hunting

events (i.e., after to voluntary closure period ending September 30; Table 3). To estimate area- and season-specific composition of the harvest using GMA, a minimum sample size of 10 individuals is considered necessary (Parent et al. 2023). Therefore, the recent samples received from Inukjuak hunters since the change in the management zone boundary now allows running the GMA on beluga collected outside of summer in the Inukjuak voluntary closure zone.

Table 3. Seasonal distribution of genetic samples collected in the Inukjuak voluntary closure area since the deployment of the Nunavik beluga sampling program in 1980.

Date harvested	Season	No. samples collected
2009-06-22	Spring	1
2010-07-03	Spring	1
2010-07-04	Spring	1
2017-07-02	Spring	2
2018-06-23	Spring	1
2022-05-30	Spring	2
2023-05-27	Spring	1
2024-05-28	Spring	2
2025-06-25	Spring	2
2025-06-26	Spring	2
2025-06-29	Spring	5
2007-08-11	Summer	1
2024-08-15	Summer	1
2024-08-19	Summer	1
2012-10-25	Fall	1
2023-10-13	Fall	1
2024-10-14	Fall	5
2024-10-28	Fall	2
2025-10-28	Fall	1
2025-10-29	Fall	1
2025-11-14	Fall	1

The genetic mixture analysis was run on spring and fall samples separately to determine the season-specific stock composition of the harvest. During fall, 61.8% (95% CI: 26.8-88.0%) of harvests were estimated to originate from the BEL-EHB stock, while 21.1% (95% CI: 1.1-57.4%), 10.9% (95% CI: 2.3-24.9%) and 7.6% (95% CI: 0.1-34.1%) of harvests were estimated to originate from the Cumberland Sound (CSB), Western Hudson Bay (WHB) and James Bay (JAM) populations, respectively (Table 4). The CSB beluga population counts fifteen private haplotypes that can identify individual samples to this summering region. Of 207 samples collected in Cumberland Sound between 1982-2021, 35% were reported to have haplotypes private to this region (Watt et al. 2023). Similarly, between 2022-2025, 39.6% of the 53 samples collected in Cumberland Sound had haplotypes private to CSB beluga (Appendix 1).

However, none of the samples collected in the Inukjuak Voluntary Closure zone in the fall had private haplotypes from the CSB population, and therefore could represent an artefact of a proportion of beluga summering in Cumberland Sound having a genetic signature similar to WHB beluga (Watt et al. 2023). During spring, the proportion of harvests originating from the BEL-EHB stock were 90.5% (95% CI: 70.4-98.7%) when defining spring as in Parent et al (2023; i.e., Feb 1- June 30; Table 4). Similarly, if spring is defined by the period of the year prior to the voluntary closure period (i.e., Feb 1- July 15), 91.2% (95% CI: 78.9-98.1%) of harvests

are estimated to originate from the BEL-EHB stock (Table 4). Uncertainty around stock compositions of the harvest are large due to the low number of samples and hunting events used to estimate proportions. Nevertheless, these genetic analyses indicate that whales harvested in the Inukjuak Voluntary closure zone are primarily BEL-EHB beluga.

Under the current management plan, the BEL-EHB values of beluga harvested in that area during spring and fall are estimated using the proportions estimated in Northeastern Hudson Bay (NEHB) because no seasonal stock composition of the harvest was available for the Inukjuak voluntary closure zone. The most recent estimates of the NEHB proportions of BEL-EHB in the harvest are 52% (95% CI: 38-65%) in fall and 22% (95% CI: 5-70%) in spring (Van de Walle et al. 2025). The present analysis indicates that the season-specific proportions of harvest originating from the BEL-EHB stock in the Inukjuak voluntary closure zone are significantly higher than those estimated in NEHB. This result is consistent with evidence from aerial surveys, GPS telemetry and community-based sighting data, which suggest that the Inukjuak area corresponds to the northern extent of the summering distribution of the BEL-EHB beluga stock (DFO 2024). In addition, GPS telemetry data suggest WHB beluga use multiple alternative migration routes to and from Hudson Strait and generally do not follow the eastern Hudson Bay coastline (DFO 2024).

Based on stock composition proportions presented in Table 4, 11 and 14 BEL-EHB beluga are estimated to have been harvested in the Inukjuak voluntary closure zone in 2024 and 2025, respectively. These additional BEL-EHB harvests are non-negligible, considering harvest levels compatible with 50% and 95% probabilities that the stock remains stable at its 2025 abundance, the lowest abundance in the time series, were respectively estimated at 51 and 35 beluga across the stock’s range (Van de Walle et al. 2025).

Table 4. Genetic mixture analysis using the haplotypes and new reference groups detailed in Parent et al. (2023) for beluga harvested in the Inukjuak Voluntary Closure Area. Ns: number of individual samples; Nv: number of different hunt dates (events); P: proportional assignment; WHB: Western Hudson Bay, BEL-EHB: Belcher Islands-Eastern Hudson Bay, JAM: James Bay, CSB: Cumberland Sound, CI: confidence interval based on variance among hunting events; CV: coefficients of variation based on individual samples (CVs) / hunting events (CVv).

Season	Ns/Nv	WHB population (%)			BEL-EHB stock (%)			JAM population (%)			CSB population (%)		
		P	95% CI	CV	P	95% CI	CV	P	95% CI	CV	P	95% CI	CV
Extended spring* (Feb 1- July 15)	20/11	3.5	0.4-10.6	72.7%	91.2	78.0-98.1	5.8%	2.9	0.6-7.6	57.8%	2.4	0.6-5.9	52.6%
Spring** (Feb 1- June 30)	16/8	3.0	0.3-10.0	73.4%	90.5	70.4-98.7	8.5%	4.1	0.3-15.4	81.6%	2.4	0.7-6.0	49.7%
Fall (Sept 1- Jan 31)	12/7	9.4	1.5-27.4	68.4%	61.8	26.8-88.0	27.1%	7.6	0.1-34.1	102.8%	21.1	1.2-57.4	73.9%

*Corresponds to harvests prior to the voluntary closure period

**In previous genetic analysis, the summer period used to define reference populations extended from July 1 to August 31 (e.g., Parent et al. 2023).

Regional variation in stock-specific timing of beluga seasonal migration in Hudson Strait

Inuit Qaujimajatuqangit (IQ) suggests BEL-EHB and WHB beluga display differential migration timings, with BEL-EHB first passing west to east through Hudson Strait during fall, followed by the more numerous WHB beluga (NMRWB & EMRWB 2020). The expected shift in stock-specific composition of the harvest during fall associated with differential migration timing between BEL-EHB and WHB beluga was the rationale for the development of the fall closure in the current Nunavik beluga management plan, in which harvesting is closed in Hudson Strait from September 1 to October 31 to allow time for EHB beluga to migrate eastward before the harvest begins.

Recent genetic analyses indicates a marked and progressive decline in the proportion of the BEL-EHB stock among beluga harvested in Hudson Strait over the course of November (Parent et al. 2023). That study showed that the proportion of BEL-EHB in Hudson Strait harvests decreased from 51.5% (95% CI: 39.0–63.9%) during the November 1-10 period, to 10.4% (95% CI: 0.9–29.5%) between November 21-30 (Parent et al. 2023), therefore supporting the suggestion that BEL-EHB beluga migrate through Hudson Strait earlier than WHB beluga. However, the stock composition estimates in southern Hudson Strait were calculated by combining beluga samples collected since 1994, whereas fall beluga migration has been delayed by an average of 10 days per decade since 1990 (Niemi et al. 2019). In addition, the four Nunavik communities of Hudson Strait have contributed differentially to sample collection (Table 5). Particularly, the samples collected in the Quaqtaq area represent 65.9% of fall samples available from southern Hudson Strait. It therefore appears that the current information on the composition of the harvest is mostly representative of beluga migrating in the vicinity of Quaqtaq, and that the reported shift in the proportion of BEL-EHB beluga in late November likely describes the timing of the stock's migration at the eastern end of its journey in Hudson Strait.

Table 5. Number of beluga skin samples collected by harvesters and provided to DFO for genetic analyses by hunting location within southern Hudson Strait. Samples were collected between 1985 and 2025. Genetic mixture analyses (GMAs) are deemed reliable if conducted on 10 samples or more.

	No. samples collected since 1985 (proportion of seasonal total)		**No. samples collected during 2021-2025 (proportion of seasonal total)**	
Closest community	**Fall (Sept 1 – Jan 31)**	**Spring (Feb 1- Aug 31)**	**Fall (Sept 1 – Jan 31)**	**Spring (Feb 1- Aug 31)**
Ivujivik	263 (26.7%)	147 (14.1%)	41 (10.7%)	59 (33.5%)
Salluit	3 (0.3%)	153 (14.7%)	0 (0%)	4 (2.3%)
Kangiqsujuaq	83 (8.4%)	268 (25.7%)	5 (1.3%)	37 (21.0%)
Quaqtaq	636 (64.6%)	473 (45.4%)	337 (88.0%)	76 (43.2%)

Additionally, while the Nunavut communities of Kimmirut and Kinngait have contributed beluga samples since 1989 which have been haplotyped as part of the latest genetic reanalysis (Parent et al. 2023), the stock composition of the harvest in northern Hudson Strait is currently not reported in any published studies. It is therefore unknown whether these communities harvest BEL-EHB beluga during the stock's migration period.

Next, we use available information from different sources to estimate the recent stock-specific timing of beluga migration across Hudson Strait. This information aims to guide eventual

management measures aiming at diverting the harvest towards WHB beluga rather than BEL-EHB beluga.

Harvest and observational data

Since the mid-1990s, designated community members across Nunavik, today known as Uumajuit Wardens, have been mandated to report marine mammal harvests and sightings to DFO. Since 2006, they have reported these landings and observations on a weekly basis. While reporting of all beluga harvested and struck and lost to Uumajuit Wardens is a requirement in the beluga management plan, reporting of marine mammal sightings by community members is encouraged but voluntary. The compilation of these weekly reports represents a rich timeseries of opportunistic sightings, reported harvests and numbers of marine mammals that are struck and lost from each community across Nunavik.

The beluga harvests and sightings reported between 2021 and 2025 were georeferenced relying on coordinates provided by Uumajuit Wardens whenever available. If coordinates were not provided, the reported harvest or sighting place name was used, and if that was also unavailable, the reporting community was used. The closest Inuit community was assigned to each harvest and sighting. A probability density function was fitted to annual reports for each of the four Hudson Strait communities (Figure 5) and curves from Ivujivik and Quaqtaq were examined for seasonal peaks corresponding to the timing of beluga migration (Appendix 2). Overall, sighting and harvest density curves displayed seasonal peaks which were generally recurrent from year to year (Figure 5). This general pattern was used to break down seasons into shorter periods (Table 6) which might represent the passage of different beluga groups in southern Hudson Strait during migration.

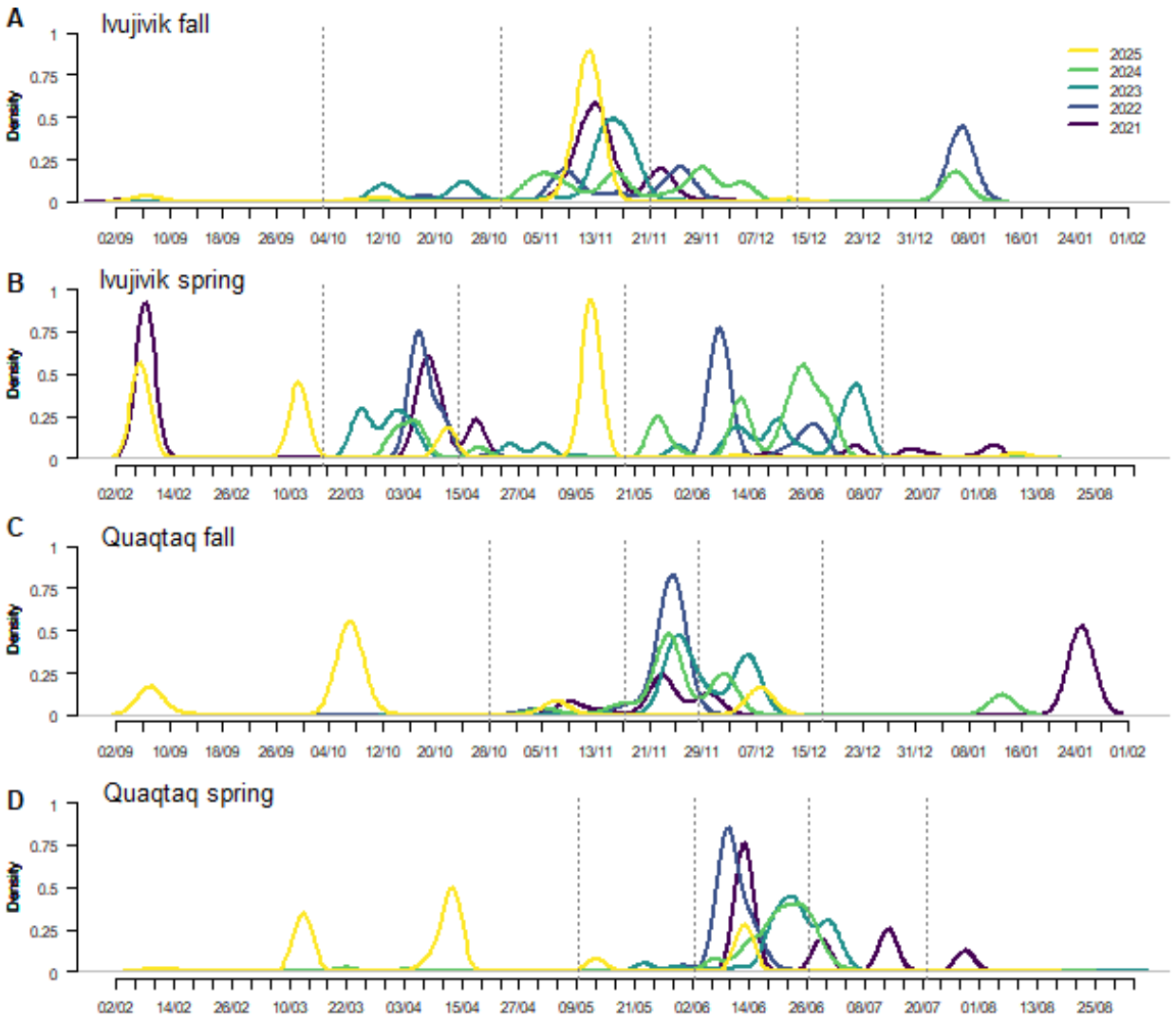

Figure 5. Density function fitted to annual beluga sightings and harvests reported by Uumajuit wardens in western and eastern Hudson Strait: A) Ivujivik, fall; B) Ivujivik, spring; C) Quaqtaq, fall; D) Quaqtaq, spring. Season- and community-specific curves were examined for seasonal peaks corresponding to the timing of beluga migration. Dashed lines illustrate cutoff dates for distinct seasonal peaks which were recurrent form year to year and used to break down seasons into shorter periods for to run the Genetic Mixture Analysis. The fall season extends from September 1 to January 31 of the following year, while the spring season extends from February 1 to August 31.

Table 6. Recurrent annual peaks of beluga sightings and harvests reported by Uumajuit wardens in the vicinity of Ivujivik and Quaqtaq between 2021 and 2025. For each period, the number of genetic samples received from the area between 2021 and 2025 is indicated.

Community	Season	Date range	No. recent genetic samples available
Ivujivik	Spring	15 Mar. – 12 Apr.	0
		13 Apr. – 18 May	0
		19 May – 9 Jul.	42
	Fall	01 Oct. – 27 Oct	0
		28 Oct. – 19 Nov.	36
		20 Nov. – 11 Dec.	3
Quaqtaq	Spring	7 May – 31 May	0
		1 Jun. – 24 Jun.	39
		25 Jun. – 19 Jul.	34
	Fall	26 Oct. – 15 Nov.	25
		16 Nov. – 26 Nov.	205
		27 Nov. – 15 dec.	122

Genetic data

To respect the minimal sample size of 10 individuals required to produce reliable GMA results, the recent (2021-2025) composition of the harvest in southern Hudson Strait during fall can only be estimated for the communities of Ivujivik and Quaqtaq (Table 5), i.e., the western and eastern ends of beluga's migration through Hudson Strait, respectively (Figure 1). GMA was used to estimate the stock-specific composition of the harvest for samples collected between 2021 and 2025 in the vicinity of Ivujivik and Quaqtaq for the different migration peaks identified from observational data (Table 7).

Table 7. Genetic mixture analysis using the haplotypes and new reference groups detailed in Parent et al. (2023) for beluga harvested in the vicinity of the communities of Ivujivik and Quaqtaq between 2021 and 2025. Ns: number of individual samples; Nv: number of different hunt dates (events); P: proportion; WHB: Western Hudson Bay, BEL-EHB: Belcher Islands-Eastern Hudson Bay, JAM: James Bay, CSB: Cumberland Sound, CI: confidence interval based on variance among hunting events; CV: coefficients of variation based on individual samples (CVs) / hunting events (CVv).

Area	Season	Ns/Nv	WHB population (%)			BEL-EHB stock (%)			JAM population (%)			CSB population (%)		
			P	95% CI	CV	P	95% CI	CV	P	95% CI	CV	P	95% CI	CV
Ivujivik	Late winter (15 Mar. – 12 Apr.)	0/0	ND	-	-	ND	-	-	ND	-	-	ND	-	-
	Early spring (13 Apr. – 18 May)	0/0	ND	-	-	ND	-	-	ND	-	-	ND	-	-
	Spring (19 May – 9 Jul.)	42/13	69.9	42.8-90.7	18.0%	13.7	3.3-29.7	50.6%	14.4	1.0-42.5	75.6%	1.8	0.8-3.2	33.6%
	Early fall (01 Oct. – 27 Oct)	0/0	ND	-	-	ND	-	-	ND	-	-	ND	-	-
	Mid fall (28 Oct. – 19 Nov.)	36/9	40.7	11.0-74.1	41.6%	54.4	20.1-86.4	32.3%	1.7	1.0-2.9	27.2%	3.2	0.7-8.6	58.7%
	Late fall (20 Nov. – 11 Dec.)	3/2	ND	-	-	ND	-	-	ND	-	-	ND	-	-
Quaqtaq	Early spring (7 May – 31 May)	0/0	ND	-	-	ND	-	-	ND	-	-	ND	-	-
	Late spring (1 Jun. – 24 Jun.)	39/23	78.2	55.5-93.9	12.9%	19.3	4.1-42.9	52.4%	1.3	0.5-2.7	40.3%	1.2	0.7-1.9	25.4%
	Early summer (25 Jun. – 19 Jul.)	34/17	63.6	30.2-91.6	25.3%	8.5	0.2-26.9	93.8%	16.7	3.0-39.1	56.8%	11.2	0.6-34.2	81.5%
	Early Fall (26 Oct. – 15 Nov.)	25/10	32.7	11.6-58.2	37.4%	62.4	32.7-86.8	22.9%	2.6	0.2-9.5	84.4%	2.3	0.2-7.8	76.0%
	Mid fall (16 Nov. – 26 Nov.)	205/25	66.4	56.6-75.8	7.4%	11.4	1.7-28.8	62.5%	7.4	0.2-24.7	91.9%	14.8	8.9-21.8	22.4%
	Late fall (27 Nov. – 15 Dec.)	122/24	86.4	71.0-96.6	7.7%	6.8	0.3-21.7	87.2%	3.5	0.0-13.4	98.2%	3.3	0.1-10.9	91.1%
North Hudson Strait	Spring (01 Feb. – 31 Aug.)	42/28	70.7	30.1-97.0	25.7%	6.5	0.5-18.9	75.9%	4.9	0.1-18.9	97.8%	17.9	0.2-59.8	93.0%
	Fall (01 Sep. – 31 Jan.)	78*/47	87.9	70.5-97.4	8.1%	0.6	0.2-1.2	40.8%	0.6	0.2-1.3	43.4%	10.9	1.9-28.4	60.0%
	Early fall (01 Sep. – 20 Oct.)	20/12	94.1	87.2-97.8	2.9%	1.4	0.3-3.0	41.2%	2.3	0.6-2.6	60.6%	2.2	0.1-4.6	37.0%
	Late fall (21 Oct. – Jan 31.)	56/35	79.3	52.0-96.4	59.6%	0.9	0.3-1.9	46.1%	0.7	0.3-1.3	33.9%	19.1	2.9-46.2	59.6%

*Two samples collected in October had no specific collection date and were therefore excluded from early/late fall samples.

The proportion of BEL-EHB beluga in the spring harvest in Ivujivik (13.7%, 95% CI: 3.3-29.7%) and Quaqtaq (19.3%; 95% CI: 4.1-42.9%) did not differ significantly and is comparable to that reported for southern Hudson Strait between 1985-2021 (12.3%; 95% CI: 8.6-16.5%; Parent et al. 2023). In Quaqtaq, the proportion of BEL-EHB beluga in the fall harvest declined from early fall (62.4%; 95% CI: 32.7-86.8% from 26 October – 15 November) to mid (11.4%; 95% CI: 1.7-28.8% from 16 November – 26 November) and late fall (6.8%; 95% CI: 0.3-21.7% from 27 November – 15 December). This trend is similar to that reported in the last assessment for southern Hudson Strait as a whole (see Table 7 in Parent et al. 2023). However the decrease in the proportion of BEL-EHB beluga appears to occur earlier and more rapidly in recent years (2021-2025). Whether this is attributable to the decreasing size of the BEL-EHB stock warrants further investigation. The proportion of BEL-EHB beluga in the mid-fall (28 October – 19 November) harvest in Ivujivik (54.4%; 95% CI: 20.1-86.4) is comparable to that observed in early fall in Quaqtaq, and larger than proportions reported for southern Hudson Strait as a whole in previous assessments (range: 10.4-51.5%; see Table 7 in Parent et al. 2023). Because sample sizes are small for other fall periods, it is not possible to determine whether BEL-EHB beluga remain the primary stock harvested in the vicinity of Ivujivik throughout the season, or if the proportion of BEL-EHB beluga eventually drops as is observed in Quaqtaq. Likewise, insufficient sample sizes in the Salluit and Kangiqsujuaq areas impedes examining the stock composition of the harvest and any temporal trend within the fall season.

CSB beluga accounted for a negligible proportion of beluga harvested around Ivujivik and Quaqtaq across most seasons (Table 7). However, it is worth noting that beluga from the CSB population represented 14.8% (95% CI: 8.9-21.8%) of animals harvested in the Quaqtaq area between November 16 and 26 in recent years. Among the 205 samples collected in mid fall around Quaqtaq, 1, 3 and 3 samples collected in 2021, 2023 and 2024, respectively, had haplotypes private to the CSB population. Of these, five were females and two were males. This validates GMA results, and indicates that the presence of CSB beluga in the Quaqtaq area was not an isolated event. The average harvest level recorded around Quaqtaq during mid-fall between 2022[1]-2025 is 74 ± 6. beluga. This corresponds to an annual average of 11 ± 1 CSB beluga harvested annually by Nunavik hunters harvesting in the Quaqtaq area during mid-fall. The CSB population is listed as Threatened under the Species at Risk Act, with an estimated population abundance of 1,090 beluga in 2018 (Watt et al. 2021). The harvest of CSB beluga has been regulated since the 1980s and the current quota is 41 beluga per year attributed to the Pangnirtung community (Watt et al. 2021; Richard and Pike 1993).

Because harvest and observational data in north Hudson Strait are scarce, the annual distribution of samples received over the last decades was examined for seasonal peaks (Figure 6), which were used to break down seasons into shorter periods (Table 8). There was insufficient temporal patterns among samples collected in spring to divide this season into smaller periods. However, the fall season was divided into early fall (01 September – 22 October) and late fall (23 October – 31 January).

[1] There was no Uumajuit warden in the community of Quaqtaq in 2021, therefore harvest reports are incomplete.

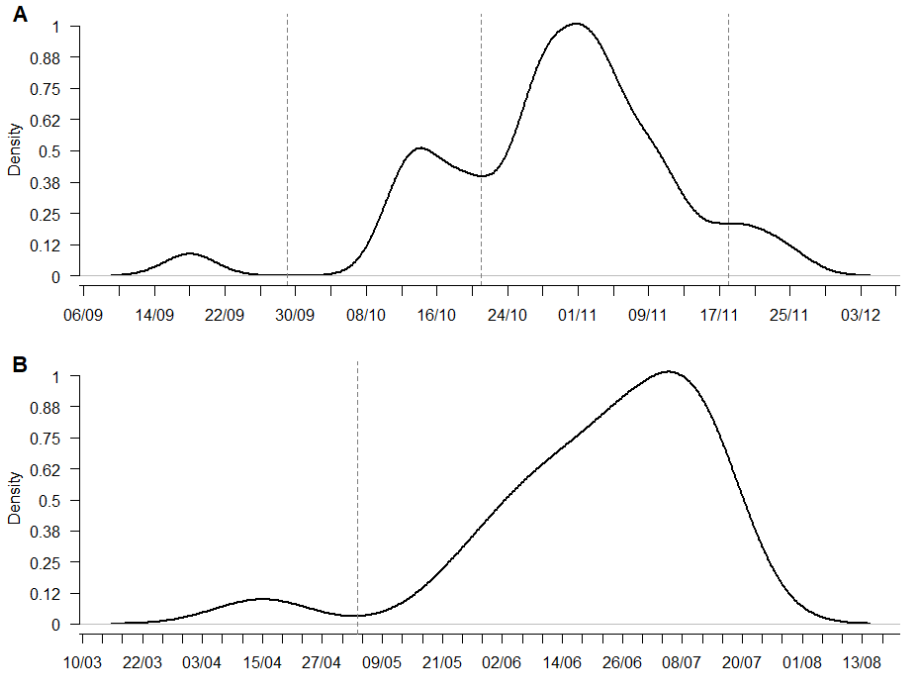

Figure 6. Density function fitted to harvest date for beluga samples collected in north Hudson Strait (i.e., Kimmirut and Kinngait areas) between 1989 and 2020 during A) fall and B) spring. Seasonal curves were examined for peaks corresponding to the timing of beluga migration. Dashed lines illustrate cutoff dates for distinct seasonal peaks which were recurrent form year to year and used to break down seasons into shorter periods to run the Genetic Mixture Analysis. The fall season extends from September 1 to January 31 of the following year, while the spring season extends from February 1 to August 31.

Table 8. Peaks in the seasonal distribution of samples collected by the Kimmirut and Kinngait communities between 1989-2020. For each period, the number of recent genetic samples received is indicated.

Season	Date range	No. recent genetic samples available
Spring	11 Apr. – 03 May	2
	04 May – 17 Jul.	40
Fall	01 Sep. – 28 Sep.	2
	28 Sep. – Oct. 20	19
	21 Oct. – 18 Nov.	51
	18 Nov. – 01 Dec.	4

More than 70% of beluga harvested in north Hudson Strait belong to the WHB population. In all seasons, the proportion of BEL-EHB was small and the lower limit of confidence interval was close to zero (0.6%, 95% CI: 0.2-1.2) in fall and 6.5%, 95% CI: 0.5-18.9 in spring). Similar to south Hudson Strait in mid-fall, CSB beluga also represented a significant proportion (19.1%; 95% CI: 2.9-46.2%) of the north Hudson Bay harvest from 21 October to 31 January. Among the 51 samples from north Hudson Strait in late fall, one male collected in 2001 had a private haplotype from CSB, thereby supporting GMA estimates. Due to inconsistent harvest reporting in north Hudson Strait in recent years (Appendix 3), it is difficult to estimate the annual number of CSB beluga this harvest represents.

Satellite tracking data

Between July and August of 1993, 1999, and 2002 to 2004, a total of 35 beluga were captured in estuaries of eastern Hudson Bay (i.e., Nastapoka and Little Whale Rivers) and equipped with satellite tags [SPOT, SDR-16 (Wildlife Computers Ltd, Redmond, Washington, USA) or SMRU (Sea Mammal Research Unit, St. Andrews, UK)] secured to the dorsal ridge. Locational data were obtained via the ARGOS satellite system, and filtered as described in Bailleul et al. (2012). Track durations ranged from days to seven months, with a mean of 129 days. Tracks from 18 individuals recorded fall migration into Hudson Strait.

Calculating the time these tagged beluga took to travel from one community to the other across southern Hudson Strait provides quantitative insights into the duration of EHB beluga migration. Southern Hudson Strait was divided into four zones roughly corresponding to the hunting areas in the vicinity of each community (Figure 7). Tracks were intersected with these zones and the arrival and departure time from each zone and for each individual were extracted (Table 9).

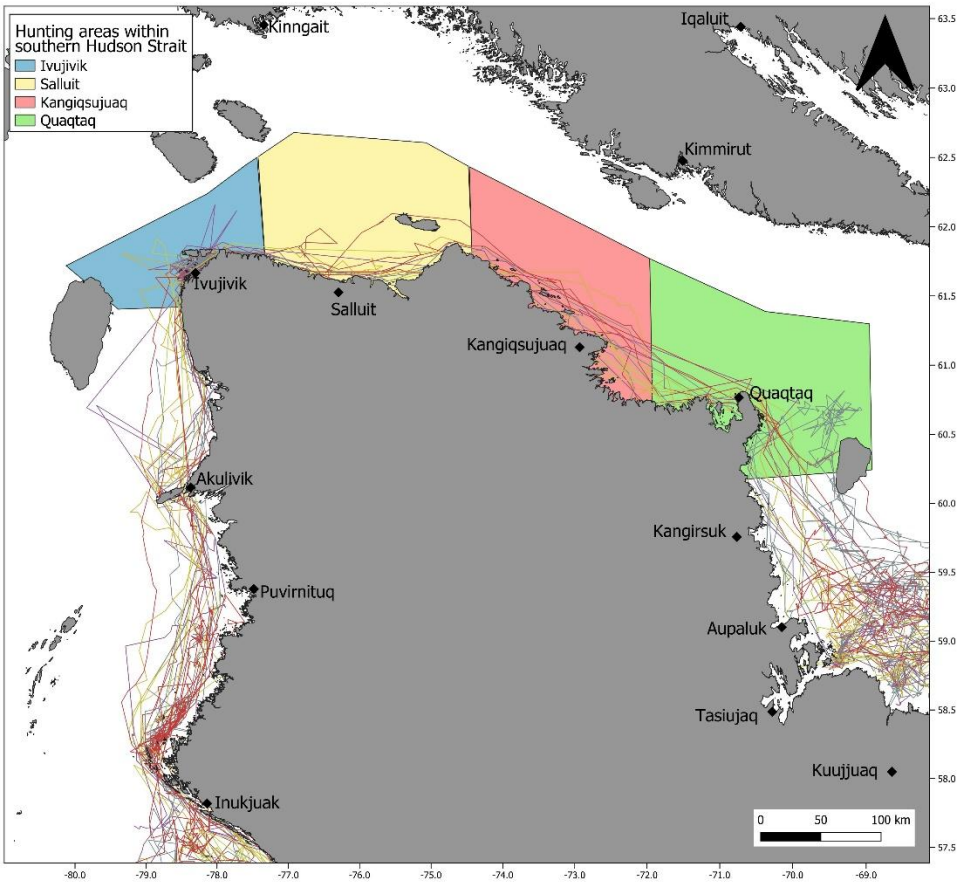

Figure 7. The Hudson Strait management area was divided into four zones roughly corresponding to the hunting areas in the vicinity of each Nunavik Hudson Strait community. These zones were used to intersect beluga tracking data to identify travel duration between each community during fall migration. Solid colored lines represent individual tracks from 18 beluga tagged in summers 2002 to 2004 in eastern Hudson Bay for which fall migration into Hudson Strait was recorded.

Tracking data revealed substantial inter-individual variation in the timing and duration of EHB beluga fall migration along Hudson Strait. Because this variation was also observed among individuals tagged in the same year, interannual variability alone cannot account for the

observed differences in migration speed. The time beluga spent to travel through an area was estimated as the time difference between the date and time of the first detection in an area and the date and time of the first detection in the adjacent area. Beluga tagged took between 12.1 hours and 20.0 days (median: 2.4 days, quantiles 25% (q25) and 75% (q75): 1.1 and 6.7 days, respectively) to travel through the Ivujivik area to the Salluit area, i.e., from their first detection in the Ivujivik area to their first detection in the Salluit area. Tagged belugas took 1.0 to 4.1 days (median: 1.7 days, q25: 1.4 days, q75: 2.2 days) to travel through the Salluit area to reach the Kangiqsujuaq area, and between 1.2 to 3.7 days (median: 1.8 days, q25: 1.5 days, q75: 2.0 days) to travel through the Kangiqsujuaq area to reach the Quaqtaq area. Overall, the time for beluga to migrate across Hudson Strait up to the Quaqtaq area ranged between 3.7 and 24.0 days (median: 6.9 days, q25: 4.9 days, q75: 9.0 days). This corresponds to movement speeds (Table 9) which are consistent with Smith and Martin (1994) and Richard et al. (1998) who reported speeds of 1.6-5.99 km/h and 1-10 km/h, respectively, during beluga fall migration.

The number of tissue samples for genetic analyses from recent (2021-2025) years is too small for beluga harvested around the communities of Ivujivik to decompose the fall season into shorter periods as was done in this assessment for Quaqtaq, and insufficient to estimate community-specific fall genetic composition of the harvest near Salluit and Kangiqsujuaq. However, average migration durations from tracking data can be used to back-calculate the timing of the primary BEL-EHB herd crossing Hudson Strait, based on the peak detection of BEL-EHB beluga in Quaqtaq from recent (2021–2025) genetic data (26 October–15 November; Table 7). Accordingly, BEL-EHB beluga were estimated to have passed by the community of Kangiqsujuaq 24 October – 13 November, by Salluit 22 October – 12 November, and by Ivujivik 20 October – 9 November. Extending these intervals to account for the migration duration 25% and 75% quantiles would result in the following migration timings: Kangiqsujuaq 24 October – 13 November, Salluit 22 October – 12 November and Ivujivik 15 October – 11 November. The intention of the annual closure in Hudson Strait between September 1 and October 31 in the current Nunavik beluga management plan is to reduce the number of BEL-EHB harvested during the fall migration. This analysis indicates that BEL-EHB beluga are still migrating through Hudson Strait by October 31. Date ranges identified by this analysis could be used to inform the ideal timing of a fall closure aiming to protect BEL-EHB beluga across their migration path through Hudson Strait.

Table 9. Date and time at which 18 beluga equipped with a satellite tag first recorded a position in the Ivujivik, Salluit, Kangiqsujuaq and Quaqtaq areas (see Figure 7). These were used to derive the time (days) as well as the average speed (knots) for individuals to migrate through these areas. Beluga speed was calculated by dividing time intervals by the area-specific east-west distance along the Nunavik coastline measured at 300-500 meters from shore.

ID	Year	Ivujivik	Salluit	Kangiqsujuaq	Quaqtaq	Time Ivujivik to Salluit (speed)	Time Salluit to Kangiqsujuaq (speed)	Time Kangiqsujuaq to Quaqtaq (speed)	Time Ivujivik to Quaqtaq (speed)
11751	1995	24 Oct. 06:41	30 Oct. 15:32	-	-	6.4 (0.34)	-	-	-
17905	2002	09 Oct. 15:00	11 Oct. 14:00	-	15 Oct. 05:57	2.4 (0.93)	-	-	6.1 (3.39)
17905	2003	09 Nov. 01:06	10 Nov. 01:01	11 Nov. 01:10	13 Nov. 01:13	1.0 (2.23)	1.0 (7.78)	2.0 (4.33)	4.0 (5.15)
17906	2003	17 Nov. 01:09	17 Nov. 13:19	19 Nov. 02:20	22 Nov. 01:02	0.5 (4.39)	1.5 (5.07)	2.9 (2.93)	5.0 (4.13)
17906	2002	29 Oct. 08:23	31 Oct. 03:10	01 Nov. 04:02	03 Nov. 03:49	1.8 (1.25)	1.0 (7.56)	2.0 (4.35)	4.8 (4.30)
17911	2003	14 Nov. 01:48	14 Nov. 13:56	17 Nov. 01:26	18 Nov. 14:35	0.5 (4.41)	2.5 (3.17)	1.5 (5.59)	4.5 (4.56)
1852	2003	06 Oct. 03:04	26 Oct. 03:06	28 Oct. 04:25	30 Oct. 03:16	20.0 (0.11)	2.1 (3.82)	2.0 (4.44)	24.0 (0.85)
1852	2002	06 Nov. 00:04	10 Nov. 00:11	11 Nov. 07:38	13 Nov. 00:41	4.0 (0.56)	1.3 (5.98)	1.7 (5.07)	7.0 (2.93)
1853	2003	22 Oct. 15:31	-	26 Oct. 11:16	30 Oct. 03:14	-	-	3.7 (2.37)	7.5 (2.76)
1854	2003	17 Oct. 07:48	23 Oct. 06:37	-	25 Oct. 09:42	6.0 (0.37)	-	-	8.1 (2.56)
1855	2002	03 Nov. 09:10	05 Nov. 00:24	09 Nov. 03:12	10 Nov. 07:28	1.6 (1.36)	4.1 (1.91)	1.2 (7.35)	6.9 (2.98)
3022	2003	25 Oct. 12:55	01 Nov. 14:39	03 Nov. 00:44	04 Nov. 11:49	7.1 (0.31)	1.4 (5.52)	1.5 (5.93)	10.0 (2.20)
3415	2003	09 Nov. 10:09	10 Nov. 14:25	13 Nov. 09:55	15 Nov. 03:37	1.8 (1.89)	2.8 (2.78)	1.7 (4.98)	5.7 (3.59)
45723	2004	12 Oct. 15:03	-	17 Oct. 07:08	-	-	-	-	-
45724	2004	05 Dec. 09:35	06 Dec. 05:55	07 dec. 16:24	09 Dec. 02:50	0.8 (2.63)	1.4 (5.44)	1.4 (6.04)	3.7 (5.54)
45729	2004	11 Oct. 23:54	-	22 Oct. 17:45	-	-	-	-	-
45730	2004	10 Oct. 19:09	27 Oct. 20:49	29 Oct. 21:46	31 Oct. 16:23	17.1 (0.13)	2.0 (3.83)	1.8 (4.89)	20.9 (0.98)
45731	2004	17 Oct. 09:44	25 Oct. 13:04	27 oct. 10:16	29 Oct. 18:47	8.1 (0.27)	1.9 (4.17)	2.4 (3.69)	12.4 (1.67)

CONCLUSIONS

Incorporating the 2025 harvest data into the BEL-EHB beluga integrated population model resulted in a 2025 abundance estimate of 2,100 (95% CrI = [1,700; 2,500]) individuals for this stock. This represents a decline of 5.0% (95% CrI = [1.4; 9.2]) between 2024 and 2025. The current BEL-EHB abundance is estimated to be at its lowest point in the last half century. Current BEL-EHB harvest levels across the stock's range, estimated at 138 beluga in 2025 and 142 beluga between 2021 and 2025 would need to be reduced by to 51, 44, or 35 BEL-EHB beluga for the stock to stabilize at its 2025 abundance with 50%, 80% 95% probabilities, respectively. If current harvest levels are maintained, the stock may reach a state of quasi-extinction between 2038 and 2040.Genetic analyses using mtDNA data estimated that 91% and 62% of beluga harvested in the Inukjuak voluntary closure zone during spring and fall, respectively, were from the BEL-EHB stock. These stock composition estimates are based on a very limited number of samples and harvest dates, and as such are subject to change as new samples become available. They nevertheless allow confirmation that BEL-EHB beluga account for the majority of whales harvested in the Inukjuak area during migration period, especially during spring. The change in the northern boundary of the Eastern Hudson Bay management zone since 2024 has resulted in an increase of 17 beluga harvested in the ARC between 2021-2023 and 2024-2025. Based on season-specific stock composition proportions estimated for this area, this represents 11 and 14 BEL-EHB beluga harvested in the Inukjuak voluntary closure area in 2024 and 2025, respectively.

More than 60% of beluga harvested between 2021-2025 in the Ivujivik and Quaqtaq areas during the 28 October – 19 November and 26 October – 16 November periods, respectively, were estimated to be from the BEL-EHB stock. In Quaqtaq, following 16 November, this proportion drastically decreased. Limited sample size after 19 November impedes exploring whether this trend also occurred in the vicinity of Ivujivik. Tracking data from EHB beluga during their fall migration suggests median migration durations of 2.4 days to travel from the Ivujivik to the Salluit areas, 1.7 days to travel from the Salluit to Kangiqsujuaq areas, and 1.8 days to travel from the Kangiqsujuaq to Quaqtaq areas. These migration durations between communities, coupled with the observed shift in the genetic composition of the harvest in Quaqtaq, could allow back-calculation of the dates when EHB beluga passed through the Hudson Strait coast in recent years. Based on genetics data from 2021-2025, EHB beluga were estimated to pass by the communities of Kangiqsujuaq 24 October – 13 November, Salluit 22 October – 13 November and Ivujivik 16 October – 7 November. These fall migration date ranges could be used to inform changes in the timing of the fall closure in Hudson Strait to reduce harvest pressure on the small BEL-EHB stock by directing hunting activities towards the larger WHB beluga stock. Additional samples collected from the Hudson Strait, particularly from the Salluit and Kangiqsujuaq areas, would help refine these estimates. In addition, there is currently no tracking data for beluga summering around the Belcher Islands. Therefore, the timing of BEL-EHB migration derived from tagging data is solely based on beluga tagged in eastern Hudson Bay estuaries during summer (i.e., by definition, EHB beluga) and may not adequately represent BEL beluga if their migration behaviours differ from that of EHB beluga.

The new genetic information presented in this document was not integrated in the BEL-EHB population model, as this would have required changes and decisions relative to internal model structure. This integration can be considered in future BEL-EHB stock assessments generating Science Advice. In parallel, further characterization of beluga population structure in eastern Canada using nDNA is underway, and genomic tools enabling its use for management purposes are being developed. These advances may eventually support individual assignment of beluga to specific populations, rather than relying on season- and region-specific harvest

composition derived from a GMA. Overall, 31% of beluga harvested by Nunavik hunters were sampled during the period 2021-2025. Increasing sampling rates across Nunavik would improve the quality of the data available to assess the efficacy of management measures aimed at alleviating harvest pressure on BEL-EHB beluga while maintaining subsistence hunting activities across Nunavik.

Tracking data for EHB and BEL beluga are outdated and non-existent, respectively. The deployment of modern satellite telemetry tags which could collect tracking data from beluga on the eastern Hudson Bay coast and from the Belcher Islands would provide new information on BEL-EHB beluga migration behaviour.

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APPENDICES

*Appendix 1 – Beluga sampled in Cumberland Sound from 2022-2025 and their dominant mitochondrial haplotype (mtDNA). *Indicates private haplotypes.*

Sample ID	Year	Sex	mtDNA
ARPG_xx_1622	2022	F	HL024*
ARPG_xx_1658	2022	F	HL024*
ARPG_xx_1687	2022	F	HL003
ARPG_xx_1693	2022	M	HL040*
ARPG_xx_1707	2022	M	HL003
ARPG_xx_1720	2022	M	HL040*
ARPG_xx_1723	2022	M	HL040*
ARPG_xx_1728	2022	F	HL024*
ARPG_xx_1730	2022	F	HL040*
ARPG_xx_1731	2022	F	HL030
ARPG_xx_1736	2022	M	HL024*
ARPG_xx_1737	2022	M	HL022
ARPG_xx_1740	2022	F	HL022
ARPG_xx_1741	2022	M	HL003
ARPG_xx_1742	2022	F	HL064
ARPG_xx_1738	2023	F	HL003
ARPG_xx_1749	2023	M	HL057*
ARPG_XX_1755	2023	M	HL024*
ARPG_xx_1757	2023	F	HL011
ARPG_XX_1758	2023	M	HL024*
ARPG_XX_1760	2023	M	HL024*
ARPG_xx_1763	2023	F	HL003
ARPG_xx_1764	2023	M	HL024*
ARPG_xx_1768	2023	M	HL024*
ARPG_xx_1770	2023	M	HL024*
ARPG_xx_1771	2023	M	HL003
ARPG_xx_1773	2023	M	HL030
ARPG_xx_1781	2023	F	HL030
ARPG_XX_1786	2023	F	HL093
BM_BIOP_0188	2023	M	HL093
DL_BIOP_0001	2023	F	HL022
DL_BIOP_0024	2023	F	HL030
DL_BIOP_0043	2023	M	HL024*
DL_BIOP_0049	2023	M	HL024*
ARPG_xx_1751	2024	M	HL030
ARPG_xx_1791	2024	F	HL030
ARPG_xx_1796	2024	M	HL003
ARPG_xx_1802	2024	M	HL024*
ARPG_xx_1810	2024	M	HL003

Sample ID	Year	Sex	mtDNA
ARPG_xx_1811	2024	F	HL024*
ARPG_xx_1815	2024	F	HL003
ARPG_xx_1817	2024	M	HL003
ARPG_xx_1819	2024	F	HL008
ARPG_xx_1822	2024	F	HL003
ARPG_xx_1825	2024	M	HL078
ARPG_xx_1766	2025	M	HL055
ARPG_xx_1813	2025	F	HL022
ARPG_xx_1831	2025	F	HL024*
ARPG_xx_1833	2025	M	HL149
ARPG_xx_1864	2025	M	HL142*
ARPG_xx_1875	2025	F	HL003
ARPG_xx_1799	2024	F	HL003
ARPG_xx_1808	2024	M	HL003

Appendix 2 – Peaks and surrounding minima observed on probability density curves produced from numbers of beluga observed, landed or struck and lost reported between 2021 and 2025 by Uumajuit wardens in the vicinity of the Ivujivik and Quaqtaq communities in southern Hudson Strait, Nunavik.

Community	Season	Year	Preceeding minima	Maxima	Following minima
Ivujivik	Spring	2021	16 March	07 April	13 April
			13 April	17 April	18 May
			30 Mai	17 June	25 June
		2022	16 March	05 April	16 April
			16 April	20 April	11 May
			30 May	06 June	14 June
			14 June	26 June	07 July
		2023	17 March	23 March	16 April
			16 April	23 April	18 May
			18 May	28 May	03 June
			03 June	10 June	27 June
			27 June	05 July	21 July
		2024	25 March	04 April	12 April
			12 April	18 April	03 May
			17 May	25 May	05 June
			05 June	12 June	17 June
			17 June	24 June	19 July
	Fall	2021	18 October	11 November	17 November
			17 November	21 November	27 November
		2022	October 12	17 October	30 October
			30 October	07 November	18 November
			18 November	21 November	04 December
			29 December	05 January	14 January
		2023	23 September	10 October	17 October
			17 October	22 October	28 October
			28 October	14 November	02 December
		2024	20 October	05 November	11 November
			11 November	16 November	21 November
			21 November	28 November	13 December
Quaqtaq	Spring	2021	03 June	12 June	20 June
			20 June	11 July	05 August
		2022	24 May	29 May	01 June
			01 June	08 June	25 June
			25 June	29 June	09 July
		2023	05 May	21 May	11 June
			11 June	21 June	10 July
		2024	12 May	06 June	08 June
			08 June	24 June	13 July

Community	Season	Year	Preceeding minima	Maxima	Following minima
			24 July	09 August	22 August
	Fall	2021	01 November	08 November	16 November
			16 November	22 November	26 November
			26 November	28 November	12 December
			16 January	24 January	31 January
		2022	28 October	02 November	10 November
			10 November	23 November	02 December
		2023	29 October	11 November	16 November
			16 November	24 November	30 November
			30 November	04 December	18 December
		2024	31 October	04 November	09 November
			09 November	23 November	27 November
			27 November	01 December	10 December

Appendix 3 – Annual number of beluga harvests reported by the communities of Kimmirut and Kinngait, northern Hudson Strait, over the last 10 years

Year	Kimmirut	Kinngait
2025	No Report	No report
2024	13	No report
2023	44	No report
2022	15	141
2021	30	17
2020	6	37
2019	2	9
2018	15	10
2017	20	12
2016	30	4

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