NEARSHORE BELUGA AERIAL SURVEYS IN DARNLEY AND FRANKLIN BAYS, JULY 2023 AND AUGUST 2024

K. Ovitz, K. Scharffenberg, F. Wolki, J. Illasiak, R. Lee, M. Lim, D. Whalen, L. Loseto, Paulatuk Hunters and Trappers Committee

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by

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ABSTRACT

Ovitz, K., Scharffenberg, K., Wolki, F., Illasiak, J. Lee, R., Lim, M., Whalen, D., Loseto, L. and PHTC 2025. Nearshore Beluga Aerial Surveys in Darnley and Franklin Bays, July 2023 and August 2024. Can. Tech. Rep. Fish. Aquat. Sci. 3709: vi + 27 p. https://doi.org/10.60825/ascr-k852

This report presents findings from collaborative research investigating nearshore Eastern Beaufort Sea (EBS) beluga whale activity in Darnley and Franklin Bays. EBS belugas, estimated at 38,500 individuals, play a critical role in the Arctic marine ecosystem and remain an important traditional food for Inuvialuit, the Inuit of Canada's Western Arctic. Although the EBS beluga population has been the focus of extensive research elsewhere within its range, there has been limited systematic investigation into beluga activity in Darnley and Franklin Bays despite the prior encompassing a marine protected area designated in part to protect belugas. As part of an ongoing research effort using remotely piloted aerial systems (RPAS) to study belugas, helicopter-based beluga distribution surveys were implemented in July 2023 and August 2024 along the coast of Darnley Bay, including the Anguniaqvia Niqiqyuam Marine Protected Area (ANMPA), and along parts of Franklin Bay. These are the first manned aerial surveys documenting nearshore beluga activity in these areas during the open-water season. Thirteen groups of belugas were observed, with group sizes ranging from 1 to more than 150 individuals. Surveys revealed the presence of large groups of belugas in areas not previously documented and provided insight into the use of specific coastal sites by EBS belugas. These findings enhance our understanding of the spatial ecology of belugas within our study area and underscore the utility of using manned aerial surveys to complement ongoing beluga research and monitoring efforts in nearshore habitats.

RÉSUMÉ

Ovitz, K., Scharffenberg, K., Wolki, F., Illasiak, J. Lee, R., Lim, M., Whalen, D., Loseto, L. and PHTC 2025. Nearshore Beluga Aerial Surveys in Darnley and Franklin Bays, July 2023 and August 2024. Can. Tech. Rep. Fish. Aquat. Sci. 3709: vi + 27 p. https://doi.org/10.60825/ascr-k852

Ce rapport présente les résultats d'une recherche collaborative sur l'activité côtière des bélugas de la mer de Beaufort orientale dans les baies de Darnley y Franklin. Les bélugas de la mer de Beaufort orientale, estimés à 38 500 individus, jouent un rôle essentiel dans l'écosystème marin de l'Arctique et restent une source alimentaire traditionnelle importante pour les Inuvialuits, les Inuits de l'Arctique occidental du Canada. Malgré des recherches approfondies sur les bélugas de la mer de Beaufort orientale ailleurs dans leur aire de répartition, il existe relativement peu d'études systématiques sur leur activité dans les baies de Darnley et Franklin, malgré le fait qu'une zone marine protégée ait été désignée en partie pour protéger ces cétacés. Dans le cadre d'un projet de recherche en cours utilisant des drones aériens pour étudier les bélugas, des relevés aériens en hélicoptère en juillet 2023 et en août 2024 le long de la côte de la baie de Darnley y compris dans la zone de protection marine Anguniaqvia Niqiqyuam (ZPM AN), ainsi que dans les zones voisines de la baie Franklin. Il s'agissait des premiers survols aériens

dans les cette région visant à étudier l’activité des bélugas près du rivage pendant la saison des eaux libres. Treize groupes de bélugas ont été observés, avec des tailles de groupe allant de 1 à plus de 150 individus. Les relevés ont montré la présence de grands groupes de bélugas dans les zones non documentées auparavant et ont souligné l’importance de sites côtiers spécifiques pour l’activité des bélugas. Ces résultats améliorent notre compréhension de l’écologie spatiale des bélugas dans la région étudiée et montrent l’utilité des relevés aériens pour compléter les efforts de recherche et de suivi dans les habitats côtiers.

1. INTRODUCTION

The Eastern Beaufort Sea (EBS) beluga whale *(Delphinapterus leucas)* population is the second largest in the world, containing an estimated 38,500 whales (DFO 2023). This population winters in the Bering Sea off the coast of Alaska and migrates each spring to the Eastern Beaufort Sea off the coast of Canada's Yukon and Northwest Territories (Richard et al. 2001; Storrie et al. 2022a). For hundreds of years, belugas (or *qilalugaq* in Inuvialuktun) from the EBS population have been an important traditional food for Inuvialuit, the Inuit of Canada's Western Arctic (Nuligak 1966; Friesen and Arnold 1995; Day 2002; Alunik et al. 2003). Today, Inuvialuit continue to harvest beluga whales for subsistence during the open-water season and are active in EBS beluga stewardship, research, and co-management (PHTC 2016; Ovitz et al. 2023).

Within the EBS beluga population's summering range, Inuvialuit and the Government of Canada have designated two Marine Protected Areas (MPAs): the Tarium Niryutait Marine Protected Area (TNMPA) in the Mackenzie River Estuary and the Anguniaqvia Niqiqyuam Marine Protected Area (ANMPA) in Darnley Bay (DFO 2010; 2016) (Figure 1). These MPAs share the objective of protecting beluga whales alongside other culturally and ecologically significant marine species. To date, beluga research in the Eastern Beaufort Sea has been concentrated largely around the Mackenzie estuary (Fraker 1977, 1978; Fraker and Fraker 1979, 1981; Norton 1983, Norton and Harwood 1985; Harwood et al. 1996; Loseto et al. 2006; Asselin et al. 2012; Harwood and Kingsley 2013; Harwood et al. 2014, Scharffenberg et al. 2019; Halliday et al. 2020), with comparatively limited systematic investigation occurring in Darnley Bay beyond the collection of beluga tissues for health and contaminant assessments (AANDC 2013; Harwood et al. 2002; Harwood et al. 2015; Ostertag et al. 2018; Harwood et al. 2020). Furthermore, while Paulatuk residents possess detailed knowledge of the Darnley Bay ecosystem, including beluga activity during the open-water season, the knowledge presented in existing publications is coarse in scale, limited to specific areas used for hunting and transit, and may not reflect more recent shifts in beluga activity under climate change (Kavik-Axys Inc. 2012; PHTC 2016; Carter et al. 2018; Hartwig and DFO 2009; Harwood et al. 2020).

Various manned fixed-wing aerial surveys have been implemented in the Eastern Beaufort Sea to examine beluga abundance and distribution. In particular, surveys were flown between 1977-1985 (Fraker 1977, 1978; Fraker and Fraker 1979, 1981; Norton 1983; Norton and Harwood 1985), in 1992 (Harwood et al. 1996), between 2007-2009 (Harwood and Kingsley 2013), and in 2019 (DFO 2023; Clarke et al. 2020). Of these, only two featured minimal coverage of Darnley Bay; this includes the 1992 survey, where a single transect line was flown from south to north in the bay with no belugas observed (Harwood et al. 1996) and a NOAA survey in August 2019, where two transect lines were flown and one beluga was observed (Clarke et al. 2020). Neither survey included coverage of coastal and nearshore areas, which Inuvialuit Knowledge (Hartwig and DFO 2009; Kavik-Axys Inc. 2012; PHTC 2016) and current research (DFO unpublished data) highlight as important to belugas. Other publications reporting beluga sightings in this area include Asselin et al. (2011) and (2012) wherein belugas were observed along the west side of Darnley Bay in fluctuating ice cover during spring ringed seals *(Pusa hispida* or *natchiq* in

Inuvialuktun) surveys between 1975-1979 and along the land-fast ice edge in neighbouring Franklin Bay in June 2008 during a helicopter survey.

To respond to locally identified research priorities and address research gaps, researchers from Fisheries and Oceans (DFO) and the Paulatuk Hunters and Trappers Committee (PHTC) collaboratively designed and implemented a study using remotely piloted aerial systems (RPAS), passive acoustic monitoring, and interviews with Inuvialuit knowledge holders to investigate nearshore beluga activity in Darnley Bay and the ANMPA[1]. As a part of this project, we conducted two manned aircraft surveys of coastal Darnley Bay and part of neighboring Franklin Bay to complement our RPAS work and improve our understanding of the spatial scope of beluga activity in these areas. Our findings provide insight into beluga activity in Darnley Bay in July and August and highlight the utility of helicopter surveys for addressing knowledge gaps in data-limited areas.

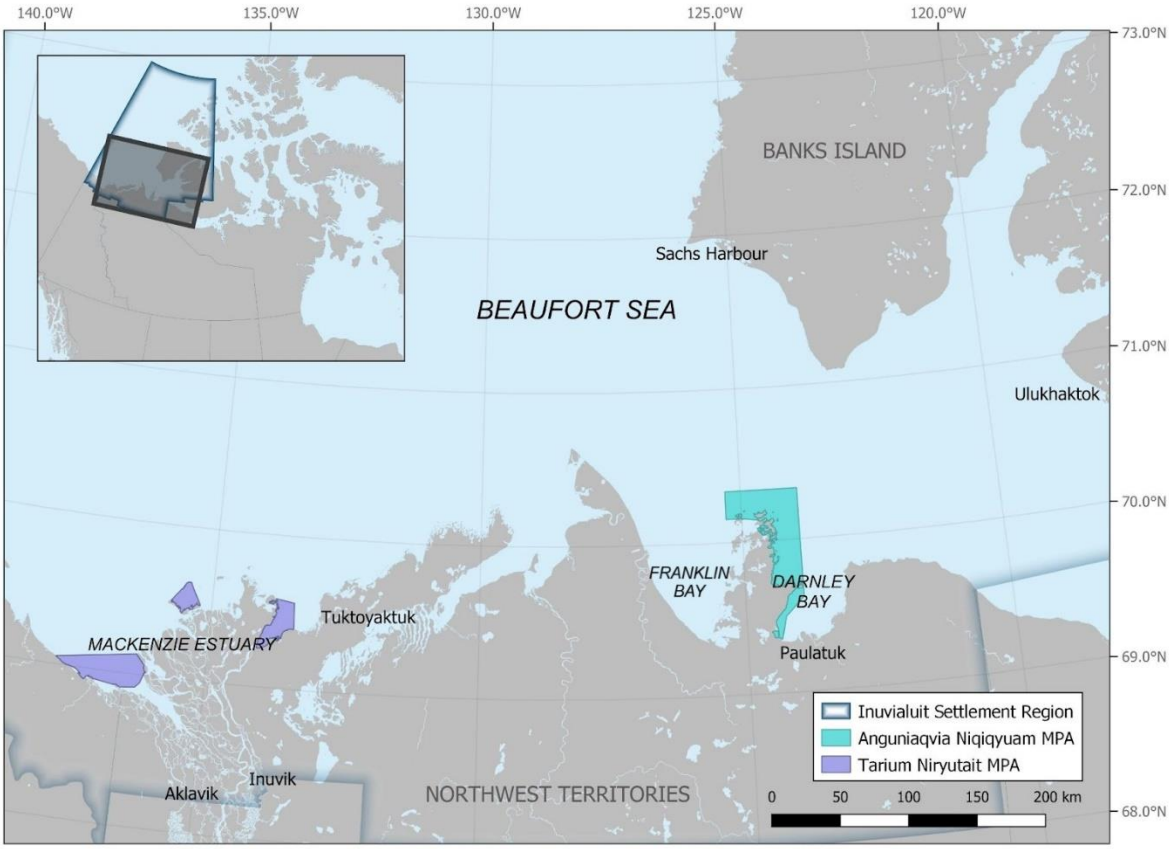

Figure 1: Inuvialuit Settlement Region and locations of the Tarium Niryutait (purple) and Anguniaqvia Niqiqyuam (green) Marine Protected Areas

[1] Priorities were identified by co-management bodies involved in beluga and MPA research including the PHTC, the ANMPA Working Group, and the Fisheries Joint Management Committee (FJMC) in 2021-2023.

1.1 Study Area

Darnley Bay is a large inlet measuring approximately 45 km long and 32 km wide extending out from the southern Amundsen Gulf in the Inuvialuit Settlement Region (Figure 1) (Paulic et al. 2012). In 2016, the western side of Darnley Bay was designated as the ANMPA (SOR/2016-280) under Canada's *Oceans Act*. The ANMPA encompasses 2,358 km² and includes nearshore and offshore habitat that supports a variety of wildlife, including belugas, ringed and bearded seals, polar bears, seabirds, and Arctic char. Core objectives of the MPA are to maintain environmental integrity in the vicinity of the Cape Parry Migratory Bird Sanctuary and to protect critical wildlife habitat along the eastern coast of the Parry Peninsula.

The Darnley Bay coastline is topographically diverse and is characterized by steep bedrock cliffs to the north and low-lying gravel beaches to the south near the Hornaday and Brock River deltas. Tidal influence is minimal, with velocities measuring 10 cm/s at Cape Parry and 1 cm/s in Darnley Bay (Hannah et al. 2008). Situated within the polar climate zone, the area experiences short, mild summers and long, cold winters. During the winter, Darnley Bay is covered in landfast sea ice from approximately October through May with breakup occurring in June (Galley et al. 2004; Paulic et al. 2012); however, local observations suggest that the timing of ice formation and melt is variable and has been shifting in recent decades under climate change (Kavik-Axys Inc. 2012).

Figure 2: Community of Paulatuk in March (top left), June (top right), and July (bottom)

At the southern end of Darnley Bay is the community of Paulatuk (Figures 1 & 2), a remote hamlet with a predominantly Inuvialuit population of approximately 327 individuals (NWT Bureau of Statistics). Inuvialuit have inhabited the Beaufort Sea coast for hundreds of years (Friesen and Arnold 2008), traditionally living a nomadic land-based lifestyle (Nuligak 1966; Usher 1971; Friesen and Arnold 1995; Alunik et al. 2003; Morrison 1997; Friesen 2004). The present-day community of Paulatuk was established in the mid-1960s and is the former site of a Roman Catholic mission and trading post built in the 1930s (PHTC et al. 2016). Given its remote location and lack of road access, Paulatuk residents rely heavily on the subsistence harvest of traditional foods acquired at inland and coastal harvesting camps. This on-the-land experience, coupled with knowledge passed down and refined over many generations, provides Paulatuk residents with in-depth knowledge on belugas and the broader Darnley Bay ecosystem (Kavik-Axys Inc. 2012; PHTC 2016).

2. METHODS

2.1 Project Development

Helicopter surveys occurred as part of Paulatuk Drone Project. This project is guided by a knowledge co-production approach (e.g., Yua et al. 2022) involving collaboration between project partners during all phases of the research process (Ovitz et al. 2022). Project planning began in winter of 2021 and has continued to the present in the form of virtual and in-person planning meetings (approximately 24 to date). In fall of 2022, our team applied to Canada's Polar Continental Coastal Shelf Program (PCSP) and DFO to obtain helicopter support to reach remote field sites typically inaccessible by boat. In March 2023, the project team and PHTC Board of Directors met in Paulatuk to discuss field plans and prospective helicopter operations. During this meeting, plans for helicopter work, including protocols for minimizing wildlife disturbance, were described and discussed, and a local lead (field team member and acting PHTC president Joe Illasiak Jr.) was appointed to help develop appropriate disturbance mitigation plans. With the PHTC board's support, our team worked with PCSP to finalize logistics and with Joe Illasiak Jr. and the helicopter pilots to plan operations.

2.2 Survey Equipment

For decades, researchers have relied on manned aerial surveys to study cetacean distribution, abundance, habitat use, and group characteristics, among other parameters (Laake et al. 1999; Würsig et al. 2018). Surveys may be implemented from both fixed-wing (Kenyon and Scheffer 1961; Fraker 1977, 1978; Rugh et al. 2005; Lowry et al. 2008) or rotary-wing aircraft (Slooten et al. 2004; Scheidat et al. 2011; Asselin et al. 2012), with each platform presenting different strengths and limitations. Generally, fixed-wing aircraft are preferable for covering larger spatial scales, where higher-altitude operations can decrease disturbance of animals and maximize the area/swath covered (e.g., commonly used for population surveys), while rotary-wing aircraft are better-suited for lower-altitude operations over shorter distances, as well as for operations where hovering and/or intermittent stops are required.

For these surveys, we used an Airbus AS350 B2 (A-Star) helicopter sourced from Great Slave Helicopters based in Inuvik, NT. The use of a helicopter enabled us to land along the planned route to implement RPAS surveys at key sites (Figure 3 and Figure 4). Our primary objective was to explore beluga distribution along the coast and to record information on group size, location, composition, and behavioral state at the time of observation.

Figure 3: Survey crew at Cape Lyon; pictured from left to right are GSH pilot Keelie Stachniak, Frank Wolki, Joe Illasiak Jr., Kimberly Ovitz, and Kevin Scharffenberg

Figure 4: Survey crew aboard the helicopter in July 2023; pictured from left to right are observers Kevin Scharffenberg, Joe Illasiak Jr., and GSH pilot Keelie Stachniak (top) and Joe Illasiak Jr., Kevin Scharffenberg, and Frank Wolki (bottom)

2.3 Permitting and Approvals

Operational approvals were granted by the PHTC Board of Directors following consultation meetings and were contingent on operations not adversely impacting subsistence beluga harvest. A DFO Marine Mammal Disturbance permit was obtained and an ANMPA Activity Plan

for research occurring within the MPA was approved by the ANMPA Working Group. Crew members from Paulatuk gave the final approval for surveys to commence and monitored our flight path and altitude to mitigate disturbance.

2.4 Survey Effort

Survey timing and duration was based on helicopter availability and weather conditions. Several helicopter days were reserved for beluga surveys in July and August of 2023 and 2024, but had to be cancelled due to inclement weather and the diversion of helicopter resources to fight wildfires in the region. Surveys were eventually flown on July 25, 2023, and between August 11-13, 2024 (Table 1; Figures 5-6). The July 2023 survey commenced in northeastern Darnley Bay at Cape Lyon and followed the coastline towards Paulatuk and Argo Bay before heading north around Cape Parry and down the east coast of Franklin Bay, covering a distance of 350 km (Figure 5). Following a refueling stop in Paulatuk, the crew returned to David's Harbour to acquire RPAS footage of a large beluga group observed earlier.

In 2024, helicopter surveys were flown along 363 km of coastline between August 11-13 in conjunction with a coastal mapping initiative led by project collaborators at Natural Resources Canada (NRCan). Due to intermittent fog and rain, as well as the requirements of the coastal mapping project, the 2024 survey crew was not able to replicate the full flight path from the year prior. Ultimately, the southwestern parts of Franklin and Darnley Bays were surveyed, capturing a larger section of Franklin Bay than was achieved in the year prior (Figure 6). In both 2023 and 2024, the crew stopped at key sites along the survey route to map coastal sites selected by the PHTC board.

Table 1: Helicopter flight information

Flight Date	Time of Departure / Arrival at Paulatuk Airport (MDT)	Stops Along Route	Elapsed Fight Time (HH:MM)
Jul 25, 2023	11:30-16:00	Cape Lyon (30 min); Cape Parry (30 min)	03:30
Aug 11, 2024	10:00-12:00	None	02:00
Aug 11, 2024	15:00-17:00	None	02:00
Aug 12, 2024	9:30-12:00	Fish Lake (30 min)	02:00
Aug 12, 2024	13:30-17:30	Argo Bay (30 min); Sugvuk (30 min)	03:00
Aug 13, 2024	11:30-14:30	Cape Parry (30 min)	02:30

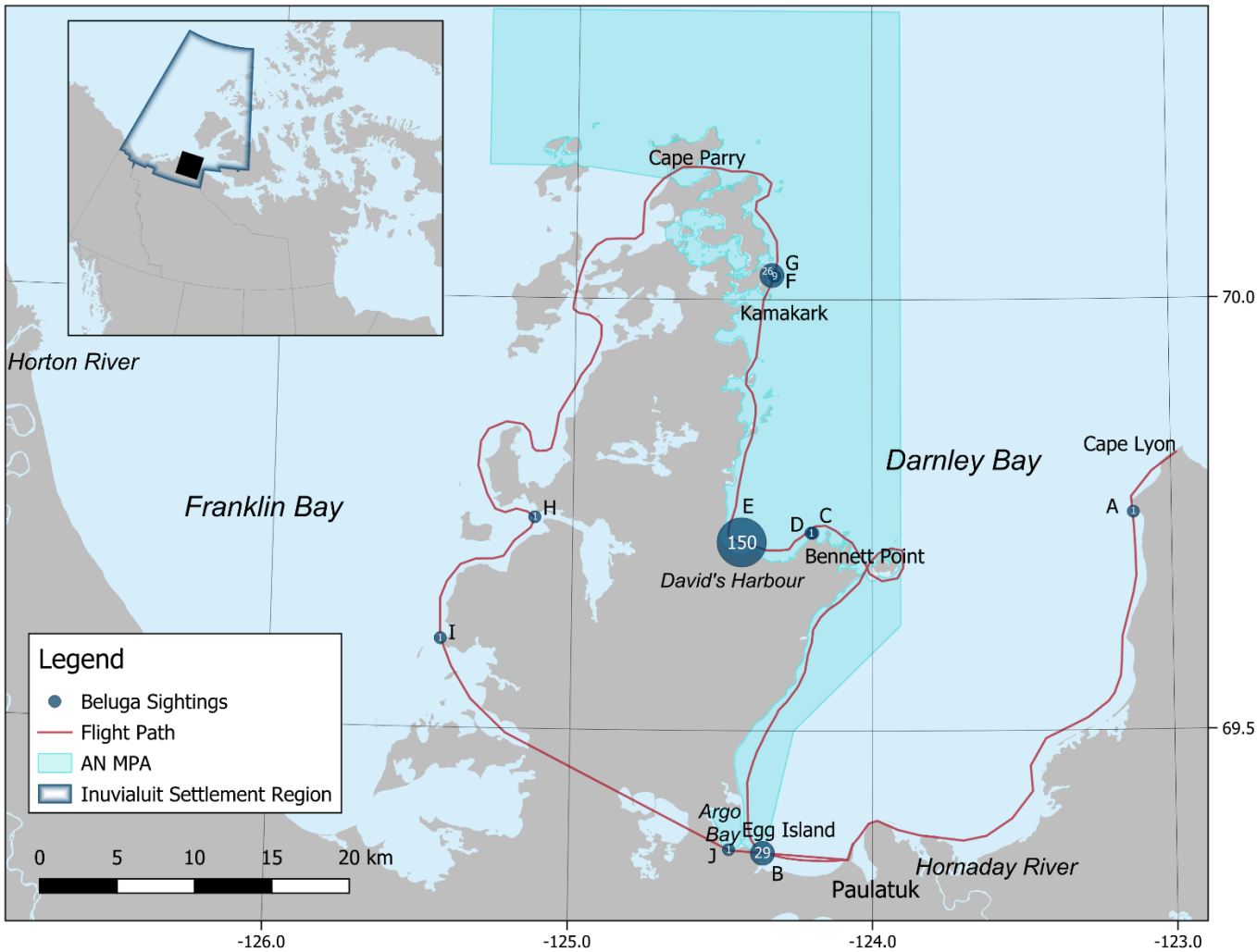

Figure 5: Survey flight path (red line) and beluga sightings on July 25, 2023; represented by blue circles. The size of the circle indicates group size corresponding with the sizes reported in Table 3

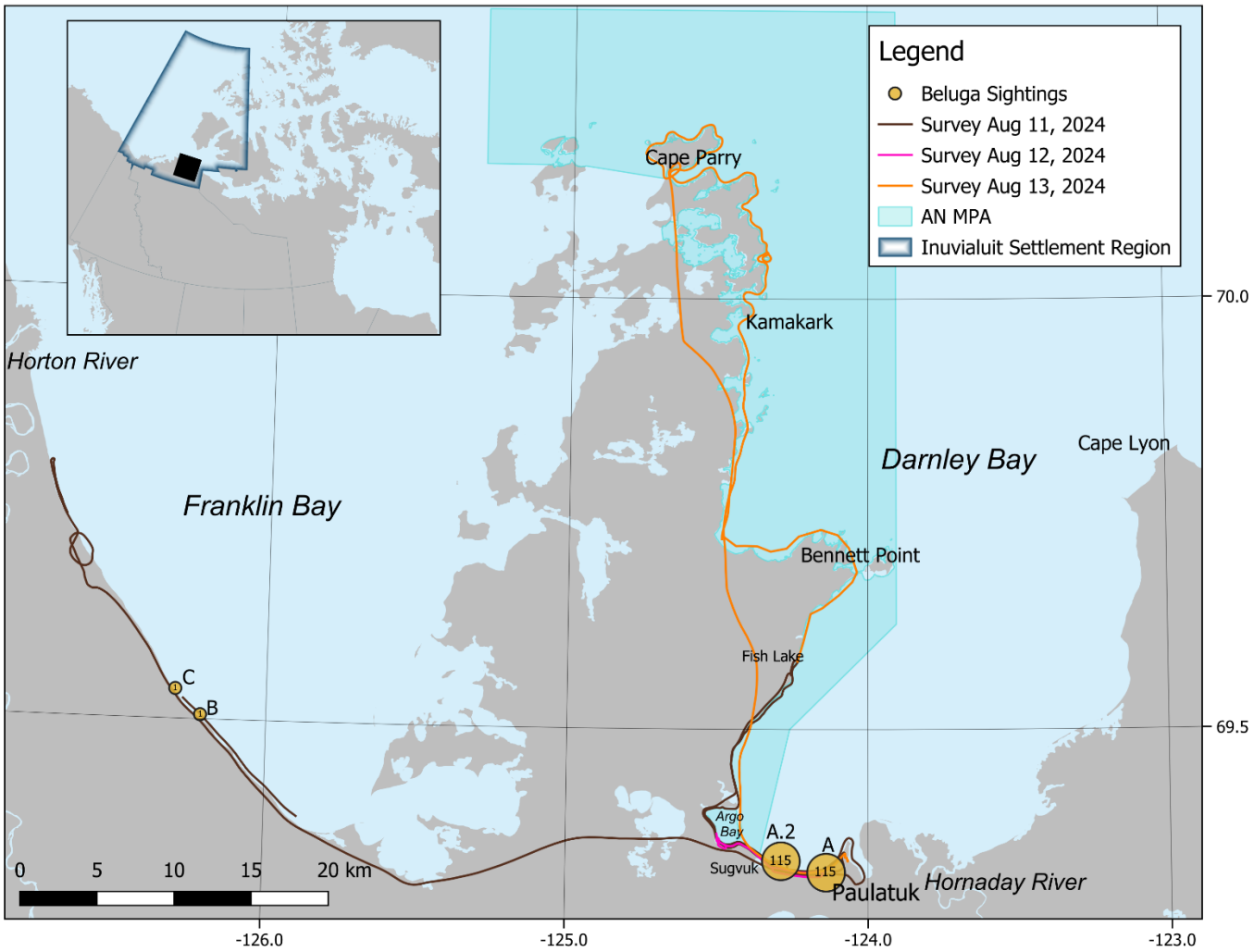

Figure 6: Survey flight paths and beluga sightings in August 2024; the yellow circles represent beluga whale sightings, the size of the circle indicates group size corresponding with the sizes reported in Table 4

2.5 Data Collection

A maximum of five crew members were aboard the aircraft during each flight. The crew was comprised of Inuvialuit wildlife experts from the community of Paulatuk, government and/or academic researchers, and the pilot.[2] The pilot operated the aircraft at an altitude of 305 m

[2] The July 2023 survey crew consisted of Joe Illasiak Jr. and Frank Wolki from Paulatuk, Kimberly Ovitz and Kevin Scharffenberg with DFO, and pilot (Keelie Stachniak); the August 2024 crew consisted of Jody Illasiak, Joe Illasiak Jr., and Frank Wolki from Paulatuk (alternating depending on availability), Rebecca Lee from NRCan, Michael Lim with Northumbria University, and pilot (D.R).

(1000 ft) and followed the coastline at a horizontal distance of approximately 1000 m from the shore over coastal waters with an approximate depth of 5-20 m.[3]

The two observers seated on the left (passenger) side of the aircraft and the two seated on the right (pilot) side of the aircraft scanned the water outside their respective windows. When present, the fifth observer, seated in the middle of the helicopter, periodically scanned out of both sides of the aircraft and recorded data.

Flight paths and beluga sighting data (location, local time, group code, and group size) were recorded in a Garmin InReach Explorer handheld GPS device (Garmin Ltd.), while additional notes on group composition and behavior were recorded in a field notebook. We defined a "beluga group" as one or multiple whales occupying the same general area exhibiting the same behavioral state. If a group of belugas was observed, the pilot slowed and circled the area until the crew agreed upon an accurate count. This required several passes for larger groups (e.g., exceeding 30 whales), during which the helicopter would circle in the vicinity of the group but not directly overhead to prevent disturbance. Given the water clarity in Darnley Bay (illustrated in Figure 7), we were able to clearly detect whales at and up to several meters below the waters' surface, consistent with values reported in Richard et al. (1984) and Stewart et al. (2024). Under these conditions, and given the multiple passes used to count larger groups, we anticipate that group sizes were estimated with a high degree of accuracy. Observers also recorded the composition of each group based on four categories (adults, subadults, mixed, and undetermined), as well as the group's behavioral state based on the ethogram developed for Cook Inlet beluga whales (Howe et al. 2015)[4]. Following this methodology, beluga groups were recorded as exhibiting one of two behavioral states: traveling, milling, or both, if the group changed behavior during the course of the sighting. When possible, discrete behavioral events (e.g., diving) were also noted; however, behavioral events beyond diving were difficult to confirm from the survey altitude. Location and group size data were plotted using QGIS (QGIS Development Team, 2023).

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[3] Bathymetric data for this area is limited, however, existing sources indicate an average depth of <20 m in nearshore areas (within several km of the coastline) reaching a maximum depth of 50-100 m and 100-200 m in the interior of Darnley and Franklin Bays, respectively (Paulic et al. 2011 and DFO Canada Marine Planning Atlas).

[4] Howe et al. (2015) defines a behavioral state as a "behavior that occurred over an extended period of time" (pg. 33) based on Martin and Bateseon (2007) and describes a state as the dominant activity exhibited by the majority of whales in the group comprised of two mutually exclusive categories: 1) milling (a whale or whales surfacing in a more or less constantly varying direction, especially in relation to each other) and 2) traveling (a whale or whales moving in a consistent, unidirectional fashion relative to other individuals in a group) (Howe et al. 2015, pgs. 33-35).

Figure 7: RPAS image of belugas in Southwestern Darnley Bay on July 15, 2023

3. RESULTS

3.1 Weather Conditions

Helicopter operations commenced when conditions permitted at the pilot's discretion. During all survey flights, visibility was moderate to high and the sea state low (measuring a 3 or below on the Beaufort Scale[5]). Average hourly weather (10:00-17:00) on each survey day sourced from Environment and Climate Change Canada and the Meteorological Service of Canada's weather station in Paulatuk, NT (69°21'28.004" N, 124°04'57.005" W), is presented in Table 2. Inclement weather in the study area and along the helicopter's route from Inuvik to Paulatuk required that various survey days be postponed and rescheduled in both 2023 and 2024. Additionally, conditions on August 11-12, 2024, including intermittent fog, scattered showers, and a low cloud ceiling, required that planned operations be modified.

[5] https://www.canada.ca/en/environment-climate-change/services/general-marine-weather-information/understanding-forecasts/beaufort-wind-scale-table.html

Table 2: Average reported weather conditions on survey days

Date	Temperature (°C)	Dew Point (°C)	Relative Humidity (%)	Precipitation (mm)	Wind Speed (km/hr)	Wind Direction (degrees)
Jul 25 2023	19	13.4	70.2	0	15.2	5
Aug 11 2024	14.1	12.4	89.9	1.4	15.6	6
Aug 12 2024	11.6	9.2	84.6	0	17.6	25
Aug 13 2024	13.2	6.4	64.2	0	11.5	24

3.2 July 2023 Survey

The July 25 survey covered 350 miles of coastline over 3.5 hours (excluding stops at Cape Lyon and Cape Parry) (Figure 5). Ten groups of belugas were observed, ranging in size from 1-150 (Figure 5; Table 3). These groups were predominantly situated along the west coast of Darnley Bay, with one lone whale observed on the east coast of Darnley Bay and two groups observed along the east coast of Franklin Bay (Figure 5; Table 3). Two groups (B and E) were resighted multiple hours later at the same locations where they were fist observed; these were determined to be resightings based on location, group size, and composition. Group B consisted of 29 belugas in southern Darnley Bay and Group E consisted of at least 150 belugas in David's Harbour. The survey crew eventually returned to David's Harbour in the late afternoon to acquire RPAS footage of Group E. This group was still present at David's Harbour at 18:37 when the survey crew departed for Paulatuk following the culmination of RPAS surveys.

Two groups (B and E) were observed milling along the shoreline (within approximately 50 m of shore) in shallow water, while the other groups were observed milling (Group G, H) and traveling (Group A, C, D, F, I, J) further from shore in deeper waters. Group F was observed traveling into a small bay along the Darnley Bay coastline towards Group G, where the latter was milling. Group H was observed in Franklin Bay making vertical dives in the water column for extended periods of time. Since this area was deeper and more turbid, it is possible that belugas mid-dive at the time of this observation were not recorded. Group E was the only group recorded using RPAS and was observed milling, traveling, diving, suspected foraging, socializing, and vocalizing (Figure 8). Vocalizations were audible above the water without the use of an underwater acoustic device. No indicators of disturbance were observed during helicopter landing, takeoff, or during RPAS operations.

Table 3: Beluga groups observed during the helicopter survey on July 25, 2023

Group Identifier	Latitude	Longitude	Time (MDT)	Group Size	Group Composition	Behavioral State	Behavioral Events
A	69.752681	-123.126651	11:36	1	Adult	Traveling	-
B.1	69.357890	-124.361379	13:18	29	Mixed	Milling	-
C	69.729548	-124.198022	13:34	1	Adult	Traveling	-
D	69.729482	-124.204085	13:35	1	Adult	Traveling	-
E	69.718443	-124.435451	13:40	150	Mixed	Milling	Diving
F	70.027197	-124.330203	13:53	9	Undetermined	Traveling	-
G	70.027197	-124.330203	13:54	26	Undetermined	Milling	-
H	69.745423	-125.127291	15:27	4	Undetermined	Milling	Diving
I	69.603164	-125.434533	15:35	1	Adult	Traveling	-
J	69.361859	-124.472601	15:51	1	Adult	Traveling	-
B.2	69.361859	-124.472601	15:52	29	Mixed	Milling	-
E.2*	69.718443	-124.435451	18:37	150	Mixed	Milling	Multiple

** Observation recorded during RPAS surveys.*

Figure 8: RPAS images captured at David's Harbour on July 25, 2023; the distance to shore at which belugas were commonly observed (top) and belugas observed socializing during RPAS surveys (bottom)

3.3 August 2024 Surveys

The August 11 survey covered 222 km of coastline over approximately 4 hours (Figure 6). Three groups of whales were observed with group sizes ranging from approximately 1-115 (Figure 6; Figure 9; Table 4). One large group of predominantly adult whales (Group A) was observed in southern Darnley Bay, approximately 150 m from shore, traveling east towards Paulatuk and was resighted further along their course an hour-and-a-half later upon the crew's return to the airport. It is possible that whales of other age classes were present but could not be discerned due to the group's large size and distance from the helicopter. Later, two lone adult belugas (Groups B and C) were observed traveling along the coast in Franklin Bay. Subsequent surveys were flown on August 12 and 13, covering approximately 23 and 141 km of coastline, respectively; however, no belugas were observed (Figure 6).

Table 4: Beluga groups observed during the helicopter survey on August 11, 2024

Group Identifier	Latitude	Longitude	Time (MDT)	Group Size	Group Composition	Behavioral State	Behavioral Events
A.1	69.333723	-124.138178	10:01	115	Adult	Traveling	-
B	69.505164	-126.217999	10:28	1	Adult	Traveling	-
C	69.534696	-126.303179	10:29	1	Adult	Traveling	-
A.2	69.346876	-124.287337	11:32	115	Adult	Traveling	-

Figure 9: Beluga group observed in southern Darnley Bay on August 11, 2024 from two different vantage points aboard the helicopter

4. DISCUSSION

These surveys represent the first manned aerial surveys investigating nearshore beluga activity in Darnley Bay and the ANMPA, and the first to systematically document large groups of belugas in these areas during the open-water season. Importantly, no indicators of disturbance were observed, suggesting manned helicopter surveys are an effective survey and transit platform, posing minimal cetacean disturbance when appropriate mitigation procedures are followed.

Previous fixed-wing aerial surveys of the EBS beluga population (1992 and 2019) featured some coverage of the interior of Darnley Bay but omitted coastal areas. Thus, our results complement these efforts by focusing on nearshore habitat, which belugas are known to use for molting, foraging, and predator avoidance (e.g., St. Aubin et al. 1990; Hobbs et al. 2005; Goetz et al. 2007; Harwood et al. 2014; Hauser et al. 2017; Ovitz et al. 2019a,b; McGuire et al. 2020). Since our objective was to explore the coastline specifically, our results do not capture beluga activity in the interior of Darnley and Franklin Bays. Additionally, due to operational limitations (competing objectives with RPAS surveys and limited pilot hours), we were not able to survey all of the small bays along the Parry Peninsula, specifically on the Franklin Bay side. As such, it is possible that more belugas were present in these areas during the surveys than are captured here.

While our results are consistent with some of the existing knowledge and observations described in the literature, including the presence of small to medium sized beluga groups in western Darnley Bay in late July (Kavik-Axys Inc. 2012, Paulic et al. 2012), they also offer new insights into beluga activity in our study area. For example, our crew members from Paulatuk were surprised by the absence of belugas around Cape Lyon and the eastern side of Darnley Bay and by the presence of large groups of belugas at David’s Harbour in 2023. The presence of these large groups was considered atypical, given that residents usually encounter groups of this size further north in the ANMPA in the vicinity of traditional harvesting camps.

Unlike in the Mackenzie Estuary and TNMPA, where belugas can number in the thousands (Fraker et al. 1979), belugas in Darnley Bay and the ANMPA are not known to form large aggregations for extended periods. Rather, Paulatuk residents generally observe smaller, more transient groups of belugas traveling along the Darnley Bay coast (Kavik-Axys Inc. 2012). Likewise, we did not observe large aggregations during our survey beyond the group of approximately 150 belugas at David’s Harbour and 115 belugas in southern Darnley Bay. Although we observed some groups traveling, we observed others milling for extended periods, including two groups that were present at David’s Harbour and Egg Island for 5 and 2.5 hours, respectively. This suggests that these groups were drawn to these sites for reasons beyond their potential utility as transit corridors. As our surveys only represent a brief snapshot of beluga distribution in late July and mid-August, additional investigation would help identify habitat features or other drivers drawing belugas to coastal sites in the ANMPA.

The spatial distribution and movements of the groups we observed largely reflect the migration routes identified by knowledge holders (Figure 10) and overlap with known beluga harvesting areas, including Argo Bay and various small bays in the northwestern part of Darnley Bay

(Kavik-Axys inc. 2012). However, this figure from Kavik-Axys Inc. (2012) does not show belugas entering David's Harbour and only a single participant at this workshop mentioned beluga whales passing by this area. When the crew returned to David's Harbour to conduct RPAS surveys, various behaviours were observed, including rubbing, suspected foraging, and socio-sexual interactions (Figure 8 and DFO unpublished data). Belugas might have been drawn to this area based on unique habitat features (e.g., the pebbly substrate suitable for rubbing, Whalen et al. 2019), prey availability, or other factors. Knowledge holders have indicated that David's Harbour supports cod spp. (likely *Boreogadus saida* or *Gadus ogac*), Pacific herring (likely Cisco species *Coregonus sardinella*, *Coregonus artedi*, or *Coregonus autumnalis*) and Arctic char (*Salvelinus alpinus*) (Kavik-Axys Inc. 2012), all of which are possible beluga prey (Loseto et al. 2009, Loseto et al. 2018). We also observed belugas in Franklin Bay diving vertically below the water's surface for extended periods, likely indicative of foraging. Similar observations were made along the ice-edge in Franklin Bay by Asselin et al. (2012) during a period of high ice coverage in June, wherein the authors proposed that they could have been feeding on Pacific herring, Arctic cod, or Arctic char. The group we observed may have been targeting one of these or other prey found in nearshore environments during the ice-free season, such as Pacific sandlance (*Ammodytes hexapterus*) or capelin (*Mallotus villosus*) (McNicholl et al. 2024).

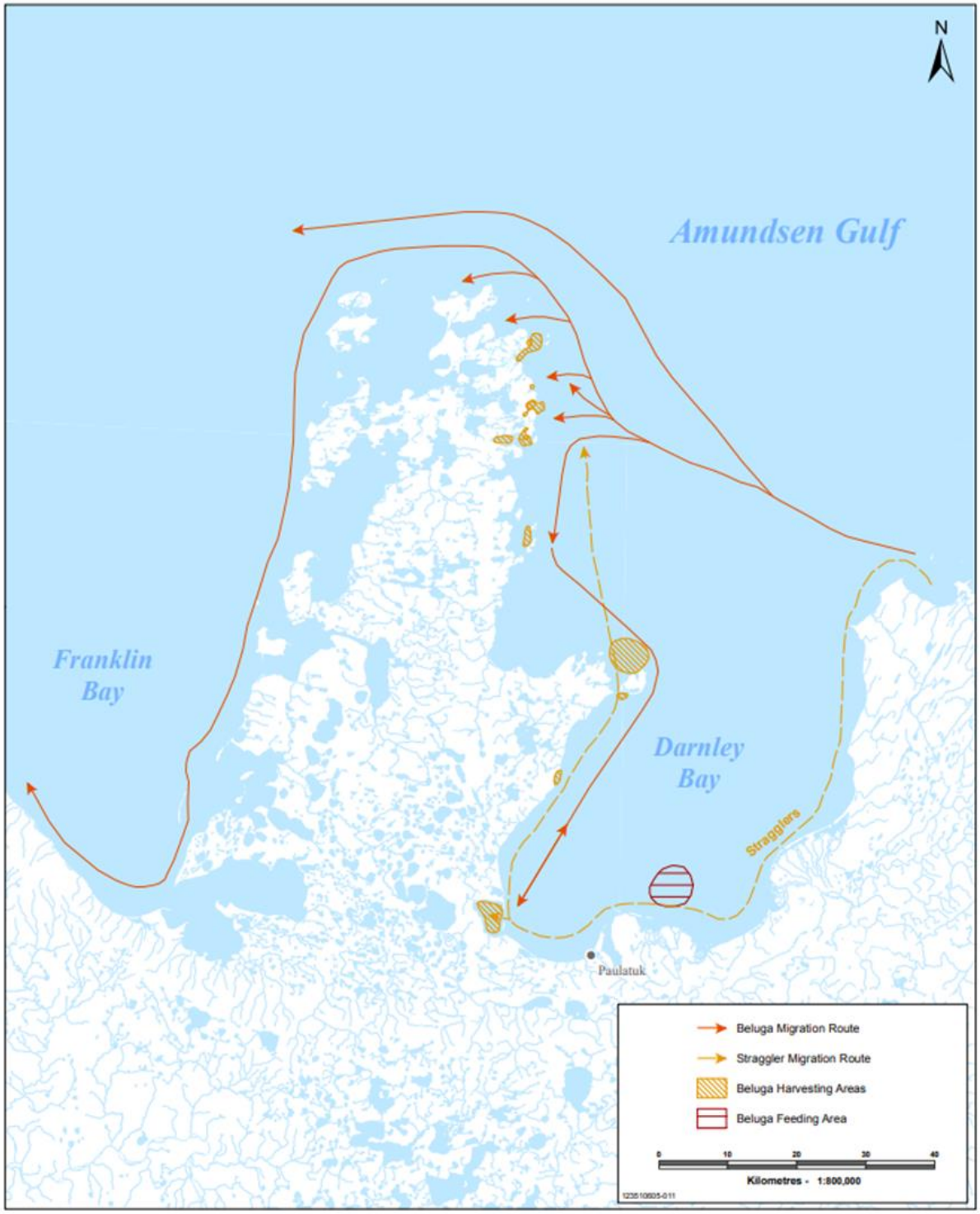

Figure 10: Beluga whale migration routes and harvest areas identified during a Traditional and Local Knowledge workshop conducted in Paulatuk in March 2011 (from KAVIK-AXYS Inc. 2012).

The proportion of time that surveyed animals spend underwater (i.e., undetectable to survey observers or photo analysts) is a key consideration in the analysis of aerial survey data, especially when estimating abundance (Marsh and Sinclair 1989, DFO 2023). Here, we elected not to include an availability bias correction factor due to the water clarity and shallow coastal bathymetry in our study area. Further, our primary objective was not to estimate abundance, but rather to map instantaneous beluga distribution to complement fine-scale RPAS surveys and identify additional study sites. However, in the case of abundance estimation, ideally, correction factors would be site-specific as dive behaviour can be influenced by many spatial factors, including location, depth, and prey availability (Storrie et al. 2022a, 2022b). For example, Kingsley and Gauthier (2002), Marcoux et al. (2016), and Matthews et al. (2017) presented unique correction factors for estimating beluga abundance in different regions and based on different dive behaviors. In the most recent EBS aerial survey, authors recommended identifying different correction factors based on dive times and visibility thresholds for turbid inshore and clear offshore areas (Marcoux et al. in prep); however, neither of these conditions reflects the clear inshore conditions observed in Darnley Bay. Further, as correction factors are most often derived from dive data collected by satellite tagged animals before a survey begins, it has been difficult, or impossible in some cases, to deploy tags on animals based on timing (i.e., inaccessible (ice) or remote areas to logistically challenging) and have them remain on the animal long enough to capture many different sites across the season. Hence, we anticipate that the RPAS footage obtained as part of this project will be ideal for identifying site-specific dive correction factors for this area.

These surveys represent a late-season snapshot of beluga distribution in nearshore Darnley and Franklin Bays, as well as in the ANMPA. Although some areas were excluded due to operational limitations, our study scale identified sites of importance to local harvesters and knowledge holders and addresses existing gaps in the literature. Our results ultimately reveal that belugas use coastal areas in Darnley and Franklin Bays for transit and other purposes (Figure 8; Figure 9). This report highlights the feasibility of surveying this study area in the span of a single day, suggesting the potential for conducting more extensive surveys throughout the summer. Depending on the underlying research questions at hand, this could take the form of additional coastal helicopter surveys or fixed-wing transects. Ideally, surveys should be conducted multiple times throughout the summer to identify important locations and capture seasonal changes in distribution, thereby providing a comprehensive understanding of beluga spatial use of the ANMPA to satisfy MPA monitoring mandates. Future surveys should involve collaboration with the PHTC to enhance planning, complement existing efforts, mitigate wildlife disturbance, and minimize interference with traditional harvesting activities.

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