

Knowledge holder experiences and perceptions of aquatic change in Igloolik, Nunavut

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Abstract

Drake, A.K., Igloodik Hunters and Trappers Association, Perkovic, A., Christie, L.R., Gauthier, P.J., Nguyen, V.M., and Dunmall, K.M. 2026. Knowledge holder experiences and perceptions of aquatic change in Igloodik, Nunavut. *Can. Manusc. Rep. Fish. Aquat. Sci.* 3320: viii + 66 p. <https://doi.org/10.60825/bt85-5293>

As the impacts of climate change and development intensify across the Canadian Arctic, Inuit communities and researchers are working together to document local knowledge of aquatic environmental change. This report presents findings from a collaboration between the Igloodik Hunters and Trappers Association, Carleton University, and Fisheries and Oceans Canada, recording experiences and perceptions of shifts in coastal, marine, and lacustrine habitats and species. Questionnaires completed with 26 knowledge holders revealed varied perspectives by ecological parameter. Views on changes in water temperature, salinity, and swells were mixed; however, knowledge holders consistently observed reductions in ice extent, thickness, quality, earlier break-up, and later formation. Accounts differed by years of experience on the land, with non-Elders more readily noticing diminished water clarity, and Elders emphasizing changes in coastal erosion, wind intensity, and wind direction. Elders also described declines in marine mammal abundance (seals, walrus), while both groups noted increasing polar bear presence. At the same time, fish populations may be decreasing, with changes in size, texture, and taste, and the appearance of new species. Trends for invertebrates were less clear, with additional insights needed to support reports of changing size and movements. These shifts are influencing harvest timing, prompting earlier spring harvests and later fall and winter efforts. Questionnaire findings offer grounded insights to inform decision-making by Iglulingmiut.

Résumé

Drake, A.K., Igloodik Hunters and Trappers Association, Perkovic, A., Christie, L.R., Gauthier, P.J., Nguyen, V.M., and Dunmall, K.M. 2026. Knowledge holder experiences and perceptions of aquatic change in Igloodik, Nunavut. *Can. Manusc. Rep. Fish. Aquat. Sci.* 3320: viii + 66 p. <https://doi.org/10.60825/bt85-5293>

À mesure que les effets des changements climatiques et du développement s'intensifient dans l'Arctique canadien, les communautés inuites et les chercheurs travaillent ensemble pour documenter les connaissances locales portant sur les changements environnementaux en milieu aquatique. Ce rapport présente les conclusions d'une collaboration entre l'Association de chasseurs et trappeurs d'Igloodik, l'Université Carleton et Pêches et Océans Canada et décrit les expériences et les perceptions relatives aux changements dans les espèces et les habitats côtiers, marins et lacustres. Les questionnaires complétés par 26 détenteurs du savoir ont révélé des perspectives variées selon les paramètres écologiques. Bien que les points de vue sur les changements dans la température de l'eau, la salinité et la houle soient mixtes, les détenteurs du savoir ont observé de manière constante une réduction de l'étendue, de l'épaisseur et de la qualité de la glace, ainsi qu'une débâcle hâtive et une formation tardive. Les témoignages diffèrent selon les années d'expérience sur le territoire, avec les non-Aînés remarquant plus facilement la diminution de la clarté de l'eau et les Aînés mettant l'accent sur les changements dans l'érosion côtière, l'intensité du vent et la direction du vent. Les Aînés ont également détaillé le déclin de l'abondance des mammifères marins (phoques, morses), tandis que les deux groupes ont noté une présence accrue d'ours blancs. Par ailleurs, les populations de poissons pourraient être en baisse; on a observé des changements dans la taille, la texture et le goût, ainsi que l'arrivée de nouvelles espèces. Les tendances relatives aux invertébrés étaient moins claires et des renseignements supplémentaires sont nécessaires pour étayer les rapports sur l'évolution de la taille et des déplacements. Ces changements entraînent une chasse printanière plus précoce et des efforts plus tardifs à l'automne et à l'hiver. Les résultats du questionnaire offrent des perspectives empiriques permettant d'orienter la prise de décisions par les Iglulingmiut.

1.0 Introduction

In Inuit Nunangat¹, compounding effects of climate change and development are resulting in profound changes to aquatic ecosystems. Arctic warming, occurring at a rate four times faster than the global average (Rantanen et al., 2022), is causing shifts in species abundance, health, and distribution (CAFF, 2013; Huntington et al., 2020; Kuletz et al., 2024), and leading to rising water temperatures, accelerating loss of multi-year ice, longer ice-free seasons, and decreasing snow cover, among other effects (Box et al., 2019; Niemi et al., 2024; AMAP, 2025). At the same time, these environmental transformations are facilitating the expansion of resource sectors (e.g., mining, hydrocarbon development, commercial fisheries), shipping, tourism, and military activities (Crépin et al., 2017; Mosoni et al., 2024; Niemi et al., 2024; Lemieux et al., 2025), which are expected to intensify in coming years (Government of Canada, 2024). However, the gaps in our baseline understanding of biodiversity, habitat use, and ecosystem structure and processes across much of the Arctic (CAFF, 2013; Dey et al., 2018; Niemi et al., 2024; Lemieux et al., 2025) hampers our ability to fully evaluate consequences for Arctic species and ecosystems.



Figure 1. The shoreline in Igloolik, Nunavut on October 3, 2025. Photo by A. Drake.

Researchers and Inuit communities are increasingly working in partnership, placing greater emphasis on local knowledge that extends, complements, and enriches the temporal and spatial scope of Western science-focused research (Riedlinger & Berkes, 2001; Moller et al., 2004; Laidler, 2006; Gagnon & Berteaux, 2009; Rathwell et al., 2015). Here, we refer to such knowledge as *Inuit knowledge*, which we understand to be a “cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment” (Berkes, 2018, p. 8)². As Inuit experience the effects of

¹ Inuit Nunangat (Inuit homelands, includes lands, waters, and ice) is a distinct geographic, cultural, and political region encompassing the Inuvialuit Settlement Region (Northwest Territories and Yukon Territory), Territory of Nunavut, Nunavik (Northern Québec), and Nunatsiavut (Northern Labrador).

² The term *Inuit Qaujimajatuqangit* (IQ) is also often used, and defined by Elders as “Inuit ways of knowing, ways of being, and worldview – past, present, and future” (Canadian Polar Commission, 2003, p. 6; Karetak et al., 2017).

habitat and species shifts daily, for example, through reduced accessibility, availability, and health of food sources, as well as heightened travel hazards (Brinkman et al., 2016; ICC Alaska, 2020; Ford et al., 2021), it follows that communities are initiating and leading research that centres local experiences of change. Such community-based participatory research or monitoring offers tangible benefits for communities, including capacity enhancement, knowledge co-production, and strengthened governance (e.g., Castleden et al., 2012; Banks et al., 2013; Johnson et al., 2015; Breitbart, 2016; Kouril et al., 2016).

Igloolik ($\Delta^{\text{u}}\text{ᓃᓕ}^{\text{b}}$ or *Iglulik*³; meaning: ‘place of houses’, Figure 1), situated on an island of the same name in Foxe Basin in the Qikiqtaaluk Region of Nunavut, is a leading site among Arctic nations for research on weather, water, ice, and other climate indicators (Bishop et al., 2025). *Iglulingmiut* (people of *Igloolik*; population: 2049, 94% Inuit, Statistics Canada, 2023) hold similar depths of expertise on sustenance species that underpin their traditional economy, namely Atlantic walrus (*Odobenus rosmarus rosmarus*, Inuktitut: *aiviq*)⁴, ringed seal (*Phoca hispida*, Inuktitut: *nattiq* or *natsiq*), Arctic char (*Salvelinus alpinus*, Inuktitut: *iqalukpik*)⁵ and caribou (*Rangifer tarandus*, Inuktitut: *tuktu*) (Ford et al., 2006; Laidler & Ikummaq, 2008). *Igloolik* is located near the mouth of Fury and Hecla Strait, which experiences extensive ice formation, creating a crucial platform for harvesting and travel (i.e., to the mainland on Melville Peninsula, Baffin Island, hunting and fishing camps, other communities) (Aporta, 2002; Laidler & Ikummaq, 2008) (Figure 2). As a result, community members hold rich and nuanced knowledge of marine conditions in the Foxe Basin area, which they refer to as *Ikiq*, translating to ‘great crossing’ (Aporta, 2002; Laidler & Ikummaq, 2008).

The marine areas surrounding *Igloolik* are biologically and culturally important to the community, while also sustaining life-history processes that link to broader ecological networks, prompting consideration of northern Foxe Basin for Fisheries and Oceans Canada (DFO) Marine Protected Area designation (see Paulic et al., 2014). The waters and ice near *Igloolik* Island support critical life stages for Arctic char, walrus, bowhead whale (*Balaena mysticetus*), and polar bear (*Ursus maritimus*) (Paulic et al., 2014), among other species. Currents in Fury and Hecla Strait transport nutrients, and together with tidal activity, maintain highly productive recurring polynyas, which function as nurseries and feeding grounds for species such as bowhead whale (Paulic et al., 2014). The region also serves as a migration corridor: northern Foxe Basin for bowhead whales, and Fury and Hecla Strait for beluga (*Delphinapterus leucas*) and narwhal (*Monodon monoceros*), which may occasionally overwinter in polynyas (Paulic et al., 2014). Despite recognition of the importance of the region, significant knowledge gaps remain regarding local environmental change near *Igloolik*.

³ We use Inuktitut names in syllabic and Roman orthography as they are records of linguistic heritage and land use history, and can indicate locations of significant events, ecologically important areas, landscape features, and potential dangers (Aporta, 2003; Wong et al., 2020).

⁴ *Iglulingmiut* are known for their practice of fermenting walrus meat, known as *igunaq*. In the past, hunters frequently travelled on moving sea ice to harvest walrus. While this tradition has become less common, it continues to be carried out by skilled hunters (Aporta, 2002; Ford et al., 2006).

⁵ During an IHTA meeting held in September 2025 (see Section 2.0, Methods), Board members informed AD that *iqalukpik* tends to refer to anadromous rather than landlocked Arctic char.

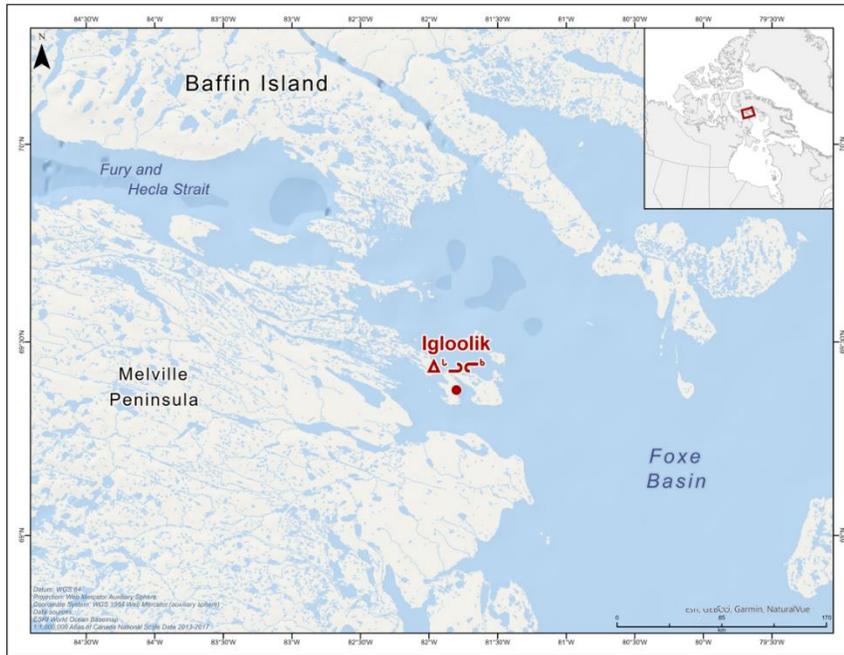


Figure 2. Map depicting Igloolik, Nunavut and surrounding areas. Land, waterways, and place names accessed from Natural Resources Canada 1:2,515,000 scale data (Natural Resources Canada, 2017). Basemap accessed from Esri World Ocean Base (Esri, 2014). Created by J. Friesen (DFO).

We focus on a project led by the Igloolik Hunters and Trappers Association (IHTA; community leaders in wildlife and resource management and conservation⁶) and researchers from Fisheries and Oceans Canada and Carleton University (AD, AP, LC, PG, VN, KD⁷) documenting Inuit knowledge about changes in aquatic ecosystems near the community. This initiative was co-developed in parallel to a coastal research project that took place in 2020 during the COVID-19 pandemic, which was headed by the IHTA and local technicians with remote DFO support (Christie et al., 2023b). In addition to completing the assessment of coastal fishes and their habitats, the IHTA was interested in recording changes experienced by knowledge holders over the course of their lifetimes. This manuscript report summarizes that latter effort, where our objective was to compile and document experiences and perceptions of change in aquatic habitats (coastal, marine, lacustrine) and species (marine mammals, fishes, invertebrates) near Igloolik through questionnaires with 26 knowledge holders. We gratefully acknowledge all those who contributed to this project, including local translator and technician J. Airut and questionnaire participants (see Section 6.0, Acknowledgements), and underline that this knowledge belongs to Igloolikmiut.

⁶ In the territory of Nunavut, the Land Claims Agreement allocates the implementation of resource management and environmental monitoring decisions to community Hunters and Trappers Associations (INAC, 1993; Lokken et al., 2019). Board members are elected by the community, with the IHTA having the authority to speak on behalf of the community on subjects pertaining to local resource management.

⁷ AD, AP, LC, VN, and KD are individuals of settler descent who reside in southern Canada, with this research informed by their environmental and social science backgrounds and shaped by their experiences supporting community-led research in Inuit Nunangat. PG is a Black Indigenous researcher of Mi'kmaq descent, who recognizes her relational connection to the place known to some as Canada.

2.0 Methods

A detailed timeline of key project steps is provided in Table 1, and includes: project conceptualization, questionnaire co-development and administration, data entry and analyses, and results dissemination and report preparation. The questionnaire was co-developed with the Igloodik Hunters and Trappers Association following a similar approach to a project in Kinngait, Nunavut (Christie et al., 2023a), which documented knowledge held by Kinngarmiut about changes across trophic levels in coastal, marine, and lacustrine ecosystems (see Drake et al., 2025). We use the IHTA's definitions of these ecosystems, where 'coastal' includes the zone from the shoreline to the low-tide line, and 'marine' encompasses areas beyond the low-tide line with open water. At the IHTA's recommendation, the questionnaire refers to six seasons: winter, early spring, spring, summer, early fall, and fall. We do not assign specific months to these seasons, as retaining this nuance may provide more holistic insight into annual change. We recognize that seasonality across Inuit Nunangat is locally specific, with community understandings of seasons closely linked to ecological cycles and harvesting practices (e.g., Dubos et al., 2023; Farnole et al., 2024; Drake et al., 2025; Cadman et al., 2025). Questionnaire topics are summarized in Table 2, and the final questionnaire is provided in Appendix A. Appendix B includes a preliminary results newsletter shared with the IHTA in fall 2021, while Appendix C contains the complete results summary discussed with the IHTA in fall 2025. All appendices are provided in both Inuktitut (North Baffin dialect) and English.

It is important to acknowledge the inherent limitations of using questionnaires to document knowledge. For instance, knowledge holders may have chosen not to disclose sensitive information. This concern was mitigated through project support from the IHTA, the involvement of a local community member in administering the questionnaires, and a collective interest in understanding environmental changes. Furthermore, opportunities for iterative interactions between the questionnaire administrator and knowledge holders may have shaped some responses (Brook & McLachlan, 2005). Conducting the questionnaires in the language chosen by each knowledge holder (Inuktitut or English) helped to reduce the likelihood of miscommunication. An in-person IHTA meeting held with lead author AD in Igloodik at the conclusion of the project allowed for clarification of uncertainties and the addition of contextual insights. This research was conducted under a scientific research license (0101221 N-M) from the Nunavut Research Institute, with ethics clearance received from the Carleton University Research Ethics Board (project ID #115098).

Table 1. Questionnaire project timeline and associated details, from October 2019 to September 2025.

Project steps	Date	Details
Project conceptualization	October 16 – 17, 2019	DFO researchers and the IHTA meet in person in Igloolik to discuss interest in an Inuit knowledge project documenting biodiversity and habitat changes near the community. The IHTA expresses support for this project, which will provide insights that complement and broaden coastal research findings.
	November 16, 2020	DFO researchers contact the IHTA to determine whether there is continued interest in a questionnaire project about changes experienced by community members. The IHTA indicates that the project will be considered at an upcoming meeting.
	December 21, 2020	The IHTA confirms support for a questionnaire project, and provides an accompanying letter for the Nunavut Research Institute licensing process.
Questionnaire co-development	December 2020 – January 2021	A draft questionnaire ^a is developed by DFO and Carleton University researchers for discussion with the IHTA. The questions are focused on changes in aquatic ecosystems surrounding Igloolik as observed or experienced by knowledge holders, where insights into biodiversity across trophic levels (marine mammals, fishes, invertebrates) and changes across ecosystems (coastal, marine, lacustrine) are sought. This draft incorporates environmental, biological, and harvest-related questions using a combination of close-ended (e.g., checkboxes) and open-ended formats ^b . The questionnaire includes an option to add the year when each change was observed.
	January 18, 2021	Researchers and the IHTA meet virtually to discuss project logistics (e.g., timelines, compensation). The IHTA decides that J. Airut will translate the draft questionnaire from English to Inuktitut (North Baffin), and that both Elder and non-Elder knowledge holders will be included so that responses represent a range of experience levels. The IHTA indicates that they consider individuals age 55 and greater to be Elders, and individuals 54 or younger to be non-Elders ^c .
	February 10, 2021	Researchers send a letter to the IHTA requesting a meeting to review the draft questionnaire, and seeking IHTA guidance on data governance considerations. These considerations include the OCAP® principles (ownership, control, access, possession; FNIGC, 2014; 2019), with researchers proposing questionnaire storage measures and identifying intended outputs for IHTA approval.
	March 9, 2021	Researchers meet virtually with the IHTA to receive feedback on the draft questionnaire. They review each question with the IHTA, who recommend the following additions: options ‘more good/bad ice’ for sea ice quality; habitat parameters salinity, wind speed, and wind direction; and seasons ‘early spring’ and ‘early fall’ for harvest timing. The IHTA also specifies that marine mammals should include polar bears. The IHTA then approves the questionnaire (see Table 2 and Appendix A).

Questionnaire administration	March 10, 2021	An IHTA meeting is held, where J. Airut is selected to administer the questionnaires and knowledge holder questionnaire participants are chosen. While non-random sampling is commonly used when eliciting expert knowledge, it can constrain the extent to which findings are generalizable to the broader community (Drescher et al., 2013; Creswell & Creswell, 2018). In this case, results may represent community knowledge as participants are experienced and recognized knowledge holders in Igloolik.
	April 6, 2021	Researchers and J. Airut meet virtually to review the questionnaire content and ensure that they share an understanding of question intent. A consent form associated with Carleton University (see Section 6.0, Acknowledgements) is also reviewed, which includes a project summary, intended use of information, participant rights (e.g., voluntary participation, withdrawal), and knowledge protections (e.g., confidentiality, questionnaire storage). J. Airut provides a list of knowledge holders selected by the IHTA to researchers, and plans to periodically check in with researchers during questionnaire administration.
	April 9 – June 3, 2021	J. Airut administers questionnaires to 26 knowledge holders (Elders and non-Elders) in their homes or at the IHTA office. Prior to each, participants are provided with the consent form in English or Inuktitut. During this time, J. Airut remains in regular contact with researchers via email, phone, and text.
Data entry and analyses	July – October 2021 ^d	Researchers receive the questionnaires, create a questionnaire database in Microsoft Excel, and conduct initial analyses. At this stage, data regarding the year that changes were experienced are deemed unusable as this section was incomplete. A newsletter is created in October 2021 to share initial results with the IHTA (see Appendix B). The original questionnaires are returned to Igloolik for long-term storage.
	December 2024 ^d – May 2025	Questionnaire data are re-entered into the database, with double-entry verification conducted to ensure accuracy. Summary figures illustrating questionnaire results are generated using Microsoft Excel.
Results sharing and report preparation	May 9, 2025	AD sends letter to the IHTA re-introducing the project and requesting support for a virtual and/or in-person meeting to discuss results.
	June 11, 2025	The IHTA confirms their interest in holding an in-person meeting in fall 2025 to review results and offer feedback on a draft report.
	July – August 2025	DFO researchers write draft report to be shared with the IHTA.
	September 29, 2025	The IHTA and AD meet in-person in Igloolik to discuss questionnaire results, during which the IHTA confirms their interest in co-authorship. Contextual information identified at the meeting is included in this report.

^a We define *questionnaire* as a tool used to acquire information about a population by administering standardized questions to a sample of individuals (McLafferty, 2016).

^b By combining qualitative and quantitative approaches, this mixed method design leverages the strengths of both to yield more detailed findings than either method alone (Creswell & Creswell, 2018).

^c Based on these criteria, approximately 93% of Igloolik’s population are non-Elders, while 7% are Elders (Statistics Canada, 2023). In September 2025, the IHTA informed AD that *inait* (meaning: the older ones) can be used to refer to Elders, while *inuit* (meaning: the younger ones) refers to non-Elders.

^d Between October 2021 and December 2024, a combination of factors (e.g., staffing, health-related) resulted in our inability to conclude this project.

Table 2. Summary of questionnaire topics.

Topic	Parameters
Participant demographic information ^a	Gender Age Number of years in community
Ocean	Water temperature Salinity Wind speed and direction Swells Sea ice characteristics (area, thickness, quality, timing of break-up and formation) Relative species abundance and diversity ^b (marine mammals, fishes, invertebrates)
Coast	Water temperature Wind speed and direction Erosion Relative species abundance and diversity (marine mammals, fishes, invertebrates)
Lake	Water temperature Wind speed and direction Water clarity Lake ice characteristics (area, thickness, quality, timing of break-up and formation) Relative species abundance and diversity (freshwater fishes, invertebrates)
Harvest information	Harvesting practices (hunting and fishing), locations, number of years, frequency, timing Most-harvested species, and changes in their abundance, timing, and locations Conditions of marine mammals, and marine and lacustrine fishes
Community concerns	Concerns about the ocean, coast, and lake
Feedback	Questionnaire effectiveness and length Missing topics and future research interests

^a The questionnaire initially contained a question related to employment status which was deemed not relevant.

^b Some of the terms used in this report differ from those used in the questionnaire. For example, ‘relative abundance’ and ‘species diversity’, seen here, are referred to as ‘number of species’ and ‘types of species’ in the questionnaire.

3.0 Results

This section presents questionnaire findings, spanning knowledge holder demographic information (Section 3.1), changes in habitats (Section 3.2) and species (Section 3.3), and other community concerns (Section 3.4). When available, direct quotes are included to elevate knowledge holder voices. In instances where knowledge holders preferred not to be identified alongside their quotes, the letter ‘P’ (for participant) followed by the questionnaire number is used to maintain confidentiality. For most figures, results are differentiated by age groups (i.e., Elders and non-Elders), where percentages are out of 13 knowledge holder participants unless otherwise specified. The response ‘not applicable’ (NA) indicates cases where multiple checkboxes were selected, knowledge holders were uncertain, or they chose not to answer.

3.1 Knowledge holder demographics

The questionnaires were administered to 26 knowledge holders. Both female and male knowledge holders with varying experience levels ($n = 13$ each for Elders and non-Elders) participated, with most participants being male non-Elders ($n = 11$), followed by male Elders ($n = 9$), female Elders ($n = 4$), and female non-Elders ($n = 2$) (Figure 3). Participant ages ranged from 24 to 81 years, with an average age and standard deviation of 56.5 ± 17 years.

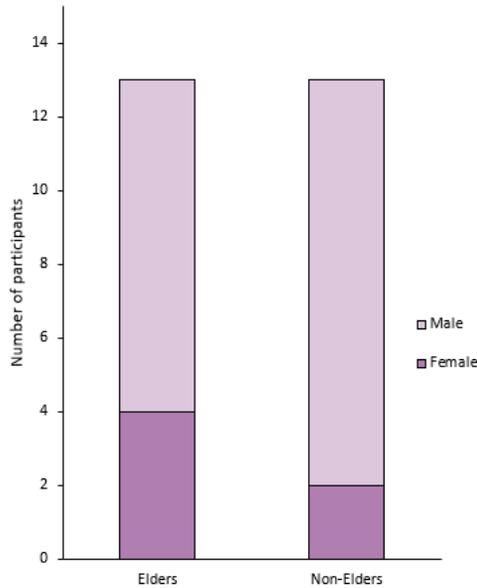


Figure 3. Number of participants by experience level and gender, where Elders were age 55 and greater, and non-Elders were age 54 and younger.

3.2 Habitat changes

3.2.1 Water temperature

Knowledge holders of varying experience levels (Elders and non-Elders) observed that water temperatures are changing across the ocean, coast, and lakes, with most noting an overall warming trend ($n = 11$ for ocean and coast, $n = 9$ for lakes; Figure 4). Elder Theophile Kangok remarked that the water “seems to be not as cold”, while Elder Peter Awa stated that the water is warming “from beneath”. However, a few people also indicated that there is no change in water temperature in the ocean or lakes ($n = 8$ each), with this being the most common response among Elders for lake ecosystems. Others, particularly Elders, indicated that water temperature is declining in the three ecosystems ($n = 4$ each).

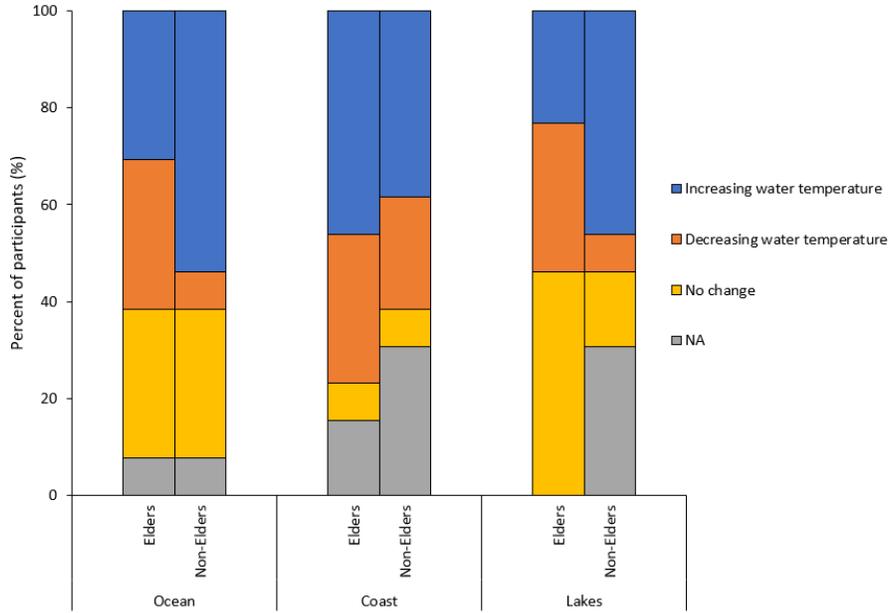


Figure 4. Percent (%) of participants reporting changes in water temperature in the ocean, coast, and lakes.

3.2.2 Salinity

Many knowledge holders ($n = 12$), particularly non-Elders, did not provide a response (i.e., ‘not applicable’) regarding changes in salinity in the ocean as they “do not know” (as written by J. Airut on questionnaire) (Figure 5). Among Elders who did respond, views were split between increasing and decreasing salinity, with one individual noting that salinity “depends on snow” (P15). Three non-Elders reported an increase in salinity.

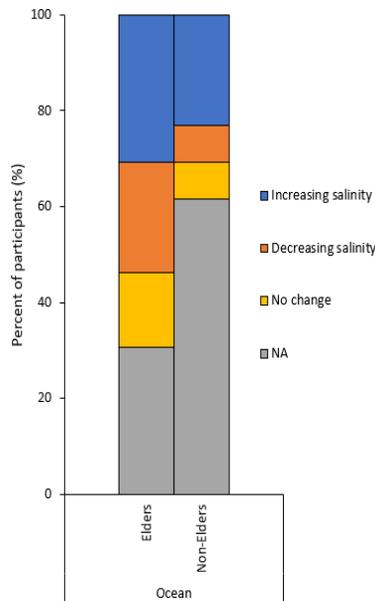


Figure 5. Percent (%) of participants reporting changes in salinity in the ocean.

3.2.3 Water clarity and lake water levels

Perceptions of water clarity in lakes varied by experience level. Three times as many Elders ($n = 9$) as non-Elders ($n = 3$) reported no change in clarity (Figure 6), while several non-Elders observed a decrease in clarity ($n = 6$).

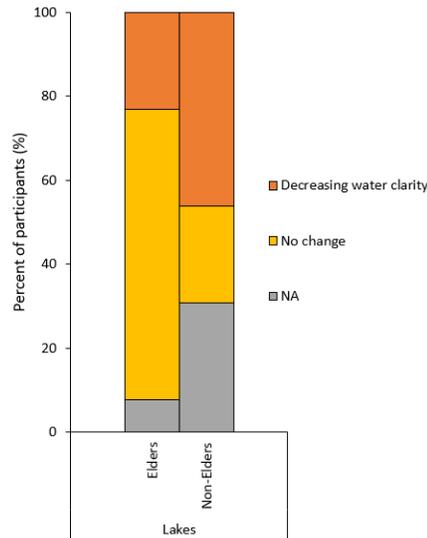


Figure 6. Percent (%) of participants reporting changes in water clarity in lakes.

While discussing water clarity, knowledge holders reported noticeable declines in lake water levels, with an individual describing “less lake water” (P26), and Elder Joachim Alaralak observing that some lakes are “drying up”. These concerns were echoed by several others, including Elder Eunice Palluq, who noted that there are “no more lakes in some areas”. A non-Elder participant explained that “in area, the lake and river are decreasing”, adding that “lakes are draining, and most lakes evaporate every year due to changing snow and warming” (P21). These changes may be linked in part to broader observations of “less rain” overall (Joachim Alaralak).

3.2.4 Erosion and swells

There was variation in responses concerning coastal erosion based on experience level. Eleven Elders and two non-Elders noted an increase in erosion, with one Elder, Theophile Kangok, explaining that he now sees “more large rocks visible” (Figure 7). In contrast, several non-Elders ($n = 5$) indicated that they had not observed any change.

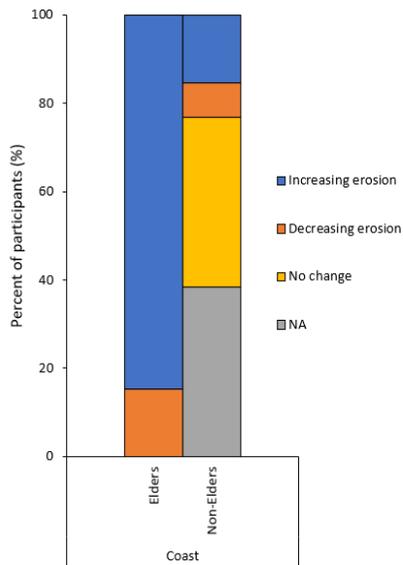


Figure 7. Percent (%) of participants reporting changes in erosion on the coast.

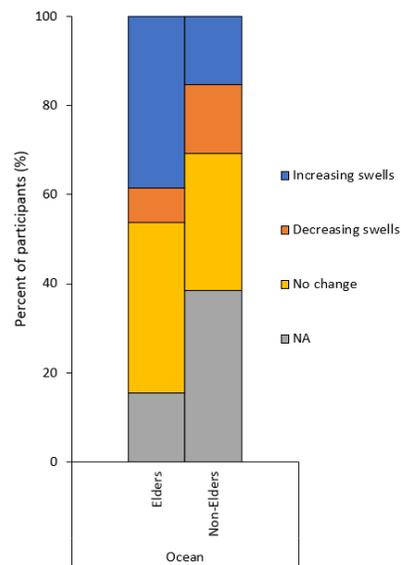


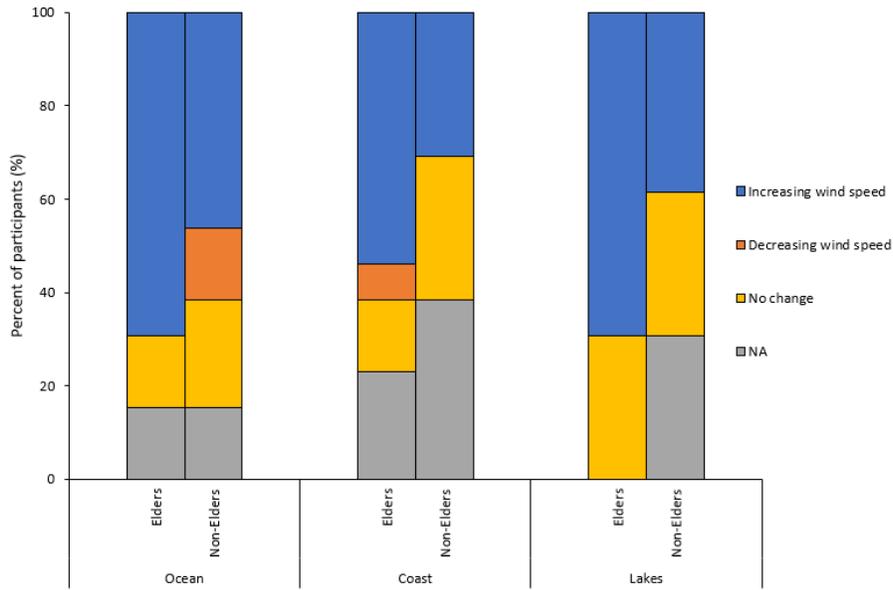
Figure 8. Percent (%) of participants reporting changes in swells in the ocean.

An equal number of Elders reported no change and an increase in ocean swells ($n = 5$ each), while non-Elder responses were divided between no change ($n = 4$) and ‘not applicable’ ($n = 5$) (Figure 8). One Elder, Theophile Kangok, offered context for the limited responses, noting he “hasn’t really noticed except in fall”.

3.2.5 Wind speed and direction

Most participants observed increasing wind speeds across the three ecosystems, with Elders frequently reporting this trend ($n = 9$ for both ocean and lake, $n = 7$ for coast) (Figure 9A). Elder Susan Avingaq remarked that there are “more winds now” in the ocean, while Elder David Inngaut commented that it is “almost always windy” around lakes. Some emphasized variability in coastal areas in particular, noting that wind speed “depends” (P13, P14). Among Non-Elders, responses were more evenly distributed, with wind speed in coastal areas and lakes either reported as increasing ($n = 4$ and $n = 5$, respectively) or unchanged ($n = 4$ for each).

A.



B.

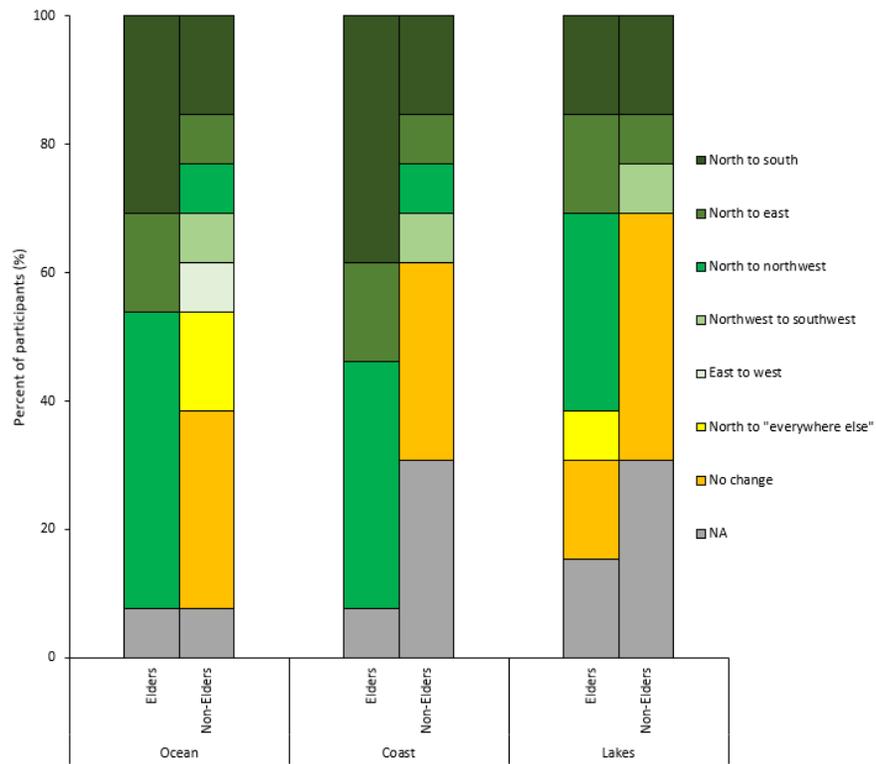


Figure 9. Percent (%) of participants reporting changes in (A) wind speed and (B) wind direction, in the ocean, coast, and lakes. Wind directions indicate the point of origin.

Most Elders reported a shift in wind direction, which now comes from the northwest in all three ecosystems ($n = 6$ for ocean, $n = 5$ for coast, $n = 4$ for lakes), followed by the south, and east, rather than from the north (Figure 9B). Two Elders observed no change in lake wind direction, which was not noted in the ocean or coast. Conversely, the most common response among non-Elders was no change in wind direction ($n = 4$ for ocean and coast, $n = 5$ for lakes), followed by two reports in each ecosystem of a change from north to south. A few knowledge holders across experience levels also described wind changing from north to “everywhere else” and from northwest to southwest.

3.2.6 Sea and lake ice

Area and thickness

Nearly all Elders reported a decline in ice area in the ocean ($n = 13$) and lakes ($n = 11$) (Figure 10A). One Elder remarked that there is “no ice” in the ocean (P4), while another noted that lake ice “melts faster now” (P7). Most non-Elder responses aligned with those of Elders; however, a few non-Elders reported no change in ocean ($n = 3$) or lake ice extent ($n = 4$). A similar pattern in responses was observed for ice thickness, with almost all Elders and most non-Elders reporting thinner ice in both environments (Figure 10B). As one Elder shared, lake ice “by January used to be five inches [and is] now three inches” (P11), while another observed that it is “melting from underneath” (P15). A third Elder added: “you can tell it’s thin ice when it’s covered in snow. Snow is softer, doesn’t get as hard” (P11). Three non-Elders stated that lake ice thickness has not changed.

Quality

Several knowledge holders from both experience levels reported a decline⁸ in sea ice quality in the ocean ($n = 7$ for Elders, $n = 6$ for non-Elders) (Figure 10C). Elders described encountering “bad ice” (Gideon Taqaogak) that “thins faster” (P4), noting that “last year’s ice [is] no more” (P7). Non-Elders echoed these concerns, observing that there is “no more old ice” (P9) and that ice is becoming “rougher” (P13). In contrast, observations of lake ice quality were more mixed. Many reported no change ($n = 7$ for Elders, $n = 5$ for non-Elders), while others noted a decline ($n = 2$ for Elders, $n = 6$ for non-Elders). Elders described lake ice as “more slushy at times” (David Irgaut) and “crystallizing sooner” (Theophile Kangok).

Timing of break-up and formation

Most Elders and non-Elders observed earlier spring ice break-up⁹ in the ocean ($n = 12$ and $n = 9$, respectively) (Figure 10D). Elders said ice “melts too fast” (P15) and “ice melts sooner” (David Irgaut), with another identifying “July 1” as the typical date for ocean ice break-up (P11). For lakes, most non-Elders similarly reported earlier break-up ($n = 9$), whereas Elders were evenly

⁸ While the questionnaire did not allow knowledge holders to specify the direction of change in ice quality in the ocean or lakes (Figure 10C), recorded comments suggest that a ‘change’ indicates a decline in quality.

⁹ The community’s understanding of ice break-up timing refers to the point at which sea ice is no longer safe for travel (i.e., platform is not useable), rather than when the ocean is entirely ice-free (IHTA as stated on 29 September 2025; see also Laidler et al., 2010; Paulic et al., 2014).

divided between earlier break-up and no change ($n = 5$ for each). For fall ice formation (Figure 10E), one knowledge holder explained that the “ice forms at different times depending on the lake size”, and that “Mogg Bay [located southwest of Igloodik Island] ice forms later than any other lake” (P11). There was also broad agreement that ocean ice forms later in the fall, with David Irngaut noting that this shift “depends on how cold” it is. Another Elder explained that “ice forms later and [there is] no more old ice”, and “[even] by October the ice doesn’t form anymore”, although “sometimes it comes back” (all P11). In lakes, most knowledge holders also reported later ice formation, although three individuals each from both the Elder and non-Elder groups reported no change.

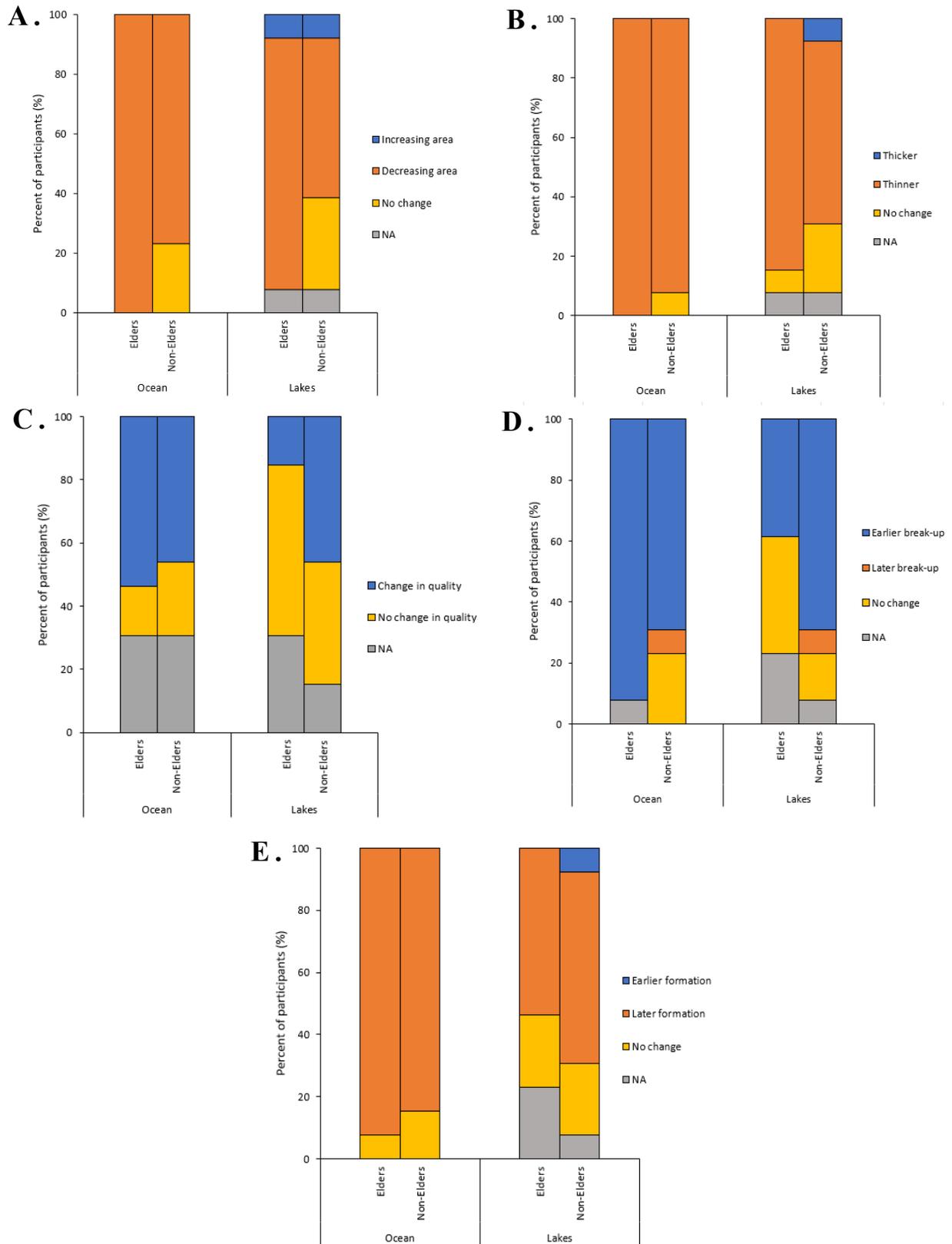


Figure 10. Percent (%) of participants reporting the following changes in sea and lake ice: (A) area, (B) thickness, (C) quality, (D) timing of spring ice break-up, and (E) timing of fall ice formation.

3.3 Species changes

3.3.1 Relative species abundance and diversity

Marine mammals

Most Elders observed a decline in marine mammal abundance in the ocean ($n = 9$) and coast ($n = 10$)¹⁰, whereas non-Elder responses were split between reports of a decline and no change (Figure 11Ai). An Elder observed “less seals due to thin ice” and “no more seal holes in the bay”, adding that there are “no more harp seals” (P11). Several knowledge holders suggested that there are “less walrus and seals due to noise” (David Irngaut, Theophile Kangok, P4) and “loud equipment [which has] scared mammals, fish, and seals” (P21) (see also Section 3.4, Other concerns and future research interests), while another attributed some species declines (e.g., walrus) to the paucity of sea ice (P11). Additionally, a few Elders reported seeing more polar bears, which they also associated with diminishing sea ice (Peter Awa, P11, P15). With regard to species diversity (Figure 11Aii), Elder responses were mixed, with some perceiving no change ($n = 6$ for ocean and $n = 7$ for coast) and others reporting a decline ($n = 5$ for ocean, $n = 4$ for coast). Most non-Elders reported no change in diversity ($n = 8$ for ocean, $n = 7$ for coast).

Fishes

Knowledge holders reported similar observations across the ocean, coast, and lakes for fish abundance. Responses were divided between reports of no change (e.g., for the ocean, $n = 5$ for both Elders and non-Elders) and decreasing abundance (e.g., for the ocean, $n = 4$ for both groups) (Figure 11Bi). One Elder shared, “there used to be lots of cod at the shoreline along with sculpin, they have decreased” (P7, echoed by P11). Elder David Irngaut shared that declines in fish abundance may be “due to people leaving dirt and mess on lakes”, while another noted that there are “no more fish by Christmas” in the lakes (P11). A smaller number of knowledge holders reported increasing fish abundance (e.g., $n = 3$ for Elders and $n = 4$ for non-Elders for the ocean). In terms of species diversity (Figure 11Bii), most non-Elders observed no change across ecosystems. However, five Elders each reported the appearance of new species in the ocean and coast. Several identified these newcomers as salmon (David Irngaut, Peter Awa, P15), while one Elder suggested that they “may be Pond Inlet [Mittimatalik] fish” (P11). Elder David Irngaut named *sulukpaugaq* as a newly observed species, which likely refers to Arctic grayling¹¹ (Randa, 2002; Government of Nunavut, 2018). A few knowledge holders also reported a decline in species diversity (e.g., for non-Elders, $n = 2$ for ocean and coast, $n = 1$ for lakes).

Invertebrates

Approximately half the knowledge holders from both experience levels did not provide responses about invertebrate abundance or diversity in all ecosystems (Figure 11C). Several

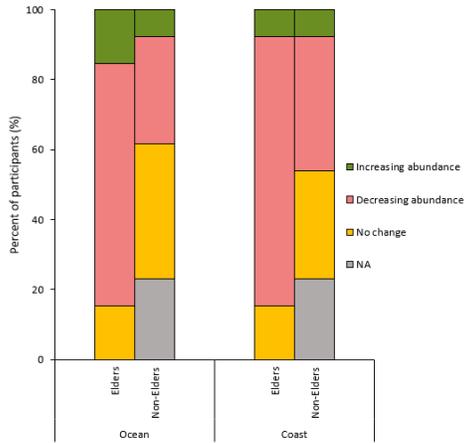
¹⁰ While marine mammals occupy both marine and coastal zones, and results across these ecosystems are broadly similar, we report them separately to maintain consistency with how results were documented in the questionnaires.

¹¹ AD made efforts to translate Inuktitut questionnaire responses into English. Translations are included in this report only when there was a high degree of confidence in their accuracy. These translations were verified with the IHTA in September 2025 (see Section 2.0, Methods).

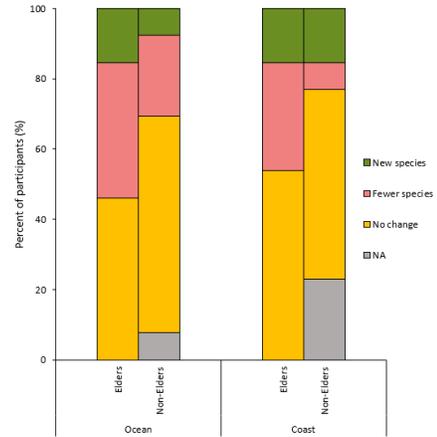
participants explained that they “don’t hunt invertebrates” (Theophile Kangok, P11), “never look under the ocean for invertebrates” (P2), or simply “don’t know invertebrates” (Gideon Taqaogak, David Irngaut). Yet, an Elder shared that “after strong winds the invertebrates go to shore” (P14), while a non-Elder noticed that invertebrates are “growing big” (P21). Among those who did respond, most reported no change in abundance or diversity. One Elder, however, reported increasing abundance and the appearance of new species in the ocean and along the coast, attributing these changes to “less water” (P4).

A. Marine mammals

i)

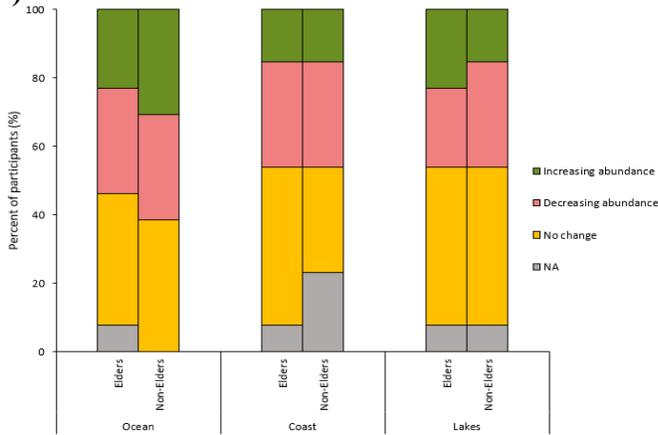


ii)

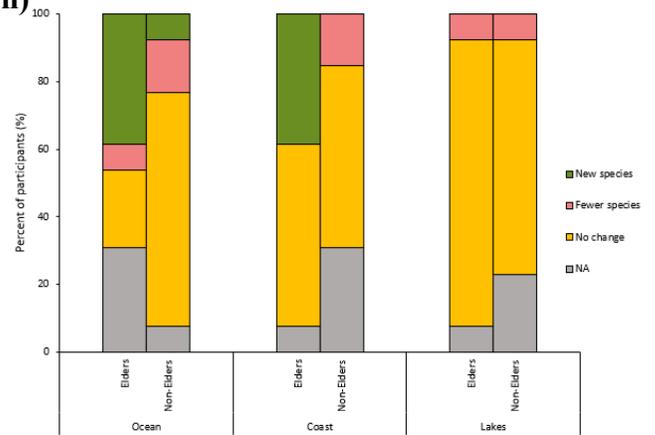


B. Fishes

i)

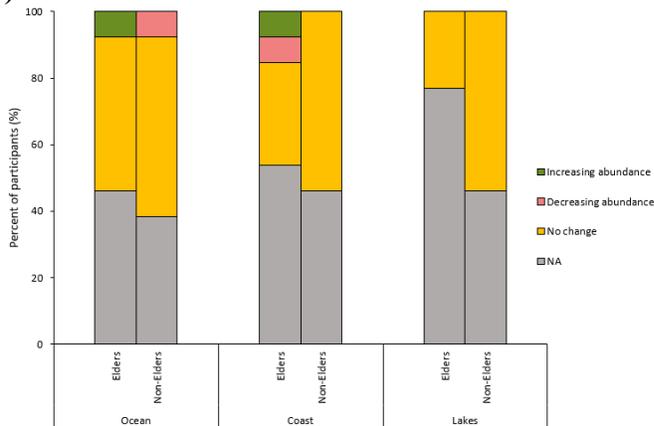


ii)



C. Invertebrates

i)



ii)

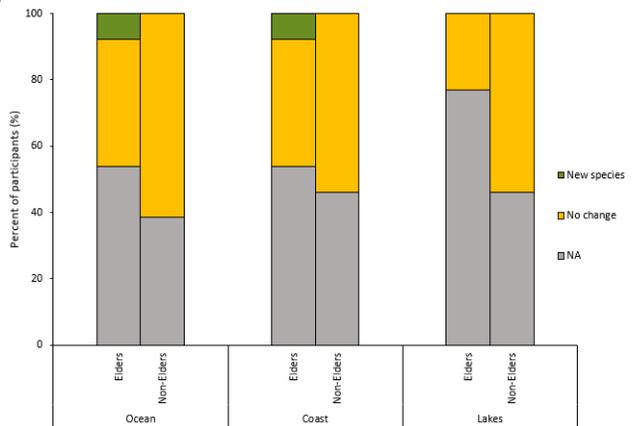


Figure 11. Percent (%) of participants reporting changes in (i) relative abundance and (ii) species diversity of (A) marine mammals, (B) fishes, and (C) invertebrates.

3.3.2 Harvesting

In this section, responses from Elders and non-Elders are combined to support a broad overview of harvesting information, rather than emphasizing distinctions related to the timing of ecological parameter changes that may be inferred from Elder and non-Elder observations in earlier sections (i.e., Section 3.2, Habitat changes and Section 3.3.1, Relative species abundance and diversity).

Species harvested

The most common species harvested by knowledge holders were Arctic char (*Salvelinus alpinus*, $n = 18$) and seals (Phocidae, $n = 16$), followed by lake trout (*Salvelinus namaycush*, $n = 8$), walrus (*Odobenus rosmarus rosmarus*, $n = 6$), trout (Salmonidae, $n = 5$), and beluga whale (*Delphinapterus leucas*, $n = 5$) (Figure 12). Species are reported using the terminology provided by knowledge holders to maintain specificity. Consequently, categories such as ‘ringed seal’, ‘bearded seal’, and ‘seal’, as well as ‘lake trout’ and ‘trout’ are presented separately.

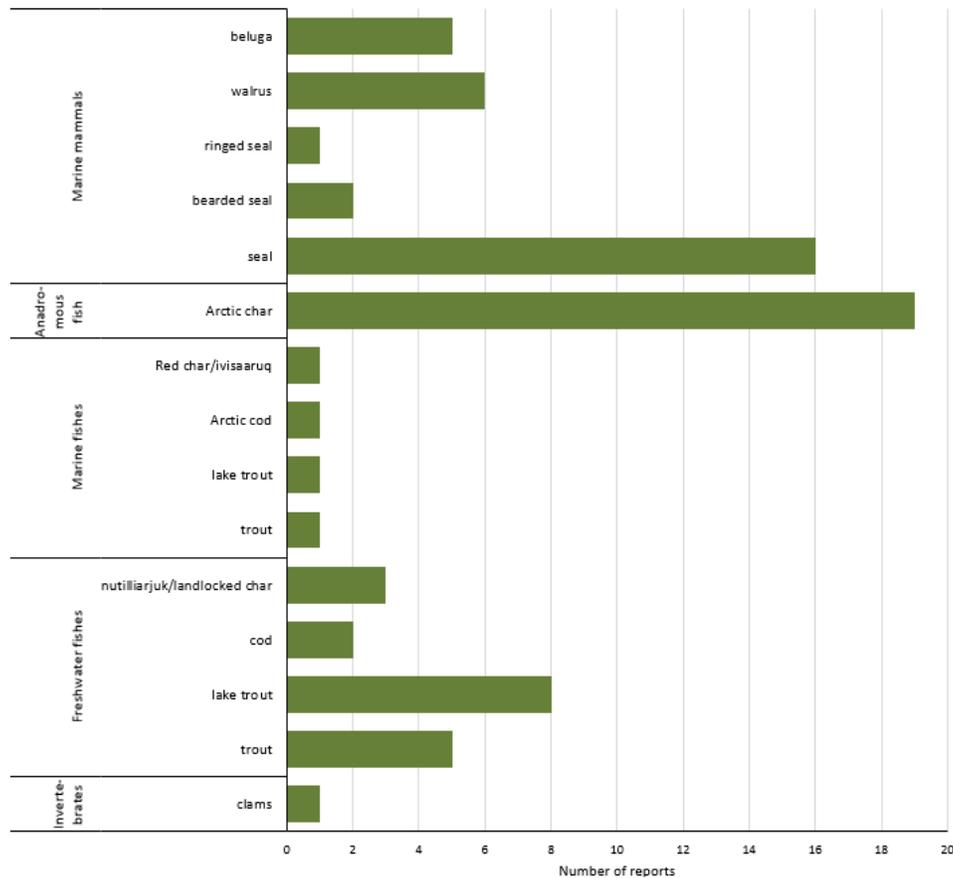


Figure 12. Harvested species reported, using species names provided by knowledge holders. Red char or *ivisaaruk* is a male Arctic char at time of spawning, while *nutilliarjuk* refers to lacustrine, non-migratory (i.e., landlocked) Arctic char (IHTA as stated on 29 September 2025; see also Randa, 2002).

Species condition

Most knowledge holders reported no overall change in species condition ($n = 13$ each for marine mammals and fishes, $n = 17$ for freshwater fishes) (Figure 13). However, several knowledge holders noted specific changes in marine mammals. A few observed shifts in size ($n = 4$), as well as colour and smell (both $n = 2$). An Elder, Michelline Ammaaq, commented that marine mammals are “less fat” while David Irgaut said “the size seems smaller and thinner for mammals”, adding that “the insides of walrus seems smaller now”. Others ($n = 1$ each) had observed changes in diet, meat quality, texture, taste, and appearance. One Elder stated that marine mammals “eat different food than before” (P13), and another observed that “some walruses have parasites” (P4).

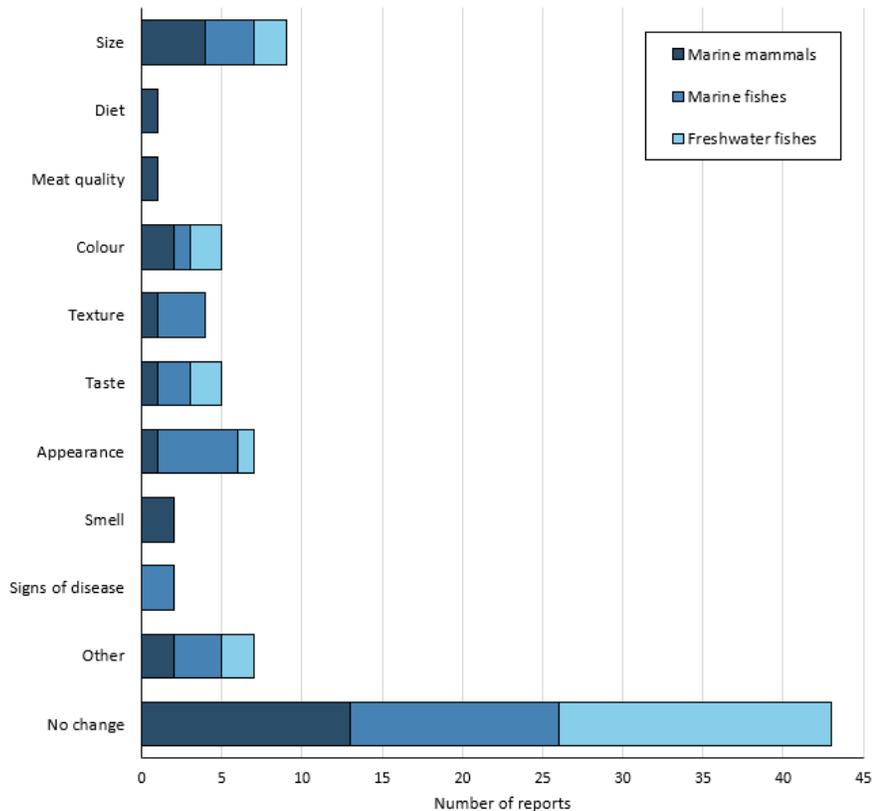


Figure 13. Number of reports of changes in the condition of marine mammals, and marine and freshwater fishes.

Among marine fishes (predominantly Arctic char), changes in appearance were most notable ($n = 5$), which included “whiter meat”, according to an Elder (P7). Changes in size and texture were also common ($n = 3$ each), with an Elder describing that “the fish seem to be slimier” (P14). Some knowledge holders have observed an increase in fish size, stating that “growing fish are now big” (P21) and “marine fish seem fatter” (P4). Interestingly, others observed the opposite trend: “the size seems smaller and thinner for fish” (David Irgaut, P2). Two knowledge holders reported signs of disease, sharing: “some have bloated stomachs that have to be checked” (P11), and “we know which ones have disease or whatnot so we don’t catch them” (P15). Two others

noted changes in taste, specifically, that fish(es) “taste more like moss” (P2). Among freshwater fishes, knowledge holders reported changes in size, colour, and taste ($n = 2$ each). Two Elders declared that “some fish are now larger” (Susan Avingaq, P11) in lakes, and a non-Elder shared that they are seeing “big fish” (P21). As with marine fishes, an Elder explained that “some have bloated stomachs that have to be checked” and “we end up throwing them” (P11).

Harvest timing

During winter, early spring, early fall, and fall, knowledge holder responses were relatively evenly distributed between later harvest timing ($n = 7, 6, 8, 7$, respectively) and no change in timing ($n = 7, 7, 6, 7$) (Figure 14). Fewer participants reported earlier harvesting ($n = 1, 4, 4, 3$) for these seasons. Elder Peter Awa underlined that during colder months, harvest timing depends on ice thickness, sharing that “hunters have to be careful of thin ice, it gets too thin”. Additionally, knowledge holders explained that timing is affected by species abundance (see Section 3.3.1, Relative species abundance and diversity) and locations, which may be shifting. For example, one Elder noted that walrus have “moved due to no ice” (P11), resulting in hunters harvesting in new areas. A non-Elder expressed concern that “whales don’t arrive anymore” (P26). In the spring, the majority of participants shared that they are harvesting earlier ($n = 12$), while in summer, most reported no change in harvest timing ($n = 11$).

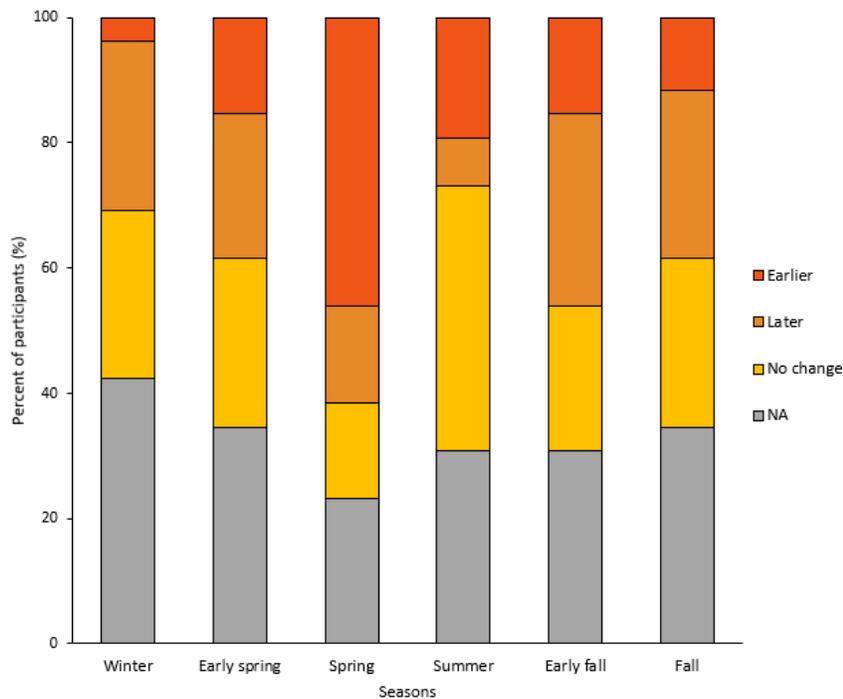


Figure 14. Number of reports of changes in the timing of harvesting across seasons, where percentages are out of 26 knowledge holder participants.

3.4 Other concerns and future research interests

Table 3. Other concerns and future research interests identified by knowledge holders in the questionnaire.

Research area	Details	Further context (if available)
Climate change ^a	- Specific effects and locations of change near Igloolik	Elder Joachim Alaralak reflected that changes are “beyond our control, the temperature is changing”. Another Elder explained that the “sun used to be warm, now we can’t go boating without our coats anymore” and the “plants and bugs are different...we see different small birds, due to climate change” (P15). Elder Gideon Taqaogak specified that more research is needed “near Siuraarjuk”, located directly north of the hamlet of Igloolik. This area has high numbers of fishes, whales, and polar bears (IHTA as stated on 29 September 2025).
Ice	- Timing of sea ice break-up and formation - Reasons for thin ice in certain areas	None provided.
Water levels	- Locations with low water levels - Low tide on coast	Elder Peter Awa commented that he is interested in research on “places where there seems to be less water, more boats marooning on rocks”. Other knowledge holders expressed concern regarding “the low tide [which] has gotten longer” (P13) and “lower” (P15).
Water quality	- Potable water	One Elder indicated that he would like to see “more research on lakes and rivers around Ikpikitturjuaq [Steensby Inlet] to see the quality of drinkable water” (P11).
Marine mammals	- Walrus - Seals (e.g., ringed and bearded seal) and their food sources - Beluga - Narwhal - Polar bear	Elder David Irgaut voiced concern that “there will be less animals to hunt”. He spoke about narwhal, saying: “they have to be researched too although there aren’t many in our area. I believe the narwhals from Pond Inlet [Mittimatalik] and Arctic Bay [Ikpiarjuk] will run to our area from the ships ^b , therefore we need more information”. Another Elder, Theophile Kangok, said there are “too many polar bears, can’t even find camping grounds”.
Shipping	- Noise	Several knowledge holders expressed concern regarding “Baffinland affecting the area” (David Irgaut, P13) ^c . As discussed in Section 3.3.1 <i>Relative species abundance and diversity</i> , specific concerns relate to declines in marine mammals (e.g., walrus, seals) and impacts on other marine species (e.g., fishes) associated with noise.
Garbage accumulation	- Cleanliness of lakes	Several knowledge holders emphasized the need for “cleaning and putting more garbage bins around the coast” and “the bottom of the lakes” (Theophile Kangok, P2) to address the growing problem of “too much garbage” (P27 ^d). David Irgaut noted that people are “leaving metal debris on lakes” and “some even leave nets all winter”. Another participant added that “there are more freeze-up of fishing nets at Mogg Bay [located southwest of Igloolik Island] and the dead fish smells” (P7).

Fishes	- Fishes (e.g., cod) and their food sources - Lacustrine fish habitat	Gideon Taqaogak expressed interest in “more research on lakes that might have fish”.
Invertebrates	- Walrus food sources (e.g., clams) - Other invertebrate species	Elder David Irgaut expressed interest in research on “invertebrates that are eaten by sea mammals”. An Elder suggested “more research on invertebrates in Ikpikitturjuaq [Steensby Inlet]” (P11).
Aquatic plants	- Macroalgae	An Elder said that in early fall and fall, “there are more abundant seaweeds until the ocean freezes” (P7), and Theophile Kangok added that it “needs to be cleared before ice forms”.
Terrestrial and avian species	- Foxes - Wolves - Ravens	None provided.

^a Climate change components may also appear in other table sections.

^b Reductions in sea ice have made Arctic shipping routes more navigable in recent years (e.g., Dawson et al., 2020; Copland et al., 2021).

^c The IHTA and other Iglulingmiut have voiced concerns about the expansion of Baffinland’s Mary River iron mine and shipping activities associated with Steensby Inlet for several decades (e.g., Antunes, 2024; Wat, 2025).

^d This identifying number exceeds 26 because the questionnaires were prenumbered and some were not distributed.

4.0 Discussion

This section offers context surrounding differing Elder and non-Elder responses (Section 4.1), habitat changes (Section 4.2), and species changes (Section 4.3). Concerns raised by knowledge holders and future research interests are included where relevant.

4.1 Elder and non-Elder responses

For all ecological parameters below, we underline that the extent to which habitat and species-related changes are perceived and their impacts felt by Iglulingmiut depends on who is experiencing these environments, as well as the nature of that use, including how (e.g., for hunting or fishing), where (e.g., specific harvesting sites), when (e.g., season or year), and for how long areas are experienced or occupied (Laidler et al., 2010; Drake et al., 2025). Notable differences in responses were observed between Elders and non-Elders for several parameters (e.g., wind speed and direction, erosion, water clarity, marine mammal abundance), which may reflect variation in time spent on the land and lived experience. In some cases, Elders reported changes where non-Elders did not, suggesting that perceived changes may relate to long-term shifts extending several decades into the past, beyond the temporal scope of younger knowledge holders. Conversely, observations of change noted by non-Elders but not by Elders may indicate more recent, marked effects of climate change. Some Elders shared that they “don’t go as often” (Theophile Kangok, P14), while others “don’t go anymore” in certain seasons (i.e., winter) or areas (i.e., lakes) (Michelline Ammaaq). This in no way diminishes the depth and richness of knowledge held by Elders, which could extend back as early as the 1940s (see Section 3.1, Knowledge holder demographics).

4.2 Habitat changes

Wind direction and intensity are parameters of key importance for Iglulingmiut, as they influence the timing and process of ice formation, movement, and deterioration, in turn impacting travel and access to harvesting sites (Aporta, 2002; Laidler & Ikummaq, 2008). Winds originating from the northwest rather than from the north, as reported in this study, bring “clear, cold weather” that “blows ice out” and contributes to “smoother freezing”, while winds from the south and east, also reported here, create “warmer, overcast weather” that “moves ice toward land, or the floe edge” and “contributes to rougher freezing” as noted by knowledge holders (Laidler & Ikummaq, 2008, p. 143; Aporta, 2002; Laidler et al., 2010). The increasing wind speed reported by Elders in this study influences ice processes, for example by moving ice back and forth, which accelerates ice break-up (Laidler & Ikummaq, 2008). Therefore wind intensity contributes to observations of earlier sea and lake ice break-up, later formation, and year-to-year variation reported in this study and previous research (Laidler et al., 2010; Knopp et al., 2022; Saros et al., 2023). Winds and related impacts can also affect summer boating conditions, as discussed by knowledge holders (Laidler et al., 2010). On the coast, the increasing swells reported by some may be resulting from the coupling of stronger surface wind speeds and declining sea ice extent, which opens new areas for wave formation (Steiner et al., 2015; Casas-Prat et al., 2018). Knowledge holder observations of swells during the fall may be connected to the timing of the minimum sea ice extent in September, which is often accompanied by forceful winds (Stopa et al., 2016). Future research should consider the interplay between sea ice and swells, which can

represent a positive feedback process (Asplin et al., 2012), and the role of wind when examining changes near the community.

Declines in ice thickness, extent, and changes in water temperature were also reported in the questionnaires. In the marine environment, these shifts tend to be most obvious near the floe edge and the perimeter of polynyas where harvesting occurs (Laidler et al., 2009), while in freshwater lakes, observations may be centered on community fishing areas. In the questionnaires, knowledge holders linked snow accumulation to thinner ice, as more snowfall on newly-formed ice insulates the ice and promotes melting from below (Ford et al., 2006; Ford, 2008; Laidler & Ikummaq, 2008; Laidler et al., 2009). On the coast, seaweed can also influence sea ice, with questionnaire concerns shared with regard to the abundance of seaweed, which should be cleared before ice freeze-up. If seaweed is not cleared, it can be “swept on top of the ice, or become lodged in the ice [where] deep sections will form...during later melt stages” (Laidler & Ikummaq, 2008, p. 141). Diminished sea ice area may be due in part to reduced grounding and piling of ice on reef structures within Fury and Hecla Strait, and to warming waters (Laidler et al., 2010). Similarly, lessened lake ice has been linked to warming water and air temperatures (Saros et al., 2023), although mixed responses pertaining to water temperature in the questionnaires may reflect difficulty distinguishing between the two (see Laidler et al., 2010). It is likely that Iglulingmiut are experiencing ubiquitous increases in water temperature, supported by questionnaire accounts of ice melting from underneath and previous observations of ice that deteriorates from below, is slower to re-freeze, and water that is warmer to the touch (Laidler et al., 2010; Saros et al., 2023).

Several knowledge holders did not respond to questions about salinity and those who did (primarily Elders) offered mixed perspectives. During a meeting held in fall 2025 (see Section 2.0, Methods), IHTA Board members explained that seals shot by hunters sink more quickly in the spring, whereas in the fall they remain afloat for longer periods. These observations may reflect lower salinity conditions in the spring and higher salinity in the fall; however, other factors, such as seasonal variation in seal blubber thickness (Insley et al., 2021; Siebert et al., 2022), may also influence buoyancy. Differences in questionnaire responses regarding salinity may reflect the high seasonal variability common in coastal areas, influenced by freshwater discharge (Niemi et al., 2024). Salinity near the ice edge may also be lower than in open water, a pattern already documented in Foxe Basin (Paulic et al., 2014). Community-led coastal research efforts that took place near Igloodik in 2020 included salinity measurements (Christie et al., 2023b); however, longer-term monitoring is needed to assess seasonal, spatial, and temporal variability. An increase in freshening, an Arctic-wide phenomenon, may occur in coming years owing to ice melt (Steiner et al., 2015; Shu et al., 2018). As salinity is an important driver of fish assemblages (Niemi et al., 2024), and alongside other environmental variables, can influence the presence of marine mammals such as belugas (Scharffenberg et al., 2019), the mixed perspectives regarding salinity among knowledge holders warrant further investigation.

Reports of coastal erosion from Elders are consistent with broader Arctic-wide trends, where increased erosion stems from permafrost degradation, declining sea ice extent, rising sea levels, and an increase in storms and wave height (Steiner et al., 2015; Schädel, 2022; Nielsen et al., 2022). Geological studies have shown that Igloodik Island and eastern Melville Peninsula consist of dolomite and limestone bedrock covered with pebbly till (Dredge, 1992b). Igloodik’s bedrock

is affected by frost action, which churns surface materials, and frost heave, which occurs when water seeps into the porous carbonate bedrock and freezes, causing it to fracture and shift upwards or laterally (Dredge, 1992a;b). These processes, intensified by ground thaw, may help explain questionnaire observations of increased visibility of large rocks in the landscape. In addition to mechanical weathering contributing to erosion, carbonate rocks are highly susceptible to chemical weathering when exposed to acidified water (Dredge, 1992a; Dubois et al., 2015), suggesting that ocean acidification should also be studied (Steiner et al., 2015). In fall 2025 (see Section 2.0, Methods), IHTA Board members confirmed that coastal erosion is occurring “everywhere”, and is particularly noticeable at camps, where “tent areas are now gone” (IHTA as stated on 29 September 2025).

Moreover, knowledge holders reported less clear waters, declining water levels, and the drying or draining of rivers and lakes. Widespread and accelerating degradation of permafrost increases suspended sediments in freshwater systems (Manseau et al., 2022; Saros et al., 2023), although other environmental factors can also influence turbidity (e.g., flow rate, precipitation, wind) (Fortino et al., 2009; Manseau et al., 2022). Further research is needed to assess potential ecological impacts of increased turbidity across trophic levels (e.g., Burpee et al., 2018; Borgstrøm et al., 2018; Burke et al., 2023), as well as direct and indirect effects on Iglulingmiut. Declining water levels and the drying or draining of rivers and lakes is an issue that is well-documented across the circumpolar Arctic (Knopp et al., 2022; Saros et al., 2023), and can be attributed directly to shifts in temperature, precipitation, and evapotranspiration (Hayward et al., 2021), and indirectly to permafrost processes (Saros et al., 2023). Igloolik relies on a nearby watershed as its primary drinking water source, and has already been identified as one of six Nunavut communities highly vulnerable to water shortages (Hayward et al., 2021).

4.3 Species changes

Marine mammals

Seals (ringed seal; *Phoca hispida*, bearded seal; *Erignathus barbatus*, harp seal; *Pagophilus groenlandicus*), Atlantic walrus, and beluga were often discussed in the questionnaires due to their importance as a country food. However, knowledge holder observations regarding marine mammals likely extend to bowhead whale and narwhal that are seasonally present in the area (Government of Nunavut, 2008; Laidler et al., 2009; Paulic et al., 2014). Knowledge holders reported that marine mammal body size is decreasing, which could be in reference to leaner seals as previously noted by hunters in Igloolik (Laidler et al., 2010). Furthermore, reports of changes in marine mammal diet and smell are consistent with a previous study reporting that the taste of *igunaq* (fermented walrus) was changing, and that bearded seal “smell is not as strong” (Government of Nunavut, 2008, p. 55). The effects of multiple interacting stressors (e.g., climate-driven habitat loss, trophic disruptions, pathogen emergence, contaminants) should be considered when seeking to understand changes in marine mammal condition reported by knowledge holders (Burek et al., 2008).

Observations of a decline in marine mammal abundance from Elders seem to be focused on seals and walrus, and were linked by knowledge holders to reduced sea ice and increasing noise. Ringed seal, in particular, is a highly ice-dependent species known to be sensitive to habitat

changes as individuals winter in ice habitats, birth and nurse within snow lairs, and use sea ice as a moulting platform (Laidre et al., 2008; Von Duyke et al., 2020). In some Arctic locations, this species has been reported to be using terrestrial areas as a haulout platform (Lydersen et al., 2017). Walrus are similarly ice-dependent, using sea ice and terrestrial haulouts for birthing, nursing, resting, moulting, and access to local feeding areas (Laidre et al., 2008; Paulic et al., 2014). Declining sea ice presents significant risks for nursing female walrus and their calves, who may be forced to undertake long-distance swims in open water (Laidre et al., 2008), or increasingly rely on terrestrial haulouts, where disturbances can lead to fatal stampedes (Udevitz et al., 2013).

The implications of sea ice declines may be exacerbated by noise pollution associated with vessels and ‘equipment’, which knowledge holders commented ‘scare’ marine mammals. Recent studies have found that noise disturbances can interfere with marine mammal communication, navigation, and foraging (e.g., Halliday et al., 2019; Stewart et al., 2025); cause avoidance of traditional migration routes, haulouts, and feeding areas (e.g., Ewing et al., 2025); result in a higher risk of stampedes among walrus in haulouts (e.g., Udevitz et al., 2013); and increase stress hormone levels (e.g., Watt et al., 2021) (see also Reeves et al., 2014; Hauser et al., 2018; Erbe et al., 2019; Halliday et al., 2020; Niemi et al., 2024). As several marine species aggregate or migrate along shipping routes in Foxe Basin (Government of Nunavut, 2008; Paulic et al., 2014), research on the effects of current and projected increases in vessel traffic are needed near Igloodik.

Reports of increasing polar bears align with previously documented knowledge that they are “everywhere” and “they come to town these days” (Government of Nunavut, 2008, p. 43). An interviewer in the Nunavut Coastal Resource Inventory recorded that “in 1961 he [an interviewee] rarely saw polar bears, but in 2006 he spotted 22 polar bears” (Government of Nunavut, 2008, p. 43). Indeed, it is widely-documented that polar bears are being forced onto land earlier due to ice break-up (e.g., Laidre et al., 2008; Laidler et al., 2010; Kuletz et al., 2024). Interestingly, knowledge holders did not discuss killer whales (*Orcinus orca*), despite their increasing occurrence in northern Foxe Basin in recent years (Government of Nunavut, 2008; Laidre et al., 2008; Paulic et al., 2014; Ferguson et al., 2025). However, during a meeting held in late September 2025 (see Section 2.0, Methods), the IHTA confirmed that killer whales were being seen in the Igloodik Island area, with reports of pods further offshore.

Fishes

Arctic char and lake trout were frequently discussed in the questionnaires, reflecting their importance as essential sustenance resources for Iglulingmiut. Some knowledge holders reported a decline in fish populations, attributing this in part to disturbances (e.g., pollution) in lakes. Shifts such as decreasing water levels or clarity in lakes, or altered temperature, wind, or ice processes may be indirectly or directly contributing to observed changes in char or trout abundance and condition (e.g., Reist et al., 2006; Paulic et al., 2014; Campana et al., 2020; Saros et al., 2023; Muhlfeld et al., 2024; Sora et al., 2025). Differences in the size of fishes across marine and lacustrine environments, with a notable increase in fish body size in lakes, could be linked to factors such as a lengthened ice-free season and temperatures that are close to growth optimums (e.g., Budy & Luecke, 2014; Torvinen et al., 2023), or changing diet (e.g., Young et

al., 2021). Dietary shifts may also explain reported whiter meat among Arctic char, as higher consumption of fishes compared to invertebrates can result in reduced red pigmentation in fish muscle (Faulkner et al., 2025). Efforts should be made to elucidate Inuktitut terms associated with anadromous versus landlocked Arctic char (e.g., Red char, *ivisaaruq*, *nutilliarjuk*) and lake trout (e.g., Red lake trout, see Government of Nunavut, 2008), which will help to better understand existing variation among species morphotypes present.

Knowledge holders reported shifts in the occurrence of several fish species. The reported appearance of new species, including salmon or *sulukpaugaq* (Arctic grayling, *Thymallus arcticus*, Randa, 2002; Government of Nunavut, 2018¹²), reflects broader trends of increased atypical fishes sightings by communities across Inuit Nunangat (McNicholl et al., 2021). Participants also reported declines in sculpin (possibly Arctic Staghorn sculpin, *Gymnocanthus tricuspis*, see Government of Nunavut, 2008 or Fourhorn sculpin, *Myoxocephalus quadricornis*, see Christie et al., 2023b) and cod (possibly Arctic cod, *Boreogadus saida*, see Government of Nunavut, 2008) on the coast (see Paulic et al., 2014 for other cottids and gadids in the area). These observations may be related to studies indicating that climate change is inducing alterations in fish habitat across ecosystems (e.g., Reist et al., 2006; Cote et al., 2021; Gillis et al., 2024; Sora et al., 2025). At the same time, stressors such as vessel noise, as articulated in the questionnaires, are slated to negatively impact fishes such as Arctic cod, for example, by altering home ranges and swimming behaviours (Ivanova et al., 2020). Given that this species, in particular, is the most abundant forage fish in the Arctic Ocean, declines in populations of this species are likely to trigger cascading effects within the Arctic marine ecosystem (Ivanova et al., 2020; Geoffroy et al., 2023). The impacts of changes among fish species on Iglulingmiut must be further explored to understand possible implications for this community.

Invertebrates

Invertebrates were not a focal topic in questionnaires, as many knowledge holders indicated that they were unfamiliar with invertebrate biodiversity. However, in the coastal environment, other knowledge holders shared observations of increases in invertebrate size and movement towards the shore, depending on wind intensity. Previous research indicates that intertidal zones (i.e., where shoreline is exposed and submerged by daily tides, considered ‘coast’) near Igloolik were devoid of benthic invertebrates as these areas consist of bedrock with a thin layer of gravel, creating harsh conditions (Dale & Leontowich, 2006). These authors add that a “short duration of the ice-free period...restricts colonization of many fauna in the intertidal zone” (p. 68); however, this may change as the ice-free season lengthens. Meanwhile, subtidal zones (permanently submerged below the low tide line, considered ‘ocean’), with unconsolidated substrates, were found to contain a high biodiversity of invertebrates from various phyla (polychaetes, mollusks, echinoderms, crustaceans) (see Dale & Leontowich, 2006). In line with concerns raised by knowledge holders, particular attention should be paid to invertebrates consumed by walrus. As noted by Paulic and co-authors (2014), walrus feeding aggregation sites (see Government of Nunavut, 2008) can indicate the location of clam beds, and sites with a high abundance of

¹² The name *sulukpaugaq* derives from the Inuktitut word *suluk* (‘feather’), referencing the species’ large, sail-like and ‘feathery’ dorsal fin (Randa, 2002). For information on species distributions, please refer to Scott and Crossman (1973) and Government of Nunavut (2018).

mussels, sea cucumbers, sea urchins, amphipods, and other invertebrates. Although specific information on invertebrates in lacustrine ecosystems near Igloolik is not available, it is likely that abundance and richness will increase in the short-term; however, over longer time scales, northward range shifts may result in the loss of endemic species (Saros et al., 2023). Further research is needed to understand the complex effects of climate drivers on invertebrates.

Harvest changes

Changes in the accessibility of certain species (e.g., walrus, ringed seal), as discussed in the questionnaires, combined with increasingly unpredictable environmental conditions, are altering the timing (and location) of harvesting near Igloolik (e.g., Ford et al., 2006; Laidler et al., 2009; Laidler et al., 2010). Earlier harvesting in the spring and later harvesting during winter, early spring, early fall, and fall, suggest harvesters may be taking advantage of open water opportunities with earlier break-ups but are waiting later in the fall for hunting areas to become accessible during freeze-up (Ford et al., 2006; Laidler et al., 2009). Iglulingmiut are also modifying their travel routes, which tend to be longer and more difficult to navigate, and are more frequently exposed to dangerous conditions, especially in the winter season (e.g., becoming stranded on moving ice, getting lost, or experiencing accidents) (Ford et al., 2006; Ford, 2008; Laidler et al., 2009; 2010). This is exacerbated by the fact that harvesters can no longer rely on navigational aids such as snowdrifts, which are shaped differently due to shifting winds (Aporta, 2002; Ford et al., 2006; Laidler et al., 2010). Please refer to Laidler et al. (2009) for detailed insights into seasonal and species-specific changes in harvesting regimes near Igloolik, and Ford et al. (2006) for the implications of changing conditions on harvesting for Iglulingmiut.

5.0 Conclusion

Inuit hold extensive knowledge of historical environmental conditions, as well as local and regional manifestations of climate change and development. Through a partnership among the Igloolik Hunters and Trappers Association, Carleton University, and Fisheries and Oceans Canada, we documented knowledge holder observations of ecological changes. Using questionnaires, we recorded shifts across marine and freshwater ecosystems and multiple trophic levels, including marine mammals, fishes, and invertebrates. Consistent with earlier work describing a “widespread feeling among Inuit in Igloolik that climatic conditions have been changing beyond expected natural fluctuations and variability since the 1990s” (Ford et al., 2006, p. 131), our findings provide evidence of these changes and illustrate a depth and diversity of participant experiences. Insights from this study, which were discussed with the IHTA in Igloolik during report preparation, help address critical knowledge gaps in Arctic ecosystems, distinguish ecological trends from underlying variability, and contribute to a record of change against which future shifts can be compared (Huntington et al., 2004; Niemi et al., 2024). Continued community leadership in research and monitoring remains essential for understanding and assessing these changes, with the information gathered supporting IHTA co-management decisions, and conservation and economic plans. As emphasized by Elder David Irngaut, this knowledge will become increasingly important as the effects of climate change intensify and as “the ships start crossing from Baffinland”.

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Appendix A: Questionnaire (Inuktitut and English)

ᐊᐱᖅᐃᑦ ᐃᓴᐅᑦ

ᓴᓴᑦ ᐅᐱᓪᓂᑦ ᖃᐅᓴᓂᑦ ᐊᐱᖅᐃᑦ ᐅᑭᐅᖅᑕᖅᑕᑦ ᓴᓴᑦ ᓄᓇᓂᑦ ᖃᐅᓴᓂᑦ

ᑭᑦᐃᓂᑦ:

ᓴᓴᑦ ᐊᓴᓴᑦᑕᓂᑦᑕᓂᑦᑕᓂᑦ ᐃᖅᐅᓂᑦ ᓄᓂᓂᑦᓂᑦᓴᓂᑦ, ᐅᐱᓪᓂᑦ ᐊᐅᓂᓴᓴᓂᑦ, ᐃᓂᓴᓂᐅᓴᓂᑦ ᐊᓴᓴᑦᑕᓂᑦᑕᓂᑦᑕᓂᑦᑕᓂᑦ. ᓄᓂᓂᑦᑕᓂᑦᑕᓂᑦᑕᓂᑦ ᐅᐱᓪᓂᑦ ᐊᓴᓴᑦ ᐊᓂᓂᑦ ᖃᓄᐃᑦᑕᓂᑦᑕᓂᑦᑕᓂᑦ ᓴᓴᑦᑕ ᑕᐱᓂ ᐃᑭᑦ ᑕᑭᓴᓂᑦᑕᓂᑦᑕᓂᑦ ᖃᓄᖅ ᐊᓴᓴᑦᑕᓂᑦᑕᓂᑦᑕᓂᑦ ᐊᓴᓴᑦᑕᓂᑦ. ᑕᓴᓂᓴᓂᑦ ᑕᓂᐃᐊᑦ ᓄᓂᓂᑦ ᖃᐅᓴᓂᑦ ᓂᑕᓴᓂᑦᑕᓂᑦᑕᓂᑦ ᐅᐱᓪᓂᑦ ᐊᓴᓴᑦ ᐊᓂᓂᑦ ᖃᓄᐃᑦᑕᓂᑦᑕᓂᑦᑕᓂᑦ ᐃᓴᓂᐅᓂᑦ ᖃᓂᓴᓂᑦ ᐱᓴᓂᑦᐊᓂᑦᑕᓂᑦ ᓄᓂᓂᑦ ᖃᐅᓴᓂᑦᐅᓴᓂᑦ. ᐅᐱᓂᑦᑕᓂᑦᑕᓂᑦ, ᑕᐱᓂ ᖃᐅᓴᓂᑦ ᑕᑭᓴᓂᑦᑕᓂᑦᑕᓂᑦᑕᓂᑦ ᓴᓴᑦ ᐅᐱᓂᑦ ᐅᐱᓂᑦᑕᓂᑦᑕᓂᑦ ᐊᓴᓴᑦ ᐊᓂᓂᑦ ᐊᓴᓴᑦᑕᓂᑦᑕᓂᑦᑕᓂᑦ ᓄᓂᓂᑦ ᐅᐱᓂᑦᑕᓂᑦᑕᓂᑦ ᐅᑭᐅᖅᑕᖅᑕᓂᑦ ᖃᓄᖅ ᓴᓴᓂᓴᓂᑦᑕᓂᑦ ᑕᓴᓂᓴᓂᑦ.

ᐊᑕᓂᑦᑕᓂᑦ ᐊᐱᖅᐃᑦ ᐊᓂᓂᑦᑕᓂᑦ ᐊᐱᓂᑦᑕᓂᑦ ᐱᓴᓂᑦᑕᓂᑦ - ᑕᓴᑦ, ᓴᓴᖅ (ᓂᓂᓂᑦᑕᓂᑦ ᓂᑭᓂᑦ), ᐊᓴᓴᑦ ᑕᓂᐅᖅ (ᓂᓂᓂᑦᑕᓂᑦ ᐅᓴᓂᑦ ᐱᓴᓂᑦ).

ᐊᐱᖅᐃᑦ ᑭᐅᓂᑦᑕᓂᑦ ᓄᓂᓂᑦ ᖃᓂᓴᓂᑦᑕᓂᑦ ᐃᓴᓂᑦᑕᓂᑦ.

ᓴᓴᑦᑕᓂᑦ ᐊᐱᖅᐃᑦ: ᑭᐅᖅᑕᓂᑦ ᑦᓴᓂᑦ

1) ᑭᓴᐱ?

- ᐊᓴᓴᑦ ᐊᓴᓂᑦ ᓄᓂᐊᓴᓂᑦᑕᓂᑦ ᑭᐅᓴᓂᑦᑕᓂᑦ

2) ᖃᓴᓂᑦ ᐊᓴᓴᓂᑦᑕᓂᑦ? _____ ᐅᑭᐅᑦ

3) ᖃᓂᓴᓂᑦ ᓄᓂᓂᑦᑕᓂᑦᑕᓂᑦ? _____ ᐅᑭᐅᑦ

4) ᓴᓴᖅᑕᓂᑦ/ᐊᓂᓂᑦᑕᓂᑦᑕᓂᑦ?

- ᐅᓂᓂᑦᑕᓂᑦ ᐅᓂᑦ ᐃᓂᐃᓂᑦ ᐊᓴᓴᑦ ᐃᓂᐃᓂᑦ
- (ᓴᓴᑦ ᐅᑭᐅᓂᑦ ᓴᓴᓂᑦᑕᓂᑦ)

- ᓄᓂᓂᑦᑕᓂᑦᑕᓂᑦ ᓴᓴᖅᑕᓂᑦᑕᓂᑦ ᐃᓂᓂᑦᑕᓂᑦ ᑭᐅᓴᓂᑦᑕᓂᑦ

ᑕᑦᑕᑦᑕᑦᑕ ᐋᐱᓂᐃᓂᓐ ᓂᓐᓂᓂᓐ - ᐋᓂᐃᓂᓐ ᐃᑲᑲᓂᓐ

ᐋᓂᐃᓂᓐ ᐃᑲᑲᓂᓐ

11) ᐋᓂᐃᓂᓐᑕᑦᑕᑦᑕ ᐃᑕᑦᑕᑕᑕ, ᐃᓂᑦᑕᐋᓂᑦᑕᑕᑕᑕᑕᑕ, ᑕᑕᐃᑕᑕᑕᑕᑕᑕ?

- ᐋᓂᐃᓂᓐ ᐃᓂᑦᑕᐋᓂᓐ ᑕᑕᐃᑕᑕ ᓇᑕᐋᓂᐃᓂᓐᑕᑕᑕᑕ ᑕᑕᑕᑕᑕᑕ

12) ᐋᓂᐃᓂᓐ ᑕᑕᐃᑕ ᓇᑕᓇᐃᓂᓐ ᐃᑕᑦᑕᑕᑕ ᐋᓂᐃᓂᓐᐋᓂᓐᑕᑕᑕᑕᑕᑕ:

- ᑕᑕᑕᑕ ᑕᑕᑕ ᑕᑕᑕ ᑕᑕᑕ ᑕᑕᑕᑕᑕᑕ

13) ᐋᓂᐃᓂᓐ ᑕᑕᐃᑕ ᓇᑕᓇᐃᓂᓐ ᐃᓂᑦᑕᐋᓂᓐᑕᑕᑕᑕᑕᑕᑕᑕ:

- ᑕᑕᑕᑕ ᑕᑕᑕ ᑕᑕᑕ ᑕᑕᑕ ᑕᑕᑕᑕᑕᑕ

14) ᐋᓂᐃᓂᓐ ᓂᓂᓂᓐ ᐋᓂᐃᓂᓐᑕᑦᑕᑦᑕ ᐋᓂᐃᓂᓐ ᐃᑲᑲᓂᓐᑕᑕᑕᑕᑕᑕ? _____

- ᐋᓂᐃᓂᓐ ᑕᑕᑕᑕᑕᑕ

15) ᓂᓂᓂᓐ ᐋᓂᐃᓂᓐᐋᓂᓐᑕᑕᑕᑕ ᐃᓂᑦᑕᐋᓂᓐᑕᑕᑕᑕᑕᑕ?

ᐃᑕᑕᑕᑕ	<input type="checkbox"/> ᓂᓂᑕᑕ <input type="checkbox"/> ᐋᓂᐃᓂᓐᑕᑕᑕ <input type="checkbox"/> ᑕᑕᑕᑕ <input type="checkbox"/> ᐃᑕᑕᑕᑕ ᐋᓂᐃᓂᓐᑕᑕᑕᑕ <input type="checkbox"/> ᐋᓂᐃᓂᓐᑕᑕᑕᑕᑕᑕ ᐃᑕᑕᑕᑕ <input type="checkbox"/> ᑕᑕᑕᑕᑕᑕ
ᐃᑕᑕᑕᑕᑕᑕ	<input type="checkbox"/> ᓂᓂᑕᑕ <input type="checkbox"/> ᐋᓂᐃᓂᓐᑕᑕᑕ <input type="checkbox"/> ᑕᑕᑕᑕ <input type="checkbox"/> ᐃᑕᑕᑕᑕ ᐋᓂᐃᓂᓐᑕᑕᑕᑕ <input type="checkbox"/> ᐋᓂᐃᓂᓐᑕᑕᑕᑕᑕᑕ ᐃᑕᑕᑕᑕᑕᑕ <input type="checkbox"/> ᑕᑕᑕᑕᑕᑕ
ᐃᑕᑕᑕᑕᑕᑕ	<input type="checkbox"/> ᓂᓂᑕᑕ <input type="checkbox"/> ᐋᓂᐃᓂᓐᑕᑕᑕ <input type="checkbox"/> ᑕᑕᑕᑕ <input type="checkbox"/> ᐃᑕᑕᑕᑕ ᐋᓂᐃᓂᓐᑕᑕᑕᑕ <input type="checkbox"/> ᐋᓂᐃᓂᓐᑕᑕᑕᑕᑕᑕ ᐃᑕᑕᑕᑕᑕᑕ <input type="checkbox"/> ᑕᑕᑕᑕᑕᑕ
ᐋᓂᐃᓂᓐᑕᑕᑕ	<input type="checkbox"/> ᓂᓂᑕᑕ <input type="checkbox"/> ᐋᓂᐃᓂᓐᑕᑕᑕ <input type="checkbox"/> ᑕᑕᑕᑕ <input type="checkbox"/> ᐃᑕᑕᑕᑕ ᐋᓂᐃᓂᓐᑕᑕᑕᑕ <input type="checkbox"/> ᐋᓂᐃᓂᓐᑕᑕᑕᑕᑕᑕ ᐋᓂᐃᓂᓐᑕᑕᑕ <input type="checkbox"/> ᑕᑕᑕᑕᑕᑕ
ᐃᑕᑕᑕᑕᑕᑕ	<input type="checkbox"/> ᓂᓂᑕᑕ <input type="checkbox"/> ᐋᓂᐃᓂᓐᑕᑕᑕ <input type="checkbox"/> ᑕᑕᑕᑕ <input type="checkbox"/> ᐃᑕᑕᑕᑕ ᐋᓂᐃᓂᓐᑕᑕᑕᑕ <input type="checkbox"/> ᐋᓂᐃᓂᓐᑕᑕᑕᑕᑕᑕ ᐃᑕᑕᑕᑕᑕᑕ <input type="checkbox"/> ᑕᑕᑕᑕᑕᑕ
ᐃᑕᑕᑕᑕ	<input type="checkbox"/> ᓂᓂᑕᑕ <input type="checkbox"/> ᐋᓂᐃᓂᓐᑕᑕᑕ <input type="checkbox"/> ᑕᑕᑕᑕ <input type="checkbox"/> ᐃᑕᑕᑕᑕ ᐋᓂᐃᓂᓐᑕᑕᑕᑕ <input type="checkbox"/> ᐋᓂᐃᓂᓐᑕᑕᑕᑕᑕᑕ ᐃᑕᑕᑕᑕᑕᑕ <input type="checkbox"/> ᑕᑕᑕᑕᑕᑕ

ᐊᓐᐱᓐᓐᓐᓐ ᐊᐱᓄᐱᓐᓐᓐ: ᐃᓐᐱᓐᓐᓐᓐ ᐃᓐᐱᓐᓐᓐᓐᓐᓐ ᓄᓐᓐᓐ

19) ᓄᓐᓐᓐ ᐊᓐᐱᓐᓐᓐᓐ ᐃᓐᐱᓐᓐᓐᓐ ᓐᓐᓐᓐ ᓐᓐᓐᓐᓐᓐᓐᓐᓐᓐ ᓐᓐᓐᓐ ᐃᓐᐱᓐᓐᓐᓐᓐᓐᓐᓐ.

ᐊᓐᐱᓐᓐᓐᓐ ᐊᐱᓄᐱᓐᓐᓐ ᐊᓐᐱᓐᓐᓐᓐᓐᓐ ᐱᓐᓐᓐᓐᓐᓐᓐᓐ - ᐅᓐᓐᓐᓐ (ᓐᓐᓐᓐᓐᓐᓐᓐ ᐃᓐᓐᓐᓐᓐᓐ ᐱᓐᓐᓐᓐᓐᓐ), ᓐᓐᓐᓐ (ᓐᓐᓐᓐᓐᓐᓐᓐ ᓐᓐᓐᓐᓐᓐ) ᐊᓐᓐᓐ ᐅᓐᓐᓐ.

	ᐃᓐᐱᓐᓐᓐᓐᓐᓐ CLDL ᓐᓐᓐᓐᓐ	ᐊᓐᓐᓐᓐᓐ, ᓐᓐᓐᓐ ᐃᓐᐱᓐᓐᓐᓐᓐᓐ ᐅᓐᓐᓐ ᐱᓐᓐᓐᓐᓐᓐᓐ?
ᐅᓐᓐᓐᓐ	<input type="checkbox"/> ᐃ <input type="checkbox"/> ᐊᓐᓐ <input type="checkbox"/> ᐊᓐᓐᓐ <input type="checkbox"/> ᓐᓐᓐᓐᓐᓐᓐᓐ	
ᓐᓐᓐᓐᓐ	<input type="checkbox"/> ᐃ <input type="checkbox"/> ᐊᓐᓐ <input type="checkbox"/> ᐊᓐᓐᓐ <input type="checkbox"/> ᓐᓐᓐᓐᓐᓐᓐᓐ	
ᐅᓐᓐᓐ	<input type="checkbox"/> ᐃ <input type="checkbox"/> ᐊᓐᓐ <input type="checkbox"/> ᐊᓐᓐᓐ <input type="checkbox"/> ᓐᓐᓐᓐᓐᓐᓐᓐ	

Igloolik Coastal Biodiversity Questionnaire: Arctic Coast Local Knowledge Component

Introduction

Climate change is altering habitats, fish distributions, and ecosystems in the Canadian Arctic. The goal of this research is to document biodiversity and environmental conditions of coastal ecosystems in the Hudson Bay Complex and understand how those have changed over time. Our objective is to collaborate with the community to document local knowledge regarding biodiversity and environmental conditions near Igloolik and build upon ongoing community-led research. This knowledge will provide a broader understanding of the coastal ecosystem and will help to monitor rapid coastal change in order to assist the communities in preparing for the future.

The questions below categorize the environment into three sections - lakes, coast (the shoreline out to low tide), and the ocean (beyond the low tide line, open water).

When answering this questionnaire, we want you to think about areas that are near your community.

Section 1: Information about respondent

1) What is your gender?

Male Female Other _____ Prefer not to answer

2) What is your age? _____ years

3) How long have you lived in Igloolik? _____ years

4) What is your current employment status?

Full time Part time Seasonal (you may not work in the winter)

Retired Unemployed Student Prefer not to answer

Section 2: Changes to the ocean

5) Have you noticed changes in the ocean? The ocean is beyond the low tide line, open water.

Yes No Not sure Prefer not to answer

6) What changes have you noticed in the ocean in your lifetime? If there was a change, approximately how many years ago did you notice this change?

Water temperature	<input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing <input type="checkbox"/> No change	____ years
Salinity (saltiness)	<input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing <input type="checkbox"/> No change	____ years
Wind speed	<input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing <input type="checkbox"/> No change	____ years
Wind direction	<input type="checkbox"/> Change from _____ to _____ <input type="checkbox"/> No change	____ years
Swells	<input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing <input type="checkbox"/> No change	____ years
<u>Sea ice</u>		
Area covered by ice	<input type="checkbox"/> No change <input type="checkbox"/> More ice <input type="checkbox"/> Less ice	
Thickness	<input type="checkbox"/> No change <input type="checkbox"/> Thicker <input type="checkbox"/> Thinner	
Quality	<input type="checkbox"/> No change <input type="checkbox"/> Change <input type="checkbox"/> _____	____ years
Timing of ice break up in spring	<input type="checkbox"/> No change <input type="checkbox"/> More good ice <input type="checkbox"/> More bad ice	
Timing of ice formation in fall	<input type="checkbox"/> No change <input type="checkbox"/> Earlier <input type="checkbox"/> Later	
Marine fish numbers	<input type="checkbox"/> No change <input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing	____ years
Types of marine fish	<input type="checkbox"/> No change <input type="checkbox"/> New kinds of fish <input type="checkbox"/> Fewer kinds of fish	____ years
Marine mammal numbers	<input type="checkbox"/> No change <input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing	____ years
Types of marine mammals	<input type="checkbox"/> No change <input type="checkbox"/> New kinds of marine mammals <input type="checkbox"/> Fewer kinds of marine mammals	____ years
Invertebrate numbers	<input type="checkbox"/> No change <input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing	____ years
Types of Invertebrates (e.g., clams, crabs)	<input type="checkbox"/> No change <input type="checkbox"/> New kinds of invertebrates <input type="checkbox"/> Fewer kinds of invertebrates	____ years
Other changes or additional comments (please describe):		

Section 3: Changes to the coast

7) Have you noticed changes to the coast? The coast is the shoreline out to low tide.

Yes No Not sure Prefer not to answer

8) What changes have you noticed to the coast in your lifetime? If there was a change, approximately how many years ago did you notice this change?

Water Temperature	<input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing <input type="checkbox"/> No change	____ years
Wind speed	<input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing <input type="checkbox"/> No change	____ years
Wind direction	<input type="checkbox"/> Change from _____ to _____ <input type="checkbox"/> No change	____ years
Erosion	<input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing <input type="checkbox"/> No change	____ years
Marine fish numbers	<input type="checkbox"/> No change <input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing	____ years
Types of marine fish	<input type="checkbox"/> No change <input type="checkbox"/> New kinds of fish <input type="checkbox"/> Fewer kinds of fish	____ years
Marine mammal numbers	<input type="checkbox"/> No change <input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing	____ years
Types of marine mammals	<input type="checkbox"/> No change <input type="checkbox"/> New kinds of marine mammals <input type="checkbox"/> Fewer kinds of marine mammals	____ years
Invertebrate numbers	<input type="checkbox"/> No change <input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing	____ years
Types of Invertebrates (e.g. clams, crabs)	<input type="checkbox"/> No change <input type="checkbox"/> New kinds of invertebrates <input type="checkbox"/> Fewer kinds of invertebrates	____ years
Other changes or additional comments (please describe):		

Section 4: Changes to lakes

9) Have you noticed changes in lakes?

 Yes No Not sure Prefer not to answer

10) What changes have you noticed in lakes in your lifetime? If there was a change, approximately how many years ago did you notice this change?

Water Temperature	<input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing <input type="checkbox"/> No change	____ years
Wind speed	<input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing <input type="checkbox"/> No change	____ years
Wind direction	<input type="checkbox"/> Change from _____ to _____ <input type="checkbox"/> No change	____ years
Water clarity	<input type="checkbox"/> More clear <input type="checkbox"/> Less clear <input type="checkbox"/> No change	____ years
<u>Lake ice:</u> Area covered by ice Thickness Quality Timing of break up in spring Timing of formation in fall	<input type="checkbox"/> No change <input type="checkbox"/> More ice <input type="checkbox"/> Less ice <input type="checkbox"/> No change <input type="checkbox"/> Thicker <input type="checkbox"/> Thinner <input type="checkbox"/> No change <input type="checkbox"/> Change <input type="checkbox"/> _____ <input type="checkbox"/> No change <input type="checkbox"/> Earlier <input type="checkbox"/> Later <input type="checkbox"/> No change <input type="checkbox"/> Earlier <input type="checkbox"/> Later	____ years
Freshwater fish numbers	<input type="checkbox"/> No change <input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing	____ years
Types of fish	<input type="checkbox"/> No change <input type="checkbox"/> New kinds of fish <input type="checkbox"/> Fewer kinds of fish	____ years
Invertebrate numbers	<input type="checkbox"/> No change <input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing	____ years
Types of invertebrates (e.g., clams)	<input type="checkbox"/> No change <input type="checkbox"/> New kinds of invertebrates <input type="checkbox"/> Fewer kinds of invertebrates	____ years
Other changes or additional comments (please describe):		

Section 5: Animals**Hunting and Fishing**

For this section, marine mammals includes polar bears.

- 11) Do you go fishing, hunting for marine mammals, or both?
 Hunting Fishing Both Neither Prefer not to answer
- 12) Please select ALL the areas that you hunt for marine mammals:
 Ocean Coast Lake River Prefer not to answer
- 13) Please select ALL the areas that you go fishing:
 Ocean Coast Lake River Prefer not to answer
- 14) How many years have you been hunting and / or fishing?
 _____ years N/A Prefer not to answer
- 15) How often do you go out on the land for hunting and/or fishing purposes?

Winter	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Once a season <input type="checkbox"/> Never <input type="checkbox"/> Prefer not to answer
Early Spring	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Once a season <input type="checkbox"/> Never <input type="checkbox"/> Prefer not to answer
Spring	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Once a season <input type="checkbox"/> Never <input type="checkbox"/> Prefer not to answer
Summer	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Once a season <input type="checkbox"/> Never <input type="checkbox"/> Prefer not to answer
Early Fall	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Once a season <input type="checkbox"/> Never <input type="checkbox"/> Prefer not to answer
Fall	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Once a season <input type="checkbox"/> Never <input type="checkbox"/> Prefer not to answer

16) Has the timing of when you hunt and / or fish changed?

Winter	<input type="checkbox"/> Earlier <input type="checkbox"/> Later <input type="checkbox"/> No change <input type="checkbox"/> Not sure <input type="checkbox"/> Prefer not to answer
Early Spring	<input type="checkbox"/> Earlier <input type="checkbox"/> Later <input type="checkbox"/> No change <input type="checkbox"/> Not sure <input type="checkbox"/> Prefer not to answer
Spring	<input type="checkbox"/> Earlier <input type="checkbox"/> Later <input type="checkbox"/> No change <input type="checkbox"/> Not sure <input type="checkbox"/> Prefer not to answer
Summer	<input type="checkbox"/> Earlier <input type="checkbox"/> Later <input type="checkbox"/> No change <input type="checkbox"/> Not sure <input type="checkbox"/> Prefer not to answer
Early Fall	<input type="checkbox"/> Earlier <input type="checkbox"/> Later <input type="checkbox"/> No change <input type="checkbox"/> Not sure <input type="checkbox"/> Prefer not to answer
Fall	<input type="checkbox"/> Earlier <input type="checkbox"/> Later <input type="checkbox"/> No change <input type="checkbox"/> Not sure <input type="checkbox"/> Prefer not to answer

Animal Specific Questions

17) We would like to ask you questions related to the animals that you hunt and / or fish for:

Animal (please write on line)	How often do you go out to hunt or fish for this animal?	Which season(s) do you go out to hunt or fish for this animal?	Have you noticed changes in the number of this animal?	Have you noticed changes in when you see or catch them?	Have you noticed changes to where you see, or catch them? (Y/N)
Most frequently harvested marine mammal : _____	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Once a season	<input type="checkbox"/> Winter <input type="checkbox"/> Early Spring <input type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Early Fall <input type="checkbox"/> Fall	<input type="checkbox"/> More <input type="checkbox"/> Less <input type="checkbox"/> No change	<input type="checkbox"/> Earlier <input type="checkbox"/> Later <input type="checkbox"/> No change	<input type="checkbox"/> Yes <input type="checkbox"/> No
Second most frequently harvested marine mammal : _____	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Once a season	<input type="checkbox"/> Winter <input type="checkbox"/> Early Spring <input type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Early Fall <input type="checkbox"/> Fall	<input type="checkbox"/> More <input type="checkbox"/> Less <input type="checkbox"/> No change	<input type="checkbox"/> Earlier <input type="checkbox"/> Later <input type="checkbox"/> No change	<input type="checkbox"/> Yes <input type="checkbox"/> No

<p>Most frequently harvested marine fish:</p> <p>_____</p>	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Once a season	<input type="checkbox"/> Winter <input type="checkbox"/> Early Spring <input type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Early Fall <input type="checkbox"/> Fall	<input type="checkbox"/> More <input type="checkbox"/> Less <input type="checkbox"/> No change	<input type="checkbox"/> Earlier <input type="checkbox"/> Later <input type="checkbox"/> No change	<input type="checkbox"/> Yes <input type="checkbox"/> No
<p>Second most frequently harvested marine fish:</p> <p>_____</p>	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Once a season	<input type="checkbox"/> Winter <input type="checkbox"/> Early Spring <input type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Early Fall <input type="checkbox"/> Fall	<input type="checkbox"/> More <input type="checkbox"/> Less <input type="checkbox"/> No change	<input type="checkbox"/> Earlier <input type="checkbox"/> Later <input type="checkbox"/> No change	<input type="checkbox"/> Yes <input type="checkbox"/> No
<p>Most frequently harvested freshwater fish:</p> <p>_____</p>	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Once a season	<input type="checkbox"/> Winter <input type="checkbox"/> Early Spring <input type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Early Fall <input type="checkbox"/> Fall	<input type="checkbox"/> More <input type="checkbox"/> Less <input type="checkbox"/> No change	<input type="checkbox"/> Earlier <input type="checkbox"/> Later <input type="checkbox"/> No change	<input type="checkbox"/> Yes <input type="checkbox"/> No
<p>Second most frequently harvested freshwater fish:</p> <p>_____</p>	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Once a season	<input type="checkbox"/> Winter <input type="checkbox"/> Early Spring <input type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Early Fall <input type="checkbox"/> Fall	<input type="checkbox"/> More <input type="checkbox"/> Less <input type="checkbox"/> No change	<input type="checkbox"/> Earlier <input type="checkbox"/> Later <input type="checkbox"/> No change	<input type="checkbox"/> Yes <input type="checkbox"/> No

Most frequently harvested invertebrate: <hr/>	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Once a season	<input type="checkbox"/> Winter <input type="checkbox"/> Early Spring <input type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Early Fall <input type="checkbox"/> Fall	<input type="checkbox"/> More <input type="checkbox"/> Less <input type="checkbox"/> No change	<input type="checkbox"/> Earlier <input type="checkbox"/> Later <input type="checkbox"/> No change	<input type="checkbox"/> Yes <input type="checkbox"/> No
Second most frequently harvested invertebrate: <hr/>	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Once a season	<input type="checkbox"/> Winter <input type="checkbox"/> Early Spring <input type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Early Fall <input type="checkbox"/> Fall	<input type="checkbox"/> More <input type="checkbox"/> Less <input type="checkbox"/> No change	<input type="checkbox"/> Earlier <input type="checkbox"/> Later <input type="checkbox"/> No change	<input type="checkbox"/> Yes <input type="checkbox"/> No

18) What changes have you noticed to the condition of marine mammals, marine fishes, and freshwater fish?

Marine mammals	<input type="checkbox"/> Size <input type="checkbox"/> Taste <input type="checkbox"/> Indications of disease (tumours, lesions) <input type="checkbox"/> No change	<input type="checkbox"/> Diet <input type="checkbox"/> Parasites	<input type="checkbox"/> Meat quality <input type="checkbox"/> Appearance <input type="checkbox"/> Prefer not to answer	<input type="checkbox"/> Colour <input type="checkbox"/> Smell <input type="checkbox"/> Other _____	<input type="checkbox"/> Texture <input type="checkbox"/> Condition
Marine fish	<input type="checkbox"/> Size <input type="checkbox"/> Taste <input type="checkbox"/> Indications of disease (tumours, lesions) <input type="checkbox"/> No change	<input type="checkbox"/> Diet <input type="checkbox"/> Parasites	<input type="checkbox"/> Meat quality <input type="checkbox"/> Appearance <input type="checkbox"/> Prefer not to answer	<input type="checkbox"/> Colour <input type="checkbox"/> Smell <input type="checkbox"/> Other _____	<input type="checkbox"/> Texture <input type="checkbox"/> Condition
Freshwater fish	<input type="checkbox"/> Size <input type="checkbox"/> Taste <input type="checkbox"/> Indications of disease (tumours, lesions) <input type="checkbox"/> No change	<input type="checkbox"/> Diet <input type="checkbox"/> Parasites	<input type="checkbox"/> Meat quality <input type="checkbox"/> Appearance <input type="checkbox"/> Prefer not to answer	<input type="checkbox"/> Colour <input type="checkbox"/> Smell <input type="checkbox"/> Other _____	<input type="checkbox"/> Texture <input type="checkbox"/> Condition
Please describe changes in condition in detail:					

Section 6: General Community Concerns

19) Please answer the following questions thinking about the animals and environment around your community, and how you feel.

The questions are divided into three sections – ocean (beyond the low tide line), coast (the shoreline out to low tide), and lakes.

Environment	Do you have concerns about this area?	If yes, what are you concerned about when thinking about these areas?
Ocean	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure <input type="checkbox"/> Prefer not to answer	
Coast	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure <input type="checkbox"/> Prefer not to answer	
Lakes	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure <input type="checkbox"/> Prefer not to answer	

Section 7: Questionnaire and Research Feedback

20) Do you think this questionnaire was effective in gathering information about the coast/ocean/lake in Igloodik?

- Yes No Somewhat Prefer not to answer

21) What do you think about the length of this questionnaire?

- Too long Too short Good length Prefer not to answer

22) Is there anything that you feel we are missing or should remove from this questionnaire? Please describe/explain.

23) What are your top 3 interests for future research?

1.

2.

3.

24) Any other comments or suggestions:

Thank you!

Arctic Coast Igloolik Environmental and Biodiversity Indigenous Knowledge Questionnaire



October 2021



Initial Results:

Environment:

Across the ocean and lake environments, most people said that there was:

- Less ice
- Thinner ice
- Worse quality ice
- Wind speeds are increasing
- Wind directions are changing

Animals:

Marine mammals:

- Most people said that there either no changes or less numbers of marine mammals, including seals, belugas, and walrus

Marine fish:

- Most people said there were no changes to numbers of marine fish such as Arctic char

Freshwater fish:

- Most people said that there were no changes to numbers of freshwater fish, such as lake trout



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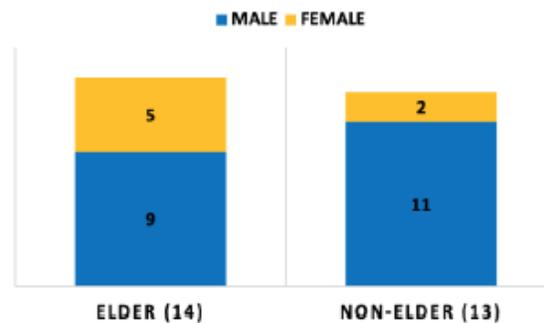
Background:

Indigenous knowledge of animals and their habitats in lakes, along the coast, and in the ocean was documented using questionnaires in Spring 2021.

Objectives:

- Document Indigenous Knowledge of animals and their habitats
- Document fishing and hunting practices of community members
- Understand community concerns and areas where future research is needed in the aquatic environment

QUESTIONNAIRES COMPLETED



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IGLOOLIK LOCAL KNOWLEDGE PROJECT

RESULTS SUMMARY

Project purpose:

The Igloolik HTA wanted to document local knowledge about changes in species and habitats (ocean, coast, and lake environments) near the community in partnership with DFO researchers.

In 2021, a questionnaire was developed with the HTA and administered to 26 knowledge holders (Elders and non-Elders).



Results:



Habitat shifts

- Water temperature, salinity, and swells may or may not be changing
- Elders noticed changing wind direction (to Northwest, South, and East), increasing winds, and more coastal erosion
- Non-Elders observed diminishing water clarity in lakes
- Ice is decreasing in area, thinner, poor quality, breaks earlier, forms later in lakes and the ocean

Species shifts

- Marine mammal numbers are declining (seals, walrus), some are smaller
- More polar bears
- Declines in some fish populations (cod, sculpin), other fishes appearing
- Changes in size, taste, texture of fishes
- Concern about effects of ice deterioration and noise on mammals and fishes
- Trends for invertebrates not clear



Harvesting shifts

- Shifts are resulting in earlier spring harvests, and later fall and winter efforts
- Dangerous conditions for travel

We thank Billy Pauloosie, the Igloolik HTA, technician and translator J. Airut, and the knowledge holders. Funding was provided by the DFO Results Fund and Marine Conservation Targets.

Qujannamiik!



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