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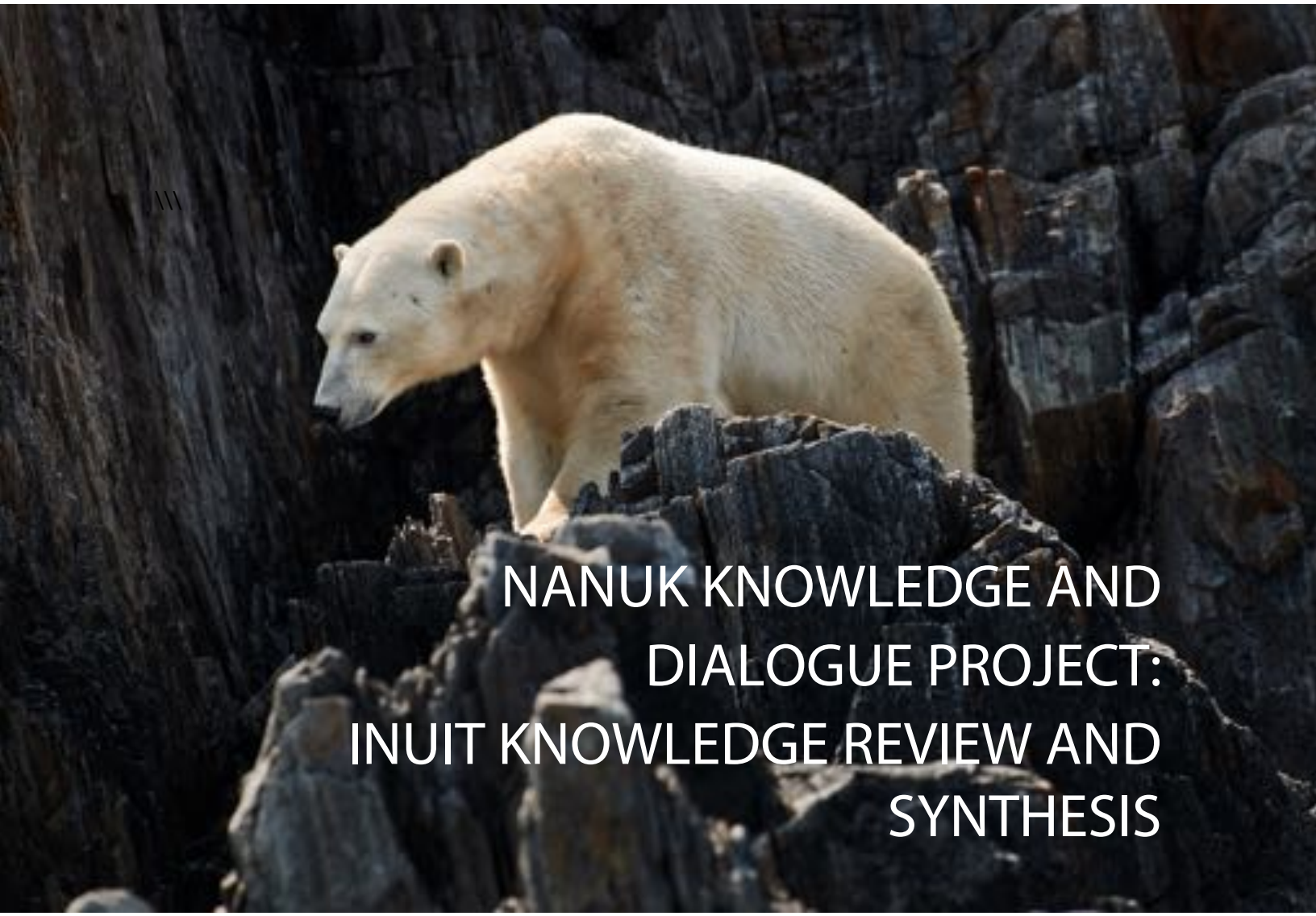

NANUK KNOWLEDGE AND DIALOGUE PROJECT: INUIT KNOWLEDGE REVIEW AND SYNTHESIS

A review and synthesis of documented Inuit knowledge related to the Davis Strait polar bear subpopulation

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1. INTRODUCTION

1.1. NANUK KNOWLEDGE AND DIALOGUE PROJECT

Polar bears (*Ursus maritimus*) are one of the pillars of Inuit culture, providing food and clothing, income in mixed livelihood strategies, and deep cultural connections. Polar bears across Inuit Nunangat, the Inuit homeland in Canada, are managed by wildlife co-management boards, established as institutions of public government by land claim agreements. Evidence indicates that polar bears face a variety of threats to their habitats with complex population level implications, including changes to the environment from human-induced climate change, resource development, and other human activities. Understanding these intersecting threats, and how to sustain the health of polar bear populations that Inuit depend on, is a key priority in Inuit Nunangat. The range of the Davis Strait polar bear subpopulation spans a large area in the eastern Arctic that extends over parts of Nunatsiavut, Nunavik, and Nunavut lands and waters in Canada, as well as Greenland (Figure 1 and Figure 2). Knowledge exchange, coordination, and collaboration between the regions in the management of these polar bears is important for the effective stewardship of this shared subpopulation.

The Nanuk Knowledge and Dialogue Project is collectively led by the Torngat Wildlife and Plants Co-management Board (TWPCB) in Nunatsiavut (project lead), the Nunavik Marine Region Wildlife Board (NMRWB) (co-lead), the Nunavut Wildlife Management Board (NWMB) (co-lead), the Nunavut Tunngavik Inc. (NTI) (partner), and the Nunatsiavut Government (partner). The project's overarching objectives are to develop a shared understanding about the Davis Strait polar bear subpopulation amongst Inuit and non-Inuit in different parts of the Eastern Arctic, and to mobilize this knowledge to strengthen management.

Objectives of the project are:

1. To review, analyze, and synthesize all documented Inuit knowledge related to the Davis Strait polar bear subpopulation.
2. To interpret the subpopulation survey results and develop plain language and culturally-appropriate communication materials that are effective in three distinct regions of Inuit Nunangat.
3. To facilitate interdisciplinary dialogue, review innovative proposals, and to make policy recommendations to the co-management boards.

It is intended that the project will position the co-management boards in the eastern Arctic as leaders in utilizing different knowledge systems to support a thriving polar bear population, a species that migrates through multiple geo-political boundaries. It will ensure that the diversity and richness of Inuit knowledge throughout Inuit Nunangat is brought together, synthesized, and mobilized. This will provide opportunities to enhance an already robust system of polar bear management in Canada by incorporating Inuit knowledge at regional, national, and international decision-making forums.

Knowledge mobilization activities will include 1) a synthesis of Inuit knowledge from the three Inuit regions; 2) communication materials and activities to inform the public about new research results about polar bear habitats, abundance, and threats from all available disciplines; and 3) the development

of policy recommendations from a transdisciplinary working group of knowledge holders. It is the shared vision of the project team that the project will lead to enhanced understanding, robust decision-making, and sustainable utilization of polar bears for generations to come.

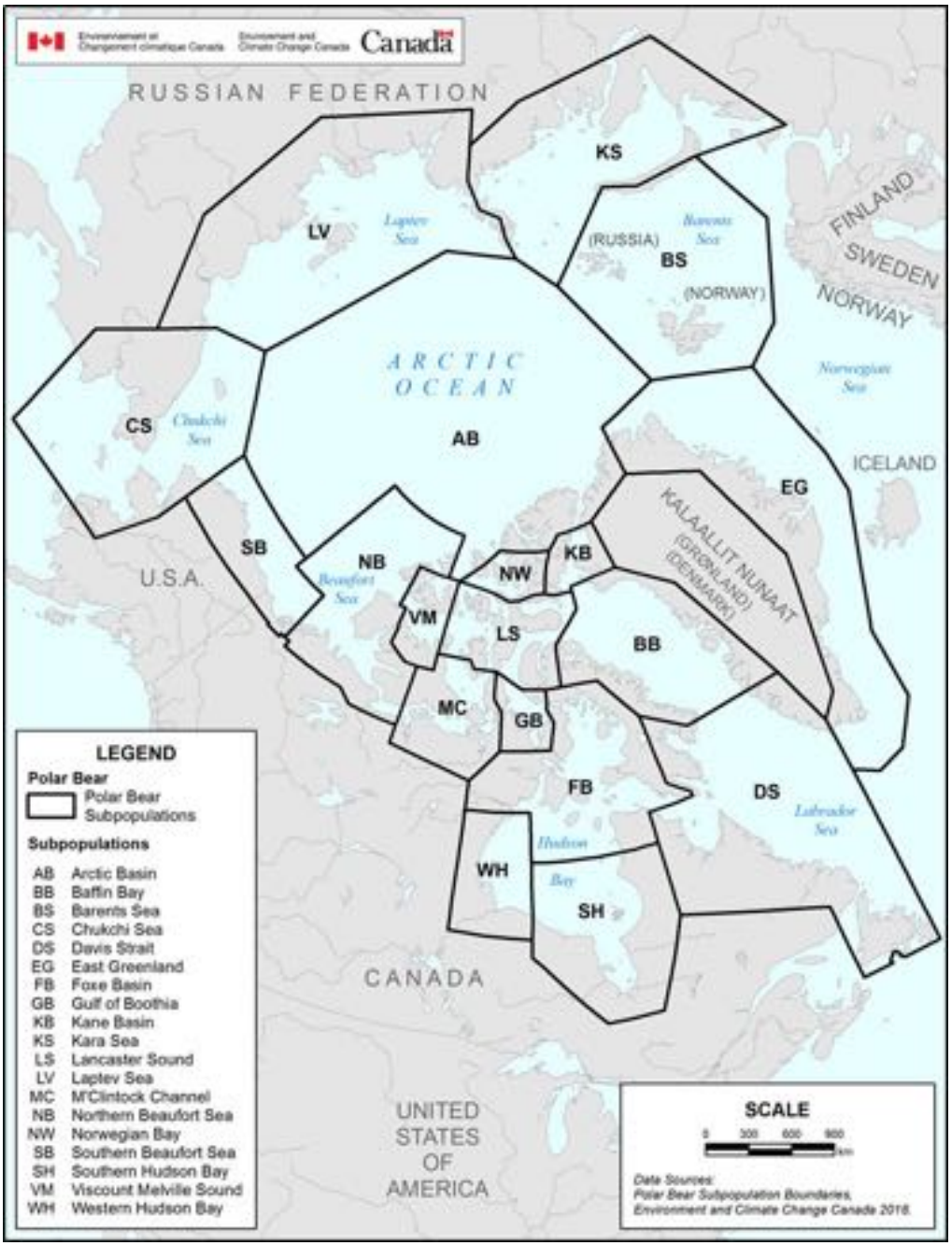

Figure 1. Map of circumpolar polar bear subpopulations (Environment and Climate Change Canada 2018)

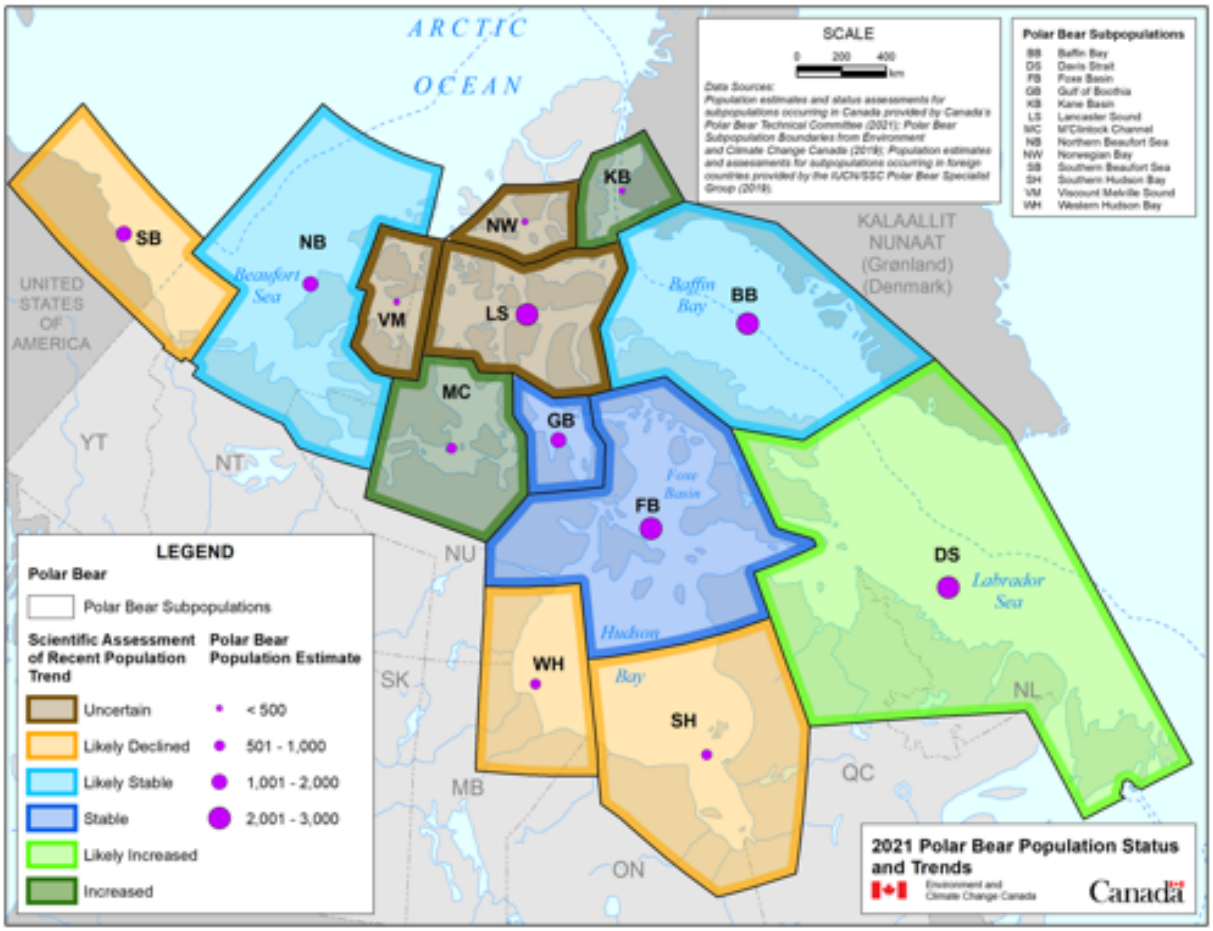

Figure 2 .Map of 2021 polar bear population status and trends of Canadian subpopulations (Environment and Climate Change Canada 2021)

1.2. INUIT KNOWLEDGE REVIEW AND SYNTHESIS

To support Objective 1 of the Nanuk Knowledge and Dialogue Project, Polynya Consulting Group was engaged to undertake a review, analysis, and synthesis of documented Inuit knowledge related to the Davis Strait polar bear subpopulation.

Inuit have vast past, current, and future-looking knowledge about polar bears. Inuit organizations, territorial, regional, and federal governments, wildlife management boards, and researchers have gathered Inuit knowledge for the Davis Strait polar bear subpopulation through qualitative studies since the land use and occupancy studies in the 1970s. Significant efforts have been made in recent years to document this knowledge to strengthen its use in wildlife management decision-making. While these reports are significant recent sources of information, Inuit knowledge of Davis Strait polar bears has also been documented in other sources. This report provides the first review and synthesis of Inuit knowledge of Davis Strait polar bears across Inuit regions.

To both assess the breadth of documented Inuit knowledge about Davis Strait polar bears and the depth of Inuit knowledge about polar bears on key topics of interest for management, we used a two-stage approach:

1. Literature review and metadata compilation of available peer-reviewed and grey literature; and
2. Qualitative analysis and synthesis of key regional Inuit knowledge reports from Nunatsiavut, Nunavik, and Nunavut.

The methods, findings, and discussion of this work are presented in the remainder of this report.

2. METHODS

2.1. LITERATURE REVIEW

A mixed purposeful and systematic strategy was used from September 2021 to May 2022 for gathering peer-reviewed and grey literature and other sources documenting Inuit knowledge of polar bears.

First, recent comprehensive regional Inuit knowledge reports about the Davis Strait subpopulation were gathered. Published reports are currently available from all regions within the Davis Strait geography, with the most recent being from Nunavut. These comprehensive regional Inuit knowledge reports (Tomaselli et al. 2022; Nunavik Marine Regional Wildlife Board 2019; York et al. 2015; Kotierk 2010a; Kotierk 2010b) were compiled as part of the literature search for this project. [1]

Second, an existing literature review database and report about the Davis Strait polar bear subpopulation was reviewed in February 2022 (Taylor and Dowsley 2012a; Taylor and Dowsley 2012b). The Excel database (Taylor and Dowsley 2012b) was compiled in 2012 for the Torngat Wildlife and Plants Co-management Board. It predominantly consisted of primary research publications from peer reviewed journals; however, government publications and grey literature (newspapers, news websites, etc.) were also included. The articles and information sources were categorized within this database based on themes. We reviewed the articles that identified with themes of "Inuit harvest" and "social" in order to document sources with content specific to Inuit knowledge of the Davis Strait polar bear subpopulation. When a source with relevant information was identified, the cited references of that source were reviewed and, where a citation indicated potentially relevant knowledge, these cited sources were examined for inclusion in this review.

Third, to identify other potential literature sources, a systematic keyword search was performed to gather peer-reviewed and grey literature using Google Scholar and Google in February and March 2022. This search was focused on the last decade (2012–2022) to identify articles published since the Taylor and Dowsley (2012b) database. Key words used included polar bear, *Ursus maritimus*, Inuit knowledge/IK, Traditional Ecological Knowledge/TEK, Inuit qaujimajangit[2]/IQ, Inuit qaujimajatuqangit, Davis Strait, and geographic identifiers (territories, regions, and place names) (see Appended Table 1 in Appendix A for search terms). The literature search included resources relevant to the Davis Strait polar bear subpopulation in Greenland. When a source with relevant knowledge was identified, cited sources were reviewed as previously detailed.

Lastly, in May 2022 we drew on existing knowledge of polar bear management and expert review of other colleagues in the field of study to identify relevant information sources from grey literature that may have not been identified through other purposeful and systematic searching.

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[1] The Tomaselli et al. (2022) report was added when published in June 2022, while other regional Inuit knowledge reports were gathered earlier.

[2] See Kotierk (2010b) for an explanation of the meaning of the term Inuit qaujimajatuqangit and discussion regarding use of Inuit qaujimajangit as compared to Inuit qaujimajatuqangit. While the terms have distinct meanings, both are used in this report.

Research was included in the review if it was:

1. On or about polar bears; and
2. Based on, integrating or incorporating Inuit knowledge; and
3. Based in or with direct relevance to Davis Strait polar bear subpopulation geographic area; and
4. Included some qualitative or descriptive presentation of knowledge.

Research that had no publicly-accessible presentation of knowledge or that solely existed in a map database with no text component was excluded.

A metadata spreadsheet was developed in Excel to document the details of the information sources including reference details, geographic scope, methods, and Inuit knowledge themes. The Inuit knowledge themes included in the spreadsheet were identified based on content from the regional Inuit knowledge reports and revised based on input from the project lead. The determinants of Inuit health themes were drawn from Snook's (2021) conceptualization of social determinants of health based on Indigenous perspectives. Thematic categories were assessed for presence/absence, while other categories (e.g. methods, reference type) were categorical. Metadata categories and their description can be found in Appended Table 2 in Appendix A. Results of the literature search are presented in section 3 of this report and the full metadata table can be found in the Appendix.

2.2. INUIT KNOWLEDGE SYNTHESIS

Regional Inuit knowledge reports (Tomaselli et al. 2022; Nunavik Marine Regional Wildlife Board 2019; York et al. 2015; Kotierk 2010a; Kotierk 2010b) were thematically coded in the qualitative analysis software QSR NVivo 12. A hierarchical thematic coding structure focusing on key themes that were identified as being of interest for management was developed based on the categories in the metadata spreadsheet and refined in collaboration with project leads. Subnodes were developed and coded where there was a high number of references (defined as 80 references or above) or where distinct themes were identified within a node.

Analysis of reports, as opposed to raw data in the form of interview transcripts, required some adaptation of analysis methods. In most cases, the reports had condensed or quantified the responses provided by participants, resulting in summaries or tables in the reports. We endeavored to avoid duplication of information in the following ways:

1. Executive summaries of reports were excluded from the analysis.
2. Summary or concluding statements were excluded from the coding unless they provided new insight or information.
3. Tables were captured as images under the analysis and reviewed for quantification of responses during reporting.

Considering the above, the number of references per node or subnode should not be interpreted directly as the number of respondents providing information on a specific theme. Instead, the number of references should be considered an indication of the frequency with which a theme was addressed in the reports.

3. LITERATURE OVERVIEW

3.1. LITERATURE REVIEW RESULTS

3.1.1. Overview

Twenty-three sources were compiled into the metadata spreadsheet, including books, peer-reviewed papers, government and management board reports, theses, and film. The literature search identified over 140 other articles/reports; however, these were excluded because they did not contain content specific to IK of the Davis Strait polar bear subpopulation. Data from the 23 sources spanned over seven decades, with 20 sources being Inuit knowledge studies including over 700 Inuit participants. Summary data on the sources is provided in Table 1. The regional Inuit knowledge reports specific to the Davis Strait polar bear subpopulation were the most comprehensive sources within the literature; these are discussed in detail under the following section.

Table 1.Summary data for Inuit knowledge sources

Literature Summary	Value
Number of sources	23
Publication year range	1976-2022
Total number of pages	2900
Total number of Inuit participants	713[3]
% sources that were Inuit knowledge Studies[1]	87%

[1]*Inuit knowledge Studies are defined as including intentional explicit (primary) collection and/or use of Inuit knowledge in the introduction or methods, as well as Inuit knowledge in the results of the paper. Conversely, studies with implicit, anecdotal, or informal collection of Inuit knowledge were defined as studies with Inuit knowledge content only.*

The sources covered all three Inuit regions within Canada with relevance to the Davis Strait polar bear population, as shown in Table 2, with the largest number of sources from Nunavut. Inuit participant numbers varied across the regions, with participants from 25 different communities. While the communities of Killiniq and Hebron on the Labrador-Quebec peninsula are not listed in Table 2 as they are not present-day communities, knowledge of relevance to these areas may have been shared by former residents that now live in other Nunavik and Nunatsiavut communities (primarily Kangiqsualujjuaq, Nain, Hopedale, and Makkovik), as well as those with family connections that have maintained ties to these places.

As most studies were based on political boundaries, rather than being specific to the Davis Strait subpopulation, not every participant/community had a direct relationship to this subpopulation. Where

[3] The number of Inuit participants is less than the actual as some studies did not specify how many Inuit participated and others noted only that the HTO's had been consulted. Further, two of the sources included in the database were reports developed based on the same series of interviews conducted with participants (Brown and Fast 2012; Fisheries and Oceans Canada 2011); as such, in order to avoid double counting no participants were listed in the full metadata table for the Fisheries and Oceans Canada 2011 report.

it was possible to separate content from communities/participants specific to the Davis Strait subpopulation, this was done in the metadata spreadsheet; however, not all reports allowed for this separation. Some sources credited quotes to a specific participant or community; thus, these sources would allow for quotes to be interpreted as being directly relevant to the Davis Strait subpopulation.

Table 2.Geographic scope of included studies and Inuit participation

Region	Number of sources	Number of Inuit participants	Communities*
Nunavut	18	391	Arctic Bay, Arviat, Clyde River, Cape Dorset, Gjoa Haven, **Iqaluit**, **Kimmirut**, Kugaaruk, **Pangnirtung**, Qikitarjuaq
Nunavik	4	76	**Aupaluk, Kangiqsualujjuaq, Kangiqsujuaq, Kangirsuk, Kuujjuaq, Quaqtaq, Tasiujaq**
Nunatsiavut	6	144	**Hopedale, Makkovik, Nain, Postville, Rigolet**
Greenland	1	94	Ittoqqortoormiit, Avanersuaq, Upernavik

**Bold indicates communities with direct relationships to Davis Strait polar bear subpopulation.*

Email correspondence from the Greenland Institute of Natural Resources confirmed that there has not been an Inuit knowledge study specific to the Greenland portion of the Davis Strait polar bear subpopulation (F. Ugarte, personal communication, March 28, 2022). It was indicated that a study from South Greenland is forthcoming sometime after 2023; however, bears from this area are likely part of the East Greenland subpopulation rather than Davis Strait. Furthermore, it was noted that typical sea ice conditions limit Greenland hunters from accessing bears from the Davis Strait subpopulation; only during icy years does the ice reach South Greenland communities.

The number of sources that included Inuit knowledge related to polar bear as determinants of heath, biology/ecology, and management and stewardship are provided in Figure 3, Figure 4, and Figure 5, respectively. The three most referenced aspects of polar bear as determinants of heath were with respect to Indigenous knowledge systems; food systems and security; and law and policy. Abundance and distribution/range were the most referenced aspects of polar bear biology/ecology, which is likely reflective of current focus on the quota system as a management tool. Aspects of management and stewardship were relatively equal in their coverage, except for subpopulation delineation. This latter aspect was only raised during consultations in Nunavut and specifically included within interview topics in the 2022 Nunavut report (Tomaselli et al. 2022).

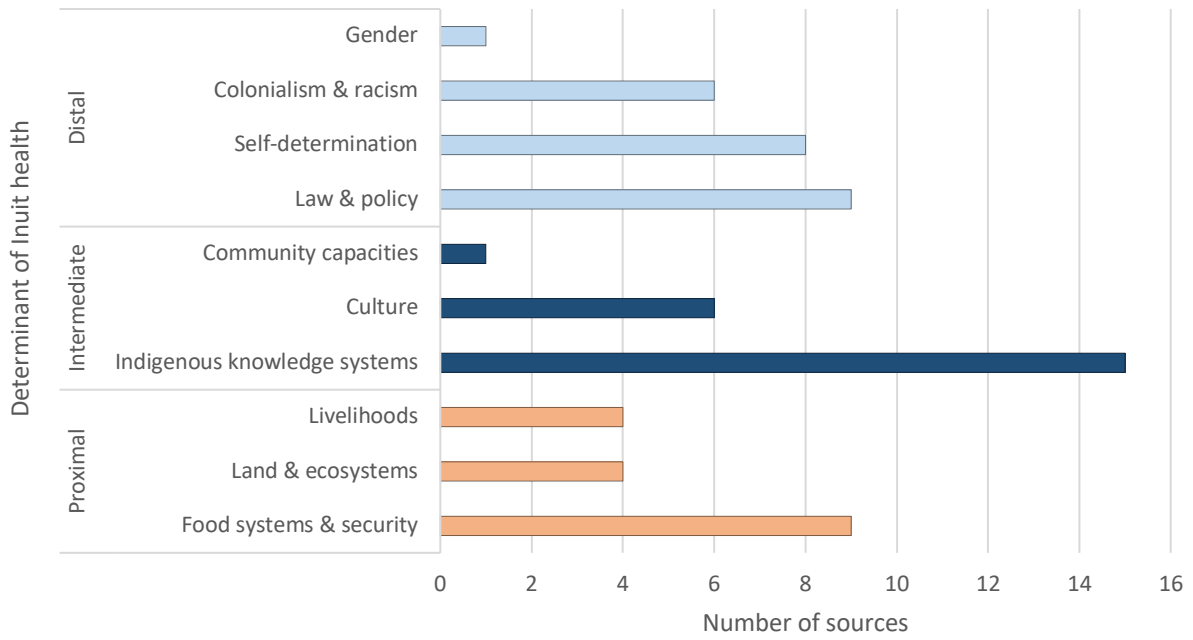

Figure 3. Sources with Inuit knowledge regarding polar bears as determinants of health

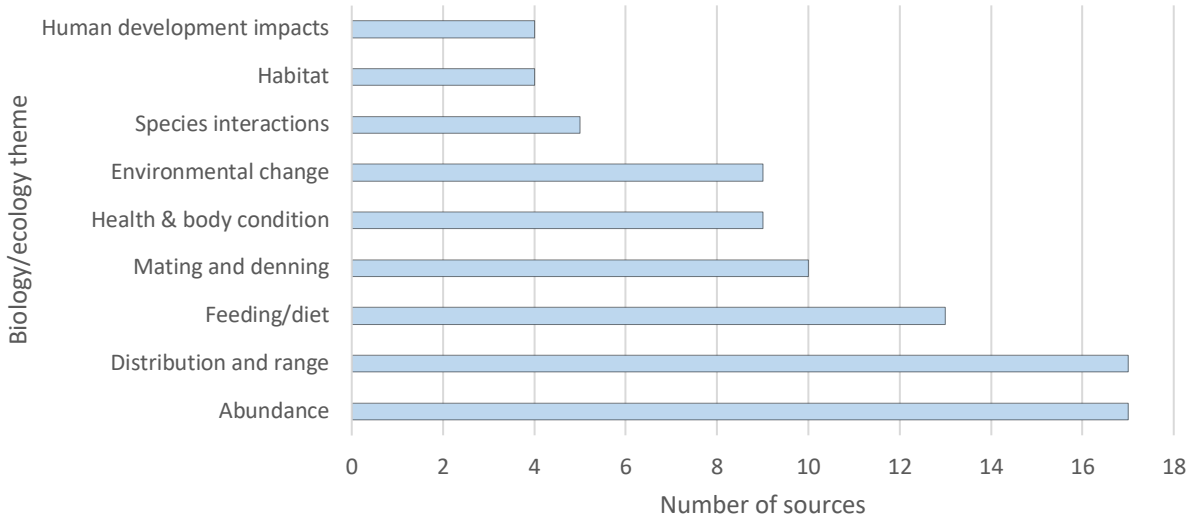

Figure 4. Sources with Inuit knowledge regarding polar bear biology/ecology

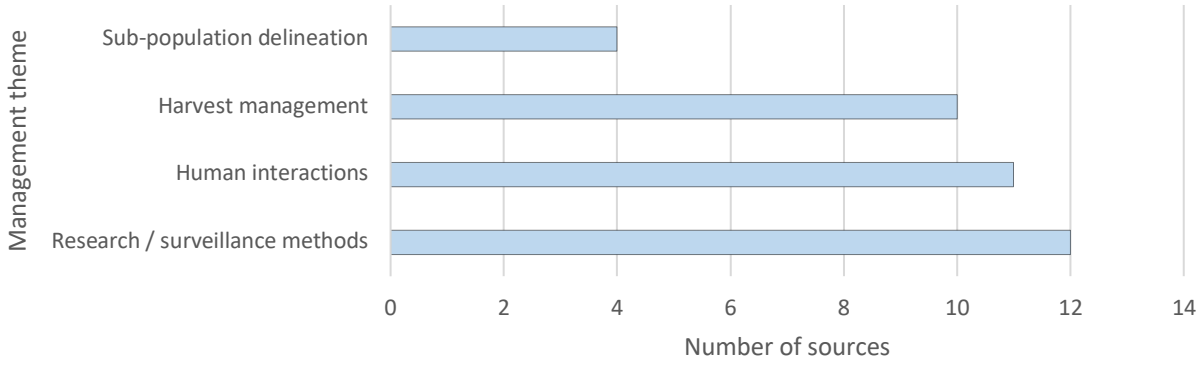

Figure 5. Sources with Inuit perspectives on polar bear management and stewardship

3.1.2. Notable Literature Groups

Regional Inuit Knowledge Reports

The Government of Nunavut undertook their first study specific to Inuit knowledge of the Davis Strait polar bear subpopulation from 2007-2008 (Kotierk 2010b). This study was conducted through public opinion polls and included both Inuit and non-Inuit participants from the communities of Pangnirtung, Iqaluit, and Kimmirut. The survey instrument included questions on polar bears, climate change, Inuit qaujimajangit, and natural resource management. The results are presented through tables and graphs of coded responses. For each response, the number of participants who said each response is provided, with Inuit and non-Inuit participants differentiated. Responses from this study indicated that Elder and Inuit hunter knowledge would be an appropriate way to include Inuit qaujimajangit within wildlife management. This finding led to the completion of a subsequent study which used an interview format to gather knowledge from Elders and hunters on polar bears, climate change and Inuit qaujimajatuqangit (Kotierk 2010a). This study was conducted over the same time frame and within the same communities, including 31 participants. The results are presented through tables of statements, with the number of participants who said each response.

In 2019, the Government of Nunavut undertook another Inuit knowledge study in support of management decisions and strategies (Tomaselli et al. 2022). This study gathered knowledge from 43 participants from Pangnirtung and Kimmirut through individual interviews, group interviews, and participatory exercises. Inuit qaujimajatuqangit was gathered as it related to polar bear cultural importance, harvesting practices, health, ecology, and management. Qualitative analysis using NVivo Pro 11 was completed on the interviews and results are presented as summaries by topic with supporting quotes. Geographic Information Systems (GIS) software was used to compile and visualize mapped data from the interviews.

A collaborative report completed in 2015 between Lakehead University and the Torngat Wildlife, Plants and Fisheries Secretariat was the first to document Traditional Ecological Knowledge on polar bears in Labrador, specifically Nunatsiavut (York et al. 2015). This study included interviews conducted in 2012 with 15 Inuit hunters from Nain, Postville, and Hopedale. The aim of the study was to collect TEK relevant to hunting practices; management perspectives; polar bear condition, behaviour, abundance and distribution; and short/long term changes to climate and sea ice. Qualitative analysis using NVivo 10 was completed on the interviews and results are presented as tables of thematic responses with

frequencies. Illustrative quotes are provided for most questions. GIS software was used to compile and visualize mapped data from the interviews.

In response to direction from Canada's Minister of the Environment to establish a formal management system for polar bears within the Nunavik Marine Region, the Nunavik Marine Region Wildlife Board (NMRWB) conducted a study in 2014–2015 to gather and document Inuit knowledge and observations from Nunavik communities. This project included all 14 Nunavik communities covering the three subpopulations in Nunavik. Specific to the Davis Strait bears, individual interviews, focus groups, and participatory mapping was undertaken with 76 participants from Aupaluk, Kangiqsualujjuaq, Kangiqsujuaq, Kangirsuk, Kuujjuaq, Quaqtaq, and Tasiujaq (Nunavik Marine Regional Wildlife Board 2019). Qualitative analysis using NVivo 10 was completed on the interviews and results are presented as summaries by topic with supporting quotes. Tables and graphs are used to summarize categorical data based on responses. Mapped data was compiled and digitized for visualization.

Land Use and Occupancy Studies

Inuit land use and occupancy studies have been conducted across the Inuit homeland, predominantly but not exclusively, as part of work to prepare and assert land claims. These studies were tasked to "produce a comprehensive, verifiable record of past and present Inuit use and occupation of the land and marine environment" (Labrador Inuit Association 1977). A study in the Northwest Territories was that informed the establishment of Nunavut was conducted by Milton Freeman Research Limited and published in 1976 (Milton Freeman Research Limited 1976a; Milton Freeman Research Limited 1976b; Milton Freeman Research Limited 1976c). Modelled on the methods and objectives of this study, a similar study was sponsored by the Labrador Inuit Association and published in 1977 (Labrador Inuit Association 1977). In Nunavik, Makivvik, then the Northern Quebec Inuit Association (NQIA), intensively conducted a land use research program between 1975 and 1980 consisting of interviews and mapping. Further mapping and information has been collected by the Makivvik Research Department in the years following, often in association with government agencies or universities, and integrated into an evolving database. More recently, the Nunavik Marine Region Planning Commission (NMRPC) conducted a land use and occupancy study from 2011 to 2016 focused on mapping of use and occupancy sites in Nunavik. However, maps and qualitative data from the NQIA, Makivvik and NMRPC studies are not publicly available. These studies provide a wealth of Inuit knowledge, covering historical and present-day time periods, on land use, wildlife, culture, and knowledge systems.

The studies for the Northwest Territories and Labrador were documented in reports with summarized information and, in the case of Labrador, direct quotes. This report-based information was included in the metadata spreadsheet as follows: Volume One of the Northwest Territories report (Milton Freeman Research Limited 1976a) and Part II of the Labrador report (Labrador Inuit Association 1977). Both studies focused strongly on participatory mapping; as such, there is an abundance of mapped data that can be directly referred to for information on the biology/ecology of polar bears and hunting, camps, and seasonality of Inuit knowledge systems.

Hearings and Management Plans

Wildlife co-management boards may choose to hold public hearings into any issue requiring a decision. These hearings provide another source of Inuit knowledge from both written and oral submissions made over the course of the hearing. While neither the TWPCB nor the NMRWB have yet held hearings related to Davis Strait polar bears, in 2011, the NWMB held a public hearing related to the management of David Strait polar bears, specifically to consider modifying the total allowable harvest. This hearing

produced a significant record of decision that can be found on the NWMB's website. Analyzing this record is beyond the scope of this review but another research project. Although less specific to wildlife, other institutions of public government, such as the impact review boards and planning commissions, also hold hearings in which knowledge related to Davis Strait polar bear may have been shared.

Regional polar bear management plans also rely heavily on Inuit knowledge. In 2019, the Government of Nunavut's Polar Bear Co-Management Plan was approved after nearly five years of consideration (Government of Nunavut 2019). At the time of writing the Polar Bear Management Plan for Québec, the Eeyou Marine Region and the Nunavik Marine Region, which was co-developed by many co-management partners, was in the final stages of approval (Anon. 2021). Management plans have not been included in the spreadsheet or this report as they tend to rely on existing sources of Inuit knowledge, rather than being primary sources.

Excluded Data

The Nunavut Atlas (Riewe 1992) was produced through information gathered for the Inuit's land claim for Nunavut. This information is presented as a series of maps and text for settlement areas, land use, and critical wildlife areas. This source was excluded from the metadata spreadsheet as it presents as a database rather than a study or report; however, it can be consulted directly for mapped data. Information from the Nunavut Atlas was included in the Coastal Resource Inventories conducted by the Government of Nunavut from 2007-2015 (Nunavut Department of Environment 2012; Nunavut Department of Environment 2009; Nunavut Department of Environment 2013); as such, it is partially captured within the metadata spreadsheet under the community-specific entries.

There were numerous sources that provided interesting information related to polar bear that was not specific, or not specifically referenced to, Inuit knowledge of the Davis Strait polar bear subpopulation. These sources were excluded as they did not fit the scope of the literature review. One such source was a chapter written by Stephanie Vaudry in the book Indigenous Peoples' Governance of Land and Protected Territories in the Arctic (Vaudry 2016). It provided information and quotes from several other primary sources, including books, studies, and film; however, the sources were not geographically referenced. In particular, two French language books were referenced in this chapter that could be consulted for additional information specific to Davis Strait:

- Randa, Vladimir (1986) L'ours Polaire et les Inuit. Paris: Société d'Études Linguistiques et Anthropologiques de France, Ethnosciences 2. 323 pp.
- Martin, Thibault. (2003) De la banquise au congélateur. Mondialisation et culture au Nunavik. Québec, Les Presses de l'Université Laval. 202 pp.

4. INUIT KNOWLEDGE SYNTHESIS

4.1. RELATIONSHIPS TO POLAR BEAR AS DETERMINANTS OF INUIT HEALTH

There is a strong link between the environment and health for Inuit (Durkalec et al. 2015; Borish et al. 2022; Richmond and Ross 2009; Cunsolo Willox et al. 2013). Harvesting, preparing, sharing and consuming wild foods has been integral to Inuit diets, culture, livelihoods for millennia. Wild foods are nutrient-dense and critical for to food security in a context where market foods are often expensive, of lower nutritional quality, or inaccessible (Kenny et al. 2018; Kuhnlein et al. 2002; Chan et al. 2006; Lambden et al. 2006). Harvesting wild foods is important for cultural continuity and identity; it is both grounded in Inuit cultural values regarding the relationship between people, animals and the land, and also reinforces these relationships (Borré 1991; Borish et al. 2022). Similarly, engaging in safe and successful harvesting, preparation, and consumption of wild foods requires extensive knowledge, for example related to how to navigate and stay safe on the land and how to prepare and store wild foods safely, and also helps build this rich knowledge. Social and familial relationships are nurtured through people collective activities of harvesting, preparing skins and foods, and eating and sharing food, which also strengthens knowledge transmission. Harvesting also brings economic or material benefits. Traditionally, all parts of animals were used for clothing, tools, shelter, furnishings, medicine, art, and games, and the sale of parts of animals such as hides is now also a valued source of income. These myriad aspects of the relationship between wildlife and Inuit influence Inuit physical, cultural, mental, emotional, social, spiritual, and economic health and wellbeing (Pufall et al. 2011; Borish et al. 2022; Borré 1991; Kenny et al. 2018).

Because of the strong and multifaceted influence of relationships with the environment on Inuit health, a determinants of health lens was employed for this work to guide the exploration of how relationships with polar bear influences Inuit health from an Inuit knowledge perspective. Determinants of health are the broad range of personal, social, economic and environmental factors that determine the health status of individuals or populations. Because health is culturally-specific and determinants that shape health are also population specific, an Indigenous-focused social determinants of health framework developed by Snook (2021) was used as a lens to examine information in the regional Inuit knowledge reports. Generally, proximal determinants are factors that have direct effects on health; intermediate determinants can be considered the origin of those proximal determinants; and distal determinants are the political, economic, and social contexts that construct both intermediate and proximal determinants (Reading and Wien 2009). This creates a nested framework for how social determinants act upon and affect health. In reality, relationships between determinants are often more complex. Distal factors such as self-determination and colonialism affect many if not all other determinants; thus, disentangling distal factors from other determinants is challenging. For brevity and clarity, we focused the analysis and reporting according to the theme that was most relevant for the content but underscore that content may be relevant to multiple themes. As an example of these complexities, Figure 6 provides a visual representation of the ways that participants from Nunavik described the importance of polar bears to them and the relationships between these factors.

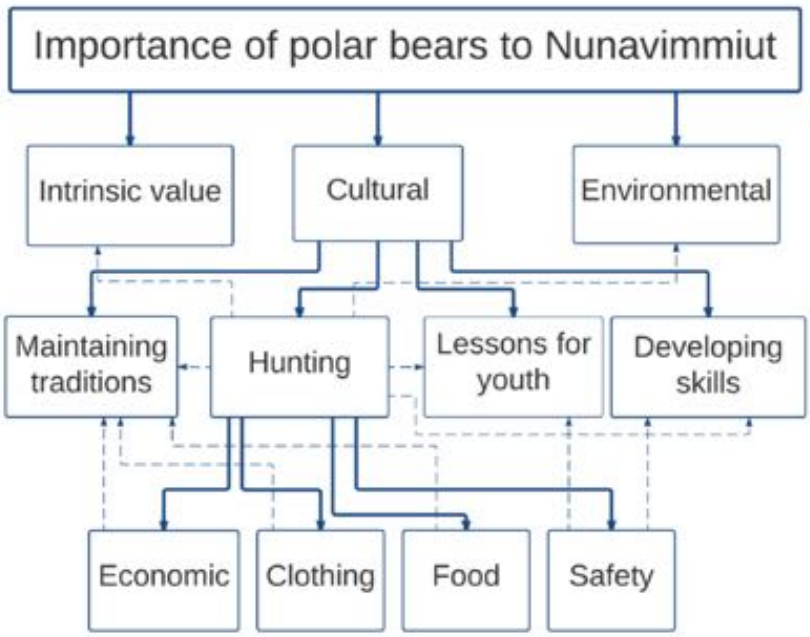

Figure 6. Flowchart depicting the ways polar bears were indicated to be important to participants, and the complex relationships between them (Nunavik Marine Regional Wildlife Board 2019, p. 94).

4.1.1. Proximal

Land & Ecosystems

All three regions describe polar bear hunting as a traditional activity that connects Inuit to the land and teaches respect for bears and the environment. This knowledge is also gained through hide processing activities, hunting other species, and travelling on the land/sea (Nunavik Marine Regional Wildlife Board 2019; Tomaselli et al. 2022).

> *You still try to make it [polar bear hunting] a traditional thing because it's the way it should be. It's was always the way I grew up and I'm taught and I'd teach my children the way we were taught just to respect it. Respect the land and that out there where the bear is frequent, don't leave no garbage around when you're out hunting. – Anonymous* (York et al. 2015, p. 64)

> *There's a lot [young Inuit could learn from hunting polar bears]. Once you start polar bear hunting you learn about the ice, the ice conditions, currents, anything to do with the ocean. It's very important. Not just because polar bear, but other species also – where they are, what they do in those areas, what you can find in those areas. It's a whole list of things. Seals, bearded seals, beluga, it's all there. So you get that knowledge, so it's very important." – Resident of Kuujjuaq* (Nunavik Marine Regional Wildlife Board 2019, p. 48)

> *Polar bears are very important to us, because they're living with us…on this land of Nunavut and Baffin Island. – Meeka Alivaktuk, Pangnirtung* (Tomaselli et al. 2022, p. 15)

Food Systems & Security

Polar bear as a country food and its role in Inuit subsistence lifestyle was noted by contributors in all three regions. Emphasis was placed on the abundance of meat that a polar bear provides and thus its importance for food security within the broader community. The meat is shared among the hunters who participated in the hunt but also with the rest of the community. Inuit harvesting values gained from Elders are consistent with and inform present-day practices, including nothing being wasted, the food being shared, and other parts being used (i.e., organs as dog meat, fat for oil, etc.).

> *It is important to keep the polar bears forever for food security. – Johnny Mike, Pangnirtung* (Tomaselli et al. 2022, p. 18)

> *Back then we would harvest a bear, nothing was wasted, all the meat was harvested except the intestines…Back then the hide was divided amongst the hunters who participated in the hunt…The organs were given to the dogs and if the bear was fat, the fat itself was used to light the qulliq [oil lamp] to provide heat. – Eliyah Padluq, Kimmirut* (Tomaselli et al. 2022, p. 17)

> *Yeah, see for me, it's our way of life. I was born and raised like that and I think it's very important. Again, it brings to my table, to my family, food. That's most important for me. Instead of buying chicken or pork chop I get to eat my country food such as beluga, polar bear, seals. I'm very proud when I bring those to my kitchen table to feed my family and family members. It is most important for us as Inuit. – Resident of Kangiqsujuaq* (Nunavik Marine Regional Wildlife Board 2019, p. 50)

> *Some people go on the radio and say: "There's polar bear meat, you can pick it up!" and people go up there. And the meat is gone within an hour or so…The more fat it has, the more people want it. So the whole meat is brought home and it's gone. – Davidee Nowyuk, Pangnirtung* (Tomaselli et al. 2022, p. 18)

In Nunavut, contributors noted harvesting and consumption preference for healthy bears and that hunters would avoid harvesting skinny bears or ones that were known to eat from the dump (Tomaselli et al. 2022).

Livelihoods

The economic role of polar bear hunting was spoken about by both Nunavik and Nunavut contributors, primarily based on the selling of hides. While hides can be used for clothing and mattresses, most participants spoke of selling the hides for their monetary value. Participants also noted the importance of selling the hide to help recover the cost of the hunt itself.

> *Before, a long time ago, we used to use it as clothing or a mattress but today we mostly sell it to the market. – Resident of Kangiqsualujjuaq* (Nunavik Marine Regional Wildlife Board 2019, p. 50)

> *Right now in the 2000s, we notice now that we can sell the polar bear skin. There's a market here, and it's useful for buying food or buying some materials for hunting or for a skidoo. It's useful when you're selling the polar bear skin. – Resident of Kangiqsualujjuaq* (Nunavik Marine Regional Wildlife Board 2019, p. 53)

The economic value of hides, and thus the incentive to hunt polar bears, differed between respondents from Nunavik and Nunavut. In Nunavik, high market prices for hides were thought to have increased polar bear hunting in the region, leading to some older hunters limiting their hunt over concerns that too many bears may be taken (Nunavik Marine Regional Wildlife Board 2019). In Nunavut, the opposite was noted by participants in Kimmirut and Pangnirtung, where lower hide prices and difficulty in selling hides has resulted in significant disincentive to hunt (Tomaselli et al. 2022). Some hunters from Nunavut also noted that fewer community members were able to prepare hides, also resulting in fewer hunts. It is worth noting that hide prices peaked in 2013 and remained high in 2014-15, during the NMRWB's study period, whereas the price of hides had decreased to approximately half that amount during the time period of the Tomaselli et al. interviews (Cooper 2022). Thus, the difference between regions is likely due to the significant change in the price of hides between the two study periods.

> *I rarely go [polar bear hunting] now because the price for polar bears is not as high as it used to be...maybe five years ago the price dropped. – Matiusie Maniapik, Pangnirtung* (Tomaselli et al. 2022, p. 19)

They are not as important to me because the cost of their hides has gone down and I don't have a wife that can clean the skins for me. – Sandy Akavak, Kimmirut (Tomaselli et al. 2022, p. 19)

Sport hunting also provides economic value to communities in Nunavut; however, it is not currently permitted in Nunavik. Some contributors from Nunavik suggested that ecotourism or sport hunting could be introduced; however, other participants disagreed with these approaches (Nunavik Marine Regional Wildlife Board 2019).

> *I am the only one with a dog team in town right now and polar bear sport hunts have to be done by dog team. When I get the chance, I try to go on a hunt. It helps me and the community with much needed wages [as I have other people coming along]...If you hunt bears by dog team it is very fulfilling. You can hear the dogs make a call or cry and no other time they will do [the same]: the sound is different. – Anonymous 02, Kimmirut* (Tomaselli et al. 2022, p. 21)

In Nunavut, study participants noted that other parts of the polar bear are being used for art and jewelry, which also provide an economic input to the community (Tomaselli et al. 2022).

> *The teeth are used to make crafts nowadays by younger generations, those who are carvers, and the claws are also useful. – Itee Temela, Kimmirut* (Tomaselli et al. 2022, p. 18)

4.1.2. Intermediate

Indigenous Knowledge Systems

The importance of polar bears to Indigenous knowledge systems was discussed in the regional Inuit knowledge reports through Inuit hunting and harvesting guidelines, hunting and processing methods, and transfer of hunting and safety knowledge to younger generations.

Inuit hunting and harvesting guidelines and values were consistently spoken about across all three regions and were generally followed both historically and currently. In all three regions, mothers and cubs were avoided; in Nunavik, juveniles were also avoided unless the focus of the hunt was meat (Nunavik Marine Regional Wildlife Board 2019). In all three regions, participants shared that a bear should only be taken if it is needed, if all of the bear would be used, and if nothing would be wasted. In Nunavik and Nunatsiavut, hunters also spoke about harvesting guidelines for certain seasons; summer was avoided in Nunavik but the seasonality of hunting in Nunatsiavut was not specified (Nunavik Marine Regional Wildlife Board 2019; York et al. 2015).

> *When I hunt, I try not to shoot the mother and cubs. … Because if you kill all the cubs there are no more polar bears after. – Resident of Kangiqsualujjuaq* (Nunavik Marine Regional Wildlife Board 2019, p. 40)

> *People had ways of doing it. It was almost like Inuit customary law, Inuit knowledge that people had, that they wouldn't hunt nanuk (polar bear) at a certain time of the year. They wouldn't take baby ones, they wouldn't take females with cubs. If they didn't need it, they didn't have it… – Anonymous* (York et al. 2015, p. 66)

Although there is not a formalized management system in Nunavik for Davis Strait polar bears, nearly 40 years ago the Anguvigaq published their own set of hunting regulations that continue to guide harvesting practices (Figure 7).

1984 Anguvigaq Polar Bear Regulations

1. That a closed season on polar bear hunting be in effect from June 1st to August 31st.
2. That female bears with cubs not be killed at any time of the year unless they are problem bears.*
3. That polar bears not be killed in their dens. Further, that no one, including scientists and Inuit, disturb a bear in its den unless authorized after consultation with Anguvigaq Wildlife Management Inc. and review by the Hunting, Fishing and Trapping Coordinating Committee.
4. That polar bears less than 2 years old not be killed at any time of the year unless they are problem bears.*
5. That polar bear cubs not be sold to any person or organization unless authorized after consultation with Anguvigaq Wildlife Management Inc. and review by the Hunting, Fishing and Trapping Coordinating Committee.
6. That the responsibility for issuing polar bear tags to Inuit hunters rests with the local government municipal corporations in northern Québec.
7. That the moratorium on drugging polar bears in northern Québec be continued.
8. That each Inuit community will recognize the right of all other Inuit communities to harvest polar bears and will continue to help each other in matters relating to polar bears.

* Problem bear is defined as any polar bear that is a threat to life or property.

Figure 7. The 1984 Anguvigaq Polar Bear Regulations (Anon. 2021, p. 43)

In all three regions, participants spoke of historical polar bear hunting as primarily opportunistic, with bears being pursued and harvested when encountered while out on the land (Nunavik Marine Regional Wildlife Board 2019; Tomaselli et al. 2022; York et al. 2015). Polar bear hunting equipment has changed from historical times to present, with the introduction of modern equipment. In the past, hunters would use dog teams to travel and dogs, knives, and harpoons would be used to surround and kill bears. In Nunavik and Pangnirtung, participants spoke about hunting bears in dens using knives; however, this hunting method was not recalled by participants in Kimmirut (Nunavik Marine Regional Wildlife Board 2019; Tomaselli et al. 2022). Present day hunts are done primarily from skidoos and use rifles to kill the bears.

> *Like I said earlier, char fishing and being out in the cabin, if a polar bear came into our camp, we used to kill it; only if it came into our area. We didn't look for them, they came by themselves. My father only got bears when they came to our camp. I don't remember him going out to look for the polar bears. It was only when the bear came into our camp. These days you need a licence to hunt bears. That is the only thing that has seemed to change. – Anonymous* (York et al. 2015, p. 57)

> *A real traditional way that I've heard and have seen it, my grandfather got a polar bear, the bear was in the den. … And he go in and even though he touched the polar bear, the bear won't bite or fight nothing, he just sit there. Only when he goes out he's going to start attacking you. My grandfather went inside the den and pushed the*

> *polar bear out and then killed the polar bear. – Resident of Kangiqsualujjuaq* (Nunavik Marine Regional Wildlife Board 2019, p. 39)
>
> *Today, there are more bears and faster machines and better rifles. The two things combined [make polar bear hunting easier nowadays]. Better equipment and more bears. – David Kooneeliusie, Pangnirtung* (Tomaselli et al. 2022, p. 21)

Nunavik hunters spoke about seasonality of hunting, with winter being the preferred time of year, spring and fall being favored by some, and summer being the least preferred (Nunavik Marine Regional Wildlife Board 2019). Hunting in these communities took place predominantly from the sea ice, although some hunters noted that it is possible, just not commonly done, to track and hunt inland (Nunavik Marine Regional Wildlife Board 2019).

Butchering is done immediately as the carcass freezes quickly, with the bear being first skinned then the carcass butchered, the stomach is usually checked for contents, the organs left, and the meat taken back to the community (Tomaselli et al. 2022).

> *I take everything with me [but] the organs…I leave [those] to the ravens to eat. [But I look at the stomach and] there is always seal in it. – Lazarusie Ishulutaq, Pangnirtung* (Tomaselli et al. 2022, p. 23)

Hide cleaning and processing is similarly tied to the importance of polar bear hunting and, in Nunavut, was identified as primarily done by women (Tomaselli et al. 2022). The processing of hides is described as a lot of work that is often done collaboratively. It was also noted that fat bear hides are easier to clean and process. Hide processing involves removing the fat, cleaning/washing, hanging, drying, stretching, and sewing into clothing, etc. The work required to clean a hide and the lack of skilled cleaners was discussed as a disincentive to hunting under the Livelihoods section above.

Polar bear hunting and safety knowledge is gained from joining in hunts with parents and mentors and thus provides a way for Inuit knowledge to be passed forward. This extends beyond the practical to life lessons such as patience, respect, and pride and skills such as understanding environmental conditions and animal habits.

> *Well, there was not a lot of bears in those days. It's not like today. We hunted for about a week and a half before we started to see tracks. I was quite young. It was quite an experience to be able to be out there with somebody that knew what they were doing… You're not aware of the danger and where not to be. You learn a lot, not just from hunting: where are you going to find bears, where the bears tend to hang out along the flow. It was a good learning experience. – Resident of Kuujjuaq* (Nunavik Marine Regional Wildlife Board 2019, p. 39)
>
> *Yes, they taught me some of it. I learned through experience but most of it I learned from people who have been around bears for years and years. – Anonymous* (York et al. 2015, p. 65)
>
> *Young Inuit, what they can learn, from what I learned, is to have patience. You need good patience to be a polar bear hunter because we're at the same time still hunting or beluga hunting sometimes in the winter time. Patience for me is important knowledge to have and for you to learn that, because a lot of people don't have*

> *patience. If they don't see it they move right away. They go home early, you know. Most patient people always catch something. It might be fish or it might be a polar bear. – Resident of Kangiqsujjuaq* (Nunavik Marine Regional Wildlife Board 2019, p. 40)

In Nunavik and Nunavut, hunters talk of their first polar bear hunt as a coming-of-age experience (Nunavik Marine Regional Wildlife Board 2019; Tomaselli et al. 2022).

> *Well, it was something to be proud of. My father was still alive and I was proud to show him that I got a bear. – Resident of Quaqtaq* (Nunavik Marine Regional Wildlife Board 2019, p. 51)

Contributors from Nunavik and Nunavut also spoke about teaching polar bear safety to younger generations in the context of coexisting with bears and for bears that come close to communities (Nunavik Marine Regional Wildlife Board 2019; Tomaselli et al. 2022).

Culture

The importance of polar bears to cultural continuity and identity is strongly tied, but not exclusive to, their importance for harvesting, which is closely related to Inuit knowledge systems and knowledge transfer. Inuit knowledge systems are inseparable from culturally-grounded Inuit epistemologies, or ways of knowing. Intergenerational transmission of knowledge about polar bears is culturally-informed and also integral to cultural continuity. As a result, there is a very close relationship between the content discussed under Inuit knowledge systems and the content described here. As many aspects related to culture are described in the Inuit Knowledge Systems section, and to minimize duplication of content, this section focuses on the importance of polar bears to Inuit worldview and other cultural aspects of relationships to polar bears. In the Nunavik report, the authors noted specifically the challenges with synthesizing this knowledge: "the perceived importance of polar bears to Nunavimmiut is as varied and unique as individual respondents" (Nunavik Marine Regional Wildlife Board 2019, p. 47).

Words used to describe polar bears illustrate how their role in Inuit culture differs from that of other animals and prey: mighty, majestic, magnificent. Polar bears are identified as top predators that are respected and feared. Intelligence was used to describe bears in all three regions, with participants in Nunavut specifically speaking about how bears can listen when people are talking about them.

> *... the polar bear species are a very dangerous species animals…And the polar bear is a very smart animal - I think it's the smartest animal – so it's very important to hunt them. – Resident of Kangiqsualujjuaq* (Nunavik Marine Regional Wildlife Board 2019, p. 32)

> *Polar bears are very mighty and they could do anything…they could be vicious to humans, and because we are talking about them they are listening. I know this from long ago. I was told that they could listen. Just by mentioning them, they know that they are being talked about. I have learned this from the Elders. – Joe Arlooktoo, Kimmirut* (Tomaselli et al. 2022, p. 16)

> *Polar bears are important to us because all the animals are very important to us. Polar bears provide us with meat and food, and it has been this way through all my life. – Eliyah Padluq, Kimmirut* (Tomaselli et al. 2022, p. 15)

Participants in Nunavut and Nunatsiavut also spoke about the resilience of bears, tied to their intelligence.

> *With what I see, I see a healthy population of nanuk (polar bear). I have not seen any evidence that nanuk (polar bear) is….there's not on the land and the sea…we're not seeing sick or hungry nanuk (polar bear) no more than what we normally would see so they're still able to adapt. They're very adaptable. Nanuk (polar bear) is very isumak (smart). They can change. – Anonymous* (York et al. 2015, p. 54)

The importance of polar bears and how this influences the importance of polar bear hunting is well illustrated by the following quote:

> *The feeling is a lot different, culturally…. If a man kills a beluga, it's completely different than killing the polar bear. Culturally, we find it very important because it brings out the great identity of Inuit. And it's a great feeling to kill a polar bear. It's a lot different than trying to kill other animals. But this one is a lot - gives you pride. … it's a very scary animal. So by killing it, it brings you joy. … By killing other animals it's, like, regular… but the polar bear, it's because it's so huge and everybody respects that animal. And if you kill the polar bear it gives you pride and makes you want to do more and that - you know you're going to provide and you're going to make clothing out of it and you're going to - you can make money out of it too. The income will be a little bit more secure by killing - getting the hide. … And if I kill a polar bear, if hunter find out they're going to call me, 'Wow, congratulations, you hunt the polar bear. Wow, I want it too.'– Resident of Kangiqsujuaq* (Nunavik Marine Regional Wildlife Board 2019, p. 44)

4.1.3. Distal

Self-determination

With respect to how Inuit could play a larger role in polar bear management, participants from all three regions both spoke about using the Inuit hunting and harvesting guidelines and values that were discussed above under Indigenous knowledge systems. Many participants in Nunavik noted that a management strategy (such as the quota being discussed) was not necessary and that stewardship of polar bears should be left as it is already being done by Inuit (Nunavik Marine Regional Wildlife Board 2019). In Nunavut, participants emphasized the importance of IQ and Inuit stewardship in bear management (Tomaselli et al. 2022). These participants spoke of wanting Inuit to have greater control over harvest management for safety reasons, as current management approaches encourage deterring problem bears. These same themes were raised by participants in the 2010 Nunavut study through statements such as "Inuit have been too agreeable" and "Inuit are trying to get more influence" (Kotierk 2010a, p. 16).

> *I think Inuit IQ should be used to manage [polar bears]. IQ should be given a chance like science knowledge that has been ruling polar bear quota. I think IQ should be put in place to manage the polar bear population as much as science has been used for quite some time…I think IQ should be given better consideration for managing polar bear populations. – Johnny Mike, Pangnirtung* (Tomaselli et al. 2022, p. 107)

> *I talked to other people in different communities and they all think that if we did it like back then, like killed polar bears whenever they come and it doesn't matter how much, it would be safer for everyone. It wouldn't be as dangerous…Other Elders in other communities think that's how it should be now because there's too many. – Lazarusie Ishulutaq, Pangnirtung* (Tomaselli et al. 2022, p. 105)

Elders, hunters, and those who live/work with bears, through both personal experience and knowledge that has been passed down, were identified as the people who should be involved in management decisions. This was suggested so strongly in the original public opinion poll for Nunavut that a subsequent study was conducted specifically for Elders and hunters (Kotierk 2010a; Kotierk 2010b).

In Nunavut, both in the 2010 and 2022 reports, the importance of research communication and collaboration was noted by participants. In the 2010 report, participants noted the differences between what researcher/government and Inuit were saying about polar bear population, the lack of trust of research, and absence of consultation (Kotierk 2010a). In the 2022 Nunavut study, several participants stated they would like to receive or have access to more scientific information, that this information needed to be shared better with the community, and that relationship building for dialogue were key to improving trust (Tomaselli et al. 2022).

> *I did not receive information from scientists, I have never talked to a scientist before. [When I was part of the bear survey], I was just counting the bears and I did not receive information back. We were just counting and they did not forwarded the conclusions. They didn't tell me. – Anonymous 01, Kimmirut* (Tomaselli et al. 2022, p. 108)

> *I think there should be, like I said earlier, a better relation between the researchers or the scientists and the people in the community so that information is accurate and that the community knows what the scientists know because we often say 'this is the truth because this is what we're hearing' or 'this is our knowledge'. If we're not hearing the scientist side then the truth may not be the whole truth...Because we're not hearing what they're saying...There's always studies saying that polar bears are decreasing and that they're becoming endangered and all that but us, we're seeing more [polar bears]. So there has to be better communication…between the two so that the information is accurate. – Anonymous 04, Pangnirtung* (Tomaselli et al. 2022, p. 111)

Colonialism

The influence of colonialism on polar bears within Inuit society is primarily represented through the influence of money and the wage economy, as well as the imposition of southern based management approaches. Money has become a necessity for most, and polar bear hunting provides a way to obtain monetary value while preserving traditions and cultural practices. The importance of hides for economic reasons was discussed above under the Livelihoods section; however, the use of hides was influenced by the introductions of the wage economy. Hides were traditionally divided among the hunters who participated in the hunt or were gifted; however, hides are now sold for money as part of supporting families and offsetting the cost of the hunt.

> *Well since time immemorial the polar bear has been part of Inuit life too. There in the earlier days of course, the hunters had to hunt for food, polar bear was one that they had to hunt for food; and of course in addition to food, for clothing and for income matters, to add to their income to help out the family, to make some money, to help in recovering the cost of their hunt. – Resident of Kuujjuaq* (Nunavik Marine Regional Wildlife Board 2019, p. 51)

In Nunavut, the value of hides influenced the preferred hunting seasons as polar bear (Tomaselli et al. 2022). Polar bear fur is thicker and longer in March and April and likelihood of harvesting large bears is greater.

> *This time of the year [spring] is the best, especially for their fur...It's mating season too. If you want to get a big one, this time is the best to find a big male. – Leopa Akpalialuk, Pangnirtung* (Tomaselli et al. 2022, p. 21)

In Nunatsiavut, a decrease in hunting activity was noted among participants and in the broader community (York et al. 2015). Reasons noted for this decease included time constraints from wage employment, the cost of hunting, and hunting regulations. Coordinating a group for hunting, as is typical for polar bear hunting, was also difficult due to time and economic constraints (York et al. 2015).

The methods of polar bear hunting have also changed from traditional practices, as discussed above under the Indigenous Knowledge Systems section. The introduction of rifles and snowmobiles has influenced how hunting is conducted, but the authors of the Nunavik report note that this has not changed the importance of polar bear or many traditional practices (Nunavik Marine Regional Wildlife Board 2019).

Law & Policy

Within the Davis Strait subpopulation, formal polar bear management systems, including a quota system, are in place within Nunavut and Nunatsiavut but not within Nunavik. This offers an opportunity to synthesize Inuit perspectives from participants who have experienced formalized management systems and those that have not. As noted in the Indigenous Knowledge Systems section, all three regions described traditional polar bear hunting as opportunistic and if a bear was truly needed it could be taken. The management system in Nunavut limits the number of bears that can be taken, specifies a male to female ratio of harvested bears, and prevents the taking of family groups. In Nunatsiavut, there are a limited number of harvest licences that are distributed via a draw system.

The quota system can impact Inuit polar bear hunting by removing its opportunistic nature. In Nunavut, the quota system has resulted in a shift to polar bear hunting, making it seasonal and sex-selective (Tomaselli et al. 2022). The quota system, combined with the value of hides, has also shifted harvesting to large adult males (Tomaselli et al. 2022). In Nunavik, participants expressed concerns that similar impacts would arise in their region should a quota system be put in place. Hunters in Nunavik worry that they will not be able to harvest a bear when an opportunity arises because the tags have already been used and that a quota system would inadvertently increase hunting pressure as hunters try to maintain their access (Anon. 2021). This could also shift the harvest season earlier in the year when quota is still available (Nunavik Marine Regional Wildlife Board 2019).

> *No matter the time of the year, they used to harvest…because they didn't have any quota or anything at that time. – Akeego Killiktee, Kimmirut* (Tomaselli et al. 2022, p. 20)

In Nunatsiavut, hunters reported that they were hunting less often than in the past, partially due to hunting restrictions.

> *When the polar bear license came out there first year, if you killed a bear on the first year, we weren't allowed to hunt them for another 5 years but now I think they got the regulations changed to 2 years. I'm not sure but that's what I heard, so if I can hunt in 2 years' time, I'd like to hunt again. – Anonymous, Nunatsiavut* (York et al. 2015, p. 59)

Some participants spoke of the influence of sex-selective harvest on overall polar bear abundance; this is discussed further under Causes of Increased Abundance. In addition, some participants from Nunavut spoke of the influence of sex-selective harvest on family groups. They reported an increase in observed family groups, which they attributed to harvesting fewer females and not harvesting denning bears (Tomaselli et al. 2022).

> *Seems to have more cubs. The family groups have increased since the time I have started to observe polar bears. Mother and cubs have increased a lot since then. One reason for this is could be that females are not to be harvested and, therefore, they are producing more cubs...and females with two cubs are seen more regularly now than before, within the past five years. – Kooyoo Padluq, Kimmirut* (Tomaselli et al. 2022, p. 36)

Although there is not a sex-selective harvest regulation for Davis Strait polar bears in Nunavik, there is concern that the imposition of one would be detrimental to the population. In the Nunavik report, it was noted that females are not considered more important than males for maintaining healthy population numbers.

The impact of restrictions on defence kills in Nunavut was highlighted through one participant's experience with a dangerous bear:

> *The polar bear was very close to one of the tents and the family woke up because their dog was barking. And they woke up and left the tent right away but they had forgotten their baby in their tent and the polar bear was so close they had to kill it to protect their baby. When I heard the yelling, I thought it was because of a wolf. So I grabbed my gun [rifle]. There was other people there with their guns and I kept telling them to shoot [the bear] before it attacks the baby. But the other people kept saying that the government says we can't shoot them. The polar bear was getting ready to jump on the tent where the baby was. And since no one would shoot it, I had to fight one of the guys who had the gun. And we were fighting over the gun. He got it and had the chance to shoot [the bear] before it jumped. – Lazarusie Ishulutaq, Pangnirtung* (Tomaselli et al. 2022, p. 106)

The management of polar bears in Nunavut has resulted in disharmony within the region; as a result, some respondents from the 2010 report indicated they would prefer to have no polar bears (Kotierk 2010b). This response is a strong indication that management approaches/systems should be considered carefully.

4.2. POLAR BEAR ABUNDANCE

The regional Inuit knowledge reports include observations of polar bear abundance over a temporal period spanning decades, based both on Inuit knowledge from direct observation and knowledge passed down intergenerationally through Elders and hunters. This temporal span was divided in the Nunavik study between historical (pre-1990) and current (1990 to present) (Nunavik Marine Regional Wildlife Board 2019). The 2022 Nunavut study provided observations within four time periods: 1960s, 1990s, around 2005, and 2016–2019 (Tomaselli et al. 2022). The other studies did not specify time periods; however, observations repeatedly indicate differences between historical and present population abundance.

All three regions reported an overall trend of present-day increasing Davis Strait polar bear abundance, including observations from both the 2010 and 2022 Nunavut studies. This trend was reported through direct observations on the land, Elder knowledge of fewer bears in the past, and hunting experience. Observations were made in all three regions of increasing polar bear encounters when out on the land, indicating a broader increase than just around communities.

> *According to the people that have been living here much longer than me, they say they'd rarely see polar bears when they were out camping...You know, [Elders] say that when they were out camping they would barely see bears in those years, now every time we go out we can see a polar bear, almost every time. – Anonymous 03, Kimmirut* (Tomaselli et al. 2022, p. 28)

> *Yes, there is a lot more polar bear now. There is a lot of them. Like if I was travelling, travelling northwards, I would sight more than one polar bear if I left here today. Before when I was a child, there were no polar bear around; they would sight probably one or two. But now there is polar bear everywhere. There is too many now. – Anonymous* (York et al. 2015, p. 28)

Elder knowledge and hunting experience also contributed to the noted increase in polar bear abundance across the regions.

> *My great grandfather, my grandma's father, had told stories of going all the way down here [south Okalik Bay] to hunt polar bears and there would never be any polar bears. – Lazarusie Ishulutaq, Pangnirtung* (Tomaselli et al. 2022, p. 28)

> *Well, there was not a lot of bears in those days. It's not like today. We hunted for about a week and a half before we started to see tracks. I was quite young. It was quite an experience to be able to be out there with somebody that knew what they were doing… You're not aware of the danger and where not to be. You learn a lot, not just from hunting: where are you going to find bears, where the bears tend to hang out along the flow. It was a good learning experience. – Resident of Kuujjuaq* (Nunavik Marine Regional Wildlife Board 2019, p. 29)

With respect to the increasing abundance trend, the 2022 Nunavut report noted that this reflects "a 'true' increase in the relative abundance of polar bears in the Kimmirut area and not an 'apparent' increase resulting from spatial and temporal changes in land use by participants and/or temporal changes in geographical distribution of polar bears" (Tomaselli et al. 2022, p. 30).

While the majority of participants spoke of an increase to polar bear population, in four instances participants spoke to observed decreases or stability in the population. In Nunatsiavut, one participant spoke of changing sea ice leading to changing distribution of bears but an overall stable population (York et al., 2015). In Nunavik, two participants spoke of changes to sea ice leading to localized abundance decreases in areas where ice no longer approached the shoreline.

> *…the population has decreased because the ice is further away now. There's less ice. Back then there used to be [ice] closer to our area around here. And when there used to be a lot of ice here there were more polar bear near this area and they sometimes would start travelling to the other coast and this is talking way into the past about what I've heard. – Resident of Kangirsuk* (Nunavik Marine Regional Wildlife Board 2019, p. 65)

In Kimmirut, a temporary decrease was noted by one group of hunters between 2005 and 2018; however, subsequent observations noted a return to increasing abundance (Tomaselli et al. 2022).

Causes of Increased Abundance

When speaking about causes of increased abundance, the cyclical patterns of animals and prey location/abundance were noted most often and in all three regions.

> *…Like I said, there seems to be a lot more polar bears than there was before. I don't know if it's a cycle. The science hasn't told me that – that it is a cycle. But traditional knowledge has told me that – that there is a cycle in each species. Polar bear is just one of them. – Resident of Kuujjuaq* (Nunavik Marine Regional Wildlife Board 2019, p. 57)

> *Polar bear are following their food. When they leave to their food, there seem to be no polar bears; when they return, there seem to be polar bears. – Anonymous* (Kotierk 2010a, p. 11)

> *It depends on what they always say: sometimes there was lots of polar bears, sometimes very few, sometimes a lot, sometimes very few; it depends on the fish or it depends on the small animals they eat, right…Like if there's a lot of seal, then there's a lot of polar bear, but in order to have lots of seal, we need a lot of fish, and to get a lot of fish, we need a lot of mosquitoes, go down the food chain. Sometimes the food chain is plentiful, then there are a lot of animals, sometimes not too many small animals, very few small animals. Right now it's full of foxes – a lot – so there's maybe lots of lemmings, right, so if there's a small lemming population, there's small fox, so the polar bear depends on how many seals there are, right. – Resident of Quaqtaq* (Nunavik Marine Regional Wildlife Board 2019, p. 56-57)

The influence of sea ice and changes to ice patterns was also noted frequently; however, the effect of this on population numbers versus distribution of bears was variable. Some participants noted that ice coming closer to communities brought more bears locally, whereas others spoke about less ice leading to bears now being more frequently inland.

> *I feel there are more bears compared to the past…I think this has to do with the ice conditions. The hunting areas of the polar bears are not as great as before and their hunting grounds have expanded. That is why we see more of them. Ejetsiak Padluq, Kimmirut* (Tomaselli et al. 2022, p. 32)

> *I think the reason why we're seeing more bears is because the change of the ice, the melting of the ice has changed their routes and is handier to us and we just see it more because it's coming to where we live almost. – Anonymous* (York et al. 2015, p. 43)

> *Sometimes I think that perhaps it's because there is less ice that polar bears are more on the land. With less ice, polar bears will be more land bound. – Anonymous* (Kotierk 2010a, p. 10)

In Nunavut, participants of both the 2010 and 2022 reports noted the influence of the quota system and sex-selective harvesting on increasing the polar bear population.

> *Polar bear harvest regulations have led to the increase in polar bear population size. – Anonymous* (Kotierk 2010a, p. 10)

> *[Polar bears have increased] because we're not allowed to shoot them. We manage them too good. – Simeonie Keenainak, Pangnirtung* (Tomaselli et al. 2022, p. 32)

> *I know they're protecting [female polar bears] for the future but if [hunters are] not going to get females, [polar bears are] just going to grow...more numbers. Because just males are being harvested. I feel there are more polar bears around because cubs are growing up…More males are caught than females. There are being more and more polar bears. – Geetee Maniapik, Pangnirtung* (Tomaselli et al. 2022, p. 107)

Impacts of Increased Abundance

The impacts of more bears were noted in all three regions, primarily through safety concerns with increased human-bear interactions. Around camps, bears have been noted with greater frequency and are causing damage to property. These factors are influencing the time that some people are spending on the land and how they are teaching their children about bears and safety.

> *Now, polar bears even break [into] cabins. Because there are so many they seem to be getting more dangerous, going into cabins and trying to look for food. – Lazarusie Ishulutaq, Pangnirtung* (Tomaselli et al. 2022, p. 34)

> *But I've seen a lot of camps closed for the whole summer. There's a lot of polar bears and the camps along the shoreline are not safe anymore these days. We used to build cabins all over the shoreline. Today we don't even spend the night anymore and our cabins are rotting down and we're not teaching our young ones to spend this beautiful time out there – part of it because of the polar bears" – Resident of Aupaluk* (Nunavik Marine Regional Wildlife Board 2019, p. 54)

> *Yes they are more [coming into cabin areas], and I really believe the reason why the bear population has gone up. You have to be very, very careful in everything that we do and everything we live on the land and I told my children and my inoKatiks (fellow Inuit) now that it doesn't make any difference. You always have to respect nanuk (polar bear) for their abilities and their strength. We're starting to find that many of our cabins are being broke into; many of our tents are being destroyed. I even had nanuk (polar bear) try to come inside of my boat and I believe it's a result that the population of nanuks (polar bears) are going up. There's more now than what we've seen before. – Anonymous* (York et al. 2015, p. 33)

The potential causes for bears entering or approaching communities were summarized in the Nunavut and Nunatsiavut reports based on participant responses (Tomaselli et al. 2022; York et al. 2015). Both reports noted polar bear abundance among the causes:

1. an increase in polar bear abundance;
2. polar bears being attracted by human food sources (i.e., dumps, carcasses from harvested animals); and
3. and changes/reduction in sea ice.

In addition, the Nunatsiavut report noted bears being hungrier and becoming accustomed to human presence as causes (York et al. 2015).

When speaking specifically about the increase in human-polar bear encounters in recent decades, the Nunavut report again attributed this partially to increased polar bear abundance (Tomaselli et al. 2022). Other factors included increased range of travel by community members, changing sea ice conditions leading to more bears in coastal areas, bears being less scared of humans and noises.

A positive impact of increased polar bear abundance was noted in Nunavik where the is currently no quota system. The increased bear abundance was linked to an increase in hunting activity and a corresponding increase in the importance of polar bear as a resource to local Inuit (Nunavik Marine Regional Wildlife Board 2019).

4.3. POLAR BEAR HEALTH AND BODY CONDITION

As described in the introduction to section 4.2, the regional Inuit knowledge reports include observation on polar bear health and body condition over a temporal period spanning decades, with some differences in the time periods covered by each report. Please refer to this description for details on time periods covered.

In Nunavik, no overall trend in health/body condition was reported by participants; however, annual fluctuations were noted with skinnier bears in the summer and fatter bears in winter/spring (Nunavik Marine Regional Wildlife Board 2019).

Similarly, in Nunatsiavut, no overall trend in body condition was noted by participants, with the authors speculating that this may be due to a local increase in harp seal population or use of alternative prey species (York et al. 2015). Participants did note indicators of health by providing responses to what good-looking and sick bears were like. These descriptors included fatness, coat shininess/colour, teeth condition, movement, and body shape.

The 2010 Nunavut reports did not speak to trends in health/body condition of bears; however, the 2022 report included extensive discussion on these characteristics (Tomaselli et al. 2022). Fatness/body condition of bears was the primary indicator discussed in this report as it was found to most reflect overall bear health by participants. Other indicators of bear health (i.e., behaviour and movement, fur and/or hide colour and condition, meat/fat colour, smell and taste, stomach contents, teeth condition, and appearance of internal organs) were discussed separately from fatness. Trends in health/body condition were further separated by community, with participants from Kimmirut and Pangnirtung providing their experiences.

> *The healthy polar bears are nice and fat, while unhealthy polar bears are usually very skinny…Heathy males show the belly nice and fat. – Johnny Mike, Pangnirtung* (Tomaselli et al. 2022, p. 69)

In Kimmirut, both individual and group interviews indicated an increase in skinny bears in recent years by most participants; however, this increase was noted as slight or minor (Tomaselli et al. 2022). Other participants observed that body condition was stable, or they were uncertain about a trend. Similarly, the proportion of unhealthy bears as indicated by in other health indicators may have increased in recent years (since 2005).

> *When I was a child, in the 70s, there were hardly any bears…but in the 70s and 80s polar bears were fatter compared to today...In particular, during the summer polar bears are not as fat and they seem skinnier also during the fall and winter. In the spring, some bears could be skinny and some bears could be fat…Nowadays, [polar bears] seem to be not as fat as they used to be… – Kooyoo Padluq, Kimmirut* (Tomaselli et al. 2022, p. 78)

> *I have seen my share of unhealthy ones and also healthy ones too...it is less likely to see unhealthy ones than we do healthy. The odd bear here and there are unhealthy and I see more frequently healthy bears…If we see an unhealthy [bear] it is likely in the time when there is no ice, in the summer or the early fall when there is no ice […] I have seen both young ones and older ones that looked unhealthy. – Anonymous 01, Kimmirut* (Tomaselli et al. 2022, p. 79)

In Pangnirtung, individual interviews indicated an increase in skinny bears in recent years (consistently since the late 2000s) by most participants (Tomaselli et al., 2022). Again, other participants observed that body condition was stable, or they were uncertain about a trend. When speaking to general bear health as indicated by other health indicators, most contributors stated bears were generally heathy while other participants stated bears were not as healthy as they used to be.

> *I would say 80% of it [local polar bear population] are healthy…In the past we don't see much polar bear like we do now... but it seems like the polar bear that we caught down there, most of it was pretty healthy bears. – Simeonie Keenainak, Pangnirtung* (Tomaselli et al. 2022, p. 83)

Causes of Fatness/Skinniness

All three reports noted natural variability in bear fatness related to season and individual bear hunting skills. Bears were observed to be fatter in winter and spring when they are able to hunt seals from the

ice and thinner in summer. Fatter bears were noted to be better hunters; thus, able to catch more prey and be better fed.

> *Some bears are still as fat as before, but some are not as fat as they used to be…You know, some bears are good hunters so they are very fat, others that are not so fortunate. It is just like humans: the good hunters provide themselves good meals regularly, those that are not as good hunters are not as fat. – Eliyah Padluq, Kimmirut* (Tomaselli et al. 2022, p. 50)

Contributors from Kimmirut and Pangnirtung provided three main causes for declines in fatness: an increase in polar bear abundance, decline in ringed seal abundance, and changes in sea ice conditions reducing polar bear access to seals (Tomaselli et al. 2022). Some participants also noted that these skinnier bears are coming close to communities. In Kimmirut, additional causes of skinniness included young bears without mothers and old age.

In all three regions, being tranquilized was sometimes noted to reduce bear fatness or otherwise cause unhealthiness.

> *We used to hunt it more for food. But less and less because the bears have been tranquilized. And sometimes they're not as fat as a result. – Resident of Quaqtaq* (Nunavik Marine Regional Wildlife Board 2019, p. 47)

Other Causes of Health Conditions

In Nunavik, only two references were made to unhealthy bears: one with respect to a skinny bear that was thought to have rabies and one with an injury that was thought to result in malnourishment (Nunavik Marine Regional Wildlife Board 2019).

Contributors from Nunatsiavut, where bears were observed to be as healthy now as in the past, identified other causes for poor health/death among bears. These included old age, disease, injuries from fighting other bears/large animals, and old bullet wounds (York et al. 2015). One participant noted a bear getting sick from eating a diseased seal.

Causes of non-hunting related mortality were discussed in detail with participants in the 2022 Nunavut study. This included observations of starvation, diseases, and other observable abnormalities. Overall, these causes of mortality were considered rare or uncommon and individual occurrences could be recalled by most participants (Tomaselli et al., 2022). Elder knowledge also indicated that dead or sick bears were rare in the past, with only one contributor sharing knowledge of a starving bear from his Elders (Tomaselli et al., 2022). Within about the last 10 years, participants from both Kimmirut and Pangnirtung have noted bears with anthropogenic waste and/or plastics in their stomachs (Tomaselli et al. 2022). These bears are described as sick or unhealthy.

> *Back then [in the past], when I opened them up I would notice their main diet which is seal meat. That's what I would notice back then. But nowadays I am noticing leather gloves or other garbage in the stomach. I think that this is happening because they are hungry. [The first time I saw some garbage in the stomach of polar bears] was around 2010. – Anonymous* (Tomaselli et al. 2022, p. 95)

4.4. INUIT PERSPECTIVES ON MANAGEMENT AND STEWARDSHIP

As noted in the Introduction, polar bears are managed based on defined subpopulations. The Davis Strait subpopulation has been delineated based on recapture or harvest of tagged animals, tracking of adult females with satellite collars, and genetic study (Polar Bear Technical Committee 2021). Population estimates have been conducted on this subpopulation in 1974/1979, 2005–2007, and 2017–2018. When conducting a synthesis of Inuit perspectives on management and stewardship, contributions related to both subpopulation delineation and research/surveillance methods were coded and are discussed below.

Traditional Inuit hunting guidelines/values and the impacts of current/potential polar bear management systems on Inuit determinants of health were examined above under Indigenous Knowledge Systems and Law & Policy sections, respectively. In this section, we discuss more specifically Inuit perspectives on the harvest management systems, including quotas, allocation of quotas, and sport hunting restrictions. While interrelated with harvest management, we have also attempted to separate discussion on how human-bear interactions are managed within the management system. Finally, Inuit recommendations for future management strategies across all these topics are presented together in the last section.

4.4.1. Sub-population Delineation

There were no references within the regional Inuit knowledge reports that spoke specifically about the accuracy or utility of the subpopulation delineation; however, there were two instances from Kimmirut, Nunavut that spoke about bears moving into their area. One observation had bears coming from northern Quebec (which could still be part of the Davis Strait subpopulation) and one observation spoke of bears coming from the west (between subpopulations (Tomaselli et al. 2022). Additionally, in the Nunavik report, there were participants who noted that bears move between the Ungava and Hudson coasts, well outside of the range of the Davis Strait subpopulation (Nunavik Marine Regional Wildlife Board 2019).

4.4.1. Research/Surveillance Methods

Inuit perspectives on research and surveillance methods were largely consistent across the three regions. Participants in all three regions spoke about the negative effects of tranquilization and/or tags/collars on bears.

> *Yeah, I want the tagging of the polar bears to be stopped because I've heard some stories. After the tranquilization, they look like they're the same but changes their mindset and the way they hunt really, it affects their lives. – Resident of Aupaluk* (Nunavik Marine Regional Wildlife Board 2019, p. 81)

> *The ones that have been put to sleep are the ones that are usually skinny. There is no specific gender or age. – Matiusie Maniapik, Pangnirtung* (Tomaselli et al. 2022, p. 82)

Participants in Nunavik and Nunavut further noted that they do not eat meat from bears that have been tranquillized, some stating safety reasons and others indicating their uncertainty about the effects to

the meat. This response was not provided in the Nunatsiavut report; however, this topic was not directly raised in the questions (York et al., 2015).

> *… some people eat the meat, when it doesn't have an earring [ear tag]. …When it hasn't been tranquilized. – Resident of Kangirsuk* (Nunavik Marine Regional Wildlife Board 2019, p. 47)

> *I would not harvest one or let people eat a bear that has a tag [which means] it has been tranquillized. If I catch a bear with a tag, I would not distribute the meat. I would just probably give it to the dogs or throw it away because it has been tranquillized and I am not sure what has been done to it. – Ejetsiak Padluq, Kimmirut* (Tomaselli et al. 2022, p. 19)

In Nunavut, several participants associated handling and tranquilization with bears being less scared of humans and more aggressive/destructive.

> *At the time I was a boy, polar bears were afraid of humans but now they are not as afraid of humans anymore. Maybe this is happening because they have put them to sleep and they became angry for being handled by humans, so therefore, they became more aggressive...I have noticed this change when they started to tranquilize them in 1979, that is when they started to put them to sleep...My father was one of the people who would go out with the biologists to help tranquillize the bears so that is why I remember. – Kooyoo Padluq, Kimmirut* (Tomaselli et al. 2022, p. 98)

As previously discussed under Self-determination, participants from Nunavut stated that research communication needs to be improved to build trust (Tomaselli et al. 2022). This topic is examined further under the Future Management Strategies section. Similarly, participants from Nunavut questioned the appropriateness of population estimates that may miss bears or not cover the geographic extent of Inuit knowledge.

> *I would like to know the population numbers of polar bears...I think I have the right to know the population numbers, the health [of bears] and what management does. – Ejetsiak Padluq, Kimmirut* (Tomaselli et al. 2022, p. 110)

> *People down South say that the polar bears are becoming extinct, that is because they have never been up here and when they are counting the population, they do not check all the places. They just go to some places but not all. – Matiusie Maniapik, Pangnirtung* (Tomaselli et al. 2022, p. 108)

4.4.1. Harvest Management

Perspectives on harvest management vary between regions, particularly between regions without quota systems (i.e., Nunavik) and those with. In Nunavik, most participants expressed some view against a quota system for the region (Nunavik Marine Regional Wildlife Board, 2019). In addition, participants provided perspectives on how current hunting keeps bears away from communities because bears know humans are dangerous. They also noted that hunting primarily males is not a traditional method for Inuit, who consider solitary females to be as important as males for the population.

> *Yes, [polar bear hunting] does [help keep people safe]. Yes, the hunters help to keep the polar bears away. – Resident of Quaqtaq* (Nunavik Marine Regional Wildlife Board 2019, p. 55)

> *First I'd like to say that all wildlife have the male and the female. I can give an example of caribou. Nowadays hunters come up north and they try and get a trophy of the caribou, the bulls. And they kill a lot of the bulls and not the females. And if there's more bulls, males being killed, there's going to be more females and there's not going to be - they're not going to be able to breed. And same goes for the Belugas that they've put quotas on before up till today when you can only catch a certain - like if they were to catch a female, only a female, the female is the one that gives birth to the calf and same goes for other animals too. If you shoot only the males then there's only the female left and they're not going to be able to breed. And that's something I wanted to mention first. – Resident of Kangirsuk* (Nunavik Marine Regional Wildlife Board 2019, p. 80)

In Nunavut, many contributors noted that the management system has been successful in increasing the polar bear population (Tomaselli et al. 2022). In the 2010 study, maintaining high population numbers was identified as a concern as it could increase problem/dangerous bears (Kotierk 2010a). Contributors also suggested that hunting quotas and hunting mostly adult males is linked to more bears interacting with humans, as discussed further in the next section.

> *In the past, I remember that the hunters had to go everywhere looking for polar bears, days could turn into weeks and into months trying to hunt a polar bear back then. Now, with the system of quotas in place, the bears are coming to the community and I find that they are getting aggressive toward humans or communities...I find that since the quotas are in place and sometimes when the quota are finished, the bears seem to know that they [community members] cannot do anything to them when they are coming to the community. – Itee Temela, Kimmirut* (Tomaselli et al. 2022, p. 31)

> *The angujuaq is the leader and if there are less of them the females and young polar bears would go in places they should not go to. – Michael Kisa, Pangnirtung* (Tomaselli et al. 2022, p. 98)

The influence of sex-selective harvesting in Nunavut, as noted above in the Law & Policy section, also relates to perspectives on harvest management as it identifies a change to observed population structure. One participant from Pangnirtung noted the restrictions on harvesting lone cubs, who have presumably lost their mother, is contrary to Inuit hunting guidelines with respect to not wasting animals:

> *The bears that we have encountered seem to be mostly females. The knowledge I have learned from my Elders [is that] if you do not hunt more females you will have more females. – Joe Arlooktoo, Kimmirut* (Tomaselli et al. 2022, p. 35)

> *Sometimes we see lonely cubs and we know a male polar bear killed the mother. Well, I think the male polar bear tried to kill the young ones and the mother tried to protect them and ended up being killed…I heard in my younger age that the polar bear do that but from then, since there is more polar bear, we start to see more. I think I have been noticing this [cubs alone] more in the last five years...and we know that the cubs won't make it alone but we just leave them because we are not allowed to kill small polar*

> *bears but that is just wasted. – Interviewee 06, Pangnirtung* (Tomaselli et al. 2022, p. 85)

Interspecies relationships were also noted as influenced by the quota system in Nunavut and provided as a reason why quotas should increase.

> *For the sake of the seal pups, the quota should increase...If there is no immediate management put in place to increase the harvesting of polar bears in Nunavut, I am afraid that the seal population is going to be very low. So therefore food security for human beings is going to be endangered, that is what I think. – Johnny Mike, Pangnirtung* (Tomaselli et al. 2022, p. 105)

In Nunatsiavut, the majority of participants expressed support for current management including the quota; however, a number of participants provided input on the management system (York et al. 2015). Several participants noted that the quota system was unnecessary as Inuit has previously managed the harvest of polar bears. The total allowable harvest was increased in 2011, which several contributors noted as alleviating their concerns with the quota. As noted under the Law & Policy section, the waiting period may also limit access to hunting, contribute to the decrease in people engaged in hunting, and result in difficulty of small communities to use their quota. Two respondents also commented on the time limits for licences and how weather or other factors could impact the hunt.

> *Back then before we had polar bear licenses we were able to kill as many as want, so that was good. Today with having to have a license to kill polar bear, we can't kill a polar bear even if we saw one. – Anonymous, Nunatsiavut* (York et al. 2015, p. 60)

4.4.2. Human Interactions

The Nunavik report contains a section related to human interactions and conflict with polar bears; however, since there is currently no formal management of these interactions in Nunavik, perspectives on the current management of human-polar bear interactions were not provided in the report (Nunavik Marine Regional Wildlife Board 2019). This topic was also not discussed within the Nunatsiavut report; as such, no content is provided for this region (York et al. 2015).

In Nunavut, concerns about public safety related to human-polar bear interactions was noted by all participants (Tomaselli et al., 2022). Some participants felt that harvest management systems needed better address these concerns and that Inuit should have more control over management to ensure the safety of people. Many contributors noted that scaring bears away from camps/communities is not sufficient; these bears should be harvested (Kotierk 2010b; Tomaselli et al. 2022).

> *I talked to other people in different communities and they all think that if we did it like back then, like killed polar bears whenever they come and it doesn't matter how much, it would be safer for everyone. It wouldn't be as dangerous…Other Elders in other communities think that's how it should be now because there's too many. – Lazarusie Ishulutaq, Pangnirtung* (Tomaselli et al. 2022, p. 105)

> *Today, when a polar bear comes, it doesn't get killed. Back then, it had to be killed because if it doesn't get killed they would come back all the time and damage anything that's old. We've heard stories...that there was a man who got killed because that polar bear probably kept going back and it wasn't afraid, anymore. Any polar bear that*

comes to camps or places where there's people they should be killed. – Leesee-Mary Kakee, Pangnirtung (Tomaselli et al. 2022, p. 106)

4.4.3. Future Management Strategies

Research Recommendations

In Nunavut, many contributors noted the challenges between the communities, researchers, and wildlife managers; as such, suggestions were provided to improve these relationships and build trust. Recommendations included researchers sharing more information and seeking input from the communities, making information available through a variety of media (e.g., community radio, reports, social media, community meetings, school presentations), and providing communications in both English and Inuktitut (Tomaselli et al. 2022).

> *Scientists could help out by providing documentation of their studies or [communicating information through] the local community radio. – Ejetsiak Padluq, Kimmirut* (Tomaselli et al. 2022, p. 109)

> *We hear information from the scientist through the radio but they don't give reports…[I would like] if they could keep us informed about what they did. I like to know what is going on in my surroundings, so if I have to do a lot of reading I can do so. If they could [provide reports] to the community that would be helpful, in Inuktitut…If they report back to me in English, I will have to have someone help me. – Akeego Killiktee, Kimmirut* (Tomaselli et al. 2022, p. 109)

> *Right now we have Facebook…to find out now which community [has] been interacting with the polar bears [and when bears] are coming into the community. We find out now a lot faster than before. – David Kooneeliusie, Pangnirtung* (Tomaselli et al. 2022, p. 109)

> *All the information are in the community…[Scientists should] work with the people along the coastline of Baffin Island. That's where the bears are. And the kids start seeing polar bears when they are still on their mother's back. So that's a good information...If scientists work together [with communities] I know more people will listen or myself, I would. – David Kooneeliusie, Pangnirtung* (Tomaselli et al. 2022, p. 111)

Harvest Management Recommendations

As noted earlier, the study and report for Nunavik was undertaken in response to direction to establish a formal management system for polar bears in that region. As such, this report includes specific responses from participants with respect to a proposed management system. While most participants indicated a lack of support for a quota system, participants still provided several recommendations for future management systems (Nunavik Marine Regional Wildlife Board, 2019). Inuit wanted a fair system that would maintain traditional Inuit stewardship, within measures including:

- Leave things as they are, no western management system is needed.
- First complete a full population survey.
- Those who work and live around polar bears should make the decisions.

- Males and females are equally important; sex-selective harvesting is not consistent with Inuit values/guidelines.
- Females with cubs should not be harvested, unless needed.
- Community-based quota system that considers the harvesting ability of the community when determining allocations.
- Flexible system, managed over multiple years, to allow changes.
- Restricting or eliminating summer harvest.
- Sport hunting could be a way to offset the financial loss that hunters may have if a quota is put in place; not supported by some participants.

> *I think they really have to do more studies on the polar bear before they can start setting any quotas, eh? Scientists say they're going to become extinct, but when you talk to local people or listen to stories, it's completely opposite. So until they do a proper study, who can really set the quota? – Resident of Kuujjuaq* (Nunavik Marine Regional Wildlife Board 2019, p. 83)

> *I'm okay with the quota that they can't shoot the polar bear in summertime, I'm okay with it. … It's okay to shoot a polar bear, but I'm respecting the one in the summertime. … I'm okay with that, but the other, in the winter or the other seasons I don't agree if they get quota. – Resident of Kangirsuk* (Nunavik Marine Regional Wildlife Board 2019, p. 88)

> *We want to make sure that we're equally open with the region that we don't want to see another difference from a bigger community to a smaller community. We want to have an open – if there's open numbers of polar bears allowed, we want them to be open to the region for us because if there's going to be a number, there's going to be three and there's going to 20-30 in bigger communities where there's no polar bear. They don't see polar bear every day in Kuujjuaq but they have a big community. Where would they get more quota than us when we have more polar bears. That's what we hope – Resident of Aupaluk* (Nunavik Marine Regional Wildlife Board 2019, p. 89)

As noted above under the Human Interactions section, participants from Nunavut provided comments on the harvest quota and regulations primarily with regards to public safety. In addition to their comments on harvesting problem bears, several participants identified an increase in the quota and two participants suggested extending harvest into summer to address public safety (Tomaselli et al. 2022).

> *Nowadays with the quotas being in place and with sometimes bears coming into camps and into the community and needing to be scared off, they [management partners] would need to work on getting quotas up higher than the normal quota range – Itee Temela, Kimmirut* (Tomaselli et al. 2022, p. 105)

Some participants also noted that traditional practices included hunting polar bear cubs and that they would like cubs to be including in the harvest (Tomaselli et al. 2022). Several participants also suggested changes to sex-selective harvesting to increase the number of females harvested (Tomaselli et al. 2022).

Participants in both Nunavik and Nunavut commented on the inclusion of defence kills or problem bears within the quota (Nunavik Marine Regional Wildlife Board 2019; Tomaselli et al. 2022). Participants from both regions noted that these bears should not be part of the total allowable take, but instead

counted separately. Furthermore, participants from Nunavut noted that the hides of these defence kills should be returned to the hunter (Tomaselli et al. 2022).

> *[Defence kills] should not come out of the quota system. Because it's self-defence. When that happens, you lose your quota, that polar bear skin. The polar bear is usually taken, skinned by the Wildlife Officer. We don't want anybody to take what we catch, if we want to use it. Because it's not endangering the polar bear. If we've only got a few polar bears, yes get it out of the quota, but there's so many polar bears – Peter Kanayuk, Pangnirtung* (Tomaselli et al. 2022, p. 106)

> *I don't think they should be part of the total allowable take, but accidental catch, which is not part of the quota. I think there should be a separate pocket for those accidental dangerous encounters. A different pocket than total allowable take. …Yeah [keep track of them, but have some kind of different system]. – Resident of Kangiqsujuaq* (Nunavik Marine Regional Wildlife Board 2019, p. 82)

In Nunatsiavut, participants were generally supportive of the management system, but respondents provided some recommendations (some of which have already been implemented): increase in quota, reduction in waiting time, and allowing unused licences to be transferred elsewhere (York et al. 2015).

> *I guess work with the local governments to figure out what is an acceptable quota, and just use the quota system for everywhere. Talking to everybody. I think northern Labrador's way of getting polar bears is probably the best one. The way that it works around here, you got the licence for 3 days; you put your name down on a piece of paper and just say that you had your name down before me, they'll call you up and if you don't want to go, it will go to the next person. Then I can go and I will have the licence for 72 hours. But your name gets taken off, it keeps going down the list and it goes back up to you again. But you got 72 hours to get one. – Anonymous, Nunatsiavut* (York et al. 2015, p.62)

5. CONCLUDING COMMENTS

The importance of nanuit to Inuit today is based on a relationship that has been developing over millennia. The relationship with polar bears is multifaceted and affects Inuit health and wellbeing in relation to food, culture, livelihoods, and more broadly, Inuit relationships with the land. Management of the Davis Strait polar bear subpopulation presents a unique challenge due to its geographic span over the vast expanse of the eastern Canadian Arctic, including parts of Nunatsiavut, Nunavik, and Nunavut lands and waters, as well as Greenland. This geographic scope necessitates effective exchange, coordination, and collaboration among jurisdictions, which in the Canadian Arctic are subject to the various governance regimes and processes established by different land claims. Critical to the effective management is that it be based on the rich Inuit knowledge that is present throughout Inuit Nunangat. Establishing a shared understanding of Inuit knowledge of polar bear, based on the knowledge from different Inuit regions, creates a strong basis to foster dialogue and collaboration among the organizations that share management responsibilities for this subpopulation.

To fulfill the first objective of the Nanuk Knowledge and Dialogue Project, this report has been prepared to bring together, analyze, and synthesize documented Inuit knowledge on the Davis Strait polar bear subpopulation. While efforts have been made to ensure the completeness of this knowledge review, the authors recognize that documented knowledge presents only a fraction of the knowledge held by Inuit on polar bears, their place within the natural environment, knowledge related to the harvest and use of nanuk, and knowledge and values related to their stewardship.

This report aims to increase the understanding of both the breadth of documented knowledge of the Davis Strait polar bear subpopulation, as well as the depth of this knowledge in relation to key topics. The Excel database provides a broad overview of topics addressed by the individual sources, which can be used to identify relevant sources on these topics of interest. This database is intended to be used to explore and discuss topics that were outside the scope of the analysis and synthesis contained within this report. The qualitative analysis and knowledge synthesis presented in this report focused on those topics most relevant to the management of these bears. The use of an Indigenous-focused social determinants of health framework recognizes and emphasises the direct and indirect effects that bears have on Inuit well-being. Abundance and body condition are biological factors identified as particularly important in the management of bears. While Inuit perspectives on the management and stewardship of polar bears responded to the current and varied management approaches in each region, the qualitative analysis underscores the shared desire across regions for Inuit to have a strengthened role in polar bear management decision-making, and for Inuit knowledge and values to be reflected in management approaches and outcomes. The review, analysis, and synthesis presented here are intended as an active tool; a foundation of available knowledge that facilitates further exploration into topics of interest. Together, this Inuit knowledge database and analysis and synthesis report provides an information resource to address objectives two and three of the Nanuk Knowledge and Dialogue Project as it moves forward with communication materials, interdisciplinary dialogue, and policy recommendations.

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APPENDIX A. SUPPLEMENTARY TABLES

Appended Table 1. Terms used for literature search

Category	Keywords
SUBJECT MATTER	Research on or about polar bears, using the following key words:
	Ursus maritimus
	Polar bear
SUBJECT MATTER	Research based on, integrating or incorporating Inuit knowledge, using the following keywords:
	Inuit knowledge or IK
	Traditional Knowledge or TK
	Traditional Ecological Knowledge or TEK
	Inuit Qaujimajatuqangit or IQ
	Inuit Qaujimajangit or IQ
GEOGRAPHIC SCOPE	Research based in or with direct relevance to Davis Strait polar bear subpopulation geographic area, using the following keywords:
	Nunavut
	Kimmirut
	Iqaluit
	Pangnirtung
	Davis Strait
	Hudson Strait
	Nunavik
	Kangiqsualujjuaq
	Kuujjuaq
	Tasiujaq
	Aupaluk
	Kangirsuk
	Quaqtaq
	Kangiqsujuaq
	Killiniq
	Ungava Bay
	Hudson Strait
	Nunatsiavut
	Nain
	Hopedale
	Postville

Category	Keywords
	Makkovik
	Rigolet
	Labrador Sea
	Torngat Mountains National Park
	Greenland or Kalaallit Nunaat
	Maniitsoq
	Nuuk
	Paamiut

Appended Table 2. Metadata categories and descriptions

Category	Sub-category	Description/Notes
Reference	Author(s)	
	Year	
	Title	
	Publication type	Book, book chapter, report, thesis, database, map or film
	# pages	
Location	Nunavut	Presence/absence
	Nunavik	Presence/absence
	Nunatsiavut	Presence/absence
	Greenland	Presence/absence
	Communities	List of community names
Methods	Data collection years	Start and end year of data collection
	# participants	Number of Inuit participants
	Survey	Presence/absence
	Interview	Presence/absence
	Focus group	Presence/absence
	Participatory mapping	Presence/absence
	Analysis method	Qualitative, quantitative, or mixed methods
	Richness of qualitative information	Rating of richness of qualitative information, where: 1- Low: very little qualitative data presentation (e.g. primarily quantitative presentation of qualitative or mixed methods research), typically very few quotes 2 - Moderate: Some qualitative data presentation, typically few quotes 3 - High: Large amount and depth of qualitative data presented, more specificity and personal or contextual revelations, typically many quotes
	Direct Quotes	Presence/absence of direct quotes
IK contribution type	IK Study	Intentional explicit (primary) collection or use of Inuit knowledge (IK) K (or both) in the introduction or methods, as well as IK in the results of the paper
	IK Content	Implicit inclusion or anecdotal or informal collection of IK (not clearly stated in the methods or introduction)
Biology/Ecology from IK	Abundance	Presence/absence
	Health / body condition	Presence/absence
	Distribution / range	Presence/absence
	Habitat	Presence/absence

Category	Sub-category	Description/Notes
	Feeding / diet	Presence/absence
	Mating / denning	Presence/absence
	Species Interactions	Presence/absence
	Environmental change impacts	Presence/absence
	Human development impacts	Presence/absence; E.g. related to mining, shipping, air travel, community development, roads, etc.
Relationships to polar bear as a determinant of health	Proximal: Land & ecosystems	Presence/absence; Connection to and use of the land via polar bear harvesting
	Proximal: Food systems & security	Presence/absence; Harvesting, consumption of polar bear as country food
	Proximal: Livelihoods	Presence/absence; Contribution of polar bear to employment, income, livelihoods – e.g. tourism-related employment (polar guide for sport hunting, polar bear monitor for camps), selling furs, any economic benefits of food harvests
	Intermediate: Community capacities	Presence/absence; Benefits or impacts to community capacity of involvement in regional or local polar bear management
	Intermediate: Indigenous knowledge systems	Presence/absence; Harvesting and safety knowledge / practices; knowledge transfer/learning
	Intermediate: Culture	Presence/absence; Relationship to bears / significance; Benefits to cultural continuity, identify, use of Inuktitut language
	Distal: Self-determination	Presence/absence; Self-determination related to polar bear management and co-management
	Distal: Colonialism & racism	Presence/absence; Marginalization; imposition of Western or external wildlife management paradigms; imposition of Western/external research paradigms and methods; impacts of residential schools, etc. on polar bear knowledge; impacts of wage economy on traditional relationships to polar bear, etc.
	Distal: Law & policy	Presence/absence; Benefits and impacts of polar bear management laws and rules
	Distal: Gender	Presence/absence; Benefits and impacts of polar bear management / relationships for gender equality
Inuit Perspectives on Management/ Stewardship	Human interactions	Presence/absence; Perspectives on how human-polar bear interactions are or should be managed
	Harvest management	Presence/absence; Perspectives on how traditional harvesting should be managed (total allowable take, allocations);

Category	Sub-category	Description/Notes
		perspectives on the management of sport harvesting
	Research/surveillance methods	Presence/absence; Perspectives on approaches for research and surveillance, issues with methods/approaches, etc.
	Subpopulation delineation	Presence/absence; Perspectives on the accuracy and utility of DS subpopulation delineation and other groupings of polar bear based in IK

Appended Table 3. Literature review results

Reference					Location				
Author(s)	Year	Title	Publication type	# pages	Nunavut	Nunavik	Nunatsiavut	Greenland	Communities
Milton Freeman Research Limited	1976	Inuit land use and occupancy project, volume one: Land use and occupancy	Report	263	X				Kimmirut (Lake Harbour), Iqaluit (Frobisher Bay), Pangnirtung
Labrador Inuit Association	1977	Our footsteps are everywhere: Inuit land use and occupancy in Labrador (Focus on Part II: Community Land Use Reports)	Report	381			X		Hopedale, Makkovik, Nain, Postville, Rigolet
Williamson, T.	1997	From sina to sikujâluk: Our footprint. Mapping Inuit environmental knowledge in the Nain district of northern Labrador	Report	119			X		Nain, Voisey's Bay
Rosing-Asvid, A.	2002	The polar bear hunt in Greenland; Technical report No. 45	Report	25				X	Ittoqqortoormiit, Avanersuaq, Upernavik
Stirling, I., & Parkinson, C. L.	2006	Possible effects of climate warming on selected populations of polar bears (*Ursus maritimus*) in the Canadian Arctic	Journal article	15	X	X	X		N/A
Freeman, M. M. R., & Foote, L.	2009	Inuit, polar bears, and sustainable use - local, national and international Perspectives	Book	252	X	X	X		
Kunuk, Z.	2009	Qapirangajuq: Inuit knowledge and climate change	Film	N/A	X				Pangnirtung, Iqaluit
Canadian Wildlife Service	2009	Consultations on the proposed listing of the polar bear as Special Concern under the Species at Risk Act	Report	249	X				Iqaluit, Kimmirut, Pangnirtung
Nunavut Department of Environment	2009	Nunavut coastal resource inventory - Kimmirut	Report	90	X				Kimmirut
Kotierk, M.	2010	The documentation of Inuit and public knowledge of Davis Strait polar bears, climate change, Inuit knowledge and environmental management using public opinion polls	Report	103	X				Iqaluit, Kimmirut, Pangnirtung
Kotierk, M.	2010	Elder and hunter knowledge of Davis Strait polar bears, climate change, and Inuit participation	Report	23	X				Iqaluit, Kimmirut, Pangnirtung
Fisheries and Oceans Canada	2011	Conversations with Nunavut communities on Areas of Ecological Importance	Report	139	X				Kimmirut, Iqaluit, Pangnirtung
Henri, D.	2012	Managing nature, producing culture: Inuit participation, science and policy in wildlife governance in the Nunavut Territory, Canada	Thesis	365	X				Kimmirut
Brown, L., & Fast, H.	2012	An overview of important ecological and biological marine features in Nunavut based on local knowledge	Report	62	X				Clyde River, Cape Dorset, Iqaluit, Kimmirut, Pangnirtung, Qikitarjuaq
Nunavut Department of Environment	2012	Nunavut coastal resource inventory - Iqaluit	Report	131	X				Iqaluit, Apex
Nunavut Department of Environment	2013	Nunavut coastal resource inventory - Pangnirtung	Report	113	X				Pagnirtung
Hotson, C.	2014	Summary of community consultations on the draft Nunavut Polar Bear Management Plan development and process	Report	15	X				Iqaluit, Kimmirut, Pangnirtung
York, J., Dale, A., Mitchell, J., Nash, T., Snook, J., Felt, L., Taylor, M., & Dowsley, M.	2015	Labrador polar bear Traditional Ecological Knowledge: Final report	Report	133			X		Hopedale, Nain, Postville, Rigolet
Wong, P. B. Y., & Murphy, R. W.	2016	Inuit methods of identifying polar bear characteristics: Potential for Inuit inclusion in polar bear surveys	Journal article	15	X				Arctic Bay, Arviat, Gjoa Haven, Kimmirut, Kugaaruk
Wong, P. B. Y., Dyck, M. G., Arviat Hunters and Trappers, Ikajutit Hunters and Trappers, Mayukalik Hunters and Trappers, & Murphy, R. W.	2017	Inuit perspectives of polar bear research: Lessons for community-based collaborations	Journal article	14	X				Arctic Bay, Arviat, Gjoa Haven, Kimmirut, Kugaaruk
Committee on the Status of Endangered Wildlife in Canada	2018	COSEWIC assessment and status report on the polar bear Ursus maritimus in Canada	Report	128	X	X	X		
Nunavik Marine Regional Wildlife Board	2019	Nunavik Inuit knowledge and observations of polar bears: Polar bears of the Davis Strait sub-population	Report	111		X			Aupaluk, Kangiqsualujjuaq, Kangiqsujuaq, Kangirsuk, Kuujjuaq, Quaqtaq, Tasiujaq
Tomaselli, M., Henri, D. A., Pangnirtung Hunters and Trappers Organization, Mayukalik Hunters and Trappers Organization, Akavak, N., Kanayuk, D., Kanayuk, R., Pitsiulak, P., Wong, P., Richardson, E. S., & Dyck, M.	2022	Nunavut Inuit Qaujimajatuqangit on the health of the Davis Strait polar bear population. Final project report	Report	157	X				Kimmirut, Pangnirtung

Metadata legend

Blank cells	Indicates absence of relevent data
*	Denotes categories that were analyzed in Nvivo

Reference		Methods									IK contribution type				
Author(s)	Year	Data collection years	# participants	Survey	Interview	Focus group	Participatory mapping	Analysis method	Richness of qualitative information	Direct Quotes	IK Study	IK Content	*Abundance	*Health / body condition	Distribution / range
Milton Freeman Research Limited	1976	1973-1974	Not specified		X		X	Qualitative	1 - Low	N	X		X		X
Labrador Inuit Association	1977	1975-1976	82		X		X	Qualitative	2 - Moderate	Y	X				X
Williamson, T.	1997	1997	47		X		X	Qualitative	1 - Low	Y	X				X
Rosing-Asvid, A.	2002	1988-1990	94		X			Qualitative	1 - Low	N	X				X
Stirling, I., & Parkinson, C. L.	2006	N/A	N/A					Quantitative	1 - Low	N		X	X		X
Freeman, M. M. R., & Foote, L.	2009							Qualitative	1 - Low	N		X	X		X
Kunuk, Z.	2009	2009	12		X			Qualitative	3 - High	Y	X		X		X
Canadian Wildlife Service	2009	2009	95			X		Qualitative	1 - Low	N	X		X	X	
Nunavut Department of Environment	2009	2009	7		X		X	Qualitative	1 - Low	N	X		X	X	X
Kotierk, M.	2010	2007, 2008	33	X	X			Mixed methods	1 - Low	N	X		X		
Kotierk, M.	2010	2007, 2008	31		X			Mixed Methods	1 - Low	Y	X		X	X	X
Fisheries and Oceans Canada	2011	2009-2010	-		X		X	Qualitative	3 - High	Y	X		X		X
Henri, D.	2012	2009				X		Qualitative	3 - High	Y	X				
Brown, L., & Fast, H.	2012	2010	18 + HTOs			X	X	Qualitative	1 - Low	N	X		X		X
Nunavut Department of Environment	2012	2012	14		X		X	Qualitative	1 - Low	N	X				X
Nunavut Department of Environment	2013	2013	9		X		X	Qualitative	1 - Low	N	X		X	X	X
Hotson, C.	2014	2014	25			X		Qualitative	1 - Low	N	X		X		
York, J., Dale, A., Mitchell, J., Nash, T., Snook, J., Felt, L., Taylor, M., & Dowsley, M.	2015	2012	15		X		X	Mixed Methods	2 - Moderate	Y	X		X	X	X
Wong, P. B. Y., & Murphy, R. W.	2016	2011-2015	56		X			Mixed methods	3 - High	Y	X			X	
Wong, P. B. Y., Dyck, M. G., Arviat Hunters and Trappers, Ikajutit Hunters and Trappers, Mayukalik Hunters and Trappers, & Murphy, R. W.	2017	2011-2015	56		X			Mixed methods	3 - High	Y	X		X	X	
Committee on the Status of Endangered Wildlife in Canada	2018											X	X		X
Nunavik Marine Regional Wildlife Board	2019	2014, 2015	76		X	X	X	Mixed Methods	3 - High	Y	X		X	X	X
Tomaselli, M., Henri, D. A., Pangnirtung Hunters and Trappers Organization, Mayukalik Hunters and Trappers Organization, Akavak, N., Kanayuk, D., Kanayuk, R., Pitsiulak, P., Wong, P., Richardson, E. S., & Dyck, M.	2022	2019	43		X	X	X	Mixed Methods	3 - High	Y	X		X	X	X

Reference		Biology/Ecology from IK						*Relationships to Polar Bear as a Determinants of Inuit Health							
								Proximal			Intermediate			Distal	
Author(s)	Year	Habitat	Feeding / diet	Mating / denning	Species Interactions	Environmental change impacts	Human development impacts	Land & ecosystems	Food systems & security	Livelihoods	Community capacities	Indigenous knowledge systems	Culture	Self-determination	Colonialism & racism
Milton Freeman Research Limited	1976											X			
Labrador Inuit Association	1977			X				X				X			
Williamson, T.	1997		X	X			X								
Rosing-Asvid, A.	2002											X			
Stirling, I., & Parkinson, C. L.	2006														
Freeman, M. M. R., & Foote, L.	2009														
Kunuk, Z.	2009					X	X	X	X			X		X	
Canadian Wildlife Service	2009			X	X	X	X		X			X		X	X
Nunavut Department of Environment	2009	X	X	X								X			
Kotierk, M.	2010								X			X	X	X	
Kotierk, M.	2010		X			X								X	X
Fisheries and Oceans Canada	2011		X			X							X		
Henri, D.	2012														
Brown, L., & Fast, H.	2012		X	X		X									
Nunavut Department of Environment	2012		X	X								X			
Nunavut Department of Environment	2013		X	X								X			
Hotson, C.	2014		X		X				X	X		X	X		X
York, J., Dale, A., Mitchell, J., Nash, T., Snook, J., Felt, L., Taylor, M., & Dowsley, M.	2015	X	X	X		X			X			X		X	
Wong, P. B. Y., & Murphy, R. W.	2016		X						X	X		X			X
Wong, P. B. Y., Dyck, M. G., Arviat Hunters and Trappers, Ikajutit Hunters and Trappers, Mayukalik Hunters and Trappers, & Murphy, R. W.	2017		X		X	X			X		X	X	X	X	
Committee on the Status of Endangered Wildlife in Canada	2018														
Nunavik Marine Regional Wildlife Board	2019	X	X	X	X	X		X	X	X		X	X	X	X
Tomaselli, M., Henri, D. A., Pangnirtung Hunters and Trappers Organization, Mayukalik Hunters and Trappers Organization, Akavak, N., Kanayuk, D., Kanayuk, R., Pitsiulak, P., Wong, P., Richardson, E. S., & Dyck, M.	2022	X	X	X	X	X	X	X	X	X		X	X	X	X

Reference				*Inuit Perspectives on Management/Stewardship			
Author(s)	Year	Law & policy	Gender	Human interactions	Harvest management	Research / surveillance methods	Sub-population delineation
Milton Freeman Research Limited	1976						
Labrador Inuit Association	1977						
Williamson, T.	1997	X					
Rosing-Asvid, A.	2002						
Stirling, I., & Parkinson, C. L.	2006						
Freeman, M. M. R., & Foote, L.	2009						
Kunuk, Z.	2009	X		X		X	
Canadian Wildlife Service	2009	X		X	X	X	X
Nunavut Department of Environment	2009						
Kotierk, M.	2010	X		X	X	X	
Kotierk, M.	2010	X			X	X	
Fisheries and Oceans Canada	2011			X	X	X	
Henri, D.	2012					X	X
Brown, L., & Fast, H.	2012						
Nunavut Department of Environment	2012						
Nunavut Department of Environment	2013			X		X	
Hotson, C.	2014			X	X	X	X
York, J., Dale, A., Mitchell, J., Nash, T., Snook, J., Felt, L., Taylor, M., & Dowsley, M.	2015	X		X	X	X	
Wong, P. B. Y., & Murphy, R. W.	2016	X		X	X		
Wong, P. B. Y., Dyck, M. G., Arviat Hunters and Trappers, Ikajutit Hunters and Trappers, Mayukalik Hunters and Trappers, & Murphy, R. W.	2017			X	X	X	
Committee on the Status of Endangered Wildlife in Canada	2018						
Nunavik Marine Regional Wildlife Board	2019	X		X	X	X	
Tomaselli, M., Henri, D. A., Pangnirtung Hunters and Trappers Organization, Mayukalik Hunters and Trappers Organization, Akavak, N., Kanayuk, D., Kanayuk, R., Pitsiulak, P., Wong, P., Richardson, E. S., & Dyck, M.	2022	X	X	X	X	X	X