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20

Key issues affecting coastal aquatic ecosystems and changing coastal conditions in Nunavut:

A comparative assessment of communities in the Qikiqtaaluk Region.

Lisette Wilson, Jade Owen, Breanna Bishop & Lucia Fanning

Marine Affairs Program, Dalhousie University

Marine Affairs PROGRAM
DALHOUSIE UNIVERSITY

Life Science Center, Room 807
1355 Oxford Street PO BOX 15000
Halifax, NS B3H 4R2 Canada

phone 902.494.3555
marine.affairs@dal.ca

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Executive Summary

The Coastal Restoration Nunavut (CRN) project draws on Inuit Qaujimajatuqangit (IQ) to document and address the health and condition of marine species and their habitats. The objective of the research project is to identify and implement physical interventions to mitigate the stressors impacting aquatic species in each of Nunavut's 25 communities. Under the Oceans Protection Plan (OPP), the Government of Canada has identified coastal restoration as a key priority to address threats to aquatic ecosystems and marine biodiversity loss. "Coastal restoration" is defined as the action of returning something to its former condition; improving its current condition; or protecting it from further or future harm. "Coastal" refers to any area where marine and terrestrial processes meet and interact.

This technical report presents the findings of the CRN team visits to Clyde River, Grise Fiord, Igloolik, Iqaluit, Kinngait, Pangnirtung, Resolute Bay, Sanikiluaq, and Sanirajak in the Qikiqtaaluk region. During these workshops, knowledge holders shared their knowledge on topics relating to coastal restoration priorities, ecological and habitat changes, and impacts on their social, economic, and cultural activities and practices. knowledge holders also identified approaches that could help address these impacts.

From the perspective of the knowledge holders, the major coastal issues described were decreasing water levels, changes in ice conditions, and species populations. Key impacts from environmental and ecological changes) on social, economic, and cultural activities and practices included reduced hunting and harvesting time, habitat, and migratory species route loss, on-the-land safety, and fluctuations in key species populations. Other impacts noted by knowledge holders were from contaminants, increased shipping and marine traffic, and garbage and debris.

Coastal priorities and management interventions identified by knowledge holders were infrastructure improvements, environment and ecological studies, cleanup of key harvesting locations, improvement of fish migratory routes and the enforcement of policies and regulations (specifically anchorage regulations for foreign sailboats, waste management policy for foreign vessels and ballast water laws).

The brief overview of Federal and territorial regulations and policies relating to coastal priorities reveals the siloed governance approach to addressing these issues. Projects and programs initiated by communities tended to be more holistic and integrative of both the social and ecological components into activities such as char monitoring, river restoration, and environmental monitoring. Most if not all projects and programs included an Inuit-centered approach and a coming together of IQ and Western science knowledge. However, policies and regulations are shifting towards a similar approach as seen in the development of the integrated fisheries management plans and waste management guidelines.

1.0 Introduction

Under the Oceans Protection Plan (OPP)[1], the Government of Canada has identified coastal restoration as a key priority to address threats to aquatic ecosystems and marine biodiversity loss. Established in the 2017-2018 fiscal year, the Coastal Restoration Fund (CRF) is a five-year grants and contributions program focusing on projects that (a) address the impacts of historical development; (b) mitigate the results of increased marine shipping; (c) contribute to the recovery of species that are considered threatened, endangered or at risk; and (d) build local capacity to restore and maintain coastal habitats[2]. In this context, "Coastal restoration" is defined as the action of returning something to its former condition; improving its current condition; or protecting it from further or future harm. "Coastal" refers to any area where marine and terrestrial processes meet and interact. The project builds on the successful baseline and monitoring programs developed and delivered by the Government of Nunavut, such as the Nunavut Coastal Resource Inventory (NCRI) and the Nunavut Community Aquatic Monitoring Program (N-CAMP).

The Coastal Restoration Nunavut (CRN) project draws on Inuit Qaujimajatuqangit (IQ) to document and address the health and condition of marine species and their habitats[3]. In collaboration with communities, the objective of the research project is to conduct feasibility studies to identify and mitigate the stressors impacting aquatic species in each of Nunavut's 25 communities. The project is committed to implementing at least three physical interventions identified as priorities by communities, one in each administrative region within the territory. The project also aims to strengthen capacity at the community level via local training; to document IQ; and to support each community in environmental restoration and stewardship initiatives.

The purpose of this summary report is to present a comparative analysis of the findings of the CRN team visits to nine communities (Clyde River, Grise Fiord, Igloolik, Iqaluit, Kinngait, Pangnirtung, Resolute Bay, Sanikiluaq, and Sanirajak) in the Qikiqtaaluk region. In each of the communities, team members held participatory mapping workshops with the Hunters and Trappers Association (HTA), Hamlet staff, elders, and/or other resource users requesting they share their knowledge on coastal health and changing coastal conditions. Community workshops and meeting discussions sought to learn more about the knowledge holders' perspectives on the following:

1. What are the coastal restoration priorities and needs in your community?
2. What coastal areas, if any, show historical or potential signs of degradation and/or contamination?
3. How have your social, economic, and cultural activities and practices been impacted by changes to the coastal environment?
4. What should be done to address these impacts?

Based on the knowledge shared during these workshops, community driven restoration projects were identified, feasibility studies conducted, and coastal restoration activities funded, following the recommendations presented in the feasibility studies.

2.0 Communities visited in the Qikiqtaaluk region

Nunavut has three administrative regions (Figure 1) - Kitikmeot (Cambridge Bay, Gjoa Haven, Kugaaruk, Kugluktuk, Taloyoak); Kivalliq (Arviat, Baker Lake, Chesterfield Inlet, Coral Harbour, Naujaat, Rankin Inlet, Whale Cove); and Qikiqtaaluk (Arctic Bay, Clyde River, Grise Fiord, Igloolik, Iqaluit, Kimmirut, Kinngait, Pangnirtung, Pond Inlet, Resolute Bay, Sanikiluaq, Sanirajak, and Qikiqtarjuaq).

[1] https://tc.canada.ca/en/initiatives/oceans-protection-plan
[2] https://www.dfo-mpo.gc.ca/ae-ve/evaluations/20-21/crf-frc-eng.html
[3] For further information visit https://www.coastalnunavut.ca/

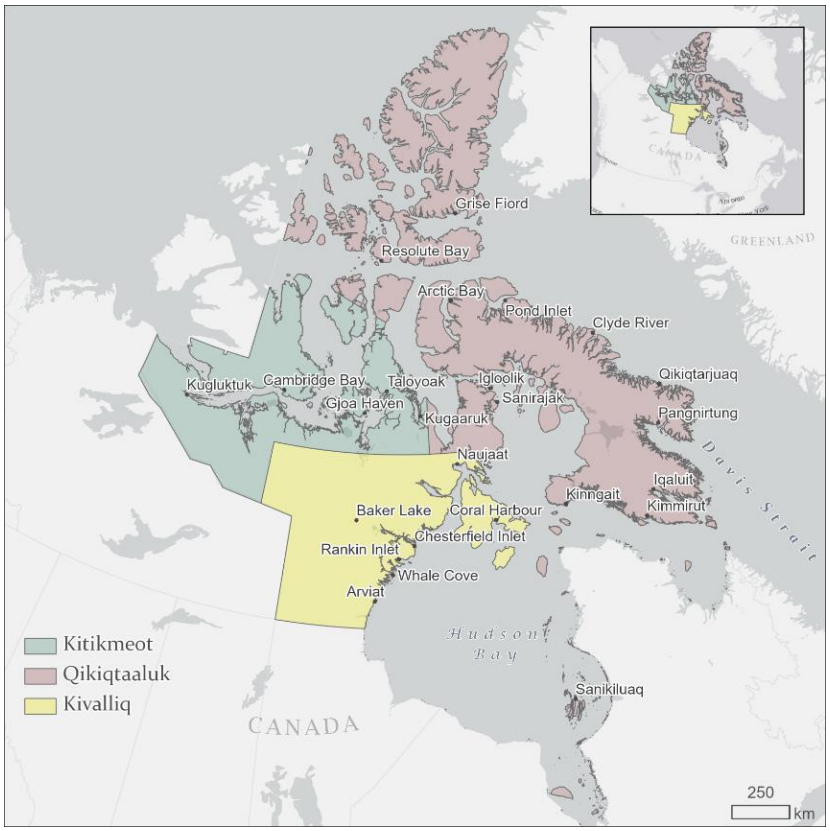

Figure 1: The three administrative regions of Nunavut

The team visited 9 communities in this region (Figure 2). A short description of each of the communities follows.

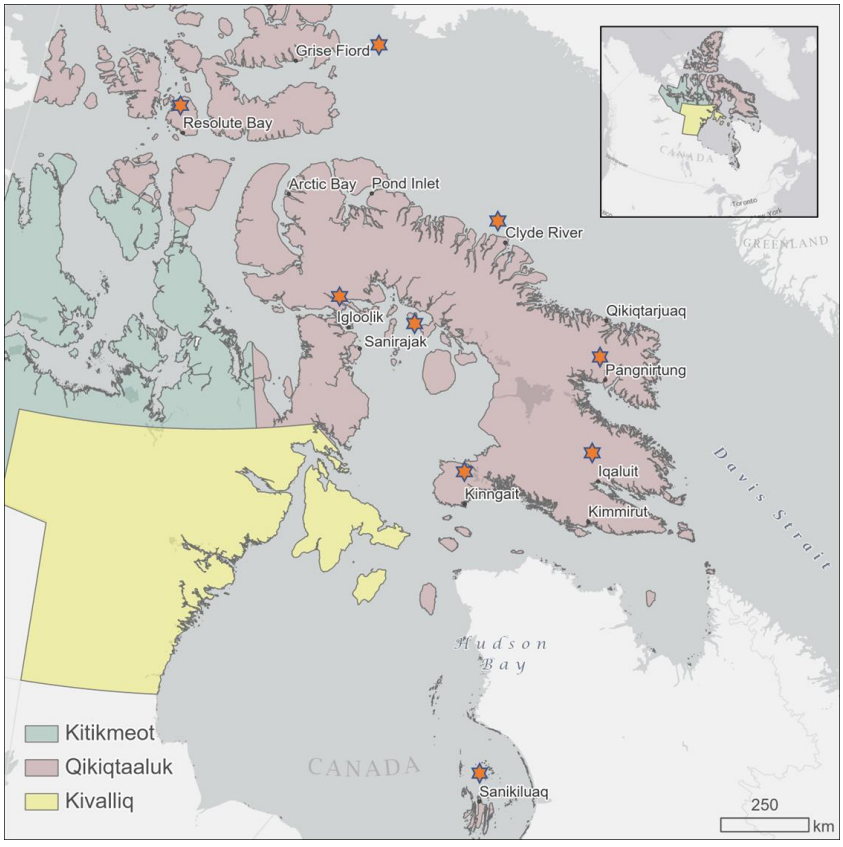

Figure 2 Location of the communities. Those visited are indicate with a star.

Clyde River (ᑲᖕᒋᖅᑐᒑᐱᒃ, Kanngiqtugaapik "nice little inlet") is located on the northeast coast of Baffin Island and is approximately four degrees north of the Arctic Circle, east of Pond Inlet, and north of Qikiqtarjuaq and Iqaluit (Government of Nunavut, n.d.a). It is situated on a flood plain on the shores of Patricia Bay at the entrance to Clyde Inlet (a fiord which extends over 100km inland). At the time of the 2016 census, the population was 1,053 (Statistics Canada, 2017a). The economy in Clyde River comprises of subsistence harvesting and hunting, and wage-based activities. The community's hunting and fishing area includes approximately 75 km out to sea, 200 km along the coast to the south, and 270 km along the coast to the north from Clyde River (Government of Nunavut, 2014).

Grise Fiord (ᐊᐅᔪᐃᑦᑐᖅ, Aujuittuq, "Place that never thaws") is the northernmost community in Canada and is situated on the southern coast of Ellesmere Island, overlooking Jones Sound. In 2016 the population was 129 (Statistics Canada, 2017b). The community is located between a mountain range and the ocean and relies heavily on the sea for food and transportation. Carving, crafts, and clothing are also important sources of income (Government of Nunavut, n.d.b). The community's hunting and fishing area includes Jones Sound, and extends into the Norwegian Bay, Baumann Fiord, Vendom Fiord, and Makinson Inlet. Nirjutiqavvik National Wildlife Area and Quttinirpaaq National Park are near the Hamlet (Government of Nunavut, 2012).

Igloolik (ᐃᒡᓗᓕᒃ, "Place of houses") is located on a small island of the same name near the eastern entry of Fury and Hecla Strait, in Foxe Basin, Qikiqtaaluk Region. In 2016 the population was 1,682 (Statistics Canada, 2017c). The economy is mixed, with many residents employed in various positions while also taking part in the land-based economy and the harvesting of country food, which forms an important part of the community's identity (Government of Nunavut, n.d.c).

Iqaluit (ᐃᖃᓗᐃᑦ, "Place of many fish") is the territorial capital of Nunavut, located on Baffin Island near the mouth of the Sylvia Grinnell River. The Nunavut Agreement was signed here in 1993 (Searles, 2010). In 2016, the population was 7740 (Statistics Canada, 2017d). Iqaluit's economy includes government services, construction, public administration, professional, scientific, and technical services (Searles, 2010). The community's hunting and fishing area spans approximately 262km north, 258km south, 228km east and 143km west of the municipality of Iqaluit, including Frobisher Bay, Resolution Island, Meta Incognita Peninsula, and Amadjuak Lake (Government of Nunavut, 2010a).

Kinngait (ᑭᙵᒐᐃᑦ, "High Mountains") is located on Dorset Island, near Foxe Peninsula, at the southwestern tip of Baffin Island in the Qikiqtaaluk region of Nunavut (Aarluk Consulting Inc., 2011). In 2016, the population was 1441 (Statistics Canada, 2017e). The land-based economy plays an important role, with many residents participating in harvesting activities (Government of Nunavut, 2018a). The community's hunting and fishing area spans approximately 300km north to south, 450km east to west including western portions of Hudson Strait and southeastern portions of Foxe Basin and Foxe Channel (Government of Nunavut, 2018a). Residents are also involved in other occupations, including sales and services, government, and trades (Aarluk Consulting Inc., 2011).

Pangnirtung (ᐸᖕᓂᖅᑑᖅ "Place of the bull caribou"), in the Qikiqtaaluk Region, is situated 50km from the Arctic Circle below the mountains of the Pangnirtung fiord, and on the northern side of Cumberland Sound. In 2016, the population was 1,481 (Statistics Canada, 2017f). The economy is comprised of subsistence harvesting and wage-based activities (Government of Nunavut, n.d.d). The community's hunting and fishing area ranges 150 km from Pangnirtung in all directions, including Cumberland Sound. Caribou, seals, and Arctic char are the most valued food sources for the community but other seasonal resources, such as turbot, ptarmigan, eiders, polar bear, kelp, Arctic hare, clams, and beluga are also important (Government of Nunavut, 2013). Pangnirtung is one of three Nunavut communities that has a fish processing plant - Pangnirtung Fisheries Limited (Galappaththi et al., 2019). The business is an Inuit-owned private entity, operating since 1992. This fish plant serves two key fisheries, Arctic char, and Greenland halibut (Dennard et al., 2010).

Resolute Bay (ᖃᐅᓱᐃᑦᑐᖅ, Qausuittuq, "Place with no dawn"**)**, is the second most northerly community in Nunavut. The Hamlet is named after Resolute Bay, which is the waterway into Parry Channel on the southern coast of Cornwallis Island, and in the middle of the Northwest Passage. In 2016, the population of Resolute Bay was 198 (Statistics Canada, 2017g). As the gateway to the High Arctic, Resolute Bay is the major stopover for expeditions to the North Pole and to

Quttinirtaaq National Park (Government of Nunavut, n.d.e). The economy can be characterized as subsistence activities, including hunting, fishing, trapping, and gathering, integrated with wage-based economic activities (Government of Nunavut, n.d.e). The community's hunting and fishing area includes Wellington Channel, Barrow Strait, Cornwallis Island, Little Cornwallis Island, Devon Island, Somerset Island, and Griffith Island (Government of Nunavut, 2018b).

Sanikiluaq (ᓴᓂᑭᓗᐊᖅ, "Home of Sandy Kiluaq") is located on the northern tip of Flaherty Island, about 150 kilometers off the west coast of Nunavik, Quebec. It is the southern-most Hamlet in Nunavut. In 2016, the population of Sanikiluaq was 882 (Statistics Canada, 2017h). Integrated with wage-based activities, hunting and fishing are crucial economic activities that support local livelihoods and the community (Government of Nunavut, n.d.f). The hunting and fishing area covers approximately 400 km north to south, and 550 km east to west (Government of Nunavut, 2010b).

Sanirajak (ᓴᓂᕆᔭᖅ, Hall Beach, "The shoreline place") is next to Foxe Basin on the eastern side of Melville Peninsula in the Qikiqtaaluk region. It is the oldest known permanently inhabited community north of the Arctic circle. The name was officially changed to its local name in 2020. The waters surrounding the Hamlet are rich in nutrients that support abundant walruses, seals, narwhals, belugas, and bowhead whale populations (Government of Nunavut, 2018c). In 2016, the population was 848 (Statistics Canada, 2017i). Residents are employed in various occupations, including tourism, and participate in the land-based economy and harvesting of country food (Government of Nunavut, n.d.g). The community's hunting and fishing area spans approximately 600km north to south, 400km east to west, and encompasses the Foxe Basin and northern portions of the Foxe Channel, Fury and Hecla Strait, and southwestern portions of the Gulf of Boothia including Committee Bay (Government of Nunavut, 2018c).

3.0 Methods

Data collection: Iqaluit and Kinngait were visited by the team in 2021, and the other communities in 2018. In each community, one focus group was conducted at the HTO and/or Hamlet council, and one-on-one interviews were conducted with Hamlet staff and HTO members with each participant list approved by the HTO board of directors beforehand. The interviews were conducted in person, with all interviews and the selection of knowledge holders coordinated through the community HTO. Focus groups and focus group attendees were coordinated through the respective HTO and Hamlet.

Data analysis (participatory maps): Using participatory mapping and semi-structured interviews, knowledge holders were asked to identify changes, damages and risks to species, habitats and coastal activities over time, and the causes of and impacts from said changes. These questions led to community-identified restoration priorities and/or potential interventions. Information from the interviews was then coded and themed by the data collection team.

Data analysis (themes): Using the codes created for the maps and assigned field notes, the information was then themed into the following four categories: general observations; changes to habitats, environment, and species; causes for these changes; and actions that are needed to address key coastal restoration issues. Table 1 provides a summary of the primary data sources used to address specific research questions.

Table 1: Research questions, sources for themes, and theme categories

Research questions	Source for themes	Theme categories
1. What are the community perspectives on coastal restoration needs?	Community field notes	• Coastal restoration actions needed in the Qikiqtaaluk region (Priorities and needs)
2 What coastal areas, if any, show historical or potential signs of degradation and/or contamination?	Mapping codes and community field notes	• Environment and ecological changes and causes
3 How have socio-economic and cultural activities been impacted by changes to the coastal environment?	Mapping codes and community field notes	• Environment and ecological changes • Coastal restoration actions needed in the Qikiqtaaluk region (Priorities and needs)

4 What should be done to address these impacts?	Community field notes	• Coastal restoration actions needed: ○ Management interventions - fisheries ○ Cleanup of contaminated sites ○ *Environmental research and monitoring ○ Restoration of key fishing areas ○ **Ecological research and monitoring
***Setting the context	Mapping codes	• General observations

Notes:
* Environmental research and monitoring are actions that focus on water quality, fish health due to contamination sources, and physical and/or chemical environmental assessments.
** Ecological research and monitoring focus on species abundance, migration patterns, habitat changes, etc.
*** Setting the context was not a research question but was used to describe mapping codes/information that did not fall into any of the other themes.

Lessons learned:
From a data collection perspective, lessons learned include prioritizing open, transparent, translated, and weekly communication with the respective communities before and after the research takes place; additional review of data, map locations and place names prior to departing the community if possible; and receipt of contact details from all knowledge holders in case follow-up information is needed.

From the data analysis perspective, having an ongoing working code book developed after the first few visits have been completed can help in standardizing the information being collected. Debriefing meetings after visits also contribute to clearer interpretation of the data and highlight the potential to adjust approaches if needed. It is also useful to ensure that there is a clear understanding and documentation of the methods being used by team members collecting the data and those doing the analysis (if different) as this helps to ensure a smooth transition in the event of changes in team personnel. From a project management perspective, clear definitions for team member roles are essential, especially for new personnel who may be joining the team at a later date.

4.0 Literature synthesis

A brief overview of existing published literature in terms of environmental and ecological changes and their impacts relevant to the targeted communities is provided here.

4.1. Environmental changes and impacts on social, cultural, and traditional practices

Glacier melt and Multi-Year Sea Ice (MYSI): Receding glaciers have the potential to increase river flow and erosion. For example, the Clyde River drains part of the remaining land ice of Barnes Ice Cap, resulting in a basin in its most advanced stages of deglaciation (Irvine, M., et al. 2008). In Grise Fiord, large pieces of ice caps and glaciers are breaking off, resulting in less water run-off in the summer. (Government of Nunavut, 2012). During the winter of 2008, less moving MYSI was observed in Igloolik, and is believed to be linked to potentially warmer water and air temperatures, especially in the summer (Ford et al., 2008). Furthermore, weaker, and more variable winds may not be pushing as much ice through Labrador Narrows and into Fury and Hecla Strait. Consequently, less moving MYSI could lead to delayed freezing of the sea ice in the autumn and thinner ice conditions overall (Ford et al., 2008). The timing of sea ice freeze-up is also occurring later in Kinngait, with sea ice being thinner and less MYSI (Laidler & Elee, 2008). Similarly, in Pangnirtung, glaciers are melting and causing runoff, which washes out bridges and floods the rivers in the National Park (Government of Nunavut, 2013). Fewer glacier-carved icebergs are noted in the fiord and less MYSI is being generated from the north, potentially linked to warmer waters or air temperatures, especially in the summer (Laidler et al., 2010).

Permafrost: In Clyde River, future warmer ground temperatures could increase the probability of permafrost thaw and subsidence in areas of moderate to high ground ice content. Permafrost melt and a sinking landmass will have an impact on current and future areas for development (Irvine, 2011). Degradation of infrastructure caused by permafrost thawing has been observed at Iqaluit Airport, and on roads (Ghias et al., 2017). Seasonal surface displacement maps produced

for Pangnirtung in 2013 indicated that the airport area appeared to be unstable, as did the area to the east of the reservoir (LeBlanc et al., 2011). This eastern area also showed several ice wedges that contained a large volume of ice (ice lenses), confirming the location's freeze-thaw sensitivity (LeBlanc et al., 2011).
Ice changes: Across the region, residents have noted and are concerned that the ice-free season is longer now, with sea ice melting and breaking up earlier than in the past. For example, residents from Clyde River have noted that unpredictable sea ice has made hunting and travelling routes more dangerous (Akimoto & Amato, 2004). Similar experiences have been noted in Grise Fiord (Government of Nunavut, 2012), Iqaluit (Government of Nunavut, 2010a), Resolute Bay (Government of Nunavut, 2018b), Kinngait (Government of Nunavut, 2018a), Sanikiluaq (Government of Nunavut, 2010), and Sanirajak (Government of Nunavut, 2018c). In Igloolik, hunters had noticed that in winter the ice is thinner, breaks up easily, and takes longer to form; however, in summer there is more floating ice, with strong winds and rough waves (Government of Nunavut, 2008).

Changes in sea ice have been reported in Pangnirtung since 2000 (Laidler et al., 2010). For example, the ice that forms and stays until the following year does not form properly and lasts for a shorter duration, with new ice that breaks off easily and more frequently (Laidler et al., 2010). A 2015 study found that Frobisher Bay had experienced a decline in the duration of the ice season (i.e., longer open water/ice-free seasons), which is consistent with the trend reported by Iqaluit residents (Government of Nunavut, 2010a). In 2017, Resolute Bay community members noted that the ice was much thinner, slower to freeze and did not form on the west side until January, which may have been due to weaker currents compared with the previous year (Government of Nunavut, 2018). In Sanikiluaq, freeze-up occurred later in the fall, and conversely the spring break-up happens earlier, which has an impact on travelling and hunter safety (Government of Nunavut, 2010b). In both Kinngait and Sanirajak, sea ice is thinner and breaks up earlier in the spring. The melting process is also a lot faster, with some areas that no longer freeze- over, which poses safety risks to the community (Government of Nunavut, 2018a&c).

Seasonal events and weather: A study conducted in Clyde River (Gearheard et al., 2010) noted that weather fluctuations were happening more frequently and decreasing the ability to effectively hunt. Winters were also shorter and summers longer (Gearheard et al., 2010). Another study noted the reduction in snow cover, which has restricted overland travel and increased permafrost thaw and ground subsidence (Fox, 2004). In Kinngait, warmer temperatures were the most notable weather change, with residents having experienced fewer days of extreme cold (indicated by the lack of ice fog present); more overcast conditions; warmer winds; and a reduction in the need to wear caribou skin clothing (Laidler & Elee, 2008). Another study in Igloolik also observed that there was more snow on the ice, which hides thin ice and there have been reported incidences of hunters falling through the ice. In Kinngait, a recent study reported that one of the main environmental changes was faster snow melts (Government of Nunavut (2018a). In Sanirajak, a recent report documented that there is more wind and less snow in the area (Government of Nunavut, 2018c).

In Pangnirtung, the prevailing winds have shifted more southerly and pushed pack ice into the floe edge, leading to ice instability and warmer weather (Laidler et al., 2010). Within the region of Sanikiluaq, sudden windstorm events common to this area of the Hudson Bay are becoming more frequent (Government of Nunavut, 2010b). In Grise Fiord there was more wind and less snow in the area (Government of Nunavut, 2012).

Kinngait community members have noted that it is getting colder later in the year and warming up earlier; there are also fewer blizzards and less snow accumulation (Laidler & Elee, 2008). Consequently, weather and cloud formations, which had formerly been used to predict weather conditions are no longer reliable (Laidler & Elee, 2008). Warmer winter temperatures are also shortening the ice season, and hunters have less time to utilize the ice, which has negative impacts on community food sovereignty (Government of Nunavut, 2018a)

The unpredictability of the weather has also created challenges for harvesters in Igloolik, as it is harder to anticipate where the animals will be (Ford et al., 2008). Hunters that use boats to access specific areas are also affected by unpredictable weather and stronger winds (Ford et al., 2008). A similar situation has also occurred in Iqaluit, as variable weather patterns have made it dangerous to travel in winter (Statham et al., 2015).

Erosion and Sea Level Rise (SLR): In Clyde River, differential subsidence[4] has caused damage to infrastructure, especially in the low-lying eastern areas of the town (Irvine, 2008). Irvine (2008) also noted that thermal erosion has led to bank erosion that has affected houses along the creek. The area has been further impacted by surface run-off, which has caused flooding, gullying, and erosion. In Grise Fiord, due to large waves along the coastline, there has been an increase in localized erosion (Government of Nunavut, 2012). In 2015, sea level rise (SLR) was identified as the dominant factor affecting infrastructure in Iqaluit (Hatcher & Forbes, 2015). Examples of SLR impacts include the exposure to the pile-up of sea ice, increased exposure of coastal infrastructure to flooding associated with storm surges and extreme high tides, and wave run-up associated from storm waves that overtop sewage-retaining berms and damage other infrastructure along the urban waterfront (Hatcher & Forbes, 2015).

4.2 Ecological changes and impacts on social, cultural, and traditional practices

Seals: Changes in the population numbers of harp, bearded and ringed seals were frequently mentioned in the literature. For example, in Grise Fiord (Government of Nunavut, 2012) and Sanirajak (Government of Nunavut, 2018c), there were fewer harp seals and ringed seals but an increase in bearded seal populations. In Pangnirtung, residents reported decreasing numbers of ringed seals, while the number of migratory harp and hooded seals had increased (Diemer et al., 2011). Kinngait residents have observed that there were not as many ringed seals compared to the past, and the population was declining (Government of Nunavut, 2018a). Some hunters believe the decline is due to polar bears eating too many seal pups or due to an increased presence of orcas in the area (Government of Nunavut, 2018a). Although bearded seal populations appeared to be healthy, they are not typically hunted by Kinngait residents (Government of Nunavut, 2018a). In Pangnirtung, harp seal pups appeared sickly, which could be because there are too many seals in the area now (Diemer et al., 2011). In another example, Sanikiluaq residents had noted that ringed seals were losing fur and the animals appeared to be much thinner than in the past (Government of Nunavut, 2010b).

Walrus: Walruses are reported as being widely distributed throughout Northwestern Foxe Basin, and extending up into Steensby Inlet, Fury and Hecla Strait and the Gulf of Boothia. For example, high numbers occur between Igloolik and Jens Munk Island where there are extensive feeding shallow areas and ice much of the year (Government of Nunavut, 2008). Whereas in Iqaluit, walruses are normally sighted at the floe edge between Gabriel Island and Sharko Peninsula during April and May (Government of Nunavut, 2010a). In Clyde River, the local walrus population has decreased, compared to numbers in the 1940s (Government of Nunavut, 2014). Walrus is an important food source for the Kinngait community; however, residents have noted they are finding worms in the meat, which makes it potentially health risk (Government of Nunavut, 2018a).

Whales: Kinngait is situated near a major migration route for belugas that pass in the spring and fall, and numbers seem to be increasing, as do bowhead whale populations (Government of Nunavut, 2018a). In Igloolik, Fury and Hecla Straits are major transit routes, including a fall migration of belugas and narwhal, possibly from Arctic Bay, whereas in summer, bowhead whales move north in April and south in July along the floe edge (Government of Nunavut, 2008). Iqaluit residents have observed that in the spring many belugas are found at the floe edge and some beluga hunting is done along the west side of Frobisher Bay (Government of Nunavut, 2010a). However, now the residents note that there are fewer belugas and narwhals in the area, and hunters must travel further to harvest meat (Carter et al., 2020). In Pangnirtung, there have been increased sightings of killer whales in Cumberland Sound (Higdon & Ferguson, 2010).

Polar bears: Overall, most communities noted that polar bear populations were increasing. For example, in Clyde River, residents attributed the increase in numbers due to the restrictions placed on hunting (Dowsley & Wenzel, 2010). In Pangnirtung some residents noted there were more sick bears, they appeared hungrier, and were less afraid of humans, especially those that have been previously tranquilized and handled by researchers (Government of Nunavut, 2013). In Grise Fiord numbers were increasing and appeared to be smaller than in the past, but still healthy (Government of Nunavut, 2012). In Resolute Bay, there were more polar bears than previously, and their fat had changed; however, it was also noted that populations fluctuate annually (Government of Nunavut, 2018b). In Sanikiluaq, polar bears are numerous when the coast is ice bound (Government of Nunavut, 2010b), although they appeared to be thinner than in the past (Hudson Bay Consortium, 2019).

[4] Sinking of the ground because of underground material movement

Fisheries: The main changes in the fisheries, notably Arctic char, relate to population numbers and the health and quality of the meat. Residents have also noted that the lakes with existing commercial char quotas are too far away from the community and can only be accessed two months of the year (Government of Nunavut, 2018a). Commenting on the health and taste of the species, Clyde River residents have observed diseases in some populations of char, leading to a less desirable taste (Barkley et al., 2018). In another example, since the arrival of large schools of capelin, Pangnirtung residents have noted that the flesh of sea run Arctic char has become whiter in color and the taste has changed (Government of Nunavut, 2013).

5.0 Knowledge holders' perspectives on coastal changes

5.1 General observations

This section describes information drawn from the community workshops facilitated by the CRN team. The section begins with community observations about general areas, species, and infrastructure. In most instances community comments were neither positive nor negative, but more a statement of what is there and the potential relevance to the person providing this information. Figure 3 presents the themes that related to general observations from each community.

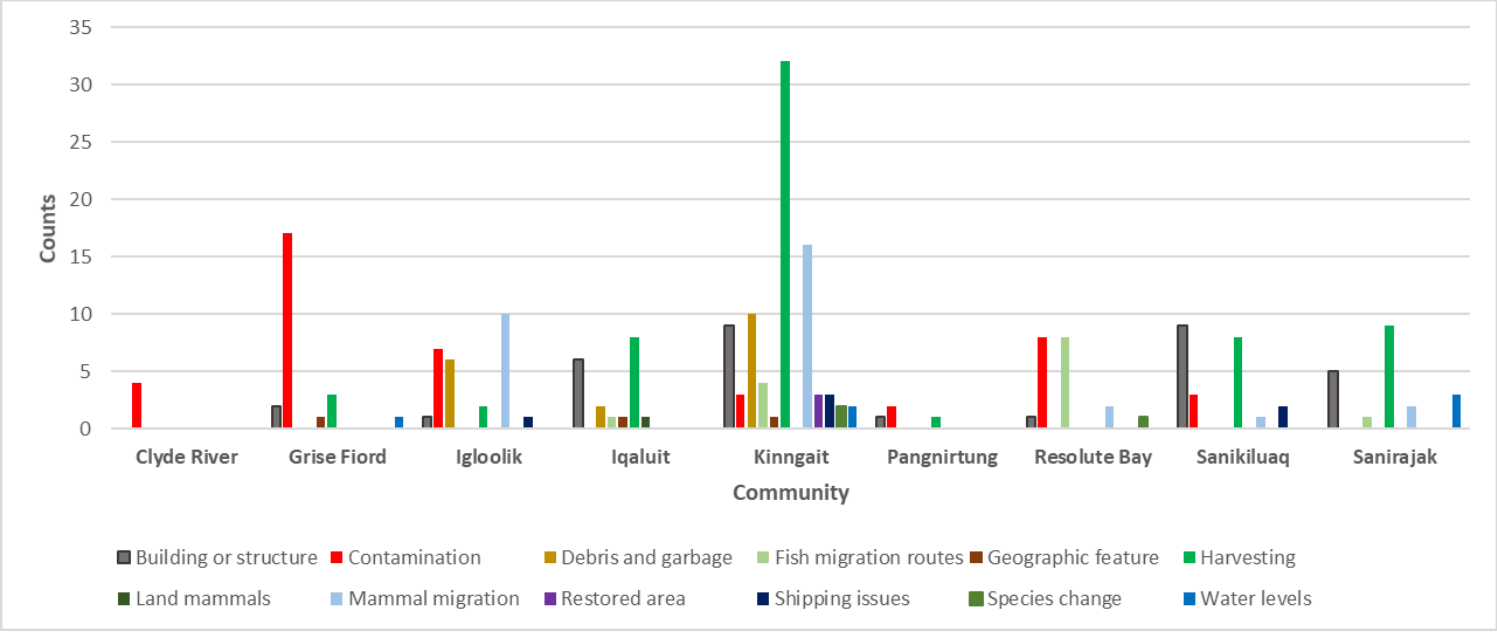

Figure 3: General areas of interest (n=226)

When the responses were aggregated across the region, the top four themes highlighted by knowledge holders in the Qikiqtaaluk region related to: Harvesting (63 responses), Contamination (44 responses), Building or structure (34 responses), and Mammal migration (31 responses).

Observations related to harvesting often referred to places where fish and marine mammals were caught or easily found. Responses relating to contamination focused on abandoned oil barrels (Clyde River, Grise Fiord), blue algae (Grise Fiord), dirt and dust from the road (Igloolik), sewage run-off (Iqaluit, Resolute Bay), impacts from sewage run-off on clams and fish (Kinngait and Pangnirtung). Building or structure observations focused on the location of outpost camps, sewage lagoons, old landing strips, cabins, mining/exploration sites, drinking reservoirs, and landfills/dumps. Mammal migration observations referred to areas where animals such as walrus, seals, beluga, and narwhales were known to pass through, or were often seen during specific times of the year.

Two other themes with more than 10 responses were Debris and garbage (18 responses) and Fish migration routes (14 response). Examples of debris and garbage responses noted trash from the commercial fisheries and old camp sites (Igloolik), abandoned/empty fuel barrels (Iqaluit), and a dump with no fence, which had garbage blowing around, and old nets stuck in ice/garbage (Kinngait). Responses for fish migration routes focused mainly on migratory corridors for Arctic char.

5.2 Environmental and ecological changes

This section represents information drawn from the maps and field notes, representing "*environment and ecological changes.*" Changes were noted to have occurred within the lifetime of the person describing the event, species, or area. Figure 4 describes the main environment and ecological changes to the coastal environments as noted by knowledge holders in the visited communities of the Qikiqtaaluk region.

The most frequently mentioned changes related to Water levels (39 responses), Ice (26 responses), and Species change (23 responses). Reduced water levels have impacted communities by limiting access to key fishing sites and migratory routes of key species such as Arctic char. Ice changes referred to glacier melt (Grise Fiord) and ice being too thin thereby restricting hunting (Grise Fiord, Iqaluit, Kinngait, Pangnirtung). Although Arctic char was noted to have increased by community members in 2018, other communities (Igloolik, Iqaluit, Sanikiluaq) have noticed a decrease in this fishery, and other fish species. The communities have also noted a decline in seal populations and increases in killer whale sightings (Kinngait), changes in the composition and appearance of different fish and marine mammal species (Resolute Bay, Sanikiluaq, Sanirajak), and changes in the meat texture of clams (Sanikiluaq). **Appendix 1** presents community-specific maps depicting the spatial extent of related observations.

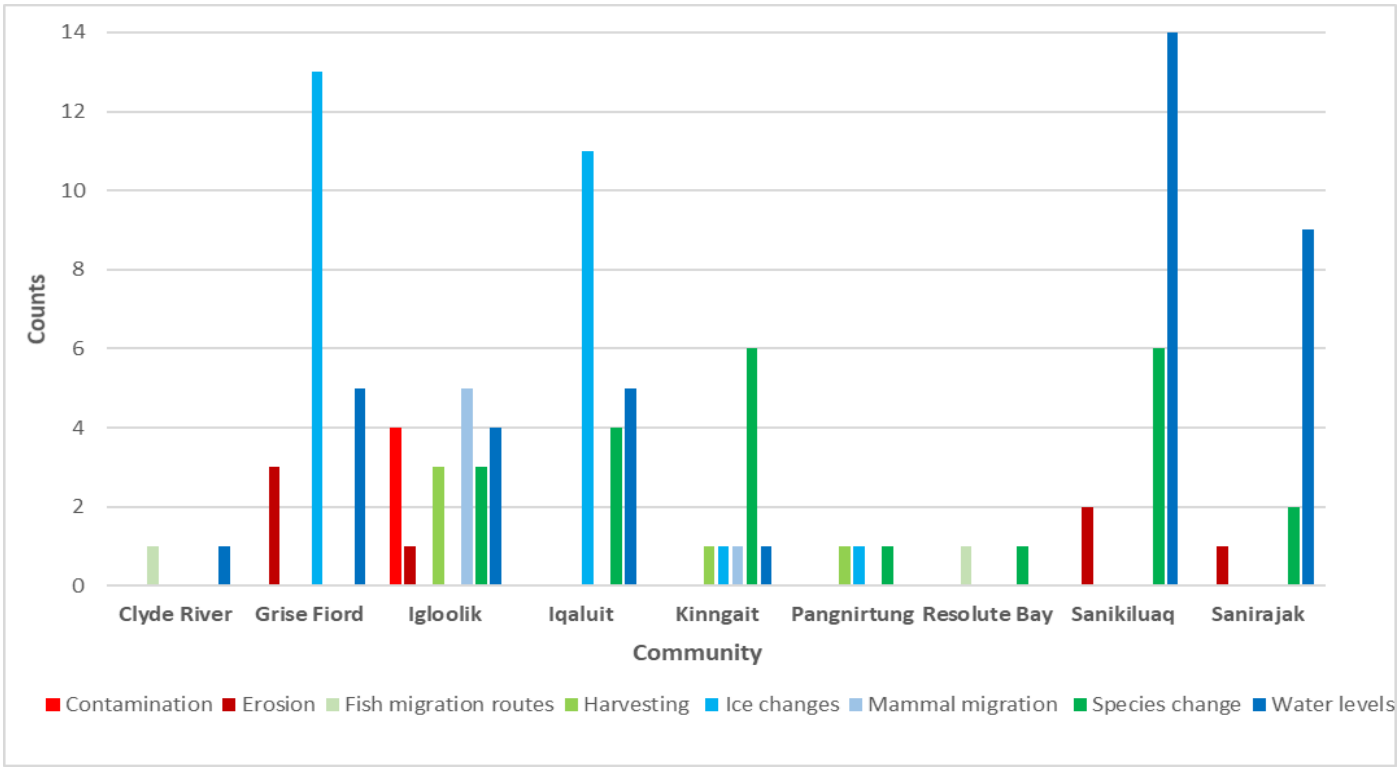

Figure 4: Environment and ecological changes in the coastal areas (n=112)

Other environmental and ecological changes noted by the communities included:

Clyde River:

- Residents were now seeing more polar bears near or in the community compared with past years.

Grise Fiord

- Environmental changes in the permafrost had impacts on infrastructure, fiords were melting faster and making ice more dangerous, and the channel between Ellesmere and Greenland has less multiyear ice.

- Increases in dead seals but the cause for this mortality was unknown and increases in the abundance and occurrence of jellyfish. Increased shipping/marine traffic and tourism, especially around walrus haul-outs and resting/calving grounds, could have a negative impact on marine mammals.

Igloolik

- Ecological changes were noted for kinguk (small crabs) that no longer appeared on the beaches and wildlife was much more abundant before.
- Other ecological changes included the presence of harp seals after 30-40 years, polar bears and walruses were moving closer to land as there was no ice, and recent shifts in wildlife distribution, feeding patterns, and predator/prey relationships.

Sanikiluaq

- More brittle ice present during winter was noted as an observed environmental change.
- Ecological changes included the following: seaweeds and cod are no longer in abundance along the shore; sea cucumbers are turning white; and sea urchins are developing without spikes.
- Species such as belugas no longer come close to the community now, which is thought to be because of run-off from the dump.

Sanirajak

- There has been a shift in wind direction from NW to N, resulting in ice crashing into the shore.
- All rivers were becoming shallower, with new rocks being observed every year. This is dangerous for boaters, for example there are many kinds of fish and old fish weirs (100 years+) found at the lake outflow. Fishing is still good, and in the past, boats used to be able to travel to the area, but now even canoes run aground going upriver.
- Belugas are moving further out but are still around the same numbers. Causes suspected of these changes included the waters becoming too shallow and increasing boat traffic.

5.3 Impacts on social, economic, and cultural activities and practices

As noted in section 4.0, the main impacts on social, economic, and cultural activities & practices from environmental and ecological changes included (a) damage to infrastructure, (b) on-the-land safety (including navigation issues and unpredictable weather patterns), (c) limited hunting and harvesting time, (d) fluctuations in key species populations such as Arctic char, seals, and walruses, (e) habitat and migratory route loss. During the CRN workshops, knowledge holders also identified similar issues to the literature findings. From their perspectives, the main impacts on their social, economic, and cultural activities and practices from environmental and ecological changes are noted in Table 2.

Table 2: Knowledge holders' perspectives on social, economic, and cultural activities and practices.

Community	Type of impact	Examples
Iqaluit	Limited hunting and harvesting time	There are still some good fishing spots, but no one goes anymore, as it is only accessible by boat due to changing ice conditions.
	Habitat and migratory route loss	Fish are struggling to climb upstream due to shape of river (sharp turn) and declining water levels. Without heavy rainfall, fish cannot migrate up the steep slope. In recent years the low water levels are made worse due to decreased rainfall.
Kinngait	On-the-land safety	In the past it was safe to travel to areas via snow machine until June, but in the last 5 years, ice and trails are too dangerous and unpredictable. If there is more snow, ice thaws faster.
	Fluctuations in key species populations	In recent years fewer seals are spotted each winter due to decreasing ice presence and thinner ice
Pangnirtung	On the land safety	During winter turbot fishing, snowmobiles do not have access to a safe trail

Resolute Bay	On-the-land safety	Worsening ice conditions are a problem for fishing in Lancaster Sound, as the ice in the channel is thinning (due to changes in currents and wind direction) and too dangerous.

In addition to impacts from environmental and ecological changes, community members also noted changes attributed to contamination issues from sewage outflows on nearby fishing areas (e.g., Igloolik) and abandoned hydrocarbon barrels leaching contaminants that could have impacts on the environment, species, and potentially human health (Resolute Bay).

For Pangnirtung, Resolute Bay, and Iqaluit, impacts from shipping and tourism are impacting key species populations, habitats, and hunting and harvesting practices. For example, in Pangnirtung, ships are disturbing beluga migration routes which are in the main shipping lane because the water is deeper there. A plan is being developed to move ships away from this deeper corridor. Similarly, a new route is being developed for shipping traffic in Resolute Bay to avoid beluga and narwhal migratory routes. Another issue in Resolute Bay is the impact on seals, belugas, and walrus populations from an increase in unregistered/unregulated sailboats. In Iqaluit, the arrival of ships/icebreakers and the recent increase in vessel traffic are thought to have caused a decline in seal populations.

Other issues noted by the communities include the negative relationships with researchers, unstable market prices and an increase in garbage and debris. According to Clyde River residents, many researchers conduct field studies in the community, but they do not return results. In Iqaluit, the decline in belugas in some areas has been attributed to the increase in research activities, including DFO monitoring equipment. There has also been in increase in garbage and debris, which is impacting key fishing areas around Iqaluit. For Resolute Bay community members, the current market price for Arctic char is considered to cheap to make the fishery commercially viable.

6.0 Knowledge holders' perspectives on coastal restoration

6.1 Coastal priorities

The information presented in this section is drawn from field notes and focuses on "*coastal restoration priorities."* Of the 28 identified priorities (Table 3), infrastructure improvements, environment and ecological studies and the cleanup of key harvesting locations were the most noted priorities. Knowledge holders also proposed management interventions to address these issues and are discussed in 6. 2.

Table 3: Summary of the main coastal restoration priorities identified by the communities.

Community	Priorities
Clyde River	1. The removal of the old access road from Clyde River's River, a key migratory corridor for Arctic char; 2. Removal of abandoned oil drums in Barrel Lake (garbage from the abandoned Cape Christian military site); and 3. Water quality testing at Barrel Lake.
Grise Fiord	1. The restoration of the eroded natural harbor and a risk assessment of the proposed work; 2. A new community freezer (foundation supporting the freezer has eroded); and 3. To rebuild the road along eroding shoreline.
Igloolik	1. A new fence for the dump; 2. Clean-up of winter char fishing sites; 3. Remediation of contaminated sites; and 4. Arctic char tagging as it seems that the fish are moving to deeper and cooler rivers.
Iqaluit	1. Clean-up is needed at old airstrips and outpost camps, lots of debris/barrels left by researchers, surveyors, and tourists; 2. Shoreline garbage, lots of garbage from the municipal dump, winds blow debris into water and on the beach, and plastics get caught in outboard motors; 3. Water levels are decreasing, there is less rainfall and snow causing rivers to become too shallow for fish to migrate upstream - they struggle to migrate to/from nearby rivers; 4. At Amadjuak Lake, ecological surveys (not just arctic char stock assessments) are needed to protect the ecosystem.
Kinngait	1. Ghost net clean-up is required at two lakes close to town; 2. Monitoring of walrus haul-outs (abundance, distribution) so impacts from increased shipping and routing can be better

	understood. There is also fear of increased shipping due to Baffinland Phase 2 proposal, which will see the volume of ships increasing in key coastal areas and walrus habitat, and 3. Coastal clean-up required at two soapstone quarry sites (Aberdeen Bay and Kelt Inlet) to remove 45-gallon drums and naphtha cans.
Pangnirtung	1. Improving access road to winter turbot fishery; 2. Extending the access road along the shoreline to key fishing sites; and 3. Testing the toxic load of shellfish in the bay.
Resolute Bay	1. Regulations for foreign vessels entering the Bay (within the Nunavut Settlement Area); 2. Anchorage regulations for foreign sailboats (must anchor further away from shore); 3. Relocation of the dump (currently beside burial site); 4. Enforcement of waste management policy (Pollution Act) for foreign vessels; and 5. Enforcement of ballast water laws (exchange ballast water before travelling through Northwest Passage).
Sanikiluaq	1. Construction of a new fence at the dump to decrease contaminants in surrounding marine and terrestrial areas; 2. Investigation as to why seaweeds and cod are disappearing along the coastline; and 3. Research on echinoderm health to ensure long-term subsistence harvest.
Sanirajak	Although the community has identified several coastal concerns, no restoration priorities were identified at the time we visited the Hamlet.

The need for additional environmental and ecological research studies were noted specifically by Pangnirtung. These included:

- Identification of the main rivers used to access spawning grounds.
- What and where are the char quotas for the 10 lakes?
- How to protect and strengthen habitats for commercial char and inshore turbot fisheries?
- How to minimize capelin in char diet due to increased occurrence of capelin (the colour and taste of char flesh is dependent on its diet)?
- Does removing boulders have any impact on shrimp and other species?

6.2 Management interventions

Knowledge holders' perspectives on coastal restoration actions are drawn from field notes and community maps, and coded as "*actions needed to address coastal restoration priorities*". Overall, the most noted responses (Figure 5) were the need to cleanup harvesting areas including both contaminated sites and general debris and garbage (45 responses), infrastructure repairs and developments (10 responses), and the improvement of fish migratory routes (5 responses). Sanikiluaq also noted five instances where the river had been drying up and restoration work was conducted by the HTO to improve the situation.

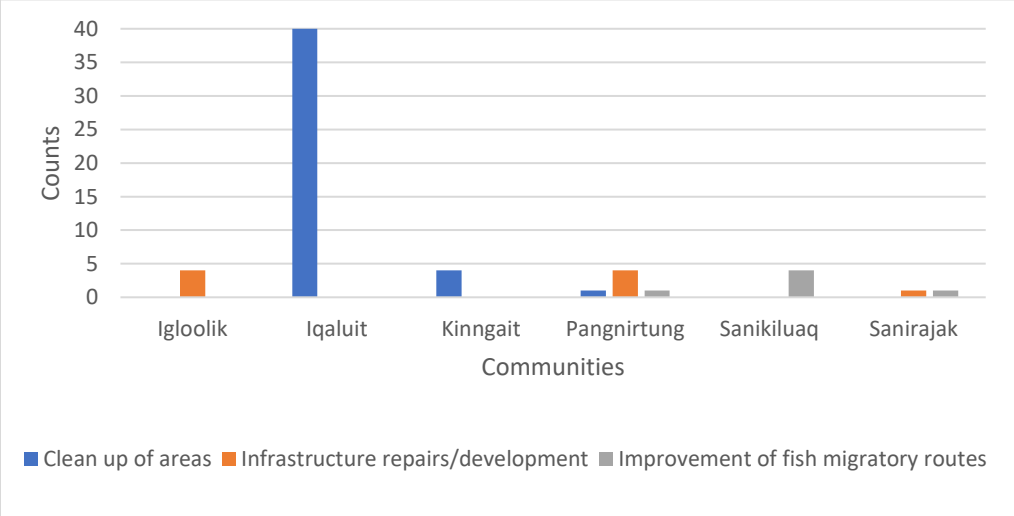

Figure 5: Actions needed to address coastal restoration priorities.

Note: During the CRN team visits, community members from Clyde River, Grise Fiord, and Resolute Bay did not have any suggestions for management interventions.

In general, cleanup actions referred to the removal of abandoned barrels that were contaminating the surrounding environment, and the collecting and disposing of debris and garbage, including materials from the dump, that were being scattered along the shoreline (Iqaluit). Other issues related to garbage around cabins and collecting ghost nets from waterways (Iqaluit, Kinngait, and Pangnirtung).

Examples of infrastructure repairs and development responses included the fence around the dump that needed to be repaired and extending sewage lagoons to address the potential for overflows and contamination (Igloolik). Other interventions included the extension of existing trails and/or new roads to access fishing sites (Pangnirtung and Sanirajak). In Sanirajak the narrowing of access road berms at the water supply may collapse as they are no longer being maintained.

Improvement of fish migratory routes were noted as assistance with boulder removal or bridge repairs (Pangnirtung) and the restoration and/or deepening of fishing lakes important for char, lake trout, and white fish (Sanikiluaq). In Sanirajak, although there was almost no noted change in lake levels; however, in one area, the creek is narrower and shallower, and participants suggested this could be solved by digging a narrow channel.

7.0 Summary and Conclusion

This technical report presents the findings of the CRN team visits to Clyde River, Grise Fiord, Igloolik, Iqaluit, Kinngait, Pangnirtung, Resolute Bay, Sanikiluaq, and Sanirajak in the Qikiqtaaluk region. During these workshops, knowledge holders shared their knowledge on topics relating to coastal restoration priorities, ecological and habitat changes, and impacts on their social, economic, and cultural activities and practices. Community members also identified approaches that could help address these impacts. From the perspective of the knowledge holders (Figure 6), the major coastal issues described were decreasing water levels, changes in ice conditions, and species populations.

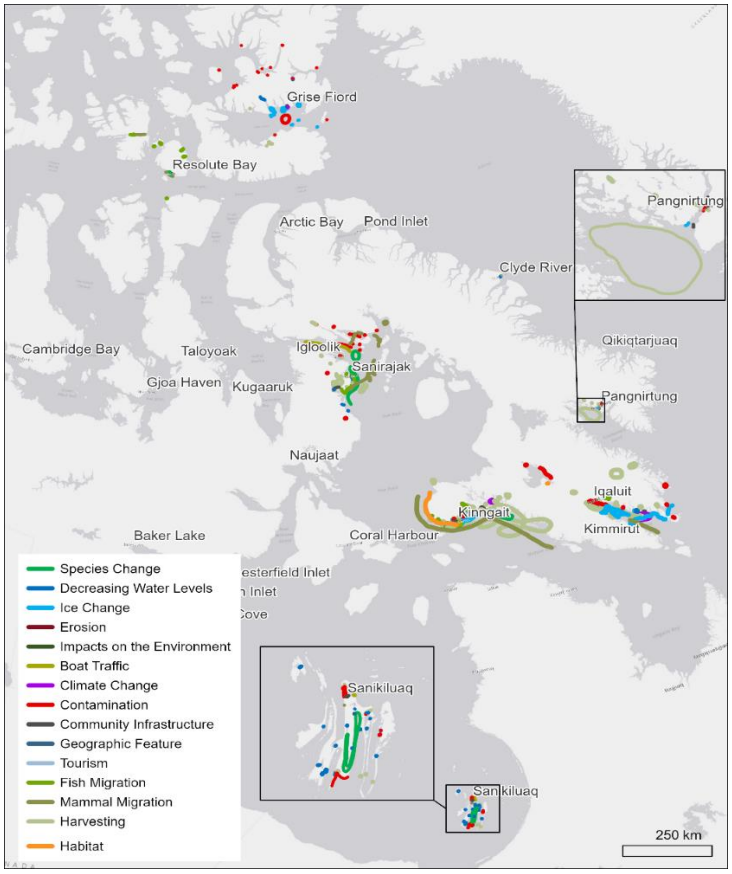

Figure 6: Overview of environmental and ecological changes

As noted, in section 5, key impacts from environmental and ecological changes on social, economic, and cultural activities and practices include: reduced hunting and harvesting time, habitat, and migratory route loss, on the land safety, and fluctuations in key species populations. Other impacts noted were from contaminates, increased shipping and marine traffic, and garbage and debris.

Coastal priorities and management interventions were identified by knowledge holders as infrastructure improvements, environment and ecological studies, cleanup of key harvesting locations, improvement of fish migratory routes and the enforcement of policies and regulations (specifically anchorage regulations for foreign sailboats, waste management policy for foreign vessels and ballast water laws).

7.1 Possible Next Steps

Drawing from guidelines, research, and reports from Nunavut and other Canadian provinces and territories, below are a few examples that could inform the research needs and management interventions identified by communities in the Qikiqtaaluk region. Please note that these examples are derived from the Kitikmeot report as the issues identified here also reflect those noted by communities in the other two administrative regions.[5].

Approaches to address these issues are grouped into five main areas: 1. Cleanup of contaminated sites; 2 Ecological research on population changes in Arctic char and other important food species; 3. Environmental research, specifically on water quality and fish contamination from mining activities; 4. Fisheries management interventions, including stock assessments, fishing quotas and gear restrictions; and 5. Restoration of key fishing areas.

A Cleanup of contaminated sites.

Waste management at the community level usually addresses municipal solid waste, referred to as "recyclables and compostable materials, and includes garbage from homes, businesses, institutions, and construction and demolition sites" (Environment & Climate Change Canada, 2017). The Government of Canada also defines a contaminated site as "one at which substances (usually a petroleum product or a metal) occur at concentrations (1) above background (normally occurring) levels and pose or are likely to pose an immediate or long-term hazard to human health or the environment, or (2) exceeding levels specified in policies and regulations" (Treasury Board of Canada Secretariat, n.d.). Based on the responses from the knowledge holders, the focus of this section will be mainly on waste management for debris and garbage. Examples of regulations that are relevant to this issue include: the Canadian Environmental Protection Act, the Transportation of Dangerous Goods Act, the Fisheries Act, the Arctic Waters Pollution Prevention Act, the National Fire Code, and the Explosives Act. Provincial and territorial governments each have their own legislation and regulations relating to environmental protection, water resources, municipalities, public health, and sanitation (Oceans North, 2021; Song, 2016).

Nunavut does not have legislation that pertains directly to solid waste management, nor is there a specific strategy for solid waste management (Oceans North, 2021). However, several regulations provide guidance on waste management (Song, 2016). These include: The Nunavut Agreement that establishes the Nunavut Water Board; Nunavut Waters and Nunavut Surface Rights Tribunal Act, SC 2020c10 (use of water and disposal of waste in waters in Nunavut); Arctic Water Pollution Prevention Act, RSC 1985cA-12 (deposit of waste in Arctic waters); Fisheries Act, RSC 1985, cF-14 (activities harmful to fish, disposal of prejudicial/deleterious substances in waters where fishing is conducted); Environmental Protection Act, RSNWT 1988, c E-7, s.5 (discharge of contaminant into the environment); General Sanitation Regulations R.R.N.W.T 1990, c. P-16 Public Health Act (insanitary conditions, accumulation and deposit of garbage, municipalities responsibilities); and various environment guidelines issued by the Nunavut Department of Environment pertaining to the disposal of various types of waste (Song, 2016).

In 2014, a fire, dubbed Dumpcano, engulfed the 150 m^2 dump. The fire lasted for four months and cost the city $3 million to extinguish. It also created up to 2000°C of heat and released chemicals into the air, resulting in health warnings and the closure of schools for several days (WWF, 2020). In July 2018, the city announced a new waste

[5] Wilson, L., Owen, J., Bishop, B. and Fanning, L. (2021). *Key issues affecting coastal aquatic ecosystems and changing coastal conditions in Nunavut: A comparative assessment of five communities in the Kitikmeot region* (Marine Affairs Program Technical Report #17). Available at Marine Affairs Program: https://www.dal.ca/faculty/science/marine-affairs-program/research/map-technical-series-reports.html

management plan that involves closing the old site and creating a new waste transfer station that aims to reduce landfill waste by 44 per cent through recycling of tires and scrap metal, among other waste diversion initiatives (Oceans North, 2021). In 2021, Iqaluit began constructing a new landfill, with additional plans to develop a recycling and eco-centre and alternative collection methods for residential, commercial, and industrial waste (WWF, 2020). Other examples of reports, guidelines, and programs addressing solid waste management are provided in Appendix 2.

B Ecological research on population changes in Arctic char and other important food species

Arctic char is an important fishery for Nunavut. In 2015, over 72,000 kg of char were caught commercially for a market value of $1.8 million (Department of Environment, Fisheries and Sealing Division, 2016). The Truly Wild Arctic Char brand and valued-added products such as char candy and char jerky are well known within and outside of Nunavut. Communities such as Naujaat, Coral Harbour, Igloolik, and Qikiqtarjuaq fish more in the winter, whereas Pond Inlet, Whale Cove, Rankin Inlet and Cambridge Bay fish in the summer months. Most fishing is done using gill nets, but at two rivers in the Cambridge Bay area, fishing is done with weirs. The Kitikmeot communities are the only region to use air transport to move char to the processing plant as fishers in other regions transport their catch to town by snowmobile and qamutik, or by boat (Department of Environment, Fisheries and Sealing Division, 2016). Other examples of community-led projects addressing ecological research on Arctic char population changes are provided in Appendix 3.

C. Environmental research, specifically on water quality and fish contamination from mining activities

The Northern Contaminated Sites Program[6], under Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), and the Northern Contaminants Program[7] (NCP) are two of the most relevant federal programs pertaining to this issue. The objective of the Northern Contaminated Sites Program is to manage contaminated sites to reduce or eliminate, where possible, risks to human and environmental health, and to decrease the federal environmental liability associated with contaminated sites in the North. Policies associated with the Northern Contaminated Sites Program include the Northern Affairs Program Environment, Health and Safety Policy; the Mine Site Reclamation Policy for the Northwest Territories; and the Mine Site Reclamation Policy for Nunavut.

At the territorial level, the Nunavut General Monitoring Plan (NGMP)[8] provides for the collection, analysis, and reporting of information on the long-term conditions of Nunavut's environment, people, communities, and economy. General monitoring is a requirement under the Nunavut Agreement and is founded within the Nunavut Agreement and the Nunavut Project Planning and Assessment Act (NuPPAA). The NGMP is managed and operated by the NGMP Secretariat and overseen and governed by the NGMP Steering Committee, consisting of representatives from the Nunavut Planning Commission (NPC), Nunavut Tunngavik Inc. (NTI), the Government of Nunavut (GN), and Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) on behalf of the Government of Canada. The NGMP Secretariat is housed within CIRNAC.

Selected projects funded and/or supported by these three programs include the Tłı̨chǫ Aquatic Ecosystem Monitoring Program, Understanding and predicting fish mercury levels in the Dehcho region, and the Community-based monitoring program for the Baker Lake/Chesterfield Inlet Ecosystem (Appendix 4).

D Fisheries management interventions

Fisheries and Oceans Canada (DFO) and the Canadian Coast Guard are responsible for fisheries management and the safeguarding of Canadian waters[9]. A number of acts support and guide these responsibilities, including the *Oceans Act*, *Fisheries Act*, *Species at Risk Act*, *Coastal Fisheries Protection Act*, *Canada Shipping Act, 2001* (which is led by Transport Canada), and the *Fishing and Recreational Harbours Act*. Other initiatives that fall under DFO, which might be of interest to communities are the Integrated fisheries management plans (IFMP), Aboriginal aquatic resource and oceans management (AAROM) program, and the Sustainable fisheries solutions and retrieval support contribution program, or Ghost gear fund.

[6] https://www.rcaanc-cirnac.gc.ca/eng/1100100035301/1537371472183
[7] https://science.gc.ca/eic/site/063.nsf/eng/h_7A463DBA.html
[8] https://www.ngmp.ca/eng/1363792048577/1363792058944
[9] https://www.dfo-mpo.gc.ca/about-notre-sujet/mandate-mandat-eng.htm

The purpose of the IFMPs is to guide the conservation and sustainable use of marine resources, support the management of sustainable fisheries, and combine science and Indigenous knowledge on fish species with industry data to determine best practices for harvest[10]. The IFMP is not a legally binding instrument, cannot form the basis of a legal challenge, can be modified at any time, and does not fetter the Minister's discretionary powers set out in the Fisheries Act. The AAROM Program[11] supports Indigenous groups to establish and maintain aquatic resource and oceans management departments that can provide fisheries, habitat, science, and oceans related services along a watershed. The program also supports community participation in advisory and co-management processes and decision-making related to aquatic resources and oceans management. The ghost gear fund[12] focuses on actions to reduce plastic in the marine environment through four main areas: 1. ghost gear retrieval, 2. responsible disposal, 3. acquisition and piloting of available technology, and 4. international leadership. Other examples of fisheries management interventions are provided in Appendix 5.

E Restoration of key fishing areas

On February 6, 2018, Fisheries and Oceans Canada introduced proposed amendments to restore lost protections and incorporate modern safeguards into the Fisheries Act. On June 21, 2019, the new Fisheries Act received royal assent and became law[13]. Prior to 2012, the Fisheries Act provided broad protection for fish and fish habitat throughout Canada. In 2012, changes were made so that only fish and habitat related to a commercial, recreational, or Aboriginal fishery were protected. Some of the key elements of the modernised Fisheries Act include the protection against the 'death of fish, other than by fishing' and the 'harmful alteration, disruption or destruction of fish habitat', requirements that Indigenous knowledge must inform habitat decisions, consideration of the adverse effects of decisions on the rights of Indigenous peoples, the protection for Indigenous knowledge when provided in confidence to the Minister, and the ability to enter into agreements with Indigenous governing bodies and any body established under a land claims agreement, as well as provinces and territories (Fisheries and Oceans Canada, 2021, April 14). Specifically focused on coastal restoration, the Coastal Restoration Fund, launched in 2017, is part of the national Oceans Protection Plan. Appendix 5 provides a broad overview of projects that have been funded under this program.

One often cited example of coastal restoration work in Nunavut is the Bernard Harbour project in Kugluktuk. Historical evidence describes large char runs in the summer and significant Inuit use of Bernard Harbour (Golder Associates Ltd., 2014). However, community members noted declines due to low water and 'blockages' in the creek. The Kugluktuk Hunters and Trappers Association (HTA) originally proposed stream restoration initiatives at Bernard Harbour beginning in the early 2000s and since then the HTO has since worked closely with Golder Associates and other partners (e.g., Environment Canada, GN Department of Environment) to advance this work. From 2010 to 2013, Golder designed, coordinated, and led a study to address community concerns and collect novel scientific information on char at Bernard Harbour. Community involvement was a crucial component of the project and was accomplished through the incorporation of Inuit knowledge and local expertise, and the engagement of HTO summer students and residents of Kugluktuk to facilitate youth education and encourage community stewardship (Golder Associates Ltd., 2014). In June 2014, an agreement to complete stream restoration work as a mining offsetting project was signed with Sabina (Sabina Gold & Silver Corp., 2015). Other examples of coastal restoration initiatives are provided in Appendix 6.

The brief overview of regulations and policies relating to coastal priorities reveals the siloed governance approach to addressing these issues. Projects and programs tended to be more holistic and integrated both the social and ecological components into activities such as char monitoring, river restoration, and environmental monitoring. Most if not all projects and programs included an Inuit-centered approach and a coming together of IQ and Western science knowledge. However, policies and regulations are shifting towards a similar approach as seen in the development of the waste management guidelines (Appendix 2) and integrated fisheries management plans (Appendix 5). Projects funded under the Oceans Protection Plan also signal the increasing attention needed to address coastal and marine protection in a more holistic and integrative manner (Appendix 7).

[10] https://www.dfo-mpo.gc.ca/fisheries-peches/ifmp-gmp/index-eng.html
[11] https://www.dfo-mpo.gc.ca/fisheries-peches/aboriginal-autochtones/aarom-pagrao/index-eng.html
[12] https://www.dfo-mpo.gc.ca/fisheries-peches/management-gestion/ghostgear-equipementfantome/program-programme/projects-projets-eng.html
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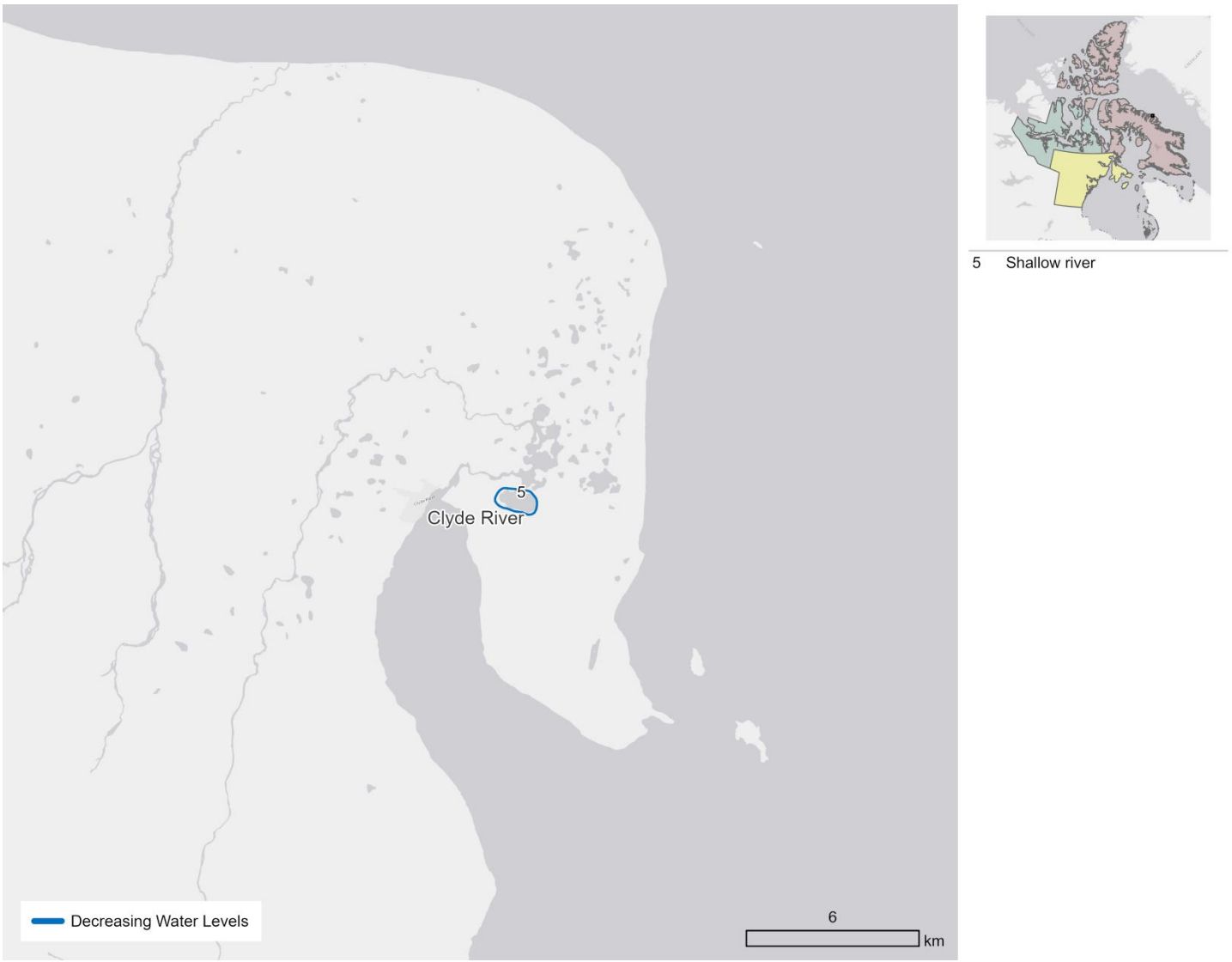
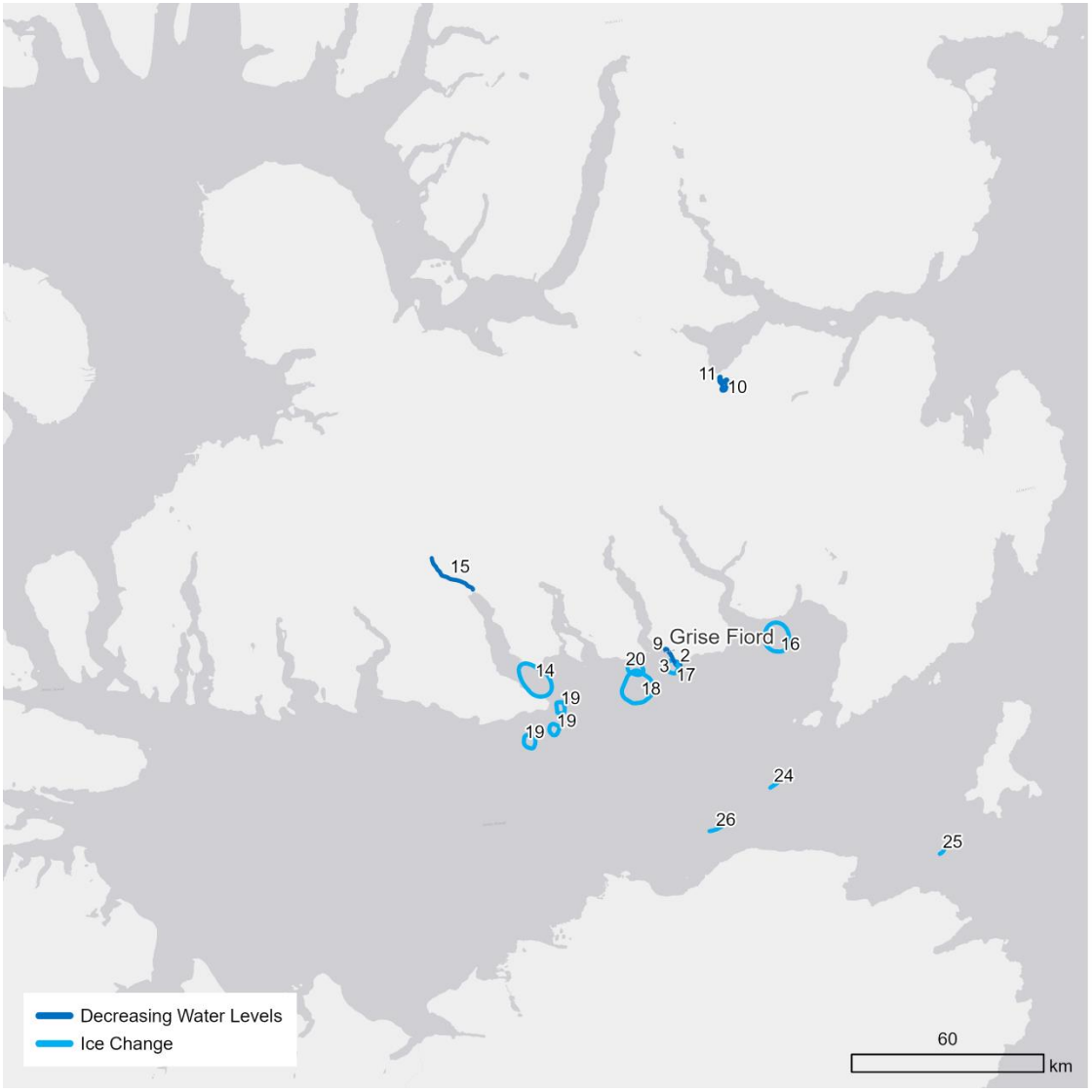
Appendix 1: Knowledge holders' observations of environmental and ecological changes (maps)

Clyde River

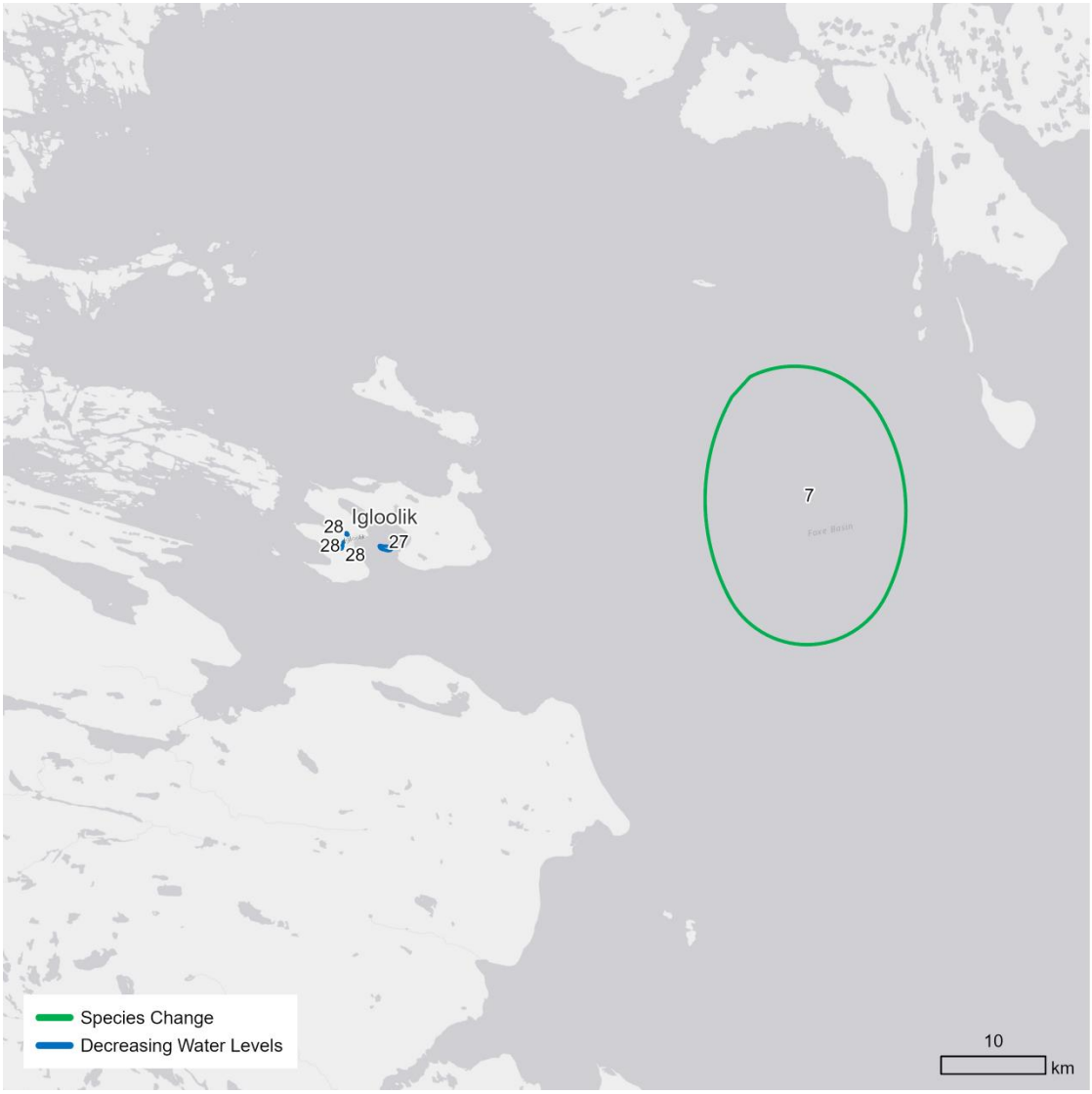


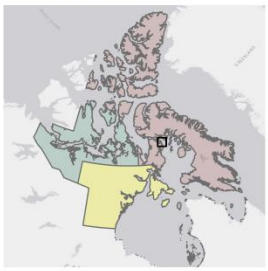
Grise Fiord



2	New island formed
3	Shallow water
9	Always water, no tide impact
10	fish becoming land-locked; abandoned oil barrels; airstrip landing strip
11	River drying up; hard for char to return to lake
14	Used to hunt seal, but too dangerous now (holes bigger)
15	Water receded (tides impact thickness/stability of ice)
16	Ice thin/dangerous since 2016
17	Ice thin/dangerous since 2016
18	Ice thin/dangerous since 2016
19	Ice thin/dangerous since 2016
19	Ice thin/dangerous since 2016
19	Ice thin/dangerous since 2016
20	Ice thin/dangerous since 2016
24	Floe edge
25	Floe edge (alternates location year to year)
26	Floe edge (impacting travel to fishing sites)

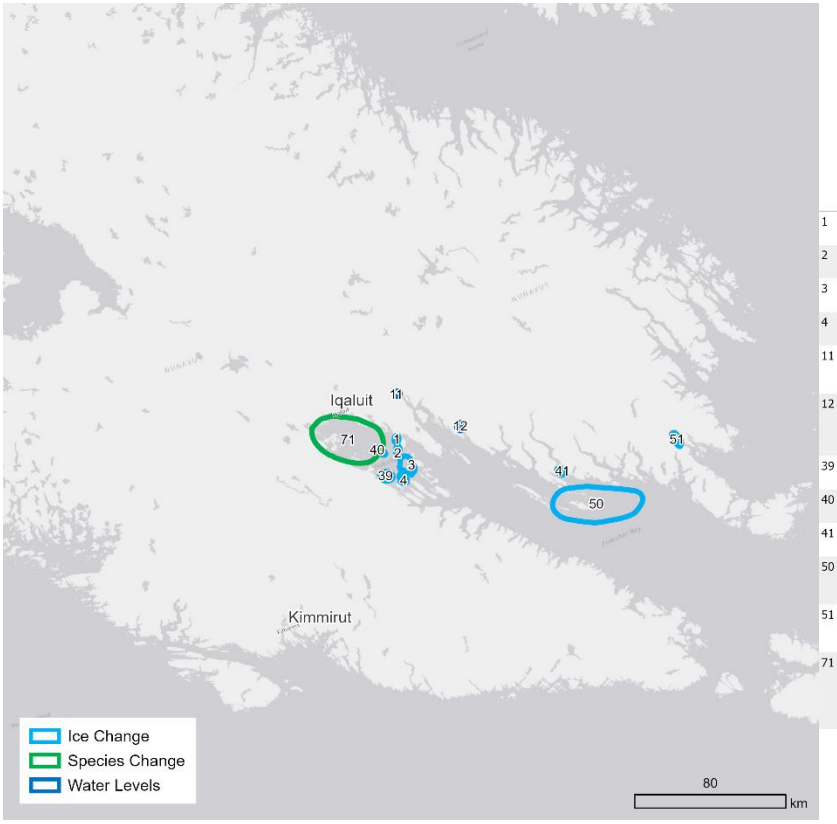
Igloolik





7	Fewer kinguit around the whole area
27	Water Levels
28	Shallower Lakes
28	Shallower Lakes
28	Shallower Lakes

Iqaluit: 1

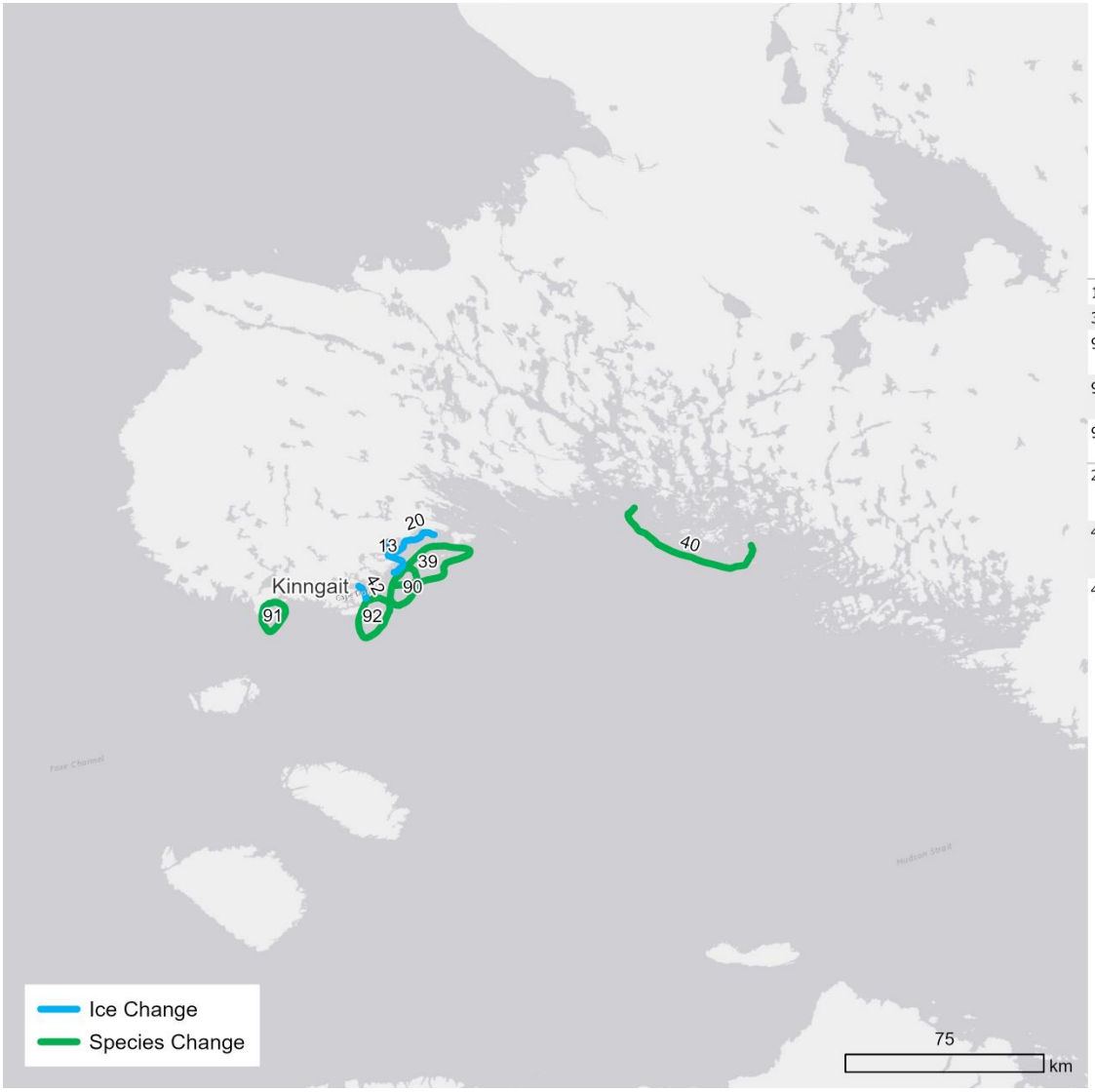


1	Dangerous ice area; thinning. Ice melting from underneath
2	Dangerous ice area; thinning. Ice melting from underneath
3	Dangerous ice area; thinning. Ice melting from underneath
4	Dangerous ice area; thinning. Ice melting from underneath
11	Ward Inlet: good fishing. Rivers drying up. Decreases in water flow caused by lack of rain.
12	Peterhead Inlet: good fishing. Water levels decreasing. Fish struggling to return to lakes. Fish migrating earlier to adapt
39	Dangerous ice in recent years (last few)
40	Dangerous ice in recent years (last few)
41	Dangerous ice in recent years (last few)
50	Changing and unpredictable ice conditions each year due to strong currents in the area
51	Good fishing but no one goes anymore. Only accessible by boat due to changing ice conditions
71	Ships/icebreakers arriving cause decreases in seal populations. Increases in vessel traffic in recent years worsen the declines. Seals abundant until ships arrive

Iqaluit: 2

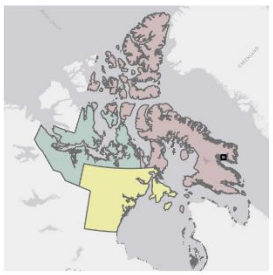
5	Floe edge 35 years ago; moving closer each year
5	Floe edge 35 years ago; moving closer each year
5	Floe edge 35 years ago; moving closer each year
6	Floe edge today. Ice only 3 feet thick; used to be at least 6 feet in the bay. Changes in current also causing thinning ice
6	Floe edge today. Ice only 3 feet thick; used to be at least 6 feet in the bay. Changes in current also causing thinning ice
6	Floe edge today. Ice only 3 feet thick; used to be at least 6 feet in the bay. Changes in current also causing thinning ice
14	Water levels decreasing. Fish struggling to return to lakes. Fish migrating earlier to adapt
15	Water levels decreasing. Fish struggling to return to lakes. Fish migrating earlier to adapt
77	There's a choke point (sharp turn). Too steep for fish migrating upstream. Fish are dying or over-harvested because easy access for fishers when fish congregate if unable to migrate upstream. River drying up. Recent years low water levels made worse due to decreased rainfall. Restoration priority
13	Water levels decreasing. Fish struggling to return to lakes. Fish migrating earlier to adapt
73	Fish struggling to climb upstream due to shape of river (sharp turn) and also declining water levels. Without heavy rainfall, fish cannot migrate up the steep slope. Really good fish; pristine area. Garbage disturbs the habitat and habitat avoidance by fish observed if debris thrown into or present in the water. Fish suffocate if too much snow too early

Kinngait



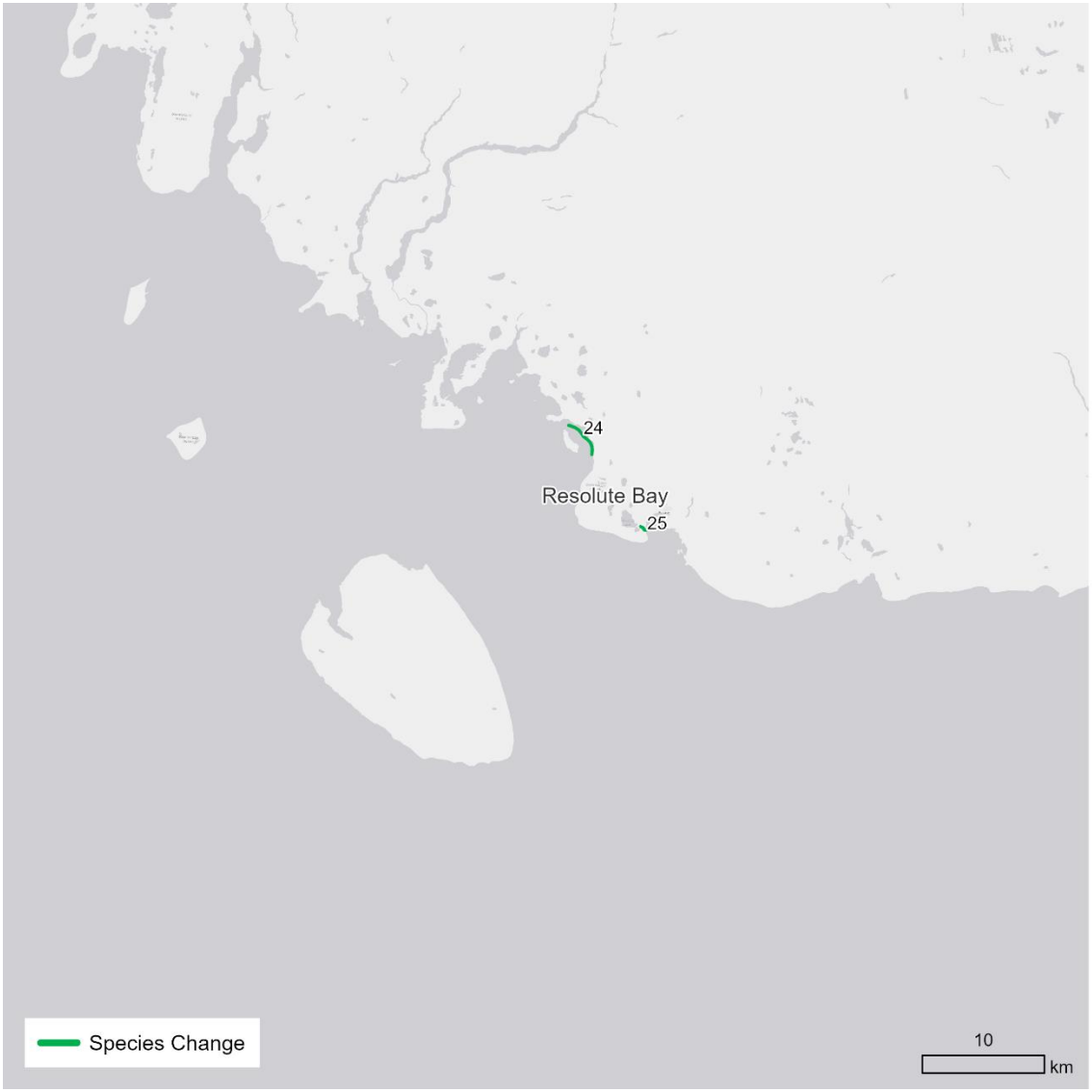
13	Fishing site (August); shallow water
39	Seal numbers declining in the area
90	Seal population declining in recent years; increase in killer whales
91	Seal population declining in recent years; increase in killer whales
92	Seal population declining in recent years; increase in killer whales
20	Less seal spotted more and more every winter in recent years due to decreasing ice presence and thinner ice
40	More walrus/polar bears seen around the little islands in recent years. Polar bears eating all the bird eggs
42	Floe edge (very thin ice in 2021)

Pangnirtung



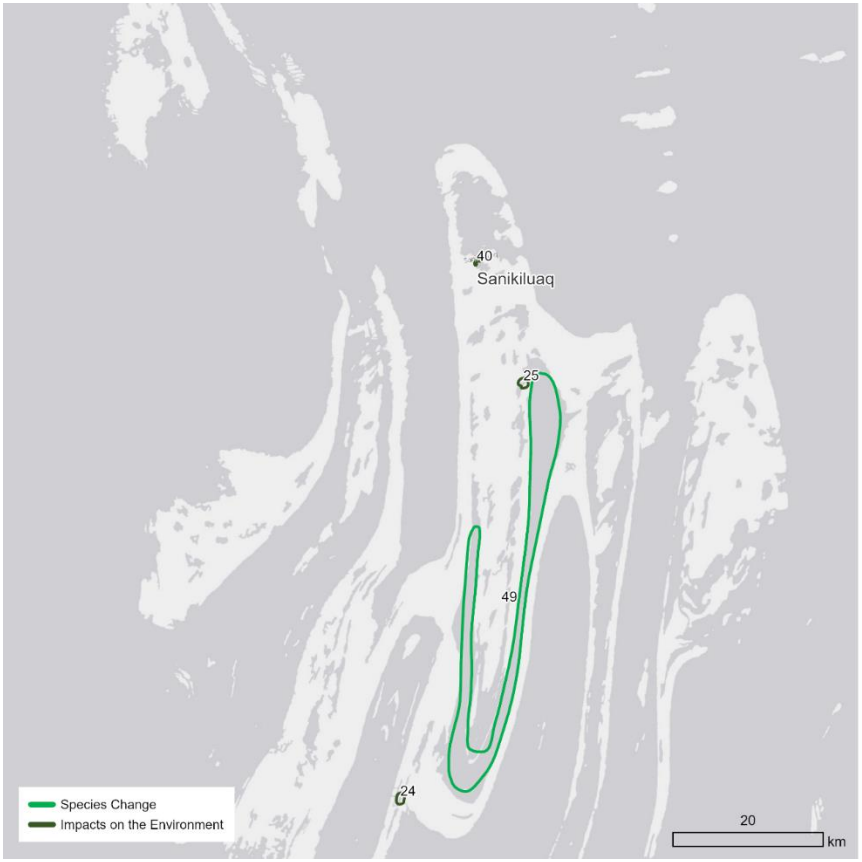
1 Bad ice conditions

Resolute Bay



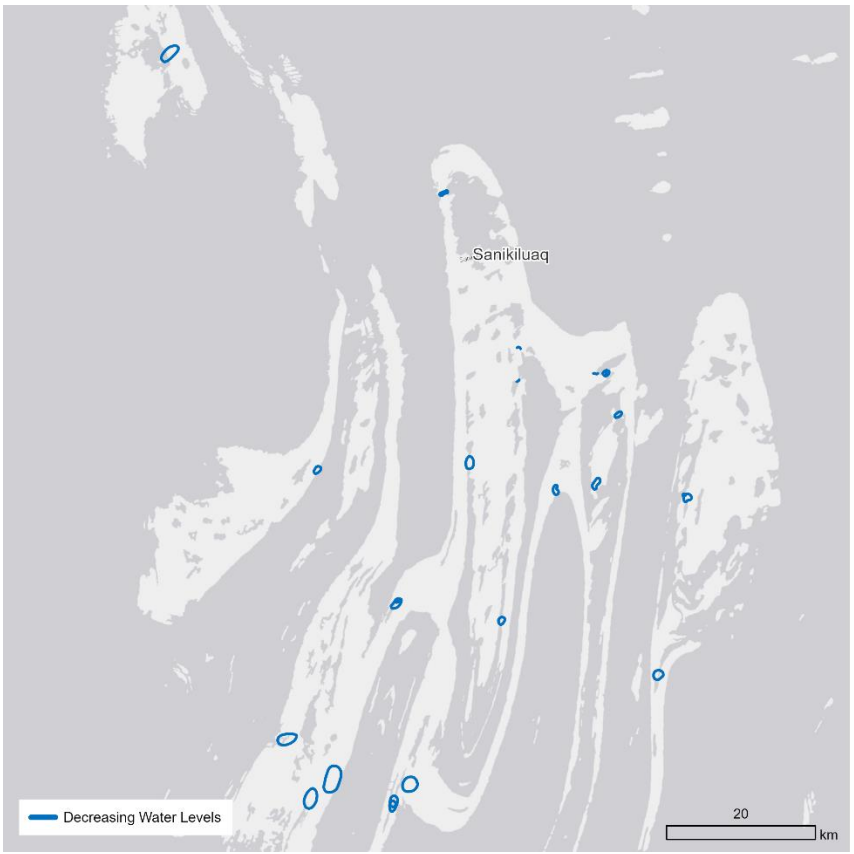
24	Lots of cod, harp seal; beluga used to fill the bay but not anymore
25	Seal lure cod to freshwater to die

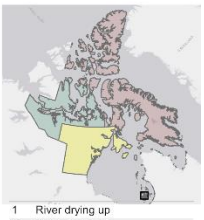
Sanikiluaq 1



24	Trail Crossing. Build bridge (ATVs driving through rivers and disturbing fish; animals healthier before machines, sounds, disturbances); fish size decreased
25	Trail Crossing. Build bridge (ATVs driving through rivers and disturbing fish; animals healthier before machines, sounds, disturbances); fish size decreased
39	Because of culverts in stream, char can't migrate now
40	Because of culverts in stream, char can't migrate now
49	Used to be lots of freshwater seals here; now sick fish because not enough seals

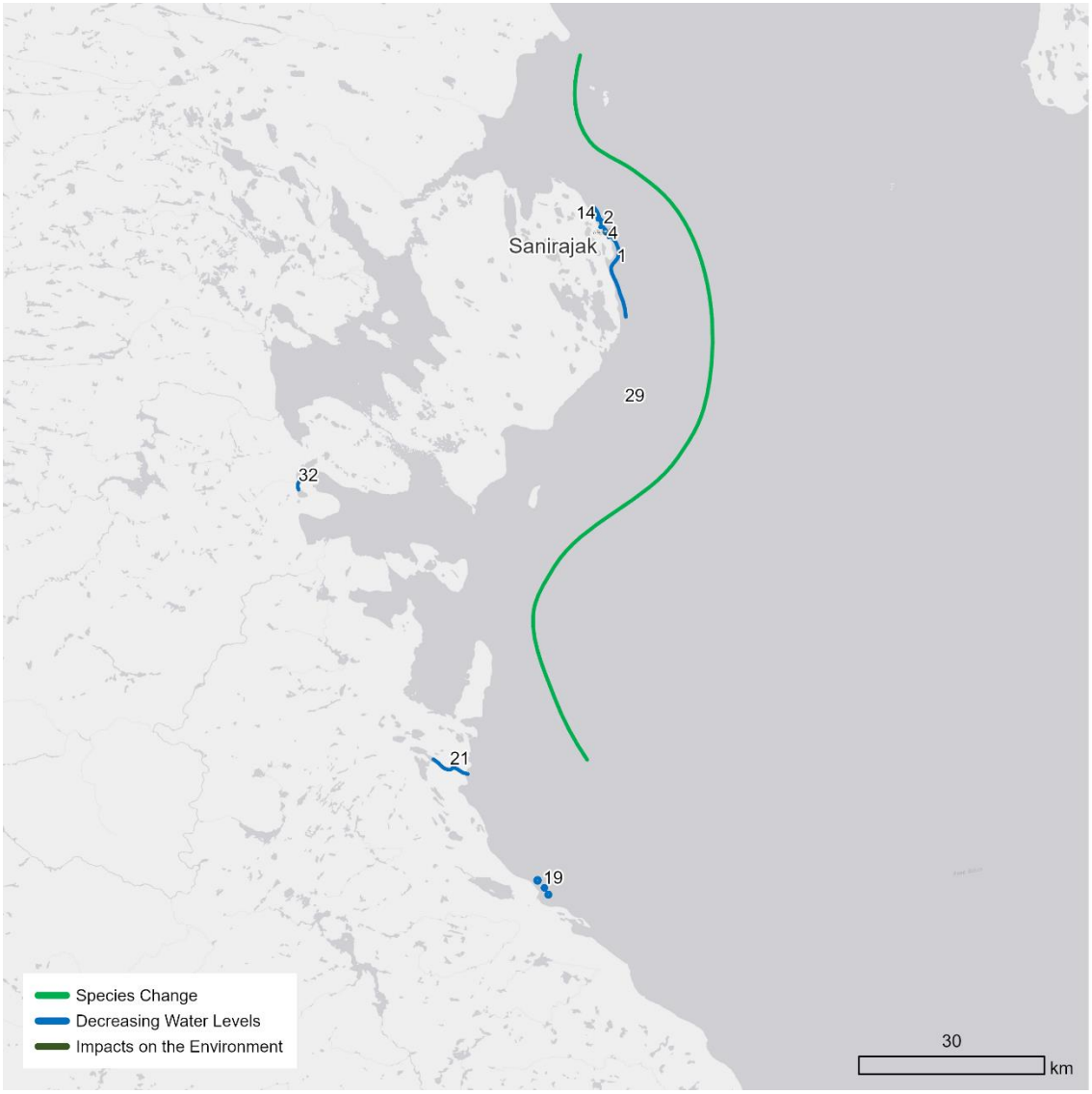
Sanikiluaq 2





1	River drying up
2	River drying up
3	River drying up
5	River drying up
6	River drying up
7	River drying up
8	River drying up
9	River drying up
10	River drying up, so HTO completed work to restore
11	River drying up, so HTO completed work to restore
12	River drying up, so HTO completed work to restore
13	River drying up, so HTO completed work to restore
14	River drying up
14	River drying up, so HTO completed work to restore
16	River dried up, haven't used since the 1960s
17	River dried up, haven't used since the 1960s
18	River dried up, haven't used since the 1960s
19	Priority to restore/deepen area (char, lake trout, white fish)
20	Priority to restore/deepen area (char, lake trout, white fish)
21	Priority to restore/deepen area (char, lake trout, white fish)
22	Priority to restore/deepen area (char, lake trout, white fish)
23	Lake drying up, cod fish present
32	Seaweed disappearing; shallower; ice in spring can scrap bottom; currents changing; boats can't even pass now (deep in 1970s)
41	ATVs pass here because so shallow now

Sanirajak



1	Shallower Water
2	Newly exposed boulders at low tide
4	Old A-frame structure debris, shifting with rough water
14	New strip of land starting to appear, exposed at low tide. Could be turned into a breakwater
19	New boulders appearing
21	Fish losing access to lakes, streams becoming too shallow
29	Capelin replacing Arctic Cod
32	Shallowing of stream

Appendix 2: Examples of reports, guidelines and programs addressing solid waste management.

Province/ Territory	Summary	Contact/Reference Links
QU	**Practical guide for the dismantlement, clean-up, and remediation of outfitting camps on the JBNQA/NEQA territory.** The Kativik Regional Government, northern Quebec (2019) has produced a practical guide for the dismantlement, clean-up, and remediation (DCUR) of outfitting camps in the James Bay and Northern Québec Agreement territory. These guidelines focus on safely and effectively conducting DCUR activities, in accordance with applicable laws, regulations, funding agreements and contracts, reducing threats to ecosystem and human health, treating contaminated areas, removing debris and hazardous materials, and transferring knowledge through the participation of Nations and their communities.	For more information see: https://bit.ly/3gottRk
NFL, NWT, NU, QU	**Towards a Waste-Free Arctic**: This report provides an overview of waste management in Inuit Nunangat (Inuvialuit Settlement Region - NWT, Nunavut, Nunavik - northern Quebec, and Nunatsiavut - northern Labrador). Highlights of the report note that although Inuit communities do not accumulate more waste than communities in other parts of Canada, they are faced with managing similar quantities of waste with inferior infrastructure, limited services and programming, extremely poor access to eco-alternatives and fewer economic, educational, and capacity resources to develop lasting solutions. The report provides recommendations for how the private sector, civil society and all levels of government can address these issues.	For more information see: Oceans North (2021) https://bit.ly/2SoJsXD
NU, NWT, YT	**Solid waste management for northern and remote communities: planning and technical guidance document.** Focusing on managing residual waste in a landfill cell within the community's solid waste facility, the guidelines provide a four-step continuous approach to waste management planning: 1. Conduct a community waste assessment; 2. Set waste management priorities for the community; 3. Identify and evaluate options, and develop a plan; and 4. Implement, evaluate, and improve the plan.	For more information see Environment and Climate Change Canada (2017). https://bit.ly/3pAg8JW
National	**The Great Canadian Shoreline Cleanup** presented by Loblaw Companies Limited, and Coca-Cola Canada is one of the largest direct action conservation programs in Canada. Netsilik School (Taloyoak, Nunavut) has been organising clean-ups since the early 90's. In 2016, Taloyoak was one of the top 5 clean-up communities with the largest number of knowledge holders. The organiser of the event noted that "Avatittinnik kamatsiarniq" or "environmental stewardship" is a key value of Inuit Qaujimatuqangiit (IQ) and it is important that the youth realize from a young age that they need to carry on the tradition of looking after the land, water and air for generations of humans and animals to come.	For more information see: www.ShorelineCleanup.ca Netsilik School story: https://bit.ly/3w8OohV

Appendix 3: Community-led projects addressing ecological research on Arctic char population changes

Province/ Territory	Summary	Contact/Reference Links
QU	**Community-based monitoring of Arctic char from the Nepihjee river system and other areas.** Makivik Corporation is the legal representative of Quebec's Inuit, established in 1978 under the terms of the James Bay and Northern Quebec Agreement. This monitoring program includes direct counting, measuring, and monitoring of Nepihjee River Arctic char to estimate the size of the population, understand size structure and growth over time, and track movement and migration patterns. Recently, the research branch secured $62,416.25 from the Indigenous Community-Based Climate Monitoring program for 2020-2021.	For more information see: https://bit.ly/3zfScQE
NU	**Science and Inuit Qaujimajatuqangit join forces to better understand iqalukpiit / Arctic char in the Kitikmeot region.** In 2013, a collaborative project between Fisheries and Oceans Canada and the Ocean Tracking Network was initiated to utilize acoustic telemetry to track the migrations of Arctic char (marine and freshwater) in the region. Local youth were trained to conduct semidirected ethnocartographic interviews to document the IQ of nine individuals from the community. In August 2016, a week-long Elder-youth knowledge exchange camp that also included biologists and social scientists was held at Ekalluk River (an archaeological site used for over 4,000 years) to exchange and share knowledge about Arctic char.	For more information see: Thorpe, et al., 2018 https://bit.ly/3gpjHPb
NFL, NWT, NU, QU	**Linking Inuit and scientific knowledge and observations to better understand Arctic char (*Salvelinus alpinus*) community monitoring.** The research explored community-based monitoring factors and parameters across Inuit Nunangat that is needed to provide information for local resource users and decision-makers to make informed choices for managing Arctic char populations. This research is helpful in that it identifies Arctic char environmental parameters that could be monitored for species and habitat health. What is also interesting about this research is the exploration of different aspects of community-based Arctic char monitoring, including the establishment of the programs, monitoring schedules and parameters, partnerships, funding, inclusion of IQ, and knowledge dissemination.	For more information see: Knopp, 2017 https://bit.ly/359CkB7

Appendix 4: Community-led environmental research - water quality and species

Province/ Territory	Summary	Contact/Reference Links
NWT	**Tłı̨chǫ Aquatic Ecosystem Monitoring Program (TAEMP).** The Wek'èezhìi Renewable Resources Board (WRRB) is a wildlife co-management authority established by the Tłı̨cho Agreement. The TAEMP is implemented by the WRRB and has the objective of building and developing a successful community-based monitoring program that meets the needs of the Tłı̨chǫ people in determining whether fish, water, and sediment quality are changing, and whether fish and water remain safe to consume. The program started in 2010, with the most recent report produced in 2018.	For more information see: https://www.wrrb.ca/about-wrrb
NWT	**Understanding and predicting fish mercury levels in the Dehcho region.** The focus of this project is to better understand why fish mercury levels are relatively low in some lakes yet not elsewhere, and why fish mercury levels are increasing in some lakes, but stable in others. This study builds on previous work by the University of Waterloo in partnership with the Dehcho First Nations. Fish, water, other small animals, and plants were sampled from eight Dehcho lakes between 2013 and 2015, and it was found that some fish mercury levels can be predicted from water quality measurements and fish age.	For more information see: Swanson & Low, 2017 https://bit.ly/2Te8hWg Online open access Dehcho Region water quality data set (2019) (https://bit.ly/2R6u1To)

Province/ Territory	Summary	Contact/Reference Links
NU	**Community-based monitoring program for the Baker Lake and Chesterfield Inlet ecosystem and other areas.** The Baker Lake and Chesterfield inlet ecosystem is a three-year project (2019-2021) funded by the Nunavut General Monitoring Plan. The project is being implemented by ARCTIConnexion, a community science group. This project focuses on the development of local capacity to monitor water quality and quantity, fish, shipping activities, and the presence of marine and terrestrial wildlife to collect independent and community-owned information that can guide future actions. The communities also perform landscape and watershed analysis with satellite imagery. Local observations and perspectives are documented in the communities through mapping and group discussions.	For more information see: Nunavut General Monitoring Plan https://bit.ly/3v47Xqp ARCTIConnexion https://arcticonnexion.ca/

Appendix 5: Examples of fisheries management interventions.

Province / Territory	Summary	Contact/Reference Links
AB	**Native Trout Recovery Program** Alberta's Native Trout Recovery Program is a comprehensive, long-term fish conservation initiative aimed at monitoring and recovering populations of native trout and whitefish in the watersheds of the Eastern Slopes. The Native Recovery Program's focus is to recover the species through understanding the threats to its survival, through co-ordinated action, and through the support of stakeholders, the public, and multiple levels of government. As a component of the integrated provincial fisheries management approach, the recovery program focuses on Westslope cutthroat trout, bull trout and Athabasca rainbow trout recovery planning processes; a watercourse crossings remediation program; and Whirling disease and invasive species management.	For more information see: https://bit.ly/2Spdhax
NU	**Integrated Fishery Management Plan (IFMP) - Cambridge Bay Arctic Char, *Salvelinus alpinus*, Commercial Fishery, Nunavut** The Arctic Char commercial fishery addressed in this plan occurs on Victoria Island, near the community of Cambridge Bay. The IFMP was developed to be relevant over a long period of time and has no fixed end date. Through regular reviews by the IFMP Working Group and stakeholders, updates and amendments will be provided to the NWMB and Minister of Fisheries and Oceans for approval, as required. The IFMP was made effective in 2014, with a 2021 review currently underway. Examples of best practices that are currently in place in the commercial fishery focus on the reduction of any potential impact to spawning populations. These include measures such as the release of spawners if captured in the gillnet fishery if still alive, all spawning char released in a manner that causes them the least harm, and when encountered in a weir fishery, all spawners should be released unharmed.	For more information see: https://bit.ly/3g6GgsY
NU	**Coastal Restoration Nunavut** The communities of Kugluktuk, Taloyoak and Kugaaruk have requested assistance with a community-wide net exchange. All the communities identified the need for strategic fishing methods to support the health and sustainability of the subsistence char fishery, which is mostly fished by gill net. A successful net exchange was first implemented by the community of Kugluktuk in the nineties to prevent high stock exploitation and a potential recruitment failure due to diminished stock size. To conduct a net exchange, fishers exchange old nets with nets of a larger mesh size. One objective of the mesh size approach is to influence the sustainable yield in the long-term. Other reasons are to protect juvenile fish from capture and to ensure that enough fish survive to maturity.	For more information see: https://www.coastalnunavut.ca/ or email crn@dal.ca.
NWT	**Paulatuk Char Fisheries Management Plan** The Paulatuk Char Working Group (PCWG) was formed in 1996 with the goal to establish a community fishing plan for Arctic char from the Hornaday River population. The community was concerned about the numbers and size of Arctic char and saw the need for a fisheries management plan. Voluntary community-based harvest surveys were conducted to enumerate fish and marine mammal subsistence harvests. These measures continue to support sustainable management of Arctic char populations in the area.	For more information see: Lee, 2020: https://bit.ly/3w6Zc0h Paulatuk community conservation plan: https://bit.ly/3pBzj63

Appendix 6: Examples of coastal restoration initiatives.

Province / Territory	Summary	Contact/Reference Links
QU	**The Nepihjee river Arctic char fishway restoration project.** The organisation is conducting a project to continue the minor restoration work initiated in 2019. The objective of this project is to remove debris in the river, allowing for a clear path for Arctic char to migrate upriver. The project is being funded by a $46,157.96 grant from the Climate Change Preparedness in the North program for 2020-2021. Another project is focused on the restoration of fish habitat affected by mining activities in the north, in collaboration with MiraNor.	More information about these projects can be obtained by contacting the Makivik Corporation https://www.makivik.org/contact/
NFL	**Parker's Brook restoration.** In 2020 the Pistolet Bay Parker's Brook char association partnered with WWF-Canada to organize the Parker's Brook: Then and Now workshop. The event brought together community members, resource managers, and science and engineering experts to share information on the Parker's Brook aquatic system and its ecologically unique population of Arctic char, Atlantic salmon, and brook trout. The project encouraged community engagement in the planning of restoration actions and long-term stewardship of the river and its aquatic resources.	Several resources can be found on the association's website: https://bit.ly/3yW2ipM
NU	**Preserving Arctic char habitat and Indigenous fisheries in Western Hudson Bay.** This project addresses issues such as isostatic rebound that has reduced water levels resulting in the emergence of physical obstacles like rocks that impede fish migration. Climate change has also impacted these areas and has increased the risk of permafrost slumping which may create new barriers (either physical or chemical) in the future. The plan includes simple, mechanical methods to improve migration opportunities (e.g., pry bars and come alongs) following examples of other similar restoration initiatives such as those used to successfully restore Nulahugyuk Creek near Bernard Harbour. Inuit will be trained to collect data inputs to habitat occupancy modeling during restoration activities in year two (2020), and as part of follow up monitoring in year three (2021).	For more information see: Nesbitt et al., 2019 https://bit.ly/3xa6C2I
NU	**Coastal Restoration Nunavut - Restoration projects in Clyde River & Coral Harbour.** The community of Clyde River (Qikiqtaaluk Region) is located on the northern shore of Patricia Bay, Baffin Island. The mouth of the Clyde River enters the bay to the east of the community. An old road crosses the river about 2,000 m upriver from its mouth. A boulder riprap (human-built structure) had been placed in the river to reduce the water depth and allow traffic to cross. Community members noted that Arctic char were impacted by these changes, as it restricted their migration routes from the ocean to freshwater. In 2018, a plan to remove the riprap structure and return the river to a more natural flow was put into place. Working with the assistance of Dalhousie University, and the Government of Nunavut, the HTO has also developed an upstream migration monitoring plan to assess and share information about the river and char runs. This plan includes a counting fence structure and a video recording system to reduce stress on the fish. The community of Coral Harbour (Kivalliq Region) is on Southampton Island in Hudson Bay. Residents have noted that Coates Island rivers are drying up and getting too shallow to dock. A rockslide occurred on Canyon River in 2017 and the community wished to remove boulders from the area to free the channel, as there is less fish in the lakes. Commercial fishing for Arctic char occurs in the lakes as well as year-round subsistence fishing, but due to the rockslide, fishing sites are difficult to access. Harvesters also hunt seals and beluga there. Six members from	For more information see: https://www.coastalnunavut.ca/ or email crn@dal.ca.

	the Aiviit Hunters and Trappers Association (HTO) travelled to the site in spring 2020 and restored approximately 10 m^2 of the river habitat. This work supports local fish populations, habitat health, and subsistence fishing and food sovereignty. Work continued in spring 2021 to maintain this important area. An additional 10 m^2 was restored.	
NWT	**Beaufort Sea Coastal Restoration Project, Northwest Territories.** This study focuses on sites in the Galiptat Area, Imnaqpaluk, and Tuktoyaktuk Island. The sites were chosen in consultation with the Tuktoyaktuk Hunters and Trappers Committee. The objectives of the study are to use historical aerial photographs and satellite imagery to map the progression of coastal erosion and thaw slumping (1967 to 2004 to 2018), study the progression of thaw slumping at these three sites, examine these effects on water quality and run-off into the Kugmallit Bay, and investigate methods by which plant species native to Tuktoyaktuk region can be used to restore disturbed coastline.	Further details on the approach and preliminary results can be found on the project's website: https://nwtresearch.com/beaufort-sea-coastal-restoration-project.
General	**Aquatic Habitat Canada** is a national network supporting aquatic habitat protection and restoration. Aquatic Habitat Canada works to encourage and assist governments, local communities, Indigenous organizations, industry stakeholders and conservation organizations to protect and restore aquatic ecosystems to ensure they are healthy, resilient to the effects of changing climate and environmental conditions and provide ecosystem services to their full potential more effectively. Four core themes of the network are: 1. Restoration planning and prioritization, 2. Resources and capacity-building, 3. Knowledge synthesis and transfer, and 4. Policy and program. In addition to technical guides and success stories, other useful resources include a 2020 review of aquatic habitat restoration regulations and policies under the Fisheries Act, and funding opportunities, both Canada-wide and province specific.	More information can be found on the network's website: https://aquatichabitat.ca/.

Appendix 7: Examples of projects funded under the Oceans Protection Plan.

Location	Project title and details	Lead agency	Aim	Activities	Website/references examples
Nunavut, Kugluktuk	Restoration of anadromous Arctic char (*Salvelinus alpinus*) and Dolly Varden (*Salvelinus malma malma*) near Kugluktuk. **Time frame**: 5 years. **Fund allocation**: $1,261,890	University of Waterloo, Heidi Swanson	To identify migratory patterns and overwintering habitats used by Arctic char and/or Dolly Varden in the Coppermine and adjacent river systems. It will also develop restoration plans for 1-2 high-priority streams which support these species fisheries and are subject to low-flow events and fish stranding.	1. Fish tagging 2. Placement of acoustic telemetry receivers 3. Water samples 4. Collection of otoliths 5. Collection of fin clips	Nunavut impact review board (https://bit.ly/3b3fzSW) CBC news article: https://bit.ly/2QN4uPa
Hudson Bay and James Bay	Hudson Bay and James Bay strategic planning for coastal habitat restoration **Time frame:** 2 years **Fund allocation**: $220,000	Arctic Eider Society	The goal of this project is to work through the collaborative framework of the Hudson Bay Consortium to coordinate on identifying restoration priorities and planning for coastal ecosystems in the Greater Hudson Bay and James Bay region	Activities between 2017-2020 • Forums, working groups, identified priority areas, and actions.	Project site: https://hudsonbayconsortium.com/ HBC – 2020 progress report (https://bit.ly/33fVwMN) Focus is on coastal restoration, stewardship, research, and monitoring.
Nunavut	Assessment of the current state of coastal restoration needs across Nunavut. **Time frame:** 5 years **Fund allocation**: $2,129,522	Dalhousie University Lucia Fanning	This project will conduct community consultations and feasibility studies to identify and mitigate the stressors impacting aquatic species in each of Nunavut's 25 communities.	It will be followed by working with Nunavut communities to develop coastal restoration plans on a case-by-case basis. At least 3 restoration projects will be implemented over the 5-year funding period.	Project site: https://www.coastalnunavut.ca/
Nunavut	Addressing existing migratory barriers that increase stress on culturally and economically important Arctic char populations in the Kivalliq Region. **Time frame**: 3 years **Fund allocation** $420,000	Kivalliq Inuit Association	Aim to addresses existing migratory barriers that increase stress on culturally and economically important Arctic char populations in the Kivalliq Region.		News article https://bit.ly/3eN4CG0

Appendix 7 cont.: Relevant Projects funded under the Oceans Protection Plan.

Location	Project title and details	Lead agency	Aim	Activities	Website/references examples
Northwest Territories and Yukon	The Inuvut, Inikputlu Project **Time frame**: 3 years **Fund allocation** $680,000	Dalhousie University Claudio Aporta	To conduct community consultations and feasibility studies to identify: important aquatic species for local communities within the Inuvialuit Settlement Region; the stressors impacting each of these aquatic species; culturally important coastal areas impacted by environmental degradation; and potential mitigation strategies for each of the communities.	Uses an approach to coastal restoration that focuses on the relationships that connect people with their environment rather than on discrete and biophysical spaces that have typically been the focus of coastal restoration projects.	Project site: https://inuvutinikputlu.ca/
Newfoundland and Labrador	Riverbank restoration Miawpukek First Nation **Time frame**: 2 years **Fund allocation**: $404,100	Mi'kmaq Alsumk Mowimsikik Koqoey Association	Restoration of riverbank and stabilization of embankment toe on the Conne River	The area has been severely eroded by extreme weather conditions and a lack of total ice cover in winter. The work will help prevent sediment, tree roots and debris from previous development activities from falling into the water. The project will benefit Atlantic salmon as the area is a known migration route for the species.	News article: https://bit.ly/3b4CcGx
Newfoundland and Labrador	Stewarding coastal habitats monitoring and restoration for priority species **Time frame**: 5 years **Fund allocation**: $3,789,720	WWF-Canada	Its goal is to identify data gaps on coastal habitats for priority species, particularly capelin, but including salmon, trout, and char.	The project will build on the momentum of a successful restoration of capelin habitat at Ship Cove, NL by the WWF.	Nunatukavut site https://bit.ly/3elXWjr News article https://bit.ly/3uqiooM
Northwest Territories	Beaufort Sea coastal restoration: Using native plant species to stabilize coastline affected by permafrost thaw slumping. **Time frame**: 5 years **Fund allocation**: $410,000	Aurora College Aurora Research Institute Erika Hille	This project will examine the effects of thaw slumping on the nearshore waters of the Beaufort Sea coast, with a focus on the region of Kugmallit Bay. It will use this research to create a plan to mitigate these effects using native plant species.	The Aurora Research Institute will work closely with the community of Tuktoyaktuk and the Tuktoyaktuk Hunters and Trappers Committee, who play a pivotal role in the study design. Local Indigenous knowledge will be used to identify study sites close to significant fishing locations.	Project site: https://bit.ly/3teLNRq CBC news article https://bit.ly/3un1RSr