






## PRACTICE INSIGHTS

## Co-designed Projects in Ecological Research and Practice

# Insights from the remote co-creation of an Indigenous knowledge questionnaire about aquatic ecosystems in Kinngait, Nunavut

Laurissa R. Christie<sup>1</sup>  | Allison K. Drake<sup>1,2</sup>  | Adam Perkovic<sup>2</sup> |  
 Aiviq Hunters and Trappers Association<sup>3</sup> | Ooloosie Manning<sup>3</sup> | Sheojuk Peter<sup>3</sup> |  
 Pudloo Qiatsuq<sup>3</sup> | Steven M. Alexander<sup>4,5</sup>  | Vivian M. Nguyen<sup>2,6</sup>  | Karen M. Dunmall<sup>1</sup> 

<sup>1</sup>Fisheries and Oceans Canada, Winnipeg, Manitoba, Canada

<sup>2</sup>Biology Department, Carleton University, Ottawa, Ontario, Canada

<sup>3</sup>Aiviq Hunters and Trappers Association, Kinngait, Nunavut, Canada

<sup>4</sup>Fisheries and Oceans Canada, Ottawa, Ontario, Canada

<sup>5</sup>Environmental Change and Governance Group, University of Waterloo, Waterloo, Ontario, Canada

<sup>6</sup>Institute of Environmental and Interdisciplinary Science, Carleton University, Ottawa, Ontario, Canada

**Correspondence**

Laurissa R. Christie  
 Email: [laurissa.christie@dfp-mpo.gc.ca](mailto:laurissa.christie@dfp-mpo.gc.ca)

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**Abstract**

1. There is growing interest in co-developing research projects that more fully address the priorities of Indigenous communities throughout the Canadian Arctic and beyond. However, details regarding collaborative methods are often not adequately described in the literature.
2. Here, we describe a process to remotely co-create a questionnaire compiling Indigenous knowledge about local aquatic species and their habitats with the community of Kinngait, Nunavut. This project was undertaken in response to interest expressed by the Aiviq Hunters and Trappers Association in understanding and assessing the impacts of climate change on coastal ecosystems.
3. Researchers from Fisheries and Oceans Canada and academic partners drafted an initial questionnaire that was revised through a series of collaborative sessions with community-based technicians.
4. We detail the stages of this process and discuss elements that enabled co-creation including: adaptable and frequent communication, community technician roles, and a pre-existing partnership.
5. This paper emphasizes that project co-development and the co-creation of research tools can be a mutually beneficial process that can broaden our collective understanding of the impacts of climate change on Arctic aquatic ecosystems.

**KEYWORDS**

aquatic ecosystems, co-creation, co-development, community-based research, Indigenous knowledge, Inuit, questionnaire

**1 | INTRODUCTION**

The Arctic is changing at a faster rate than anywhere else around the world due to climate warming (IPCC, 2022). These changes are disrupting aquatic ecosystems and are creating new challenges for northern

Indigenous communities (reviewed in Huntington et al., 2020). For example, rising temperatures and decreasing sea ice are resulting in new shipping routes (Dawson et al., 2020) and increased tourism (Palma et al., 2019), as well as biodiversity change (Alabia et al., 2020), and the northward distributional shift of species (Fosheim et al., 2015; McNicholl

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et al., 2021). Assessing the impacts of these changes is difficult due to the paucity of baseline data for Arctic species (Dey et al., 2018; Laidre et al., 2015). Indigenous knowledge, which we understand to be evolving and developed through long-term and direct interactions with other living beings and the environment (Berkes, 2018; ICC, 2021), can often help address these knowledge gaps.

Indeed, Arctic research in Inuit Nunangat (Inuit homelands in Canada) is often reliant upon the knowledge and experience of Inuit (e.g. Carter et al., 2019; Fox, 2004; Henri et al., 2020), and the importance of meaningful collaborations with Inuit communities is well documented (ICC, 2021; ITK, 2018). There has been an associated growth in studies across Canada that draw upon both Western and Indigenous knowledge systems for ecological research, monitoring and management (reviewed in Alexander et al., 2019, 2021). Such endeavours can also increase the breadth and local applicability of knowledge gained (Chapman & Schott, 2020; David-Chavez & Gavin, 2018; ICC, 2021). Although researchers are placing more importance on community engagement throughout the entire research process, methods used for documenting Indigenous knowledge are often not adequately reported in the literature (Alexander et al., 2019; Drake et al., 2022). This can lead to confusion for researchers and render it challenging to build on and learn from previous efforts in this developing field.

Here, our objective is to describe a process of co-creating<sup>1</sup> a questionnaire to compile and document Indigenous knowledge about aquatic ecosystems with the community of Kinngait, Nunavut. As this occurred during the COVID-19 pandemic when travel was restricted, the co-creation process was remote. This project is part of an ongoing research partnership between the Aiviq Hunters and Trappers Association (HTA) and Fisheries and Oceans Canada (DFO) that began in 2019. The goal of this research partnership is to better understand changes in coastal ecosystems near Kinngait in response to climate change. The questionnaire, which enabled the documentation of Indigenous knowledge about ocean, coast and lake ecosystems as well as changes in harvest species and practices, occurred alongside a field-based, community-led coastal monitoring program. Together, these two projects enable a more holistic view of ecosystem change as the questionnaire documented change over time (i.e. years), while coastal monitoring provides insight into conditions each season. The Indigenous knowledge questionnaire is, therefore, an important piece of a larger collaboration that provides spatial and temporal details about aquatic change.

## 2 | BACKGROUND

### 2.1 | Study location

The hamlet of Kinngait (ᐱᕐᕐᕐᕐᕐ) is a remote Inuit community in the Canadian Arctic (64.2304°N, 76.5410°W) located in the Qikiqtaaluk Region of Nunavut (Baffin Island). Kinngait is home to approximately

1400 inhabitants, whose primary languages are Inuktitut and English (Statistics Canada, 2022). The Aiviq Hunters and Trappers Association (HTA) in Kinngait is responsible for implementing resource management and environmental monitoring decisions, in accordance with the Nunavut Land Claims Agreement (INAC, 1993; Lokken et al., 2019). These associations provide support for permits and scientific research, which is often undertaken in partnership with southern researchers to address community questions and priorities. The Aiviq HTA board is composed of eight members elected by the community and has the authority to speak on behalf of the community on subjects pertaining to local resource management.

### 2.2 | Project initiation and pre-pandemic plan

Researchers from DFO first met with the Aiviq HTA in person in November 2019 to gauge interest in coastal research. The DFO team had received funding to support coastal monitoring and compile Indigenous knowledge in Nunavut and wanted to discuss the development of a coastal research program with the HTA in Kinngait. The Aiviq HTA was very interested in both coastal monitoring and Indigenous knowledge documentation, and conversations led to plans to develop a knowledge documentation tool. The Aiviq HTA and researchers jointly decided to document Indigenous knowledge about locally important species and their habitats through in-person interviews with knowledge holders in 2020. However, due to the onset of the COVID-19 pandemic and associated travel restrictions, this plan had to be adapted. Due to challenges associated with potential language barriers and the limited technological capacity to support remote participation in interviews, the researchers proposed developing a questionnaire with the Aiviq HTA. The questionnaire would address the priority of the Aiviq HTA to document Indigenous knowledge on key topics related to Aiviq HTA interests and that could be delivered in person by community-based technicians. Although several groups were involved in this project (DFO, Carleton University, Aiviq HTA, Kinngait community members), it was discussed early in the process that the knowledge documented belongs to the community of Kinngait and the knowledge holders who shared their experiences and perceptions of change. Results can therefore be used for purposes that are decided on by the community (e.g. co-management decisions, conservation plans).

### 3 | CO-CREATING THE QUESTIONNAIRE

The process to co-create the Indigenous knowledge questionnaire is explained in detail below. Note that the entire project (questionnaire co-creation and steps beyond this) was conducted under a scientific research licence (0101221N-M) from the Nunavut Research Institute, and we received ethics clearance (project ID #115098) from the Carleton University Research Ethics Board. Consent was received from the Aiviq HTA to publish this paper and to share the co-created questionnaire.

<sup>1</sup>Here, we define *co-creation* as a process of two or more groups (in this case, DFO researchers, community technicians, Aiviq HTA) working collaboratively to share, learn, and produce a particular output (in this case, a questionnaire as an example of a research tool) (adapted from Galappaththi et al., 2019).





**FIGURE 2** Community-based technicians (Sheojuk Peter, Ooloosie Manning and Pudloo Qiatsuq) in Kinngait, Nunavut, working on questionnaire co-creation with DFO researchers (present via teleconference).

Inuktitut while discussing ideas among themselves, and used English when speaking and summarizing their thoughts to researchers. The technicians indicated that they did not want the questionnaire translated into Inuktitut because they were bilingual and could deliver it in either language. This would ensure consistency in communication with participants.

During the first collaborative session, researchers provided a tentative session schedule for the questionnaire co-creation process. While this schedule was adapted throughout the remaining sessions, having initial consensus on timelines, tasks, and expectations enabled an effective process. There was a specific objective related to the draft questionnaire for each subsequent collaborative session to focus the discussions (e.g. clarifying individual sections of questionnaire, drafting a list of potential questionnaire participants; [Table 1](#)), with the overall goal of clarifying content and ensuring its alignment with community interests. Discussions on the draft questionnaire began in the second session and continued through the fourth session. During the questionnaire feedback sessions, the researchers reviewed each question and asked the technicians if they

had feedback or suggested changes. Several changes were made to the original draft ([Table 2](#), [Appendix 1](#)), such as adding a question regarding aquatic plant biodiversity in the coastal environment in response to the technicians explaining that there could be community interest in plants. A seasonal component was added to the section on animals to better understand seasonal changes and to document the time(s) of year that animals are typically harvested in this community. Additional questions were included to gain further details related to hunting and fishing experiences among participants. Specific terms were also clarified by technicians; for example, the terms ‘sea ice quantity’ and ‘lake ice quantity’ were changed to ‘area covered by ice’, so that vocabulary would be more accessible to participants. The technicians also provided their definitions of ocean and coastal ecosystems based on language used in the community to describe these areas. In addition, a section on the effectiveness of the questionnaire was added to receive feedback from the community on the structure and format of the questionnaire in case similar research tools are used in the future, and to evaluate the utility of the questionnaire in documenting local Indigenous knowledge. These changes helped tailor the final questionnaire to address topics of community interest and increase relevance to the community and Aiviq HTA.

Collaborative sessions 5–11 ([Table 1](#)) focused on how to raise awareness in the community about the questionnaire, participant selection, questionnaire delivery and monetary compensation for participants. The technicians made a list of suggested participants who harvested within—and, therefore, had knowledge of—local lake, ocean and coastal areas. During these sessions, the technicians also decided to use social media pages and the local radio to inform the community about the questionnaire. Later, researchers reviewed a consent form that Carleton University collaborators had created to ensure that all details surrounding consent could be explained to knowledge holder participants during questionnaire delivery. The consent form was translated into Inuktitut for accessibility and enabled participants to decide how their knowledge was reported (i.e.



**FIGURE 3** The logistical steps involved in the co-creation of an Indigenous knowledge questionnaire with the Aiviq HTA, community technicians and DFO researchers. In-person meetings (Aiviq HTA, community technicians) in Kinngait, Nunavut followed public health guidelines, with researchers attending via teleconference.

**TABLE 1** Tasks, topics of discussions and details from each session with researchers and technicians during the co-development process. Each session occurred over a morning and/or afternoon and varied in length from 45 min to 2 h, with at least one 15-min break.

Date	Number of sessions per day	Tasks/topics of discussion	Details
14 January 2021	1	Introduction to team and project	Reviewed a tentative schedule for questionnaire co-creation. Researchers and technicians introduced themselves
20 January 2021	2	Questionnaire feedback	Clarified question details (see <a href="#">Table 2</a> )
21 January 2021	2	Questionnaire feedback, Questionnaire delivery	Further clarified question details (see <a href="#">Table 2</a> ). Discussed questionnaire delivery and how to spread word about the questionnaire in the community
22 January 2021	1	Questionnaire delivery	The technicians identified possible knowledge holder participants. Discussion of compensation for participants
27 January 2021	2	Questionnaire delivery	Review, discussion, and explanation of the participant consent form. Further discussion of compensation for participants
28 January 2021	2	Questionnaire delivery	Technicians reviewed changes and confirmed interest in leading discussions with the Aiviq Hunters and Trappers Association at the following meeting. The technicians decided to divide participants equally among themselves so that each technician would have the opportunity to learn from different community members and hear stories
29 January 2021	1	Questionnaire delivery	Discussed how to spread word about the questionnaire (radio/social media), and the predicted amount of time to complete each questionnaire

whether they wished to be named or remain anonymous, or identified as an Elder or non-Elder).

### 3.3 | Step 3: Finalizing the questionnaire

A second Aiviq HTA meeting (February 2021) was held after the questionnaire was co-created to discuss the process, receive approval on the final questionnaire ([Appendix 2](#)) and accept the list of possible participants. At this meeting, the technicians presented the final questionnaire to the Aiviq HTA for review. The Aiviq HTA then provided their support for questionnaire delivery to begin.

## 4 | CO-CREATION IN PRACTICE: ENABLING ELEMENTS

Based on our experience in Kinngait, and through reflective discussions, the following elements emerged as having enabled the co-creation of the questionnaire.

### 4.1 | Adaptable and frequent communication

Adaptable and frequent communication between the Aiviq HTA board, researchers and community technicians became increasingly important during the shift to remote interactions associated with COVID-19. Several different communication mediums and strategies were used to co-create the questionnaire including: telephone,

text message and email. Consistent and timely communication allowed for the development of the initial draft questionnaire and subsequent collaborative sessions with community technicians. The importance of ongoing and culturally appropriate communication is echoed by several authors and organizations (e.g. Carter et al., 2019; ICC, 2021; Pearce et al., 2009; Yua et al., 2022). Another dimension of communication involved translation between English and Inuktitut. All materials shared with the Aiviq HTA board were translated in advance, and a translator was present for Aiviq HTA meetings. Adequate time was allotted for the process of translation and communication during these meetings. As the community technicians chosen were bilingual, a translator was not present during the questionnaire co-creation sessions with researchers. The successful co-creation of the questionnaire remotely demonstrates the possibility and opportunity for researchers to build on regular and consistent communication throughout projects when potential in-person visits to communities may be limited.

### 4.2 | Community technician roles

Offering employment opportunities for community members is an important part of conducting respectful research and addressing community priorities. Often, participants are involved in the data collection/knowledge documentation phase of research but have little involvement in earlier phases (David-Chavez & Gavin, 2018; Drake et al., 2022). Community technicians and co-authors OM, SP and PQ took on leading roles in the questionnaire in Kinngait (i.e. led discussions about certain topics on draft questionnaire, spoke



TABLE 2 Changes made to the questionnaire through remote co-creation with technicians and the Aiviq Hunters and Trappers Association board members in Kinnigait, Nunavut.

Category of change	Questionnaire section	Original draft	Change made	Comments
Language clarification	Changes to the ocean	Sea ice: Quantity <ul style="list-style-type: none"> <li>No change</li> <li>More ice</li> <li>Less ice</li> </ul>	Sea ice: Area covered by ice <ul style="list-style-type: none"> <li>No change</li> <li>More ice</li> <li>Less ice</li> </ul>	The term 'ice quantity' was unclear and was replaced with 'area covered by ice'
Language clarification	Changes to the ocean	Not included in draft questionnaire	'This is the area beyond low tide where there is open water'	Technicians added their definition of the ocean to the questionnaire at the beginning of the ocean section to remind participants of the definition for consistency
Additional question to address community interest	Changes to the coast	Not included in draft questionnaire	Types of plants (e.g. seaweed) <ul style="list-style-type: none"> <li>No change</li> <li>New kinds of plants</li> <li>Fewer kinds of plants</li> </ul>	A question about plants was added because the technicians indicated that there could be interest. They suggested asking this question to determine if there was indeed community interest on this topic
Language clarification	Changes to the coast	Not included in draft questionnaire	This is the area from the shore to the low tide zone	Technicians added their definition of the coast to the questionnaire for clarification and consistency
Language clarification	Changes to lakes	Lake ice: Quantity <ul style="list-style-type: none"> <li>No change</li> <li>More ice</li> <li>Less ice</li> </ul>	Lake ice: Area covered by ice <ul style="list-style-type: none"> <li>No change</li> <li>More ice</li> <li>Less ice</li> </ul>	Similar to above, the term 'ice quantity' was found to be unclear and changed to 'area covered by ice'
Additional question to address community interest	Animals: Hunting and Fishing	Not included in original questionnaire draft	If you do not currently hunt or fish, have you been hunting or fishing in the past? <ul style="list-style-type: none"> <li>Yes</li> <li>No</li> <li>Prefer not to answer</li> </ul>	This question was added as some Elders may not currently hunt or fish, but still have a wealth of knowledge because they have hunted or fished in the past
Additional question to address community interest	Animals: Hunting and Fishing	Not included in draft questionnaire	If you do not go hunting or fishing yourself, does a member of your household go hunting or fishing? <ul style="list-style-type: none"> <li>Yes</li> <li>No</li> <li>Prefer not to answer</li> </ul>	This question was added because some participants may not hunt or fish themselves, but are aware of changes because someone in their household has spoken about changes they experienced on the land
Additional question to address community interest	Animals: Specific Animal Questions	Not included in draft questionnaire	During which season(s) do you go out to hunt or fish for this animal? <ul style="list-style-type: none"> <li>Spring</li> <li>Summer</li> <li>Winter</li> <li>Fall</li> </ul>	The technicians suggested this question be added
Technical change	Animals: Specific Animal Questions	Changed wording for response options	What changes have you noticed to the condition of marine mammals, marine fishes, and freshwater fishes? Added: scars as a check box	The technicians suggested that 'scars' be added as a checkbox, and 'condition' be removed because the term was not clear

TABLE(2) (Continued)

Category of change	Questionnaire section	Original draft	Change made	Comments
Additional section to obtain feedback	Questionnaire and Research Feedback	Not included in draft questionnaire	<p>Do you think this questionnaire was effective in gathering information about the coast/ocean/lake in Kinngait?</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> <li>• Somewhat</li> <li>• Prefer not to answer</li> </ul> <p>What do you think about the length of this questionnaire?</p> <ul style="list-style-type: none"> <li>• Too long</li> <li>• Too short</li> <li>• Good length</li> <li>• Prefer not to answer</li> </ul> <p>Is there anything that you feel we are missing or should remove from this survey? Please describe/explain.</p> <p>What are your top 3 interests for future research?</p> <p>Any other comments or suggestions</p>	Technicians agreed that it would be helpful to determine if participants felt the questionnaire was an effective way to gather insight into their experiences and perceptions
Formatting changes	All sections	Questions were formatted to increase consistency, readability, and clarity. The HTA gave the researchers permission to do this before they approved the final version		

with the Aiviq HTA on behalf of the research team, created a list of knowledge holder participants, and decided how best to deliver the questionnaire). The participation and contributions of these community technicians were essential in questionnaire co-creation and facilitated the incorporation of community priorities into the questionnaire. Additionally, active roles taken by technicians can lead to the enhancement of existing skills or the development of new skills. These skills are likely to be transferable and can contribute to advancing individual and collective capacity in future research (Carter et al., 2019; Pearce et al., 2009).

### 4.3 | A pre-existing partnership

The DFO research team has been collaborating on a coastal monitoring project with the community of Kinngait since Fall 2019, which included two in-person visits (prior to the COVID-19 pandemic) as well as the remote coordination of fieldwork (throughout the pandemic). The in-person visits helped foster mutual respect and trust and were an essential foundation that allowed for other researchers on our DFO team to become involved in the project. It is important to emphasize that this community-researcher partnership was characterized by multiple individual relationships within and between DFO, the Aiviq HTA, and the community technicians. Such relationships are a critical component of conducting meaningful research with Indigenous communities (e.g. Fox, 2004; Henri et al., 2020; Yua et al., 2022). We are uncertain as to whether the questionnaire could have been co-created through virtual means without a pre-existing partnership.

## 5 | CONCLUSION

The co-creation of an Indigenous knowledge questionnaire enabled community research interests and priorities to guide Indigenous knowledge documentation about changes in aquatic ecosystems in the community of Kinngait, Nunavut. This will also help address the paucity of ecological data available. The Aiviq HTA guided this project, with DFO researchers and community technicians collaborating during 11 sessions to review and revise an initial draft questionnaire. In this paper, we described the process used for this project in three stages (plan, participate, finalize) and highlighted three enabling elements (adaptable and frequent communication, community technician roles, a pre-existing partnership) during the co-creation process. Our hope is that sharing details regarding our experience will assist others in carrying out collaborative projects using co-created research tools.

### AUTHOR CONTRIBUTIONS

All authors contributed to this manuscript. Karen Dunmall, Laurissa Christie, Steven Alexander and Vivian Nguyen conceptualized the approach to document Indigenous knowledge. Karen Dunmall, Laurissa Christie and the Aiviq HTA conceptualized and planned the

co-creation process. Laurissa Christie, Allison Drake, Adam Perkovic, Ooloosie Manning, Sheojuk Peter and Pudloo Qiatsuq participated in the questionnaire co-creation process. Laurissa Christie wrote the original manuscript, with edits provided by Allison Drake, Karen Dunmall, Vivian Nguyen, Steven Alexander and the Aiviq HTA.

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## CONFLICT OF INTEREST STATEMENT

Vivian Nguyen is an Associate Editor of Ecological Solutions and Evidence but took no part in the peer review and decision-making processes for this paper. The remaining authors have declared that no competing interests exist.

## PEER REVIEW

The peer review history for this article is available at <https://www.webofscience.com/api/gateway/wos/peer-review/10.1002/2688-8319.12236>.

## DATA AVAILABILITY STATEMENT

All data relevant to this manuscript are available in this article and in its online supplementary material.

## ORCID

Laurissa R. Christie  <https://orcid.org/0000-0002-2651-0987>

Allison K. Drake  <https://orcid.org/0000-0002-6712-9525>

Steven M. Alexander  <https://orcid.org/0000-0001-9285-879X>

Vivian M. Nguyen  <https://orcid.org/0000-0002-8666-8137>

Karen M. Dunmall  <https://orcid.org/0000-0002-0831-7219>

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

**Appendix 1:** The original draft questionnaire that was prepared and presented to the Aiviq HTA.

**Appendix 2:** The questionnaire after co-creation with community technicians, under the guidance of the Aiviq HTA.

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