Community-based Coastal Beaufort Sea Monitoring

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Introduction:

a. In this section, describe the project. The description can come from the proposal (description and justification sections)
   - Describe the objectives / goals of the project.

The overall goal of this project was to initiate a school-based monitoring program in Northwest Territory coastal communities (e.g. Tuktoyaktuk). The objective of the monitoring program is to deliver long-term information on sea-ice and surface water productivity, given the climate-driven changes observed in and predicted for the Arctic. Long-term monitoring is critical for prediction of changes and the adaptation of Northern communities. The delivery of sea-ice and water column data from the monitoring program will educate students and the scientific community about changes in the Arctic ecosystem and help them understand how cumulative changes can affect them directly and indirectly.

During the preliminary phase of this program, which we report on here, we aimed at establishing working relationships with high school students and teachers from Mangilaluk School in Tuktoyaktuk. The results we wished to obtain from this projected included both feedback from and training of students. Specifically our goals were to:

- Assess the student's concerns and knowledge of their marine environment
- Determine the potential for a student-led sea ice and water monitoring program. The information gained in this preliminary phase will help us prepare a working plan to move forward with school-based monitoring in Northwest Territory coastal communities
- Train and instruct students about the needs and methods of monitoring.

- Describe personnel involved with the project.

The DFO personnel directly involved with this project are Drs. Christine Michel and Andrea Niemi (Arctic Aquatic research scientists). Dr. Michel is an experienced Arctic Research Scientist at DFO, whose career has focused on Arctic Marine productivity. Dr. Michel leads the Marine Productivity programs at the Freshwater Institute in Winnipeg; she was involved in the planning and overall science aspects of the project. Dr. Niemi is a Biologist at DFO and has acquired extensive Arctic research experience over the past 5 years. Dr. Niemi is also involved in various outreach and training initiatives, and has extensive experience in teaching and knowledge transfer with communities, and primary and high-school students. Dr. Niemi was directly involved in the development of the educational program for Mangilaluk School. Her tasks included the preparation of outreach material tailored for students from Tuktoyaktuk, and the initiation and delivery of a hands-on coastal monitoring experience to the students, as detailed below.

Dr. Niemi initiated contact with teachers of Mangilaluk School in Tuktoyaktuk, to determine how coastal monitoring could be blended into the science curriculum and developed options for providing teachers and students with hands-on experiences during her visit. Dr. Niemi then traveled to Tuktoyaktuk to meet with the principal and teachers of Mangilaluk School. She worked specifically with the Experiential Science class, a group of Grade 10 students, and their teacher Eph Warren. Dr. Niemi had prepared visual presentations and hands-on experimental material which formed the core of the science training material for the students. Classroom discussions/PowerPoint presentations, hands-on laboratory experiments and measurements and a field trip were used to assess the students' knowledge of monitoring and their marine environment. The students provided written feedback and produced summaries of the knowledge they gained from the program. Arctic perspectives and comments from elders about the environment that are included in the Arctic Marine Science Curriculum were also included in the presentations and discussion.

- Describe any other similar work that has been done, taking place or expected to take place in the future.

This project is not currently part of a larger project, although data collected from a student based monitoring program could be partnered with data from recent large-scale Beaufort Sea studies (e.g. Canadian Arctic Shelf Exchange Study (CASES 2003/04) and the Canadian Flaw Lead (CFL 2007/08) system study) as well as community based marine mammal monitoring programs. The student-monitoring efforts could also compliment near-shore DFO research based from the CCGS Nahidik with important links to oil and gas development.

Although this project is not currently part of a larger monitoring network, we believe we have established a foundation that can be linked to other existing community monitoring programs (e.g. marine mammals) or become part of a greater marine community monitoring effort within the CIMP. With continued funding, there is much potential to expand this monitoring program to educate and include more youth and different communities in the NWT.

Methods:

a. In this section, give a detailed record of how the project was completed.

We enjoyed a successful meeting with the school and students. We were able to supply equipment for the students to use and spent 3 days with the class during which hands-on and interactive classroom and field activities were conducted. The students and teachers were very appreciative of the visit, deemed the activities “fun” and there was an obvious transfer of knowledge between us and the students and vice versa.

In the classroom:
-An interactive presentation was given to discuss why coastal marine monitoring is needed and how the students could contribute to such monitoring. A list of things/organisms that the students felt were important to monitor was created.
-An interactive presentation was given to describe the importance of primary productivity in their marine environment and to introduce the role of sea-ice as a host of productive microbial communities that support the Arctic food web.
-Hands-on labs and experiments were conducted to investigate the difference between sea water and freshwater ice and to investigate ocean stratification and circulation (aquarium experiments) as it applied to their own near shore marine environment.
-Students were trained in taking salinity measurements.
-Students summarized the knowledge they gained their marine environment by preparing a marine food web poster which they could compare to terrestrial food web posters they previously created.
-Students filled out a monitoring survey form (a sample of a form is attached).

In the field:
The students and their teacher were taken onto the coastal sea ice. Each pair of students had a list of information and samples to collect. The students and teacher were trained in using the ice corer and other equipment (e.g. GPS).
Planned measurements included

- -snow and ice depth
- -ice, brine and water salinity measurements
- -ice core collection
- -CTD (Current, temperature, depth sensor) deployment

Pictures of the activities are attached.

b. Describe how the communities/organizations were involved.

This project was based on the participation and input of the students and teachers of Mangilaluk School. Jacob Pokiak was hired as a guide for the field trip component. He also participated by sharing his knowledge of the local marine environment, including sea ice conditions and the use of freshwater under the ice.

c. Describe how traditional knowledge was used, if applicable.

The curriculum of the Experiential Science course was reviewed before the visit. The curriculum contains interviews with elders and their views on changing environments. This material, in addition to Inuit derived Arctic food web examples, were used in discussion of why monitoring is needed and how the different components of the ecosystems are all linked. In addition, the location of the field activities was based on the input of teachers and our guide Jacob.

Results:

a. Describe what results were discovered or learned.

(If results outlined in the report are preliminary, please explain how 'final' results will be accessible.)

This project supports both of the CIMP project categories "Monitoring and Research" and "Capacity Building and Training".
From the capacity-building perspective, we trained grade 10 students and their teacher. They learned about the importance of monitoring and were introduced to components of their marine ecosystem that were new to them –i.e., primary producers and sea-ice communities. The students and teacher were trained in sea ice sampling techniques, salinity measurements and recording of their own observations as important traditional and scientific information sources.

From a monitoring/research perspective this pilot project assessed the potential for a long-term community based monitoring program which would lead to the collection and analyses of valued components monitoring/baseline data. The valued components focused on during this preliminary project were Climate and Climate Change and Marine Life. The feedback and information gained from the students will be summarized to aid in planning the next steps of this project.

We believe we were successful in providing the students with a basic understanding of how cumulative impacts can affect their local marine ecosystem and in stimulating an interest in student-based monitoring of the marine environment.

Discussion / Conclusions:

a. Describe how the results of this project will further knowledge of cumulative impacts.

We would like to build on the success of the preliminary stage of this study and continue to foster relationships with students and the schools. It is evident that the students involved in this preliminary phase had a very limited understanding of their local marine ecosystem and linkages to cumulative impacts. We see a great need and opportunity to enhance communities' foundational understanding of marine coastal ecosystems with outreach to the youth. We found that few students had a traditional understanding of the marine environment and we believe that the development of a student monitoring program could facilitate knowledge transfer between scientists, youths and elders. We also hope that our interactions with students will help promote attendance in school and encourage them to improve their basic literacy and mathematic skills thereby promoting and fostering education in the North.

The students were very responsive and interested in the different components of their environment, even water stratification, and the ramifications of cumulative impacts (e.g. ice melt). There is definite potential to enhance their knowledge of cumulative impacts with further educational interactions. By building on our success we can move student monitoring forward in a way that will enhance scientists and community's knowledge of cumulative impacts in the North.

b. Describe how results of the project were communicated to the communities and other groups.

The survey forms we provided allowed us to receive feedback from the students. These forms will be kept on record for reference and a copy will be available upon request. The training presentations and topics discussed will also remain available. We will keep in contact with the students and teachers via email and will follow-up with those who showed interest in being involved with monitoring in their community. A student monitoring website would be a great development with future support of this program.