

REPORT  
2016 Oceanography Program  
Kaktovik, Alaska

prepared for



U.S. Fish & Wildlife Service  
Fairbanks, Alaska

Sponsored by



Bureau of Ocean Energy Management

The University of Texas Marine Science Institute  
750 Channel View Drive  
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## Program Organization

The annual Kaktovik Summer Oceanography Program was taught at the Kaktovik Community Center in Kaktovik, AK from 8-13 August 2016. The University of Texas Marine Science Institute (UTMSI) and the U.S. Fish and Wildlife Service (USFWS) jointly designed and implemented the program. Cliff Strain, an ocean sciences middle school teacher at Flour Bluff School District, TX served as the lead instructor. UTMSI graduate student Christina Bonsell, along with Ken Dunton (UTMSI) and Allyssa Morris, ANWR Outreach Coordinator, coordinated the program. They were assisted by several other instructors, including graduate students William Daniels (Brown-MBL), Craig Connolly (UTMSI), and Arley Muth (UTMSI). In addition, Will Wiese, Lizzie Bonczek, and Elizabeth Schell (USFWS) led a guest scientist lesson on tracking eiders with radio tags.

Students (*older than 9)	
Doe Doe Sittichinli*	Larry Tikluk*
JD Tikluk*	Charles Brower Jr*
Jim Allen Killbear*	Bradley Brower*
Janette Killbear*	Mya Arshanas
Billy Fred Killbear*	Joziah Sanders
Troy Soplu*	Renasia Sanders
Cora Soplu	Kaden Kulukhan
Skyler Soplu*	Vernon Arey
Marcus Gallagher*	Danny Gordon*
	Edwin Solomon*

This year, we focused our program on middle and high school level students. Our theme was “Exploring our Oceans!” The aim was to expose students to diverse techniques and technologies (including a Remotely Operated Vehicle, ROV) that scientists use for ocean exploration, and help them better understand the unique coastal zone of the Beaufort Sea. We took advantage of our unique location on an Arctic barrier island

and used Kaktovik lagoon as a natural classroom. We were very successful with participation of students ages 9-12. As we discovered in 2014 and 2015, it is difficult to engage the upper end of the targeted age range because many of them work jobs during the summer or are away hunting or visiting friends before the start of the school year. As an attendance incentive, students who attended every day of the program were entered

into a drawing to win a Cheerwing Syma Drone. On average, 12 students attended the program each day and 3 were eligible to enter the drone drawing. Thirteen students in our target age range (9+) attended the program for at least one day (Table 1).

### Summaries of Daily Activities

	Main Activities
<b>Monday</b>	ROV and seining at lagoon, marine algae discussion and herbarium pressing
<b>Tuesday</b>	Food web discussion, trawling and mud grabs on RV Proteus, ROV at freshwater lake, meet and greet with Coast Guard
<b>Wednesday</b>	Taxonomy discussion, foraging behavior experiment, plankton nets and sediment core on RV Proteus, plankton identification, shark dissection
<b>Thursday</b>	Jobs with USFWS, beach erosion survey and post-survey discussion, groundwater and lagoon water quality
<b>Friday</b>	Tracking eiders with the USFWS Eider Crew, poster making, fish-printing on program t-shirts
<b>Saturday</b>	Seining and plankton collection at lagoon

On the first day of the program (Monday), students learned to pull a seine net to capture fish and invertebrates along the shoreline of Kaktovik Lagoon. Students later identified these organisms and added them to an aquarium tank in our classroom for observation. The biota collected included various fish, mysids, amphipods, and seaweeds. Students also learned how to pilot an ROV from our research vessel with Ken Dunton to look at the underwater lagoon environment. Arley Muth then led an afternoon discussion on seaweeds, initiating conversations about the role of primary producers in ecosystems (which was talked about more in depth on Tuesday) and compared seaweeds with terrestrial plants. The students then created seaweed herbarium pressings and marine art.

Tuesday morning, students learned about trophic levels and played a food web game that included drawing their favorite Arctic plant or animal and discussing how

these organisms are connected in a hypothetical food web. The concept of energy transfer from the sun through primary producers, primary consumers, secondary consumers and apex predators was discussed in detail. The older students (older than 9) then sampled the lagoon biota from the RV Proteus using a small bottom trawl and a Ponar mud grab. They also explored the Barter Island's Freshwater Lake with Ken Dunton, using the ROV piloting skills that they gained from the lagoon activity. In the late afternoon, the group took advantage of a visit by the crew of the *USCGC Alex Haley*, who described their responsibilities as crew members and gave tours of some of the small vessels they use on patrol.

Wednesday, students learned about the science of taxonomy, using dichotomous keys to identify organisms, and how to classify various types of marine life. They then performed an experiment where different organisms (e.g. isopod, predatory amphipod, fish) were placed in containers with prey (brine shrimp). They developed questions about foraging behavior of the taxa, and made observations to attempt to answer their questions. We used this activity to talk about experimental design and the importance of experimental controls. In the afternoon, the older students again went aboard the *RV Proteus* to sample plankton and collect a sediment core from Kaktovik Lagoon. The sediment core was used to discuss the concept that scientists can reconstruct past environmental conditions through examination of sediment deposited over time. Core samples were taken to the lab and examined using microscopes. The students were very engaged and excited to find a number of phyto- and zooplankton species. Afterward, Cliff Strain led an activity on shark dissection as he discussed how sharks use their lateral line sensory-organ system to detect and capture prey.

Thursday, Allyssa Morris led a discussion about the role of the USFWS within the Arctic Refuge and various job opportunities that are available to the citizens at local communities. We then ventured out for our annual GPS-based survey of beach cliff erosion. We followed this with a discussion of the accelerated rates of erosion on Barter Island. The next activity involved a comparison of water chemistry between groundwater and water from Kaktovik Lagoon. Students collected groundwater samples using

piezometers (groundwater wells), which were analyzed in the lab for water quality and nutrient concentrations using environmental monitoring kits.

On the last full program day, the USFWS Eider Crew joined us for a guest scientist lesson. They led an activity on tracking eiders using radio transmitters, allowing students to use equipment to locate transmitters around town. That afternoon, the instructors and students discussed the activities conducted throughout the week and students made posters that reflected their favorite activities.

Saturday, students went seining in the morning to collect fish and plankton for the open house that was being held later that afternoon. The open house included displays of the student's posters and artwork from the week. We also provided refreshments. Students demonstrated to their parents and local teachers how they used microscopes to examine plankton and water quality kits to test salinity and nutrient concentrations in lagoon water. Over fifteen community members, including elders and adults that did not have children in KOP, attended the open house.

### **Program Assessment**

Overall, the 2016 program was very successful. We attracted 19 students, which represents about one-third of all K-12 students in Kaktovik. Students developed skills in a wide range of tools and technologies for exploring their local environments and investigating marine biology and chemistry. The program included hands-on science activities that focused on several important principals in marine environmental science and were interconnected throughout the week. Students applied knowledge gained in discussions and activities later in the week. They enjoyed the outside activities. They especially found the hip-waders a unique way to immerse themselves in deep water without getting wet. Microscopy was also very popular, and students really enjoyed looking at their collections of biota and geology samples up close. In addition, many students responded favorably to more creativity-based educational activities. These included the algae-pressing activity, using a dichotomous key to identify fictional characters, and the food web game. The addition of new tools (e.g. the ROV) attracted students and citizens alike and was an activity that produced a lot of excitement.

## Future Suggestions

- Set expectations for safety and learning on the first day of the program and reiterate these expectations throughout the week.
- Include a morning routine activity to help students adopt the science mindset for the day. Examples include: measurement of water quality parameters in the fish tank or discussion of a 'Science Word of the Day'. This would help students stay focused and know what to expect each day.
- Wrap-up each day with a discussion and a take-home message.
- Provide workbooks with handouts for each planned activity instead of blank notebooks. Students seem eager to use their notebooks, but need some direction on what to write. Workbooks will help their writing skills and also help synthesize the lessons in their minds.
- Emphasize the scientific lessons. While this is more difficult with younger students, they engaged with several of the lessons this year. This would be enhanced by more discussion and writing.
- We allowed many younger children (<10 years old) to attend the program. As a result, a few of the older students stopped attending. This is something that should be considered in planning future programs.
- Allyssa Morris, Craig Connolly, and Levi Rexford were willing and able to act as bear guards. We may want to consider bear guards in future years.
- The water quality lesson may have been too advanced for the students we had in 2016. We either need to dedicate more time to the lesson, or simplify what they are supposed to take away from it.
- Further organize the GPS data from past years for the erosion survey. Creating an organized long-term dataset will improve this lesson.
- Improve the foraging experiment protocol. The brine shrimp were too small to count, hindering implementation of this exercise. We should use mysid shrimp or amphipods as food and expand discussion on feeding mechanisms used by different animals (filter feeders, hunters, detritivores, etc.).
- Include Plankton Races. This activity integrates ecology, engineering, and creativity.

- Continue with the tradition of designing and distributing t-shirts to all participants.

## Acknowledgements

We thank Mayor Nora Jane Burns (City of Kaktovik), RV *Proteus* skippers John and Ted Dunton, Susan Schonberg (UTMSI), Fred Tagarook (City of Kaktovik), Levi Rexford (citizen), and the crew of *USCGC Alex Haley* for helping us make our summer oceanography program a big success. We also thank our BOEM Program manager, Cathy Coon, for her enthusiastic support of our outreach program in Kaktovik (BOEM Award Number M12AS00001).

For more photos, see: <https://utmsi.utexas.edu/visit/summer-science/kaktovik-alaska>



Photo 1. Group photo in front of the community center



Photo 2. Students and Cliff Strain measure the size of a “kook” during the erosion survey



Photo 3. Students and Ken Dunton pilot the ROV from the *RV Proteus*



Photo 4. Students in chest waders pull in a seine



Photo 5. Students examine algae samples using microscopes