

IKAAGVIK SIKUKUN

KOTZEBUE

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Photo by Sarah Betcher
Farthest North Films

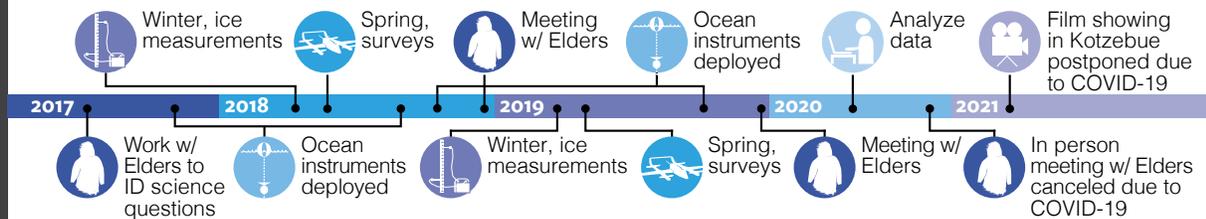
Spring 2020 newsletter 4: Bridging science & Indigenous communities to study sea ice change in Kotzebue Sound

Ikaagvik Sikukun—Ice bridges

The frozen environment around Kotzebue Sound is changing. Ikaagvik Sikukun—*lñupiaq* for ice bridges—is a research project in Kotzebue, Alaska that connects the community with scientists to understand how sea ice, ocean physics and marine mammals are changing in the Sound. The science is guided by an Elders Advisory Council and documented through several films. This is the last of four newsletters about the project.

Ikaagvik Sikukun began in 2017 and is expected to finish in 2021. The following pages share perspectives on the project from the Elders Advisory Council, explore how *ugruk* (bearded seal) hunting has changed over the past two decades, give insights into the unusual sea ice conditions of 2019, and show how the Ikaagvik Sikukun documentary was filmed. If you are interested in reading past newsletters or learning more about the project visit www.ikaagviksikukun.org.

Project timeline



Learn more!

To learn more about Ikaagvik Sikukun visit us online at www.ikaagviksikukun.org or email questions/comments to ikaagvik_all_pis@lists.ldeo.columbia.edu.

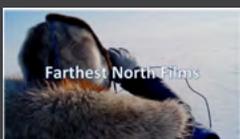
Support

Ikaagvik Sikukun thanks the Gordon and Betty Moore Foundation for funding and Selawik National Wildlife Refuge for logistical support.

Participants



Lamont-Doherty Earth Observatory
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Elder Advisory Council



Bobby Schaeffer
Kotzebue Elder



Cyrus Harris
Sisualik Elder



John Goodwin
Kotzebue Elder



Roswell Schaeffer Sr.
Kotzebue Elder

Guided by Elders

The Ikaagvik Sikukun Elder Advisory Council shared their Indigenous Knowledge, passed down through generations, and learned from decades of observing the animals, ice, water and weather in and around Kotzebue Sound. The Elders proposed the questions Ikaagvik Sikukun studied. They used their knowledge of the ice to guide when, where and how to collect data, and led the science team on the ice to ensure safe travel. The Elders also helped interpret the significance of results.

In this section, we share perspectives from the Elders on Ikaagvik Sikukun and the changes they are observing.

Messages from the Elders

Different ways of knowing

The Iñupiaq have called the Arctic home since time immemorial and have developed a knowledge system shaped by the environment. For thousands of years, hunters have studied the animals, ice, land and ocean. Ikaagvik Sikukun acknowledges these different ways of knowing and believes that knowledge is stronger when scientists and Indigenous Knowledge work together as equal partners.

Cyrus Harris said: “The Indigenous people from way back in the day, they’ve always studied the climate and the weather as a way of survival. It gives them an idea of what conditions are going to look like for harvesting in certain areas or traveling.”

Several findings from Ikaagvik Sikukun were already known to the residents of Kotzebue. For example, the on-ice measurements showed that there is less ice where deep snow accumulates.

Cyrus Harris said: “We do a lot of ice fishing. Before we had augers we had homemade ice chisels which we call a *tuuq*. When I was growing up my parents, they would select a spot to start chipping ice. What I noticed is that the spot they were actually picking is an area that’s got a fair amount of snow cover ... And as they are ice chipping it is obviously a foot thinner than 20 feet away where the snow was 4 or 5 inches. That kind of thing was always known. With this project it was great to see that the Indigenous Knowledge and science fit well together.”

Ikaagvik Sikukun acknowledges that there is a long history of science conducted in ways that were not equitable to Alaska Native communities. Ikaagvik Sikukun endeavored to do better and always accept Indigenous Knowledge as equal to western science.

John Goodwin said: “We worked as a team. It was not one sided, it was not from the science department only, [Ikaagvik Sikukun] worked with the locals and with us Elders. And by doing that you get better results.”

Messages from the Elders

Climate change

When humans burn fossil fuels like coal, natural gas and oil, they release high concentrations of carbon dioxide into the air. These emissions heat the atmosphere and are the leading cause of global climate change. The Arctic is impacted more than any place on Earth. Several processes in the Arctic accelerate climate change. Thawing permafrost releases methane gas which further warms the atmosphere. As sea ice melts, the darker open ocean absorbs more heat, causing additional warming.

The Elders stressed that overcoming climate change will take action and national leaders, scientists and Indigenous communities working together.

Roswell Schaeffer Sr. said: “There are a lot of us that felt that our country [around Kotzebue Sound] is changing too fast. We have to understand these problems and these changes...To help our people be ready for it, it is really important that they support this kind of science and Native knowledge working together.”

Bobby Schaeffer said: “We can’t shut our eyes [to climate change], it’s not going to go away... We have to change what we are doing, we have to quit burning fossil fuels otherwise there is no hope. We are on a very fine line right now. If we continue with our habits we’re going to go over that hump.”

The past five years

According to the Elders, the past five years differed notably from what had been the norm for decades. Recent observations include thin, dangerous ice, shorter winters, thawing permafrost, and changing animal, fish and bird movements.

Roswell Schaeffer Sr. said: “Yesterday [October 2, 2020] it was 51°F above which is unheard of in the Arctic in October. It should be freezing. The bay should be frozen, or at least partially frozen. The ducks are still here, the geese are still here.”

“Since about five years ago it started doing this, getting warmer and warmer each year. We’re getting longer falls. Falls are all the way toward November. Our spring is occurring in March or April, rather than May or June. So our winters are becoming very very short. It causes so much changes for all animals, including us humans.”

Why invest in science?

Over the years, the four Elders have participated in a variety of roles related to the environment, fish and wildlife monitoring, and science research projects. When asked why they invest so much time on science, observing and sharing their knowledge, they focused on future generations.

Roswell Schaeffer Sr. said: “I do this because I want my grandkids and my great-grandkids to have this knowledge after I’m gone. That way the kids in the future will be able to understand our culture right now and why it is important to continue this way of life and not lose it.”

Cyrus Harris said: “Indigenous Knowledge is through memory and passing down that information through voice. Putting this [findings from Ikaagvik Sikukun] together in written form will help the younger generation catch up.”

Observations can’t stop here

Efforts to respond and adapt to climate change in the Arctic must be guided by long-term environmental monitoring. For this reason, the Elders emphasized the importance of continuous and unbroken data gathering in Kotzebue Sound. Many science projects are funded for relatively short periods. For example, Ikaagvik Sikukun is only a five year project, but the changes documented will continue into the future. This is one of the many reasons why strong partnerships between scientists and Indigenous communities are so critical.

Bobby Schaeffer said: “The information we’re gathering should be continuous, it shouldn’t end, in order to use data it has to be done on a continuous basis.”

To carry on the important science started during Ikaagvik Sikukun, the Alaska Arctic Observatory and Knowledge Hub will continue local efforts to gather sea ice measurements and observations of wildlife and coastal waters.



Photo by Sarah Betcher
Farthest North Films



Photo by Sarah Betcher
Farthest North Films

Hunting ugruk



Alex Whiting
Native Village of Kotzebue,
Environmental Director



Donna Hauser
Scientist, marine mammal
ecology

Spring *ugruk* (bearded seal) hunting ends about 26 days earlier in Kotzebue Sound than it did in 2003. Sea ice breaks up three weeks earlier.

Hunting *ugruk* is like hunting ice

Ugruk in Kotzebue Sound are closely tied to certain ice conditions, so hunting them is essentially the same as hunting ice. To quantify how the loss of sea ice has impacted the *ugruk* hunting season length, and start and end dates in Kotzebue Sound, **Alex Whiting** and **Donna Hauser** co-led a project interviewing Elders, examining Tribal records, and analyzing sea ice data.

Interviewing Elders

The Elder Advisory Council provided Indigenous Knowledge about the sea ice conditions that impact *ugruk* and *ugruk* hunters in Kotzebue Sound.

What *ugruk* need



Kotzebue Sound is the only major estuary north of the Bering Strait where fresh and salt water mix in a shallow, productive nearshore environment. The Sound is important for fish, shrimp, clams and other animals *ugruk* eat while breeding and molting.

To enter Kotzebue Sound, *ugruk* need open leads (linear cracks in the ice) and the ice to start breaking up. Persistent “white ice” floes make ideal places for the *ugruk* to feed, molt, and haul out directly above their feeding areas. In this habitat, *ugruk* build fat reserves before continuing their migration north to the northern Chukchi and Beaufort Seas.

What hunters need



To avoid shooting *ugruk* in the water and risk having them sink, hunters prefer harvesting *ugruk* that are hauled out on ice floes. To access the floes, Kotzebue hunters need to wait until the channel (where the Noatak and Kobuk rivers merge and flow out of the Sound) in front of town opens and they can launch their boats. To make hunting safe and affordable, the broken ice floes need to be relatively close to town.

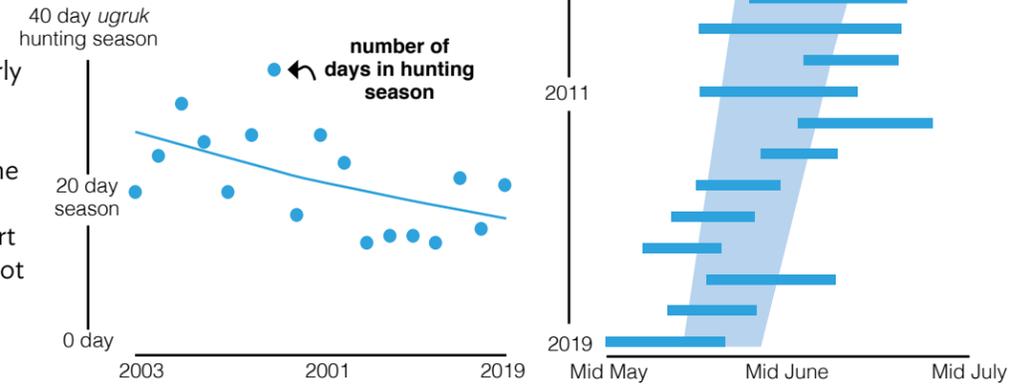


Photo by Sarah Betcher
Farthest North Films

Check out the data

Shorter *ugruk* season

Alex and Donna’s team found that over the past 17 years, the length of the spring *ugruk* hunting season for the Qikiqtaġruṅmiut people decreased nearly a day per year. Kotzebue Sound now breaks up about 22 days earlier than it did in 2003 and is the main reason for the shrinking hunting season. Compared to the early 2000’s, the hunting season start date is now slightly earlier, but there is not a significant trend. The most significant change is that the hunting season now ends in mid-June rather than early July.



Tribal records

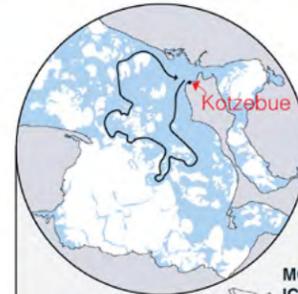
As the Environmental Program Director for the Native Village of Kotzebue, **Alex Whiting** has made weekly reports on weather, travel conditions, wildlife and fish, and hunting and fishing since 2002. Each spring, he records when *ugruk* hunting season starts—based on when the first hunters are able to boat out of Kotzebue—and when the season ends—the last *ugruk* harvested or when people can no longer find *ugruk*. Alex’s journals created a way for Ikaaġvik Sikukun to quantify how much the *ugruk* hunting season changed since 2003.

Sea ice data

Ikaaġvik Sikukun scientists used satellite data to understand why the *ugruk* hunting season was shortening. They examined satellite images to detect annual events in the ice cycle that the Elders said were important for *ugruk* and hunters. They identified the day of each year (from 2003–2019) when:

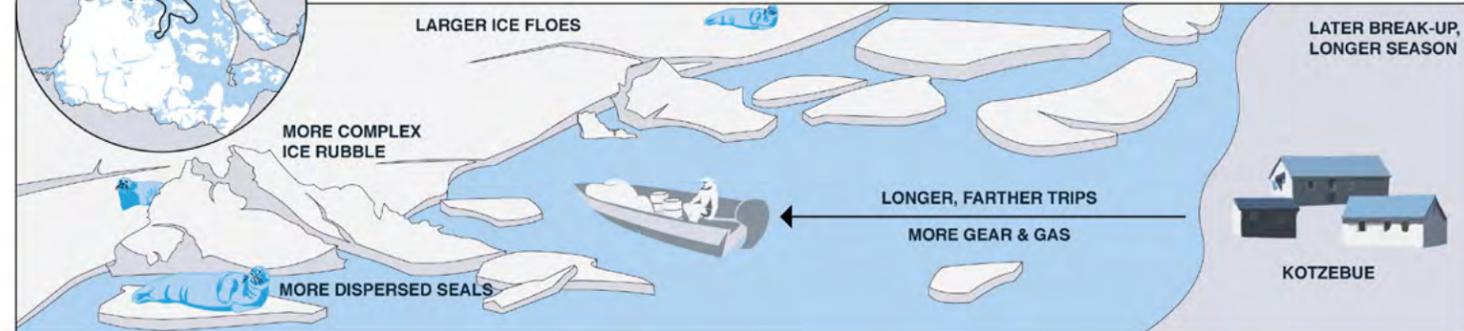
- Spring sea ice first broke up and was presumably favorable for *ugruk* to enter the interior region of Kotzebue Sound.
- The channel in front of town first opened allowing hunters to launch boats.
- Ice was gone from interior of Kotzebue Sound.
- All broken ice floes were gone from Kotzebue Sound.

Ice pattern in a typical past season: Consistent ice, more searching for *ugruk* (black line shows hypothetical hunting route).



Past *ugruk* hunts

In the past, Kotzebue Sound was reliably covered by near-continuous sea ice from January–April. Open water typically began forming in May, but broken ice existed into July. Hunters typically went on longer, farther trips navigating through complex ice floes searching for *ugruk*.



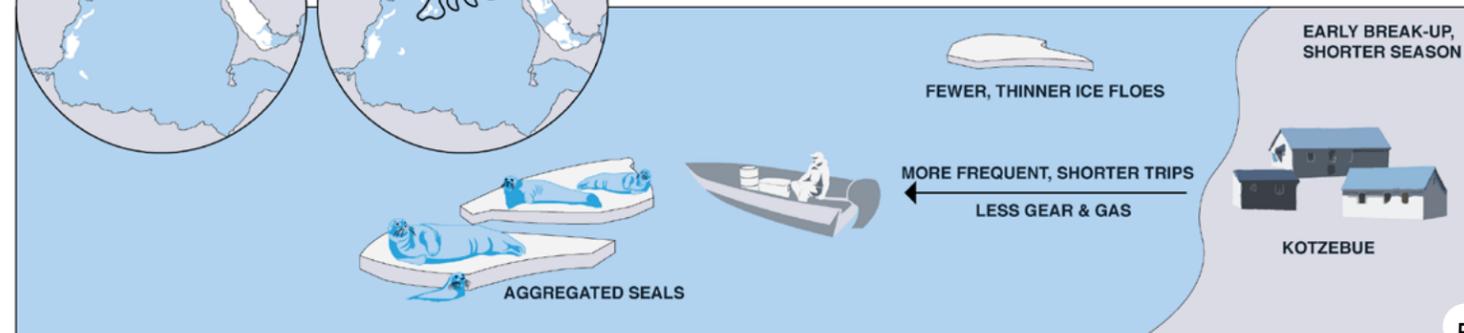
Ice pattern in 2019: Many *ugruk* on a few ice floes close to Kotzebue. Low effort to hunt, high success.



Alternate future ice pattern: Few ice floes further from shore, hunting requires more searching, less chance of success.

Current *ugruk* hunts

Around 2010 sea ice patterns changed in Kotzebue Sound. Ice floes disappear from the Sound about three weeks earlier than they did in the past. Today’s May/June ice looks like historical June/July ice. While hunters are not necessarily able to begin hunting any earlier, the season is increasingly cut short. Hunters typically embark on shorter, more frequent trips. Hunt success has not necessarily changed.



Sea ice



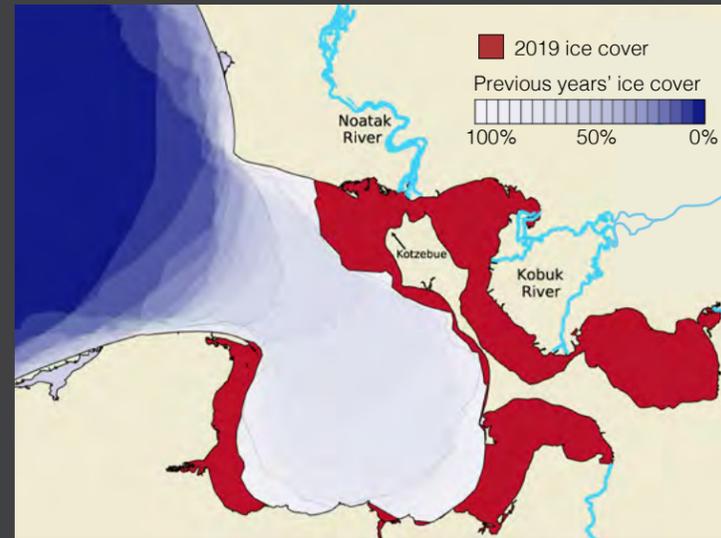
Carson Witte
Graduate student, air-sea-ice interactions



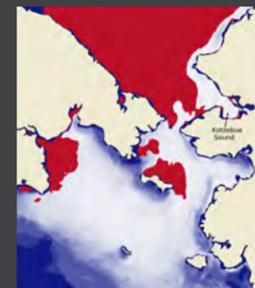
Chris Zappa
Scientist, air-sea-ice interactions

Winter 2019 was unusual

2019 had the lowest sea ice on record. In Kotzebue Sound there were relatively few ice floes and landfast ice covered only near-shore areas. Ikaagvik Sikukun is helping to understand what caused the unusual conditions. **Carson Witte** and **Chris Zappa** used images from satellites to compare shorefast ice in 2019 to the past 20 years.

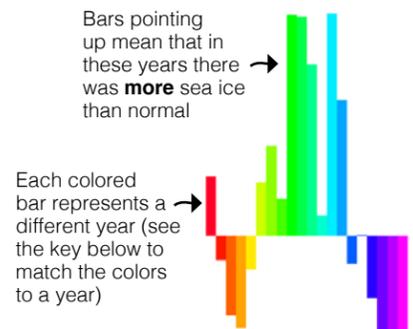


In these maps, the red area shows where there was ice in April, 2019. The landfast ice in Kotzebue Sound (left) and sea ice extent (below) for previous Aprils are shown as a transparent white layer. The whiter the area, the more times during the past 20 years the area had ice.

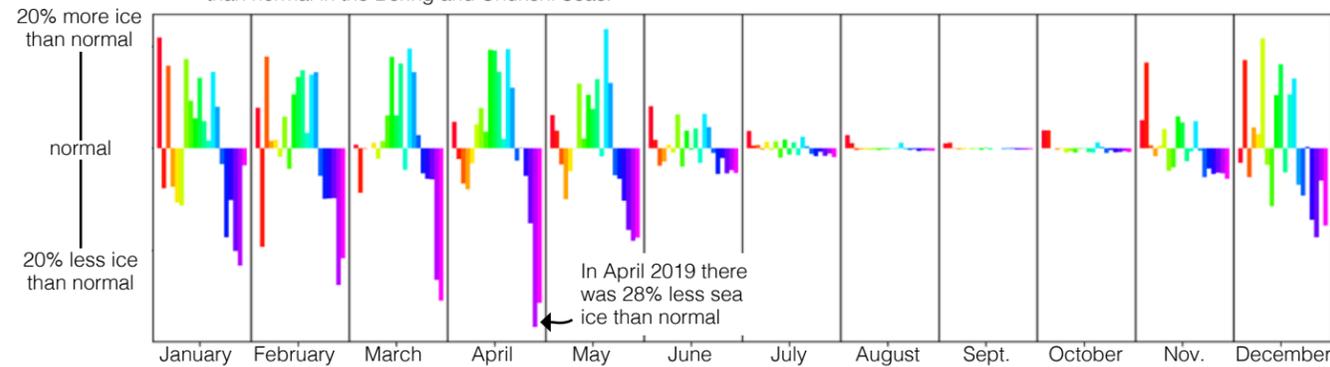


Learn how to read these graphs

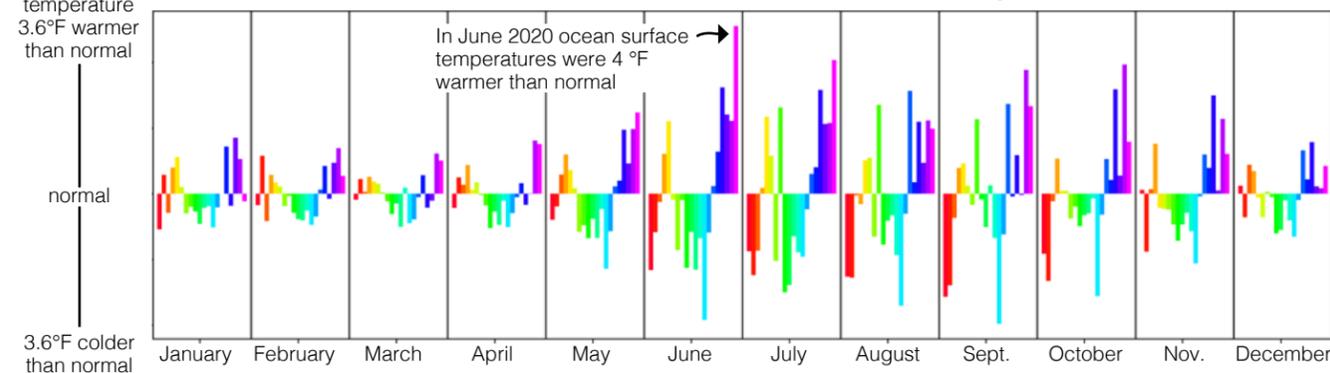
The two panels of graphs below, created by Carson, show 20 years of sea ice and ocean temperature data. Each of the 24 boxes shows data from 2000–2020 for a given month. Compare the colored bars to learn how sea ice and ocean conditions have changed during the past two decades.



Less winter sea ice: The long purple and pink downward pointing bars show that since 2015 there has been considerably less winter sea ice than normal in the Bering and Chukchi Seas.



Warmer ocean temperature: The long purple and pink upward pointing bars show that since 2015 ocean surface temperatures in the Bering and Chukchi Seas have been warmer than usual. During summer, temperatures are now 3–4°F degrees warmer than normal.



Simulating the past



Andy Mahoney
Scientist, sea ice & impacts

How unusual was 2019?

Has the sea ice in Kotzebue Sound ever been as thin as it was in 2019? The short answer, not likely.

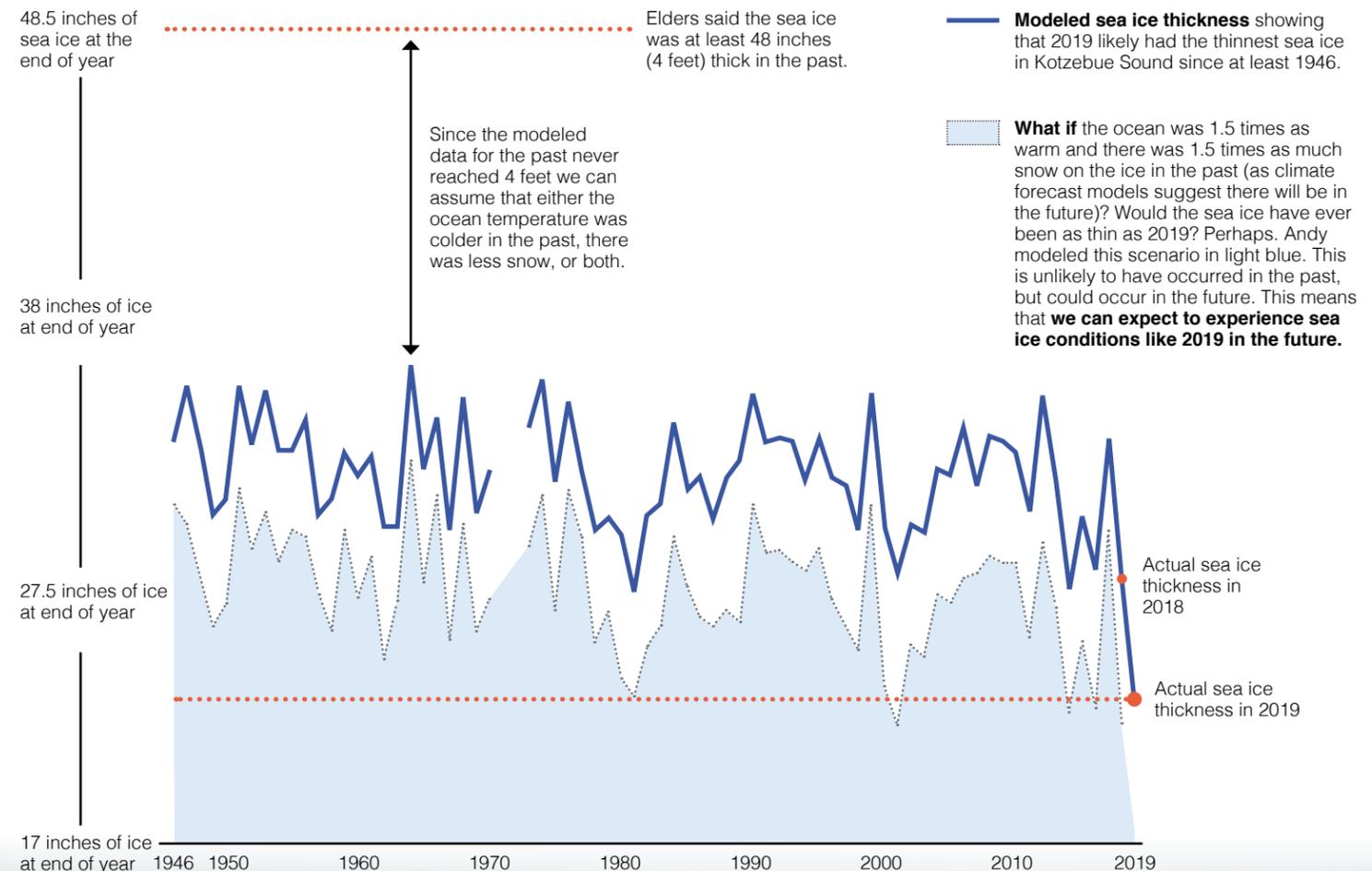
Unfortunately there are not records of sea ice thickness in the Sound going back in time, but Elders indicate that historically the sea ice was commonly four to five feet thick by end of the season. For comparison, in 2019 the ice was less than two feet thick.

Ikaagvik Sikukun scientist **Andy Mahoney** used a computer to model (simulate) sea ice thickness based on different past scenarios. He used the following three things, known to

impact sea ice thickness, to set up his model:

1. Air temperature (available back to 1940s)
2. Ocean temperature (no historical data, so in model used 2019 temperatures)
3. Snow depth on the ice (no historical data, so in model used 2019 snow depth)

Andy simulated the potential sea ice thickness back in time using the actual air temperature from each year, but the ocean temperature and snow depth from 2019. The dark blue line shows that in the past the sea ice was likely never as thin as it was in 2019.



Modeled sea ice thickness showing that 2019 likely had the thinnest sea ice in Kotzebue Sound since at least 1946.

What if the ocean was 1.5 times as warm and there was 1.5 times as much snow on the ice in the past (as climate forecast models suggest there will be in the future)? Would the sea ice have ever been as thin as 2019? Perhaps. Andy modeled this scenario in light blue. This is unlikely to have occurred in the past, but could occur in the future. This means that **we can expect to experience sea ice conditions like 2019 in the future.**



Photo by UAF

Making a documentary



Sarah Betcher
Documentary filmmaker

Arctic research on camera

Filmmaker **Sarah Betcher** joined Ikaagvik Sikukun to create a documentary and several short films about Ikaagvik Sikukun science. The films give viewers a front row seat as Elders and scientists snowmachine across the frozen sea ice in search of seals, and from the air as unoccupied aerial vehicles (UAV) soar across the sky taking measurements of the sea ice.

Ripping wind and freezing temperatures cut through clothes, freezing fingers and toes as scientists and Elders measure ice and snow. Sunny spring days quickly turn to flat light, making navigating to and from field sites challenging. The films capture these challenges, shedding light on what life is like while doing science in the harsh, frozen Arctic.

Ikaagvik Sikukun's films not only tell a science story, but they also record the current state of the rapidly changing Kotzebue Sound and preserve the Indigenous Knowledge shared by the Elders.

Documentary film themes



Scientists Each Ikaagvik Sikukun scientist was filmed while taking measurements related to marine mammals or what happens on and under the ice in Kotzebue Sound. The films also show the 'behind-the-scenes' science, like analyzing data and sharing findings in science journals.



Elders The films show Elders sharing their Indigenous Knowledge of Kotzebue Sound, guiding the science team by snowmachine, collecting data, installing and maintaining instruments, and hunting *ugruk*, *natchiq* (ringed seal), and *tuttu* (caribou).



Unoccupied aerial vehicles (UAV, or drones) The films show how scientists used UAVs to collect data in Kotzebue Sound when it was unsafe to travel on the ice. The films also show the UAV "cold climate" testing in Oregon which ensured they could withstand the Arctic environment.

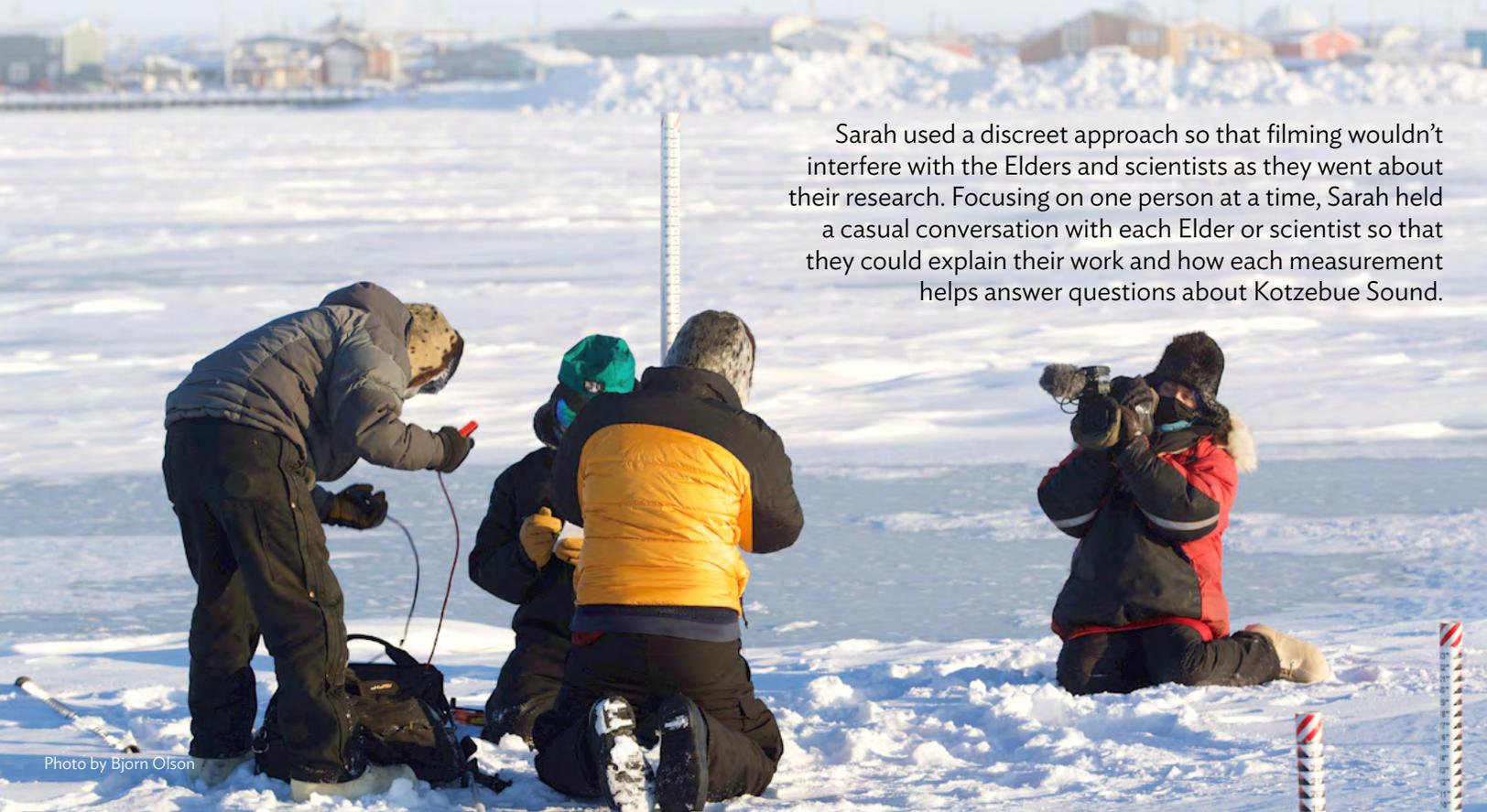


Science instruments The films show how specialized science instruments were designed and installed to answer questions about the water, weather and sea ice of Kotzebue Sound.



Community The films show how Ikaagvik Sikukun connected with the Kotzebue community by visiting the middle and high school, the UAF Chukchi campus, the radio station and other local organizations.

The screening of Ikaagvik Sikukun's feature length documentary film in Kotzebue has been postponed due to coronavirus. Until then, watch the short themed videos about the project by searching for Ikaagvik Sikukun on **YouTube**.



Sarah used a discreet approach so that filming wouldn't interfere with the Elders and scientists as they went about their research. Focusing on one person at a time, Sarah held a casual conversation with each Elder or scientist so that they could explain their work and how each measurement helps answer questions about Kotzebue Sound.

Photo by Bjorn Olson



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