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

Ikaaġvik Sikukun—Ice bridges

The frozen environment around Kotzebue Sound is changing. Ikaaġvik Sikukun—Iñupiaq 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 newsletter about the project.

Ikaaġvik 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 Ikaaġvik Sikukun documentary was filmed. If you are interested in reading past newsletters or learning more about the project visit www.ikaagviksikukun.org.

Project timeline

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Guided by Elders
The Ikaaġvik 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 Ikaaġvik 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 data, and learned from decades of observing the animals, ice, water and weather in and around Kotzebue Sound. The Elders stressed that overcoming climate change will take action and national leaders, scientists and Indigenous communities working together.

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 Ikaaġvik Sikukun] together in written form will help the younger generation catch up.”

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: “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 Ikaaġvik Sikukun, the Alaska Arctic Observatory and Knowledge Hub will continue local efforts to gather sea ice measurements and observations of wildlife and coastal waters.

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 5°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.”

Ikaaġvik Sikukun acknowledges that there is a long history of science conducted in ways that were not equitable to Alaska Native communities. Ikaaġvik 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, [Ikaaġvik Sikukun] worked with the locals and with us Elders. And by doing that you get better results.”

Several findings from Ikaaġvik 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 lot of conditions are going to look like for harvesting in certain areas or traveling.”

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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. Sea ice first broke up and was gone from interior of Kotzebue Sound around mid-June rather than early July.

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 hunting safe and affordable, the broken ice floes need to be relatively close to town.

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.

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.

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 Qikiqtarjuaqutut 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.

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.

Current ugruk hunts

Around 2010 sea ice patterns changed in Kotzebue Sound. Ice floes disappeared 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.
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. Ikaaġvik 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.

Sea ice

In these maps, the red area shows where there was ice in April 2019. The lightest ice in Kotzebue Sound (left) and Chukchi Sea (right) for previous Aprils are shown as a transparent white layer. The winter the area for the first time during the past 20 years the area had ice.

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 (1.5–2.2°C) degrees warmer than normal.

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 the end of the season. For comparison, in 2019 the ice was less than two feet thick.

Ikaaġvik 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)

And 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.

Simulating the past

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.

Each colored bar represents a different year (see the key below to match the colors to a year)

Bars pointing up mean that in those years there was more sea ice than normal

Bars pointing down mean that in those years there was less sea ice than normal

What if the ocean was 1.5 times warmer 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 simulated this scenario to 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.
Arctic research on camera

Filmmaker Sarah Betcher joined Ikaaġvik Sikukun to create a documentary and several short films about Ikaaġvik 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.

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Making a documentary

Sarah Betcher
Documentary filmmaker

Documentary
film themes

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.

Scientists Each Ikaaġvik 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.

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 Ikaaġvik 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 Ikaaġvik 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 Ikaaġvik 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.