



BEST-BSIERP *Bering Sea* PROJECT

UNDERSTANDING ECOSYSTEM PROCESSES IN THE BERING SEA 2007–2013

Synergies Between Traditional and Western Environmental Knowledge

LINKING LOCAL AND GLOBAL

Between 2006 and 2010, the Calista Elders Council (CEC), the primary research organization for Southwest Alaska, worked with elders and community members from five Nelson Island communities on the Bering Sea coast to document the natural and cultural history of their homeland.

The last 60 years has seen dramatic change in the way Nelson Islanders inhabit their land. Perhaps most significant is the concentration of people into five permanent villages and the abandonment of hundreds of small camps and settlements that were still vibrant through the 1940s. These five villages—ranging in population sizes from 250 to 600—are small by modern standards, but huge compared to the tiny settlements of the past.

As people gather closer together on and around Nelson Island, the island's resources, although still abundant, are more distant. People still harvest from the fishing sites their parents used, but at a cost many find difficult to afford. Now men often travel miles, either by gasoline-hungry snowmobile or skiff, to set their nets and traps.

How We Did It

We interviewed Nelson Islanders to learn their unique, nearshore perspective on the Bering Sea. While oceanographers attempt a comprehensive understanding of the ocean, Yup'ik hunters are most concerned with surface features of the water and ice cover because of their impact on hunting success and safety of travel. Yet, coastal Yup'ik residents also see the ocean as an integral part of *ella*, a word they translate as weather, world, universe, or awareness, depending on context.

In the many warnings elders give of a dangerous and unpredictable ocean, they also identify key research problems. One example is connecting the response of the nearshore ice regime to ocean swells and tides. Yup'ik people have many words describing the appearance and response of ice to currents and winds. One opportunity for western science/traditional knowledge synergy could be to start with communication that enables sharing such insights and knowledge, followed by focused research partnerships to study the linkage of wind, wave, and ice dynamics.

continued on page 2

The Big Picture

The emerging question that concerns both Yup'ik and non-Yup'ik ocean observers is: How can we link local observations with large-scale environmental issues? Our oceans are now being monitored. If we add to this a greater understanding of the seas immediately offshore, the contrasting scale of global versus local can be bridged. How do we make this potential integration a reality? We can make a start by listening to Yup'ik community members, engaging those whose understanding of the ocean is not only useful but represents a unique worldview. They have long accepted personal responsibility for changes in their homeland. They lead by example.

Fig. 1



Ice mixed with mud on the north shore of Toksook Bay, May 2008.

Fig. 2



Visiting officials, including Senator Mark Begich, inspect the eroding shoreline at Newtok, spring 2010.

Another opportunity for collaboration is provided by meteorologist Uma Bhatt who used satellite images to demonstrate the links between diminishing Arctic sea ice and changes in the Arctic terrestrial ecosystems. She and her colleagues found that areas in the High Arctic have experienced the largest changes, with some exceptions over land regions along the eastern Bering. In discussions with Bhatt, elders pointed out both a decline in tundra berry production and the timing of the harvest in recent years, which they associate with a decrease in fall rain and snow cover. Winds during the growing season were another factor. These observations point to the need to look at changes in wind and precipitation, as well as sea ice cover, to explain changes in coastal ecosystems.

Elders also shared valuable observations about sediment-laden ice--a common characteristic of the

shallow, muddy coastal environment (Figure 1). Sea ice scientist Hajo Eicken notes that while coastal erosion is often attributed to a lack of sea ice, in fact sea ice is the most effective mover of sediments in waters with seasonal ice cover. How the ice interacts with the coast is not well understood and cannot be captured by satellites. Local observers recording locations of dirty ice can help with modeling sediment transport by ice.

The rise of sea level and related effects of increased fall storm surges are of particular concern, both to ocean scientists and coastal residents. Elders' long-term observations of these changes may be particularly valuable. The village of Newtok, 10 feet above sea level, was established in 1950 on the low-lying tundra north of Nelson Island. Men chose the site because it was accessible to barges bringing in lumber for the new school. Despite Newtok's marshy location, it doubled in size to 350 today. At the same time Newtok was growing, the land was sinking and eroding at an alarming rate (Figure 2). A move to relocate the village to a bedrock site on Nelson Island is already underway.

Why We Did It

Yup'ik coastal residents of all ages are concerned by the unprecedented changes in climate and ecology they are witnessing along the Bering Sea coast, including changes in the ranges and availability of fish, mammals, and birds; coastal erosion; later fall freeze-up and earlier spring breakup; unusual weather patterns; and increased storminess. Community members feel strongly that elders' perspectives on past periods of resource scarcity, storm

surges, and unusual ice and weather conditions, as well as their views on ongoing changes in the Bering Sea ecosystem, will be invaluable in preparing them for the future.

Our work with Yup'ik community members has been a major collaborative effort during which we made a serious attempt to co-produce the knowledge we share. Meetings went beyond consultation and cooperation, with mutual sharing of ideas and understandings. These deep collaborations offer powerful alternatives to more conventional research approaches.

Ann Fienup-Riordan, Calista Elders Council (CEC)
Mark John, CEC
Alice Rearden, CEC

The Bering Sea Project is a partnership between the North Pacific Research Board's Bering Sea Integrated Ecosystem Research Program and the National Science Foundation's Bering Ecosystem Study. www.nprb.org/beringseaproject

Fig. 3



Mark John and Alice Rearden looking over archival photos with Maryann Andrews of Emmonak and Barbara Joe of Alakanuk during an elders' gathering in Anchorage, April 2012.