



Environmental and Social Research in Central Beaufort Sea Oil and Gas Fields: Successes and Challenges

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Hilcorp

A Company Built on Energy

Integrity ★ Urgency ★ Ownership ★ Alignment ★ Innovation



Environmental and Social Research

- Hilcorp presence in the Arctic – background
- Environmental and social research projects
 - Permit-driven, voluntary, in-kind support
- Successes and challenges
- Ideas for the future of O&G industry-supported research in the arctic



Hilcorp Alaska LLC in the Arctic

- November 2014 Hilcorp purchased BP Alaska assets:
 - Milne Point Unit
 - Northstar Island
 - Endicott Main Production Island and Satellite Drilling Island
 - Liberty Development Project



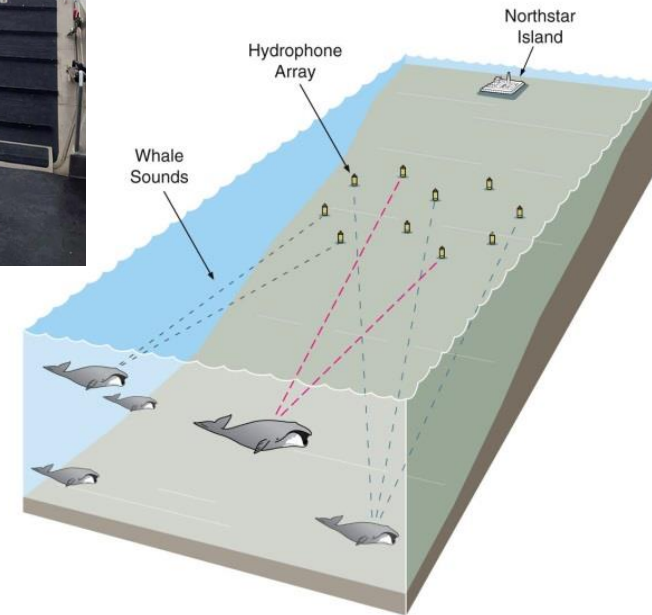
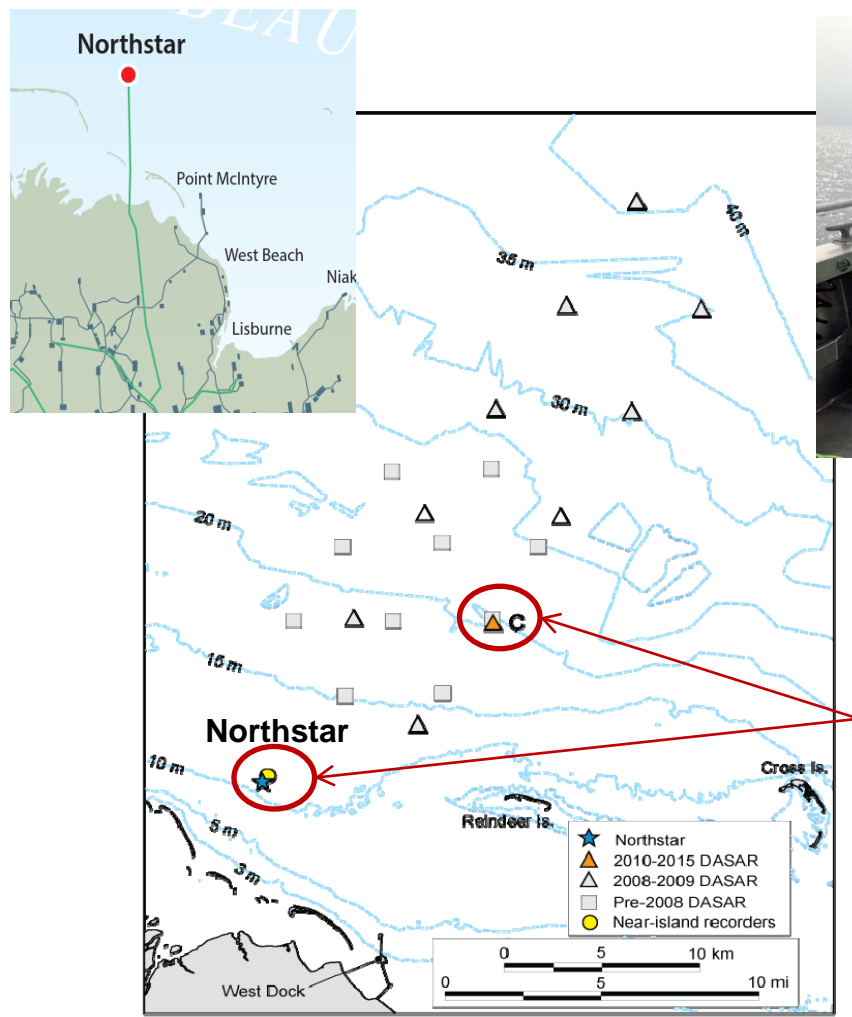


Permit Driven Studies

- Environmental monitoring studies mandated by operating permits
 - Northstar Acoustic Monitoring
 - Endicott Nearshore Fish Monitoring
 - Endicott Lagoon Bathymetry Study



Northstar Acoustic Monitoring



2010-2016
recorder
configuration



FIGURE 2.1. Locations of offshore and near-island DASARs with respect to Northstar Island, Aug.–Sept. 2015. Two DASARs were deployed at location C and three at the near-island location just north of Northstar (see Fig. 2.2). For comparison, DASAR locations used in prior monitoring years are also shown.



Northstar Acoustic Monitoring

- Every fall acoustic recorders are deployed near the Northstar production island
- Original design included a large array of recorders
- Currently recorders deployed in two locations
 - Approximately 450 meters (1500 ft) seaward of the island; records island sounds
 - Approximately 15 kilometers (9 miles) seaward of the island, records bowhead whale calls as they pass east to west during fall whale migration
- Presence of seals around Northstar is also recorded by daily observations from the island



Northstar Acoustic Monitoring

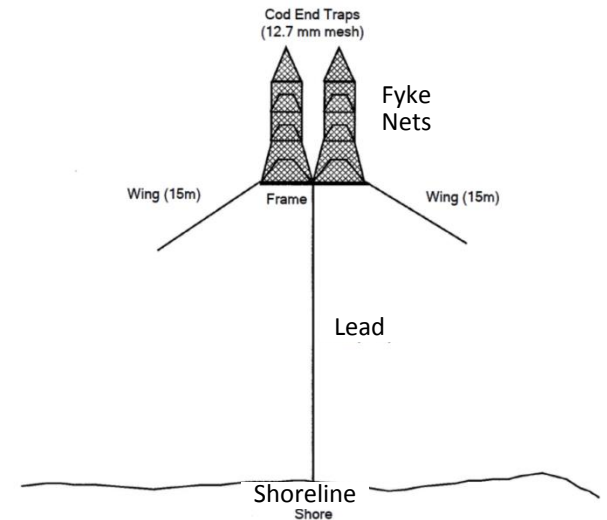
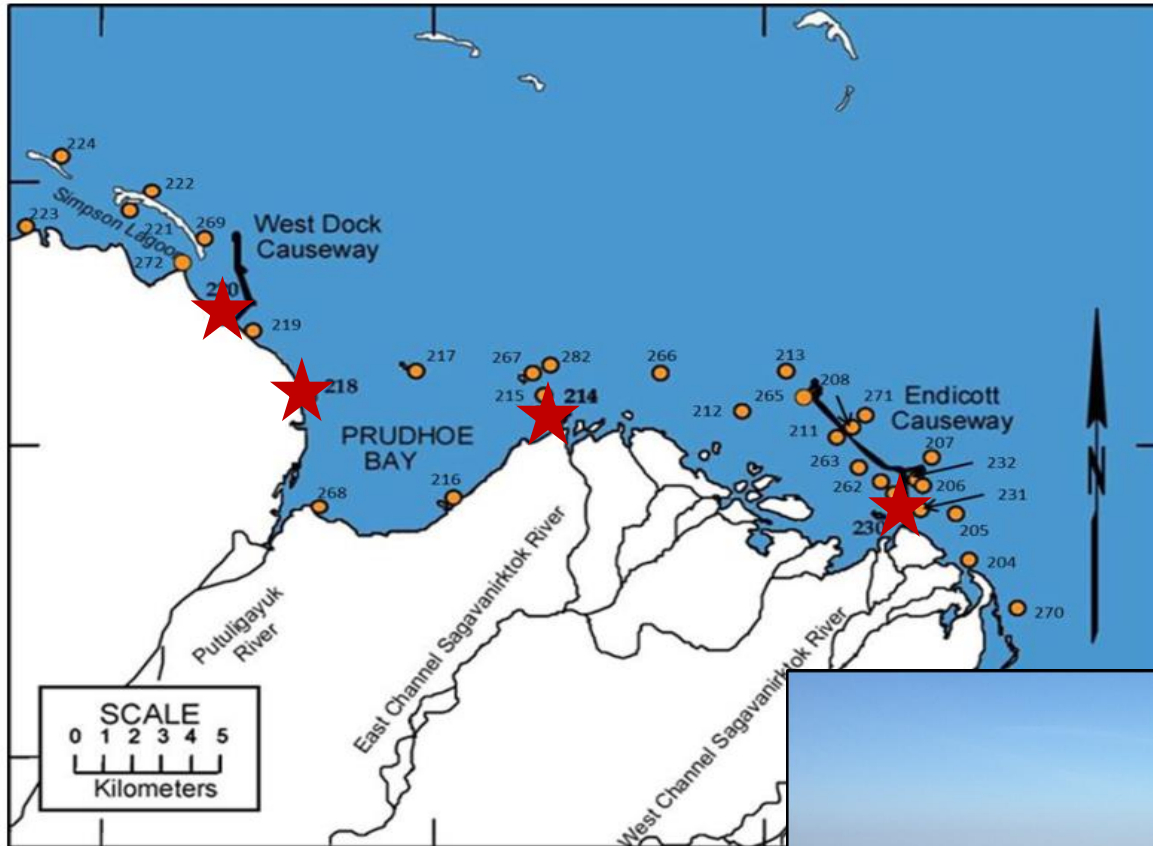
General Trends Over 15 Years (2001-2016)

- Level of broadband sounds nearshore (near the island) and offshore is dominated by sound generated from sea state (wind and waves) and by the occurrence of transient high-level sound spikes from passing vessels
- Baseline broadband levels fluctuate approximately in parallel with wind speed
- Results of seal monitoring suggest that on-going Northstar activities have no measureable/detectable effect on seals
- Acoustic data from 2001-2004 (full array) shows there were limited but statistically detectable changes in the distribution of localized bowhead whale calls in the southernmost part of the migration corridor during periods with relatively noisy island operations*
- A similar analysis of call-location data from 2009 did not identify a consistent relationship between offshore distance of bowhead whale calls and Northstar sound, possibly because of confounding by reactions of bowhead whales to sound pulses received from a seismic survey that was ongoing far to the east in 2009

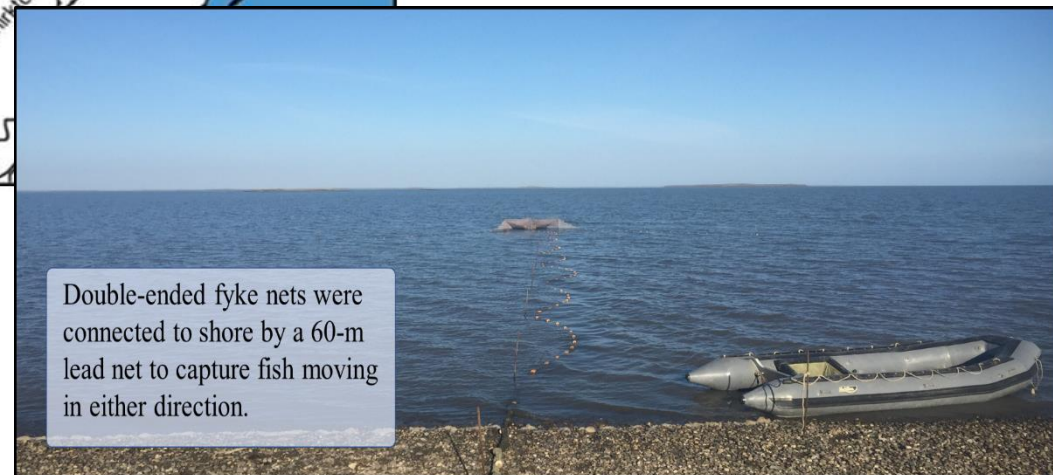
* The change in call detection could be the result of whales deflecting away from the island, the nearest whales merely reducing their calling rates (and not deflecting) in response to increased sounds, or both in combination. The effect might also be at least partly related to changes in whale headings, given newfound evidence of directionality in bowhead whale calls.



Near-shore Fish Migration Study



- Sites sampled in 1985-1996
- ★ Sites sampled in 1997-2015





Near-shore Fish Migration Study

- Annual surveys since 1985
- Originally designed to assess effect of Endicott causeway on fish migration
- Early data showed there was likely restriction of fish migration
- As a result, breaches with bridges were installed in the causeway
- Changes in fish counts were seen immediately following installation of breaches
- One of the most comprehensive and continuous databases on nearshore Arctic fishes



Near-shore Fish Migration Study

- General Trends over 30+ years
 - Much variability over the years in catch per unit effort (CPUE, i.e., number of fish counted in nets each day during open water season)
 - No detectable effect of Endicott Causeway on fish migration after breaches installed
 - Wind-driven currents effect young-of-the-year (YOY) recruitment of Qaaktaq (Arctic Cisco), which is an important subsistence species for the village of Nuiqsut
 - No detectable gross changes of fish communities from expansion of Endicott satellite drilling island (SDI) in 2009 (analysis of Endicott Lagoon bathymetry study is a separate project)



Near-shore Fish Migration Study

2

Researchers catch and measure some young Qaaktaq each summer.



3

Fish grow for 6 to 7 years in the Colville and nearby waters.

BEAUFORT SEA

→ Adult
← Juvenile

1

Young Qaaktaq move west when winds blow from the east.

Colville River

Nuiqsut

Prudhoe Bay

Kaktovik

Mackenzie River

4

Nuiqsut fishers catch older Qaaktaq each winter.



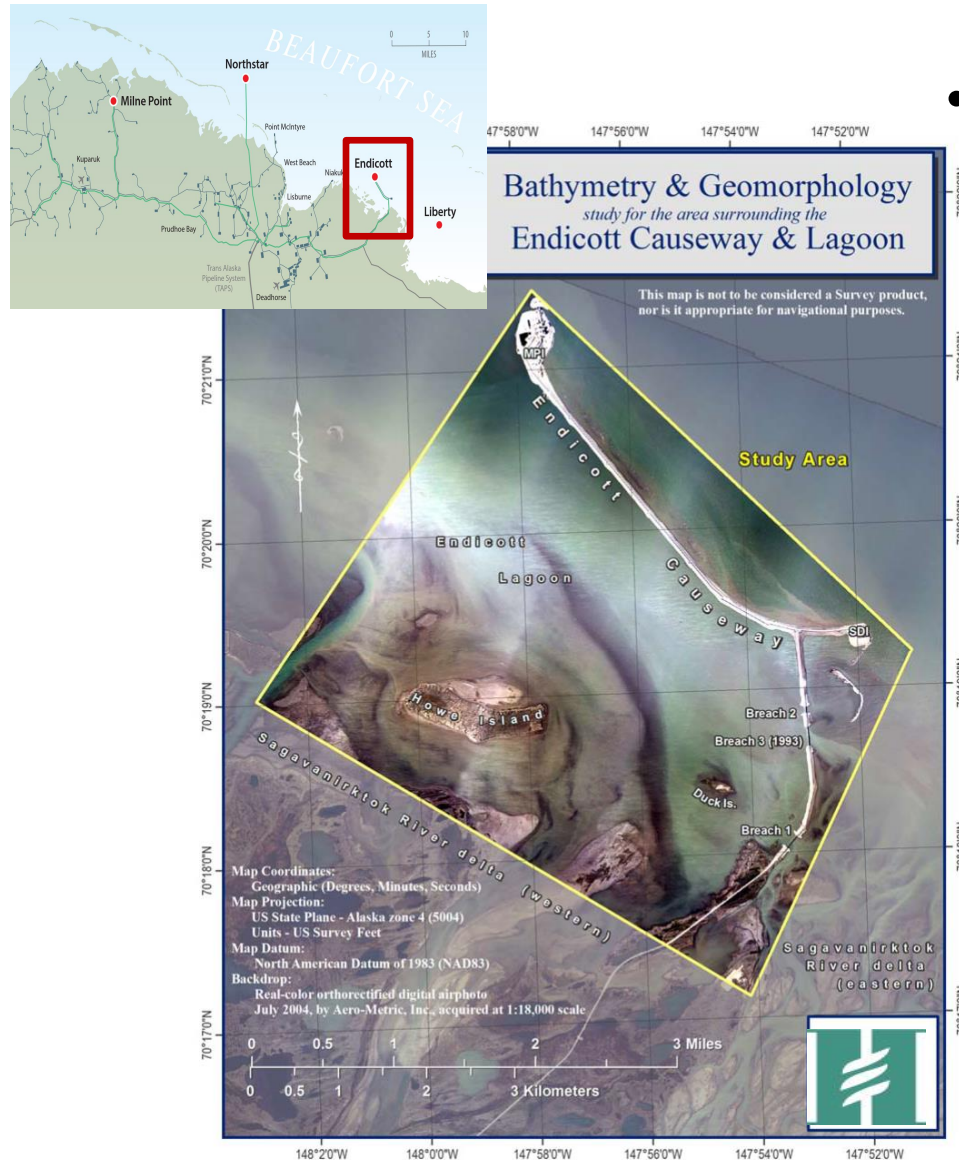
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Adult Qaaktaq migrate back to Mackenzie River.

UNITED STATES
CANADA



Endicott Lagoon Bathymetry Study

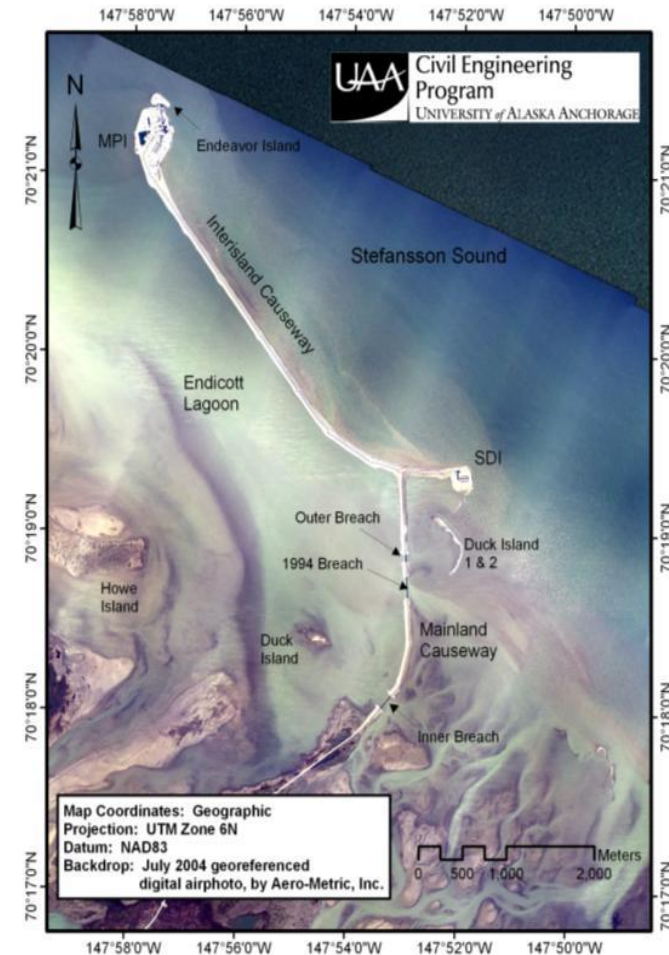


- **Endicott Lagoon Bathymetry and Geomorphology**
 - Required every 5 years to assess long term effects of the Endicott causeway
 - Monitors sedimentation and erosion rates in the Endicott Lagoon
 - Compares bathymetric data and aerial photography at ~5 year intervals



Endicott Lagoon Bathymetry Study

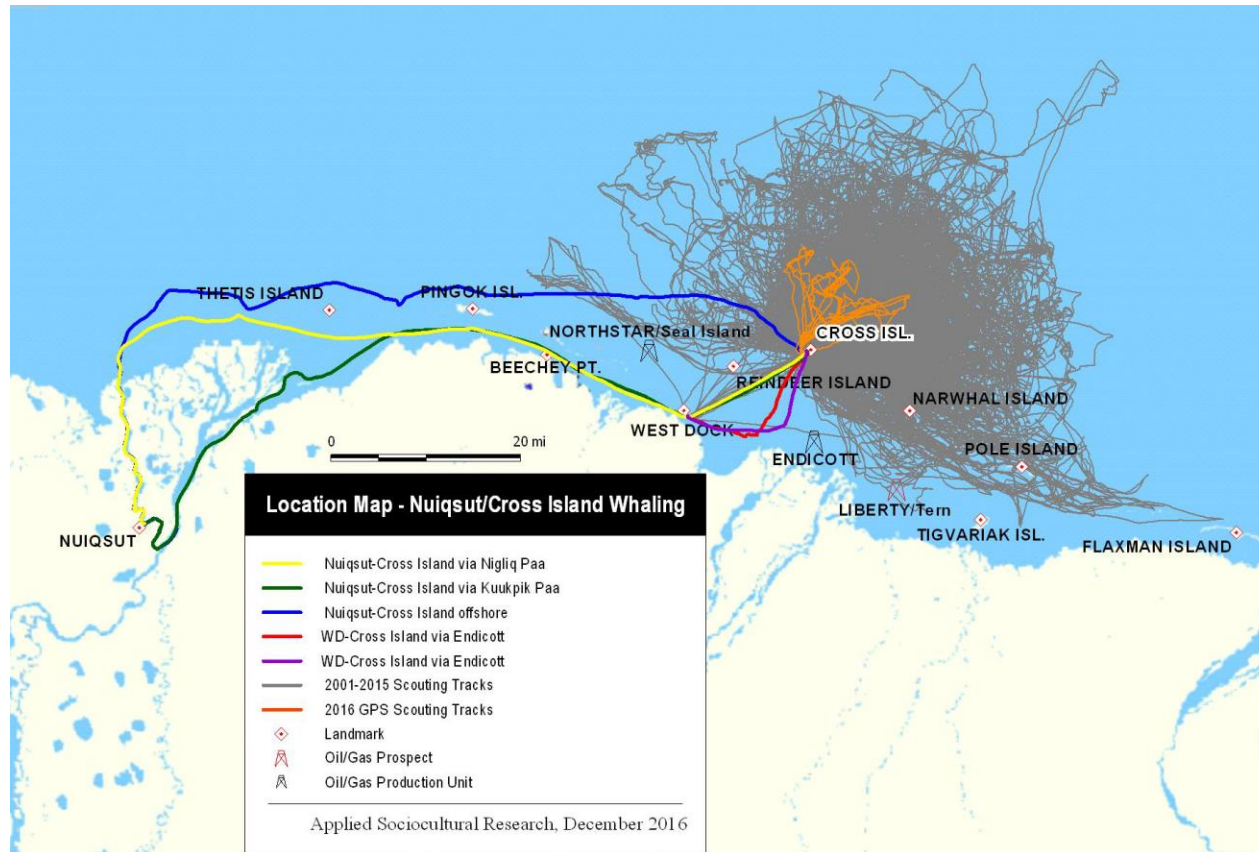
- General trends 1989-2010
 - Construction of the Endicott causeway in 1986 created a relatively quiescent hydrodynamic environment in the northwest section of the Endicott Lagoon resulting in increased sedimentation rates
 - Some areas of increased erosion were noted near the inner breach in the causeway
- General trends 2010-2015
 - Reduction in the sedimentation rate in the northwest section relative to 1989-2010 but increase in rate in some areas of the lower section
 - Continued erosion near the causeway breaches indicating fish passage not likely impeded





Voluntary Study

- Subsistence whaling survey at Cross Island
 - Since about 1986, Village of Nuiqsut travels to Cross Island every fall to harvest their subsistence quota of bowhead whales





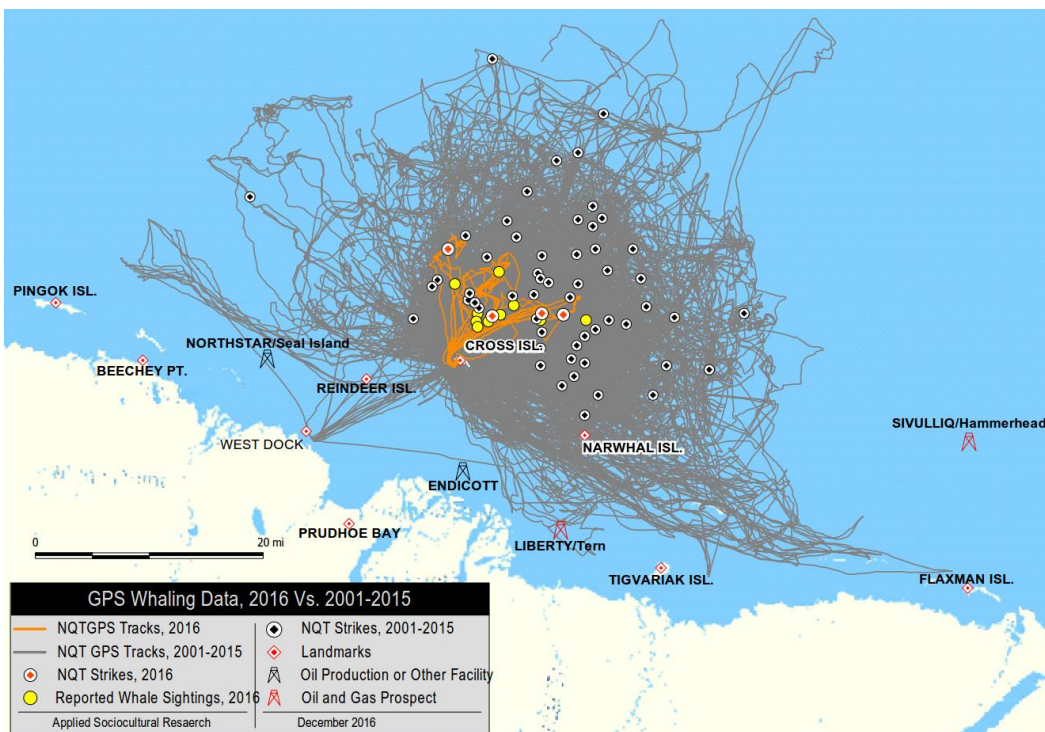
Subsistence Whaling Survey at Cross Island

- Survey initiated in 2001 by US Department of Interior - Bureau of Ocean Energy Management (BOEM)
- Triggered by interagency reviews of environmental impact statements and development and production plans for Northstar Island and the Liberty prospect
- BOEM funded the survey through 2012
- BP Alaska voluntarily funded survey 2013-2014
- Hilcorp chose to continue the study 2015-present in response to concerns of Nuiqsut hunters about the effects of industrial activities on whale hunting and from a direct request to continue funding the survey



Subsistence Whaling Survey at Cross Island

- Systematic recording of observations of whaler activities and hunting success at Cross Island
- Collection of daily vessel locational information from handheld GPS units
- Documentation of whalers' self-reports and perceptions





Subsistence Whaling Survey at Cross Island

- General trends 2001-2016
 - Average of 5 crews go out each year
 - Average length of whaling season in 25 days
 - 12 out of 16 years the whalers have harvested >120 feet of whale, the amount considered to meet the perceived minimum needs of the Nuiqsut community (quota is 4 whales)
 - Average whale length is 38 feet
 - Factors affecting whale hunt success
 - Weather and sea state
 - Ice conditions
 - Disturbance from non-whaling vessel traffic*

*Hilcorp limits vessel traffic and other activities during the whale hunt to reduce our potential impacts through an agreement with The Alaska Eskimo Whaling Commission (AEWC) call the Conflict Avoidance Agreement (CAA)



In-Kind and Other Support

- Polar Bears International – polar bear denning research
- Argonne National laboratory – arctic tundra polygon carbon stocks
- University of Texas Marine Science Institute – Stafansson Sound boulder patch research
- Alaska Department of Fish and Game – North Slope grizzly bear research
- University of Alaska Fairbanks – Detecting methane in the marine environment: research and response protocols



Successes

Working with the University of Alaska

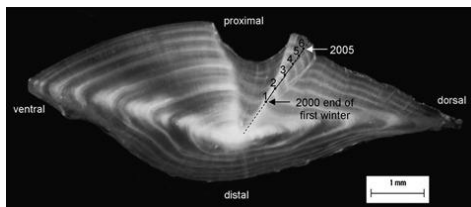


- Funding and logistics opportunities can be leveraged to provide educational opportunities outside of Hilcorp's particular needs



- Academic opportunities from the fish monitoring study:

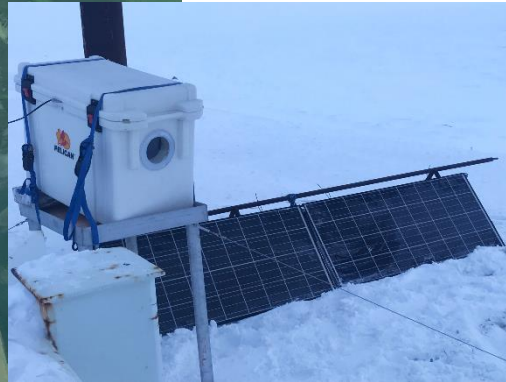
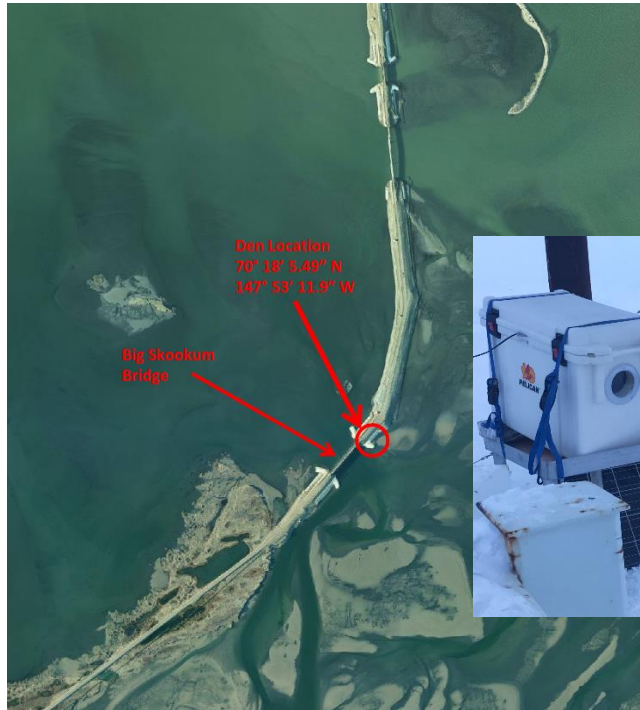
- Time series analysis of environmental factors influencing fish community assemblages
- Effects of climate change on bioenergetic dynamics of juvenile broad whitefish
- Arctic cisco growth chronology (using otoliths)





Successes

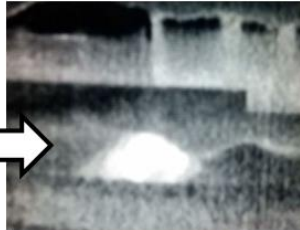
Working with Polar Bears International



- Hilcorp provides logistics support, room and board, storage unit; BP provides direct funding
- PBI provides useful data from their research and assists us with specific polar bear denning issues
 - 2015-2016 Endicott Road polar bear den



Den entrance along Endicott Road



Momma bear's heat signature in her den





Challenges

- Balancing industry-required studies with need for more integrated ecosystem-wide research
- Typical studies required by operating permits are appropriate at the beginning of a development and provide some understanding but...
 - limited to a small geographic area immediately surrounding our operating units (e.g. Northstar acoustic study)
 - And sometimes don't lead to meaningful mitigation measures
- How can the money spent to conduct long-term industry-required studies be better used to address broader emerging issues and cumulative impacts region wide?



Ideas for the Future

- Establishing a fund to which O&G industry members could contribute to satisfy long-term operating permit obligations for research – similar to the compensatory mitigation program for wetlands impacts
- Establish a system where the research community is directing and doing the long-term research, not the O&G industry
- Identify existing or emerging region-wide issues in the Arctic that warrant research funding
 - Increased ocean shipping and ocean tourism in the Beaufort and Chukchi
 - Retreating/changing sea ice conditions
 - Shifts in diversity and abundance of marine mammals, fishes, terrestrial, and avian species (e.g., rare species becoming more frequent)
 - Effects of the above on subsistence activities



Summary

- Lots of environmental studies are being executed in the central Beaufort Sea area by many members of the O&G community
- Some studies are more useful than others
- Money spent on individual projects in some cases may be better leveraged to support ecosystem-wide research of emerging arctic issues
- The conversation has started and I'm hopeful for the future of industry-supported research in the arctic.



Thank you!
Questions?