Alaska Fisheries Science Center Surveys in the Arctic: Preliminary Findings from Summer/Fall 2018

UPDATED OCTOBER 24, 2018

We study marine ecosystems. Our research supports sustainable management and conservation of Alaska marine species. We collect a variety of biological, ecological, and environmental data to learn about the health and size of zooplankton, fish, crab, marine mammal and other species populations and the key areas where these species feed, breed, and grow.

Through long-term, consistent data collection during dedicated research surveys, we can monitor trends in marine species populations and changes in their distribution. This information helps Alaska Native and coastal communities, and resource managers better prepare and respond to changes in Alaska marine ecosystems to ensure sustainable use of marine resources, food security and coastal resiliency.

NOAA FISHERIES

Vessel-based Studies of Ice-associated Seals

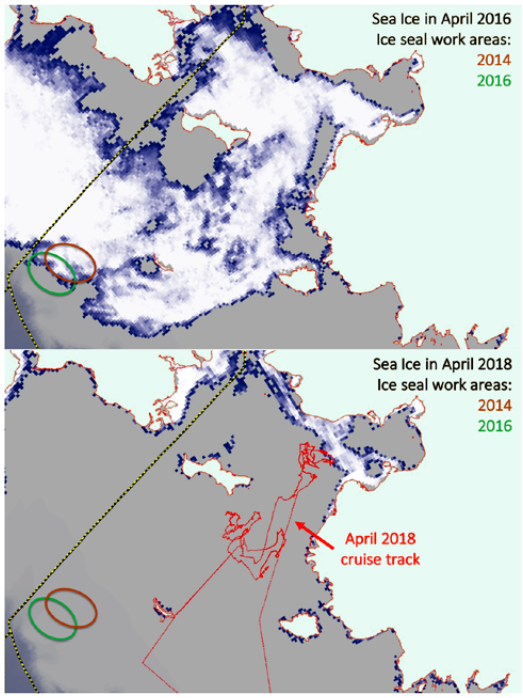
Why were you working in the area?

NOAA's Alaska Fisheries Science Center's Marine Mammal Laboratory collects information to monitor the abundance of bearded, ringed, spotted, and ribbon seals. We are also studying their habitat needs, health and condition, diet, and the relationships between different populations of each species.

What did you do?

On March 30-April 24, we conducted an ice-associated seal research survey onboard the NOAA Ship Oscar Dyson in the Bering Sea. The primary objectives for the survey were to deploy satellite-linked tags on ribbon, spotted, and bearded seals, which are closely associated with sea ice during this time of year, and to collect biological samples from the seals.

Where did you go?



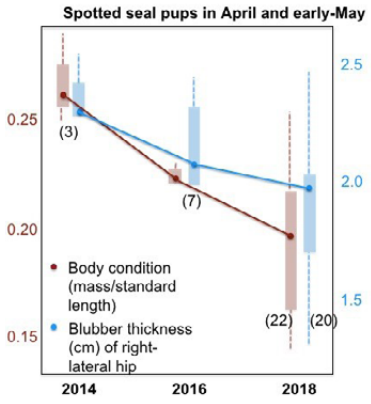
On past ice-edge surveys in April, typically, ribbon and spotted seals have been found in high densities at the ice edge SW of St Matthew Island, which is where our survey effort is usually conducted. But in 2018, the nearest ice edge that could be accessed for this study was between St. Lawrence Island and Norton Sound, about 235 miles to the NE.

What are the key preliminary findings or impressions?

This year, we measured (i.e., length, girth and mass) of 27 spotted seals (5 adults and 22 pups) and 2 bearded seal pups. We sampled mother-pup pairs. There were very few ribbon seals on the little ice that was encountered. There is no evidence that the ribbon seals went northeast into Norton Sound. It remains unknown where they went and whether their reproduction was compromised by the absence of ice in their usual breeding grounds. It is possible that they went into Russian waters, but no reports were received about unusually high numbers of ribbon seals being seen there. Among the few adult seals that were sampled and tagged, all of which were spotted seals, no active cases matching the recently-closed Northern Pinniped Unusual Mortality Event were observed; in 2014 and 2016 several cases were observed in ribbon seals.

Although the samples are small, there appears to be a continued declining trend in body condition and blubber thickness in spotted seal pups from 2014 to 2016 to 2018.

More walrus and bearded seals were seen than usual, likely because the survey was farther north, in areas where these species tend to be more prevalent than in the more typical ice edge zones to the south.



What are the impacts or implications?

The data, together with information collected during similar surveys since 2005, will help us better understand timing of hauling out (critical for calculating abundance estimates from aerial surveys); dive behavior and seasonal movements (useful in identifying important habitat); and the health and condition of the seals. All of this information is important for Alaska Native communities who rely on ice seals, and for monitoring ice seal populations in accordance with U.S. federal laws.

How and when will you be communicating with communities?

We shared preliminary results with the Ice Seal Committee at their annual meeting in May, 2018, and plan to share results with other organizations and Bering Strait communities in November during the Kawerak Regional meeting and with the Bering Strait region communities via in-person meetings, radio and newspaper interviews and conference calls. Preliminary survey results will also be shared during the Alaska Federation of Natives meeting in Anchorage, AK in October.

What are your future plans?

We hope to conduct this survey again in 2020 subject to funding availability.

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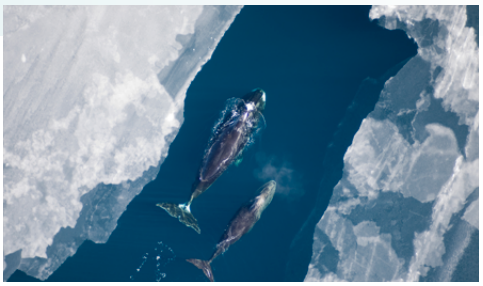
Aerial Survey of Arctic Marine Mammals



Why were you working in the area?

Under an Interagency Agreement between the Bureau of Ocean Energy Management and the Alaska Fisheries Science Center, an Aerial Survey of Arctic Marine Mammals (ASAMM) is conducted each year in the summer and fall in the eastern Chukchi and western Beaufort seas. The purpose of the survey is to document the distribution and relative abundance of bowhead whales, gray whales, beluga whales, ice-associated seals, walruses, polar bears, and other marine mammals in areas of potential seismic surveying, drilling, construction, and production activities.

What did you do?

From July 1 to October 31, our scientists collected information via airplane to monitor the spatial and temporal variability in the density, distribution, and behavior (including calving/pupping, feeding, hauling out) of marine mammals (cetaceans, ice-associated seals, walruses, and polar bears) in the Alaskan Arctic. During line-transect aerial surveys, we collect supplementary information from aerial photo-identification data. Information collected also helps us to describe the annual migration of bowhead whales across the U.S. Arctic.

Where did you go?

The surveys is conducted in the eastern Chukchi and western Beaufort seas.

What are the key preliminary findings or impressions?

Through the first three months of the 2018 season, ASAMM flew over 400 hrs. and 100,000 km. The northeastern Chukchi Sea study area was devoid of sea ice by mid-August, but sea ice remained in the western Beaufort Sea study area until well into September. The presence of sea ice and colder than usual water temperatures may have affected summer bowhead whale behavior, as very few bowhead whales were observed in July and August. Bowhead whales may have stayed in the Canadian Beaufort Sea to take advantage of more productive feeding grounds.

Gray whales were observed primarily in two areas, an area, rich in bottom-dwelling species in the southcentral Chukchi Sea and south of Hanna Shoal in the northeastern Chukchi Sea, and nearly all were actively feeding. Far fewer gray whale calves were seen compared to recent years.

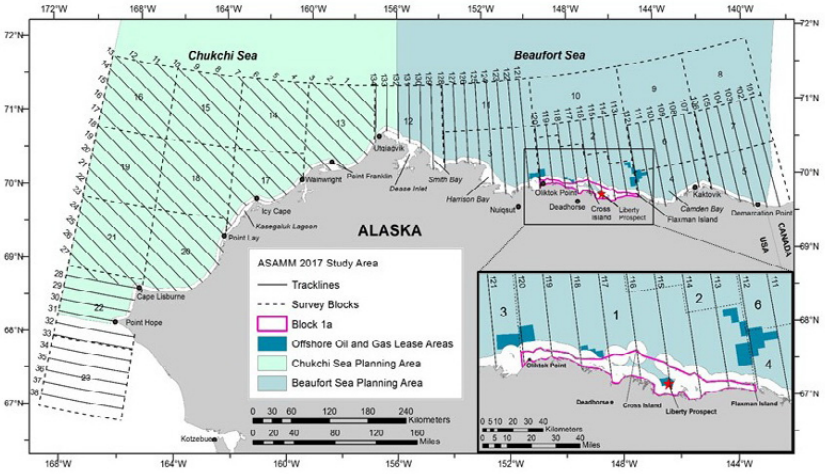
Fin and humpback whale occurrence in the southcentral Chukchi Sea appears to be increasing with sightings occurring in 2018 whenever surveys were conducted there.

Other cetaceans observed in 2018 included minke whales, killer whales, and harbor porpoise. Walruses started hauling out on a barrier island near the village of Pt. Lay in late August, and ASAMM documented the size and scope of the haulout on four different days.

Sightings of polar bears have been far fewer than in past years. Most bears were seen on shore or swimming close to (<1 km) shore, but a few bears were sighted swimming 20-95 km from shore in ice free waters.

What are the impacts or implications?

Results are used to provide near real-time data or derived products, such as graphical data summaries, on marine mammals and environmental conditions in the U.S. Arctic to the Bureau of Ocean Energy Management and NOAA Fisheries. We also provide information on marine mammal abundance and distribution to Alaska Native communities for use in management of subsistence hunts and assessments of human impacts on marine mammal resources. Collected data also provides an objective wide-area context for understanding marine mammal ecology in the U.S. Arctic to help inform management decisions and interpret results of other small-scale studies.



How and when will you be communicating to communities?

During spring, information about upcoming ASAMM surveys are shared with Alaska Native communities in an outreach pamphlet that provides an overview of all of the Alaska Fisheries Science Center's marine mammal research activities. During the field season, daily reports summarizing preliminary results from ASAMM are posted to the NOAA Fisheries' website within 24-72 hrs. of the completion of each survey flight. ASAMM communicates flight plans with the village of Point Lay if survey flights are expected to pass offshore of the village when walruses are hauled out in mass. The ASAMM historical database and additional results from ASAMM are available on the NOAA Fisheries' website. Preliminary survey results will also be shared during the Alaska Federation of Natives meeting in Anchorage, AK in October.

What are your future plans?

We hope to conduct this survey again in 2019, subject to funding availability.

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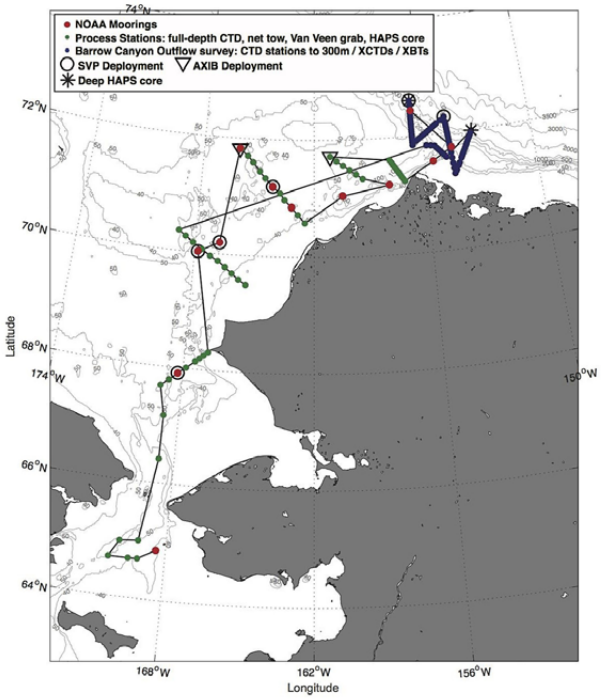
Distributed Biological Observatory Collaborative Research Survey

Why are you working in the area?

NOAA Fisheries' Alaska Fisheries Science Center and NOAA Research's Pacific Marine Environmental Laboratory collaborate as part of a multi-institutional cross-disciplinary research team to maintain and extend the network of climate observing systems in the U.S. Arctic. Researchers work with national and international partners and members of local Alaska Native communities to make observations from a suite of Arctic climate observatories.

What did you do?

From August 6-23, a research survey is conducted aboard the U.S. Coast Guard Cutter *Healy*. Using observing systems, including the network known as the Distributed Biological Observatory (DBO), scientists measure the temperature of the water and air, presence and extent of sea ice, species abundance, biodiversity and production. The DBO has been monitoring ocean changes every year since 2010 in areas of high productivity and biodiversity. Scientists use the data derived from DBO monitoring to document current physical state of the U.S. High Arctic (Chukchi and Beaufort Seas), examine the biological and ecological responses to that physical environment, and make comparisons with past observations. Engaged scientists include physical oceanographers, biogeochemical scientists, benthic ecologists, and marine biologists who collaborate to examine the ecosystem responses to climate variations. Scientists at the Alaska Fisheries Science Center focus on examining production in the water column (phytoplankton, zooplankton, marine fish eggs, and larvae) to determine diversity and availability of prey at the base of the arctic food web.

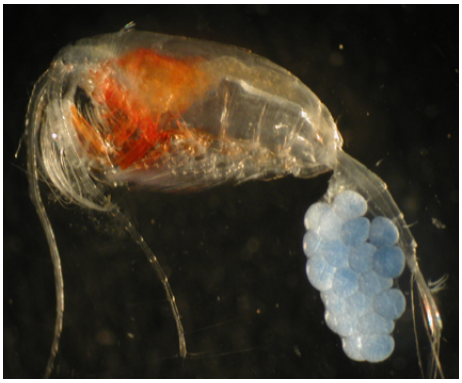


Where did you go?

The survey is conducted in the Chukchi and Beaufort Seas.

What are the key preliminary findings or impressions?

Results to date indicate that the location of zooplankton and larval fish communities is influenced by ocean processes and sea ice. During warmer-than-average years there is an increase in the northward transport of water through Bering Strait into the U.S. Arctic. Summer communities of fish and plankton are likely advected (transported) from the northern Bering Sea into the Chukchi Sea. We noted that warm temperatures were associated with species that are more commonly found at lower latitudes. In contrast, years with colder temperatures and later sea ice melt were associated with increases in larger, lipid-rich (more nutritious) copepod species that are critical prey to upper trophic level fish, seabirds, and whales. We also noted that the smallest sizes of larvae from a key ecological species, arctic cod, are associated with sea ice, suggesting that sea ice is also critical to the spawning success of this species. Work to analyze additional data collected from 2018 is underway.



What are the impacts or implications?

Results are used to increase understanding of processes involving ocean heat, circulation, and transport pathways into and out of the Arctic region, and to understand effects on lower trophic level biological resources (plankton).

How and when will you be communicating to communities?

We will be working with educators from the North Slope Borough School District to develop new science curricula for K-12 students. Potential topics could include monitoring long-term changes in arctic ecosystems, ecology of fish and zooplankton, and benthic-pelagic integrated studies. Our team meets annually with communities to share results and review work plans for the coming years. We also participate in radio and newspaper interviews and conference calls. Preliminary survey results will also be shared during the Alaska Federation of Natives meeting in Anchorage, AK in October.

What are your future plans?

This is an annual survey, which will be conducted again in August 2019.

Contact: Libby Logerwell: libby.logerwell@noaa.gov

Northern Bering Sea Bottom Trawl Survey

Why are you working in the area?

This survey represents one component of NOAA Fisheries' Alaska Fisheries Science Center's multi-faceted research plan to track environmental and ecological change throughout the Bering Sea. The project is called LOSI or Loss of Sea Ice. Beyond the potential impacts of environmental change, the scale and extent of fish and crab movements can also vary from year to year in response to a variety of biological or environmental processes causing changes in distribution and abundance that extend beyond the traditional survey boundaries (e.g., southeastern Bering Sea) creating an additional need for survey data that provides comprehensive coverage of the entire Bering Sea. We collected abundance data, length and age data for numerous fish species. Additional studies were conducted during the survey including tests for the presence of harmful algal bloom species (at the request of Bering Strait communities), genetic studies for Pacific cod and snow crab, and predator-prey studies for several fish species.

What did you do?

From August 8–14, we conducted a special survey as a rapid response to assess the impact of sustained warm water temperatures on the northern Bering Sea ecosystem. Previous winter sea ice coverage had been low. There was a historic reduction in the size of the spring cold pool, which results from melted sea ice and creates a natural barrier for fish distribution between the northeastern and southeastern Bering Sea. After the annual southeastern Bering Sea survey was completed, scientists moved northward to survey an additional 49 stations in the northern Bering Sea. A full survey of the northern Bering Sea (142 stations), including Norton Sound was conducted in 2017. However, due to time and budget limitations the amount of area that could be sampled again in 2018 had to be reduced.

Where did you go?

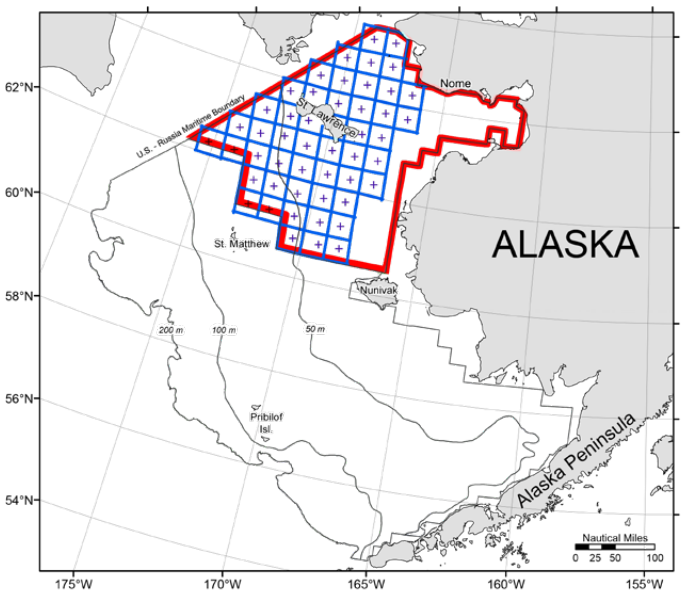
We conducted the survey in the northern Bering Sea.

What are the key preliminary findings or impressions?

As in 2017, another warm water year, we again saw large numbers of Pacific cod and pollock in the northern Bering Sea in 2018. Prior to 2017, the last time the northern Bering Sea had been fully surveyed by the Alaska Fisheries Science Center was in 2010. At that time, few pollock and Pacific cod were seen. Species collected in 2010 were primarily Arctic species (e.g., Arctic cod and saffron cod) and other bottom-dwelling (or benthic) species. In 2010 seasonal sea ice covered the northern Bering Sea in the winter and water temperatures were much colder in the summer.

In 2018, pollock biomass (total estimated weight of fish in the surveyed area) in the northern Bering Sea was 1.15 million mt, which was 14% less than 2017. But, abundance (total estimated number of fish in the surveyed area) increased 6% to 2.0 billion compared to 2017 (1.9 billion). The distribution of pollock was also more concentrated along the northernmost edge of the US Russia Maritime Boundary near the Bering Strait compared to 2017. Pacific cod biomass in the northern Bering Sea increased from 289 thousand mt in 2017 to 565 thousand mt in 2018. Morevover, the 2018 northern Bering Sea survey biomass for Pacific cod exceeded the estimated survey biomass observed in the standard southeastern Bering Sea survey by 11% (507 thousand mt). We also observed higher than expected abundances of juvenile pollock and Pacific cod (< 20cm) in the northern Bering Sea.

Greenland turbot, Kamchatka flounder, and flathead sole, all deeper water species associated with the outer shelf (100-200 m), dispersed across the deepest areas (> 50 m) of the northern Bering Sea shelf southwest of St. Lawrence Island. In the same area, arrowtooth flounder were observed for the first time in this new survey series. Even though the survey area was reduced from 2017, it still was surprising to see only 7 Arctic cod captured from all the stations sampled, and to see the biomass of jellyfish almost triple compared to 2017.



What are the research impacts or implications?

These findings raise new research questions including whether the pollock and Pacific cod overwintered in the northern Bering Sea since it was virtually ice-free during the 2017/18 winter months. Also in question is the origin of these fishes, Russia or the southeastern Bering Sea, and what will happen to them if we get a winter freeze this year? Will they move into Russian waters or into the southeastern Bering Sea? It is also not clear whether northward shifts in distribution have occurred during previous warm years and whether Pacific cod and pollock are spawning in the north? If so, will the young fish survive and recruit to the adult population? It is also unknown what effects there will be to the marine food web resulting from the added predation pressure introduced by the dramatic increases in the abundance of plankton-eating jellyfish and pollock as well as so many bottom-feeding Pacific cod.

The data we collect complements the Traditional Knowledge of Alaska Native hunters and fishers providing a more complete picture of bottom-dwelling species across the entire eastern Bering Sea shelf to help us better understand the effects of a changing marine environment and diminishing annual sea ice on marine food webs. This has important implications for Alaska Native communities food security and the sustainable management of commercial fish and crab stocks.

How and when will you be communicating to communities?

We shared initial results from a few survey stations with Nome residents and via conference calls with other Bering Strait communities prior to completing the survey. We plan to present the complete preliminary survey results to Bering Strait region communities and Alaska Native organizations in October in Nome, AK and during the Kawerak Regional meeting in November and during the Alaska Eskimo Whaling Commission and Alaska Federation of Natives meetings in Anchorage, AK in October. Outreach includes working with University of Alaska, Fairbanks and Alaska Sea Grant Marine Advisory Program (MAP) agent to conduct in person meetings, radio and newspaper interviews, presentations, and conference calls. .

What are your future plans?

The plan is to conduct a full survey again in August 2019.

Contact: Bob Lauth; bob.lauth@noaa.gov or Lyle Britt; lyle.britt@noaa.gov

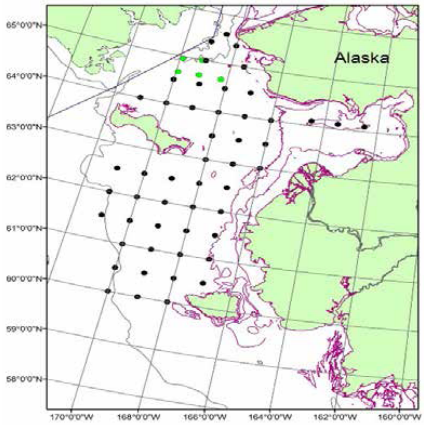
Northern Bering Sea Surface Trawl Survey

Why are you working in the area?

NOAA Fisheries conducts fisheries oceanographic surveys to gather needed data to understand the impact of the loss of sea ice on the pelagic (middle water column) ecosystem of the northern Bering Sea. Alaska Fisheries Science Center scientists who participate in these surveys, which have been occurring annually since 2003, partner with the Alaska Department of Fish and Game and U.S. Fish and Wildlife Service. Together, they provide annual information on the status of salmon, groundfish, forage fish and seabirds as well as the state of the pelagic ecosystem in the northern Bering Sea. This year, the survey was conducted aboard a charter vessel, *Northwest Explorer*.

What did you do?

From September 1-20, we conducted an integrated ecosystem survey (physical environment, nutrients, phytoplankton, and zooplankton).



Where did you go?

Samples were taken at stations (black dots) within the northern Bering Sea ecosystem between 60°N and 67°N.

What are the key preliminary findings or impressions?

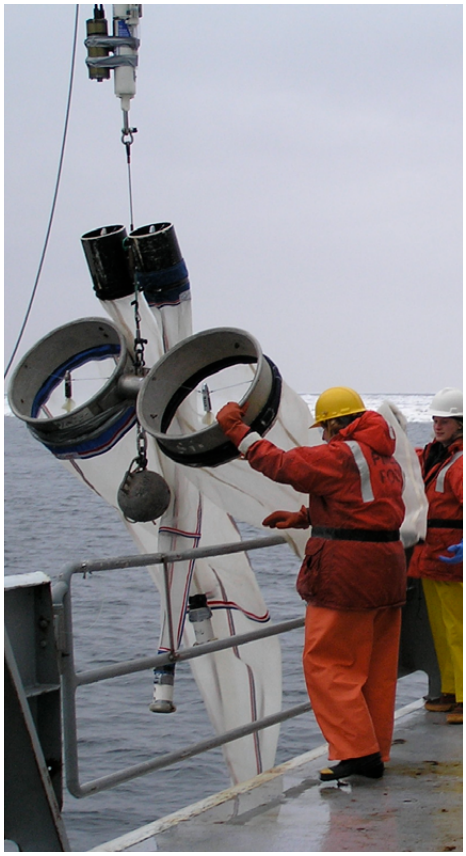
The sea temperatures in the survey region were warmer than past years (time series spans 15 years). There were fewer juvenile Yukon River Chinook salmon, fewer capelin and more Pacific herring than in past surveys. We captured most of the juvenile Chinook salmon in the northern region of our survey grid. We found age-0 pollock in high abundance within top 20 m of the water column along our southernmost transect (60N). This is not unusual for a warm year. We will conduct additional testing on samples collected to determine the "fitness" of various fish – that is we will analyze the lipid content in individual fish. We found a few adult walleye pollock throughout the northeastern Bering Sea in our surface trawl samples (n < 30). These adults did not appear to be in good shape as they were long and thin.

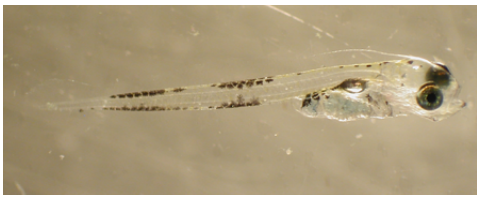
What are the research impacts or implications?

Through this long term survey we are able to monitor the distribution and fitness of (age-0) groundfishes in their first year of life, juvenile Pacific salmon, and forage fishes; and monitor shifts in ecosystem indicators including sea temperature, nutrients, phytoplankton, and zooplankton. We are also able to produce an annual Yukon River Chinook salmon forecast based on juvenile Yukon River Chinook salmon catch-per-unit-effort. The absence of the "cold pool" is potentially related to movement of groundfish to the north. Capelin are an important "high fat" forage fish for juvenile Chinook salmon in the region. The relative abundance of juvenile Yukon River Chinook salmon is a leading indicator for future (2-to-3 years) adult returns to the river. Less juvenile Chinook salmon suggests a decline in future returns. Recent information from western Alaska suggests that the number of adult Chinook salmon returning to the region is down and that these lower returns may impact bycatch harvest levels in the Bering Sea walleye pollock fishery. Our leading indicator for future adult returns of Chinook salmon to the Yukon River suggests that lower bycatch harvest levels may be in place into the near future.

How and when will you be communicating to communities?

We will present the integrated ecosystem information in Nome, AK during early November as part of a community outreach effort with Alaska Sea Grant. The juvenile Yukon River Chinook salmon index is presented at the Joint Technical Committee for the Yukon River and is used by US/CANADA (treaty) and the Alaska Department of Fish and Game as a forecast tool for future understanding and management of Yukon River Chinook salmon stocks (i.e., much of the subsistence and/or potential for commercial fishing on Yukon Chinook salmon occurs in Alaska; yet nearly 50% of the Yukon River Chinook salmon spawn within Canada). Therefore, the juvenile index is critical to help manage numbers of Chinook salmon captured in Alaska in order to allow sufficient numbers of Chinook salmon to cross the border into Canada for subsistence needs and spawning requirements. We also intend to share preliminary survey results during the Alaska Federation of Natives meeting in Anchorage, AK in October.





What are your future plans?

This is an annual survey which we expect to conduct again in September 2019.

Contact: Ed Farley: ed.farley@noaa.gov

Passive acoustic monitoring

Why were you working in the area?

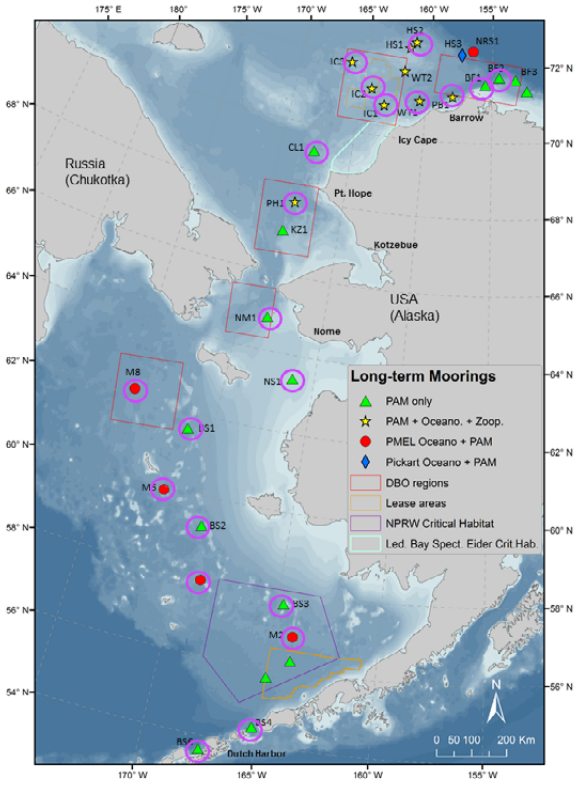
The Arctic is changing. Ice is diminishing, anthropogenic impacts are increasing, and subarctic species are intruding; more complete information is needed on the year-round presence of Arctic marine mammals and their acoustic communications. Passive acoustic monitoring (PAM) remains the best tool for large-scale, year-round assessment of marine mammal spatio-temporal occurrence, and ambient noise levels, especially in the harsh conditions of the enormous Alaska Region. We have been partnering with the Pacific Marine Environmental Lab (PMEL) since 2007 to deploy ~20 year-round passive acoustic recorder moorings (mostly BOEM-funded) in the Bering, Beaufort, and Chukchi Seas in close proximity to oceanographic moorings.

What did you do?

We participated on three separate research cruises to recover and redeploy our long-term moorings (including the Distributed Biological Observatory Collaborative Research Study cruise mentioned above). Data was extracted from the recovered instruments and will be analyzed (as funding permits) this winter in Seattle.

Where did you go?

Moorings were recovered and/or deployed at 19 sites in the Bering, Chukchi, and Beaufort Seas



What are the key preliminary findings or impressions?

The analyses have not begun; however differences have been seen in the timing of Arctic and subarctic species between the Bering and Chukchi Seas in the past couple of years. These differences appear to be related to sea ice formation and retreat.

What are the impacts or implications?

Long-term data on marine mammal spatio-temporal occurrence are critical for establishing baseline information that can be used to for decision-making in Alaskan waters. In addition, marine mammals are excellent proxies for ecosystem change, since they respond to shifts in abundance and distribution of large zooplankton and small fish taxa.

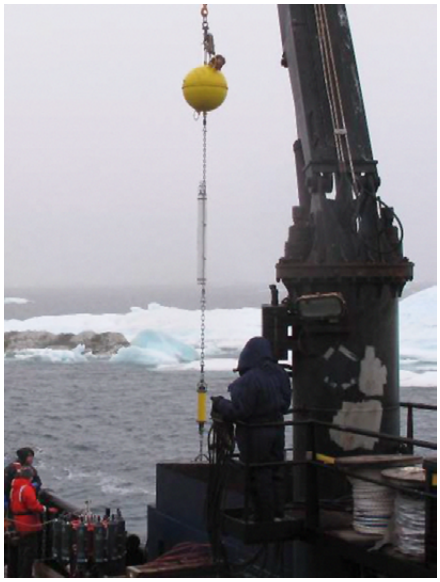
How and when will you be communicating to communities?

We no longer have our own dedicated research cruises, therefore information on our research is included in the outreach and communication efforts by the Chief Scientists and/or PIs on these cruises.

What are your future plans?

We hope to redeploy all moorings again in 2019.

Contact: Catherine.Berchok@noaa.gov



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March 2018

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