

**NOAA FISHERIES MARINE MAMMAL LABORATORY – MONITORING AND RESEARCH, 2020****ICE SEAL POPULATION ABUNDANCE – BERING AND CHUKCHI SEAS**

We have continued to work on completing updates to abundance estimates for seals in the U.S. waters surrounding Alaska. In the past year, we have learned a lot about seal haul-out timing and variability, and we know that those are very important parts of the picture for abundance estimation, so we are taking a lot of care with the analysis.

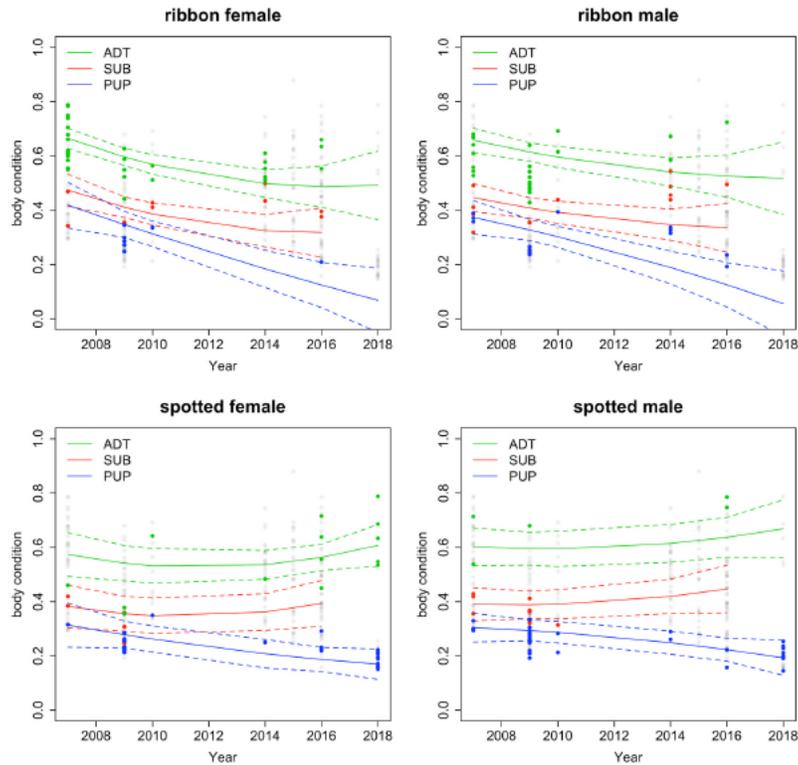
Our analyses of data from our 2016 Chukchi Sea surveys have given us some new insights into ringed seal haul-out timing and variability. We believe this will be helpful for completion of estimates for ice seal abundance in the Bering Sea (2012-2013 surveys), so we have paused those until we can include ringed seal results and not have to separate the Bering Sea results into two separate papers (one for bearded, spotted and ribbon, and another for ringed). As a result, we intend to complete the 2016 Chukchi Sea abundance estimates first, so that the ringed seal haul-out approach can then be incorporated into the 2012-13 Bering Sea results.

A collaboration with Jessica Lindsay, a PhD student at UW supervised by Kristin Laidre and Peter Boveng, has developed a very promising idea for using haul-out and environmental data to tackle the difficult problem of accounting for the timing of both haul-out and lair emergence, which is really the crux of estimating ringed seal abundance from aerial survey data. We look forward to keeping you informed about this and the overall progress toward new ice seal abundance estimates.

**DECLINE IN BODY CONDITION OF SPOTTED AND RIBBON SEAL PUPS, 2007-2018**

Spotted and ribbon seals have been measured and weighed as part of NOAA satellite-tagging projects since 2007. A simple index of condition (fatness) was formed by dividing each seal's weight by its length, giving a sense of how heavy (or fat) it is for its length. This condition index was analyzed for a trend over time and for differences between species, sexes, and age classes. A sample of harbor seals in the Aleutian Islands from three of the years was also included in the analysis.

The results indicated that spotted and ribbon seal pup condition declined over the period 2007-2018, as did the condition of ribbon seal subadults and adults. Spotted seal subadult and adult condition was stable or slightly increasing. The observed declines in condition may be related to the decline in spring Bering Sea ice extent that occurred over the same period; lower ice extent and earlier spring melt have been shown to have impacts on forage fish in the Bering Sea. The results are some of the first to detect and quantify impacts on Alaska seals from environmental changes that are linked to Arctic warming.



The study was published as a journal article that is included in the meeting packet and available on the web at <https://doi.org/10.3354/esr01087>.

The study was also described in a more 'plain language' version as a NOAA web story:

<https://www.fisheries.noaa.gov/feature-story/condition-seals-declined-during-rapid-warming-alaska>

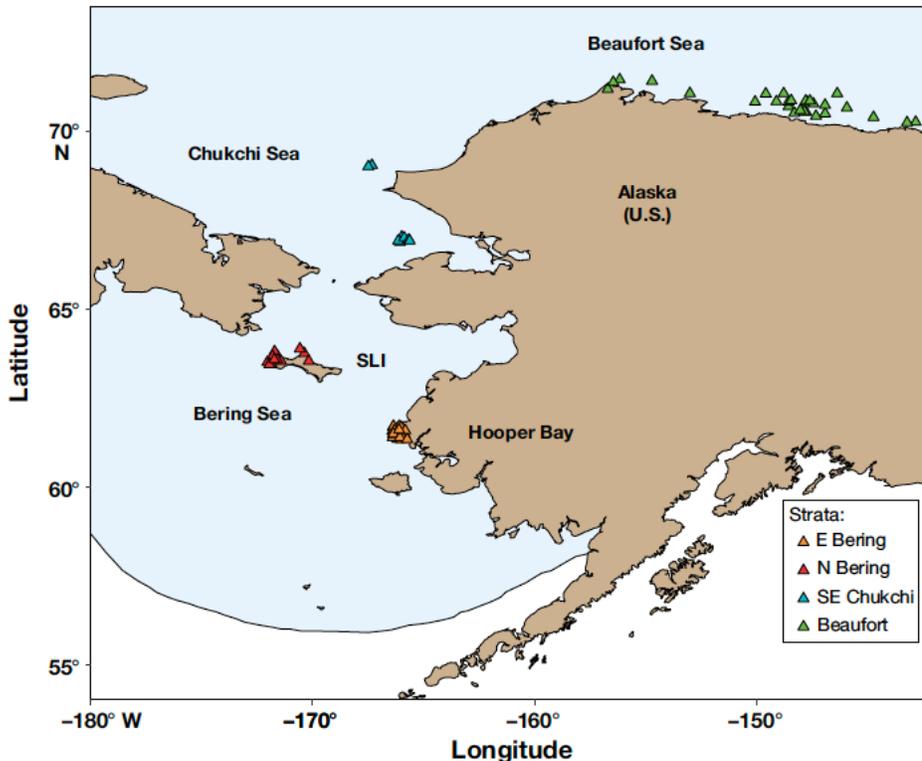
## RINGED SEAL POPULATION STRUCTURE: GENETICS PAPER PUBLISHED

### THERE MAY BE MORE POPULATIONS OF RINGED SEALS THAN RECOGNIZED

For animal conservation, it's important to know whether a species consists of one population or several populations that are separate from each other; in other words, individuals born in one population rarely go and breed in a different population. Separate populations can become depleted more easily than a single population of the same total size.

Previous studies of ringed seal genetics have concluded that Arctic ringed seals seem to consist of one big population. Because those studies have been based on a relatively small portion of the seals' genetic code, a new study was done that used a much larger portion of the code. This provided more ability to detect differences between seals from different areas. There were 113 ringed seal samples collected in 2000-2017 by hunters (n=59)

and by researchers sampling remains of seals killed by polar bears (n=54). The samples were collected in the Beaufort Sea, Chukchi Sea, Northern Bering Sea (St. Lawrence I.), and Eastern Bering Sea (Hooper Bay).



There were bigger differences in the genetics between the Beaufort Sea and the Eastern Bering Sea seals than would be expected if those areas were connected populations. A large majority of the seals from each of those areas could be assigned to their area based on their genetic code.

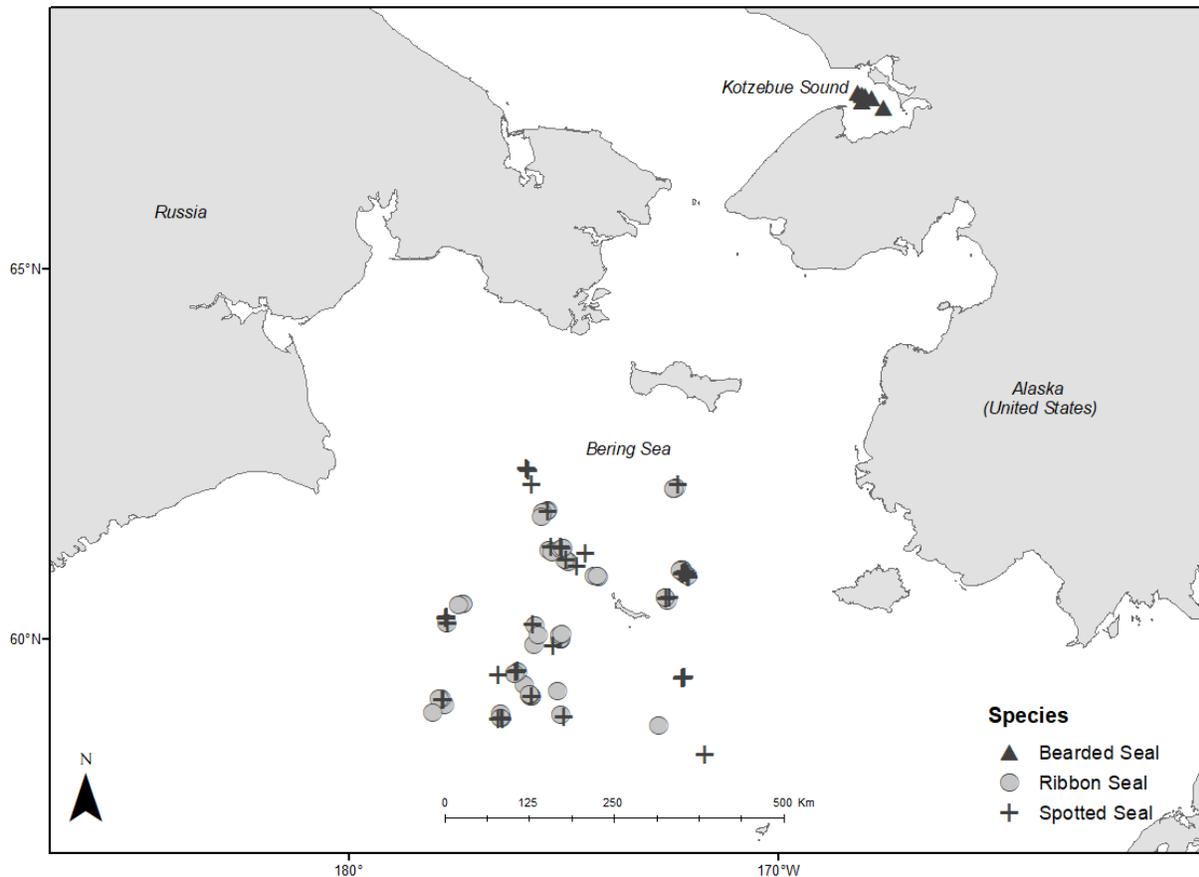
These results on their own don't tell us whether there are actually separate populations or where population boundaries are. They just show that Arctic ringed seals as a whole are not behaving as a single, highly mixed population. The results do indicate that there is some 'isolation by distance'. If ringed seals become depleted in one area, their recovery probably won't be aided much by new seals coming in from distant areas, and they could be slow to recover.

The study was published as a journal article that is included in the meeting packet and available on the web at <https://doi.org/10.3354/esr01087>.

Lang, A. R., P. Boveng, L. Quakenbush, K. Robertson, M. Lauf, K. D. Rode, H. Ziel, and B. L. Taylor. 2021. Re-examination of population structure in Arctic ringed seals using DArTseq genotyping. *Endangered Species Research* 44:11-31.

## SPOTTED, RIBBON, AND BEARDED SEAL DISEASE SURVEY – BERING SEA

Little has been published about exposure to pathogens (disease-causing viruses, bacteria, or other organisms) among ribbon, spotted, and bearded seals of the Bering Sea. In a new study to assess exposure to several pathogens, ribbon and spotted seals were sampled from the pack ice of the Bering Sea, and bearded seals were sampled in Kotzebue Sound (though satellite tracking of the bearded seals indicated they were from the portion of the bearded seal population that over-winters and breeds in the Bering Sea).



Antibodies in blood serum tell us what viruses, bacteria, or other pathogens (disease-causing organisms) an individual has been exposed to. The seals' blood serum was tested for antibodies against eight pathogens: phocine herpesvirus-1, phocine distemper virus (PDV), influenza A, *Brucella*, *Coxiella burnetii*, *Leptospira interrogans*, *Toxoplasma gondii*, and *Sarcocystis neurona*.

Spotted seals were positive for antibodies to phocine herpesvirus-1 (76.6%), PDV (41.5%), influenza A (10.6%), *Brucella* (9.5%), and *Coxiella burnetii* (8.3%); ribbon seals were positive for phocine herpesvirus-1 (9.5%), PDV (41.2%), influenza A (4.8%), and *Coxiella burnetii* (8.0%); and bearded seals were positive for PhHV-1 (33.3%) and PDV (100%). All species were negative for antibodies to *Leptospira interrogans*, *Toxoplasma gondii*, and *Sarcocystis neurona*.

This study shows evidence that small numbers of ice seals in Alaska have been exposed to at least five pathogens. **These five pathogens, or closely-related variants of them, have all been detected previously in some Alaska**

**marine mammal species.** Because some of these pathogens could pose health concerns for indigenous Arctic communities when handling or eating seals, we recommend continued serology monitoring to detect and identify any new human health concerns and to monitor changes in seal health that might be exacerbated by effects of climate warming. We also recommend that communities work with organizations that have expertise in both wildlife diseases and traditional uses of seals, to determine whether the findings in this study warrant any changes in customary ways of handling, preparing, and consuming seals. Such organizations may include the Alaska Native Tribal Health Consortium, the Alaska Sea Grant Marine Advisory Program, the North Slope Borough Department of Wildlife Management, and regional or tribal organizations with a focus on traditional foods.

The paper has been accepted for publication as an article in the journal *Marine Mammal Science* and a copy of the accepted version (subject to further edits in the proof stage) is included in the meeting packet.

Ziel, H. L., T. Goldstein, P. B. Conn, and P. L. Boveng. In press. Serologic survey for exposure to potential pathogens in ribbon seals (*Histiophoca fasciata*), spotted seals (*Phoca largha*), and bearded seals (*Erignathus barbatus*) in the Bering Sea. *Marine Mammal Science*.

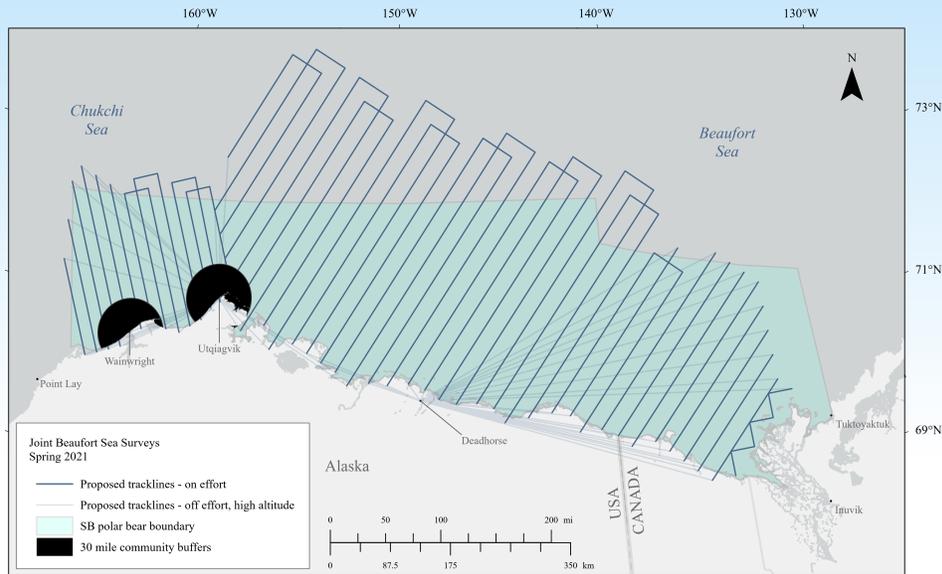
## MARINE MAMMAL LABORATORY – MONITORING AND RESEARCH PLANS, 2021

### AERIAL SURVEYS FOR BEARDED AND RINGED SEALS, BEAUFORT SEA, 2021

Please see information flyer on the following 2 pages.

## Aerial Survey for Seals and Polar Bears in the Beaufort Sea

April 5 – June 14, 2021



### Who is conducting the research?

Scientists from NOAA Fisheries’ Alaska Fisheries Science Center. The U.S. Fish and Wildlife Service provides support for inclusion of polar bears.

### What is the survey objective?

NOAA Fisheries marine mammal biologists plan to conduct an aerial survey to collect digital and thermal images of ringed and bearded seals in the U.S. waters of the Beaufort Sea. They also will be collecting images for the U.S. Fish and Wildlife Service and the U.S. Geological Survey to support an independent estimate of abundance for the Southern Beaufort polar bear sub-population, which extends into the Chukchi Sea.

### Where is the survey area?

Based in Deadhorse and Utqiagvik, surveys will extend out to the U.S. EEZ and throughout the Southern Beaufort polar bear subpopulation boundary.

### Why is the data important?

Currently there are no reliable estimates of ringed and bearded seal abundance or trends in the Beaufort Sea. Survey results are critical to support sound planning and decisions by agencies and the communities that rely on these traditional resources.

Collaboration among federal agencies reduces the amount of survey effort needed to complete this work. Scientists are able to obtain simultaneous assessments of the seals and their primary predator, polar bears. Polar bear survey data will be provided to the U.S. Fish and Wildlife Service and U.S. Geological Survey to strengthen population assessments and to help inform local, state, national and international policy makers regarding conservation of the species and its habitat.

*See timetable on back*

## Schedule for the 2021 Seal/Polar Bear Survey

Team Shelter In Place begins	March 29th
Begin weekly testing (continues throughout project)	April 2nd
Survey preparation in Seattle	April 5th
Survey team mobilization in Deadhorse	April 11th
Survey operations begin	April 12th
1 <sup>st</sup> crew swap (Shelter in Place and testing)	April 28-33
2 <sup>nd</sup> crew swap (Shelter in Place and testing)	May 19-24
Survey operations end	June 13th
Demobilization in Anchorage	June 14th

\* Tentative schedule as of January 26, 2021. Survey start date is dependent on aircraft readiness and transition from previous projects.

### What steps are you taking to prevent conflicts with bowhead whale hunting?

- Applying 30-mile buffer zones around spring whaling communities
- Working with individual communities to determine if/when there are opportunities to survey within buffers (30 - 40 minutes of flight time needed)
- Contacting community whaling leaders to discuss operations and communication plans
- Maintaining survey altitude 1000 feet (+/- 200ft temporary variations)
- Diverting from the flight track if any human activity is observed ahead
- Distributing daily flight plans including field team contact number
- Adopting additional COVID-19 mitigation protocols, used successfully to implement 2020 North Slope Borough bowhead whale surveys and NOAA harbor seal surveys, including pre-survey quarantine and weekly testing
- Working directly with communities to determine whether and how to do the project to ensure the safety and well-being of local communities and survey team.

### How do you plan to communicate survey results?

We will send a report of our survey activities to the tribal offices along the coast in the study area within 30 days after the survey. We also will be participating in various local and regional outreach activities including webinars with communities and radio interviews.



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**January 2021**

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AIRBORNE MONITORING OF SEAL BODY CONDITION

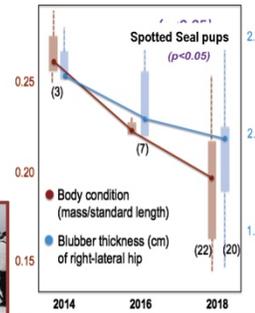
### Monitoring the Body Condition of Seals with UAS

**Objective:** Develop and test a small, hand-launched, camera-equipped, rotor-driven UAS to photograph seals hauled out of the water onto ice or land, and digitally extract scaled measurements from the photos to estimate body condition.

**Funding:** Internal RFP to develop and integrate the use of UAS into NOAA's missions.

**Justification:**

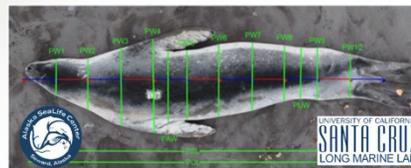
- We've detected an apparent reduction in the body condition of some young seals that may reflect impacts from recent warming and sea ice loss in the Bering Sea. But our sample sizes are low, and catching and measuring seals is challenging and expensive.
- The research compliments the long-term community-based subsistence harvest work facilitated by the ADFG.



- NOAA Fisheries' Alaska Fisheries Science Center, Marine Mammal Laboratory
- Institute of Marine Sciences, University of California Santa Cruz, Long Marine Laboratory • Alaska SeaLife Center
- Joint Institute for the Study of Oceans and Atmosphere, University of Washington • University of San Francisco

**Phase 1 (2020):** Evaluate UAS platforms, sensors and software.

**Phase 2 (2021):** Procure and test equipment. Perform calibration and validation test flights at captive-care facilities using trained seals to develop species-specific morphometric models and imagery processing workflows.



**Phase 3 (2022):** Conduct final field tests of the system using seals hauled out at the marginal ice zone of the Bering Sea, in spring. Develop standard operating procedures for conducting future UAS-based ice seal monitoring expeditions aboard NOAA vessels.

**Long-Term:** We hope to apply the morphological relationships developed in Phase 2 to the tens of thousands of seal images collected during large-area fixed-wing abundance surveys, dramatically increasing our sample sizes for estimating body condition.

