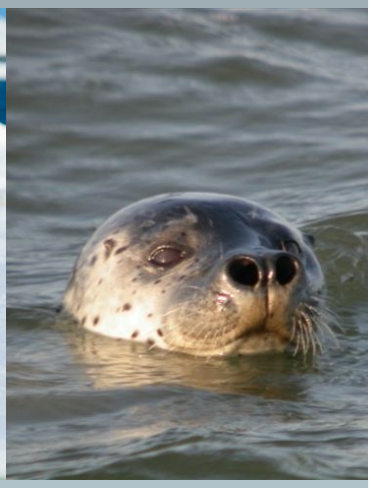
The Health and Status of Ice Seals of Alaska



What have we learned from seal samples?

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Why is this important?

- Ice seal population health and status have been monitored using samples from the Alaska Native subsistence harvest since the 1960s.
- This long time series of data shows how seal populations and individual seals respond to changes in the environment.
- Declining sea ice is predicted to negatively affect ice seals due to their reliance on sea ice for resting, pupping, nursing, and molting.

Samples were collected from:


Ringed seal


Bearded seal


Spotted seal


Ribbon seal

Where are samples collected?

What did we do?

- We used ice seal tissues and measurements to examine seal health and status in years before the sea ice decline (1960s-1970s) and years during sea ice decline (2000s-2020s).

We assessed:

- Body condition
- Age of maturity
- Productivity
- Pup survival
- Diet
- Disease
- Parasitic infection
- Exposure to contaminants and toxins

What did we find?

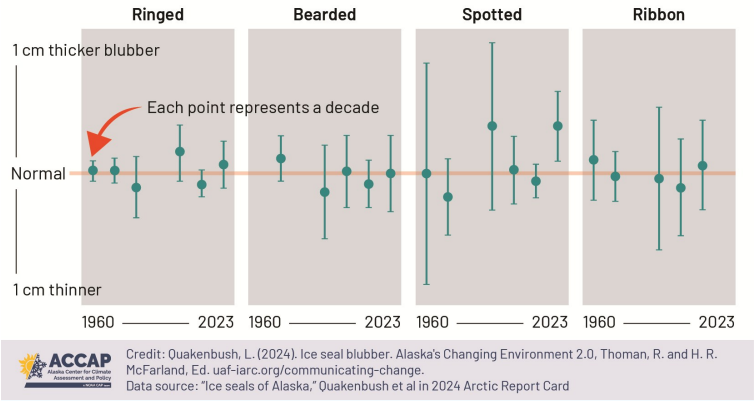
All four ice seal species are healthy and productive.

- Body condition, productivity, and pup survival remain stable or above average.

Read further for more information on these results:

Has seal body condition changed?

- Yes! Some decades seals are skinnier (dots below the orange line) and other decades seals are fatter (dots above the orange line). However, no long term changes in blubber thickness have been detected.
- Seals were skinnier during the 2010s, but they rebounded after.



ACCAP Alaska Center for Climate Assessment and Policy

Credit: Quakenbush, L. (2024). Ice seal blubber. Alaska's Changing Environment 2.0, Thoman, R. and H. R. McFarland, Ed. uaf-iarc.org/communicating-change.
Data source: "Ice seals of Alaska," Quakenbush et al in 2024 Arctic Report Card

Are seals becoming pregnant?

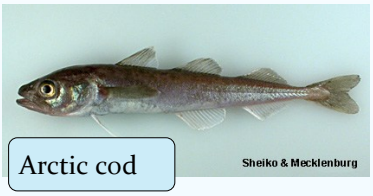
Yes, pregnancy rate has remained high (>75%).

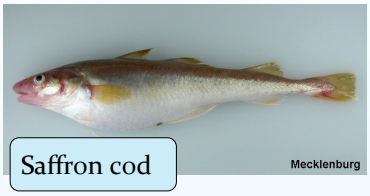
Are pups surviving?

Yes, the proportion of pups in the harvest has remained high (>40%) for ringed, bearded, and spotted seals, indicating that pups are surviving past weaning.

Is seal diet changing?

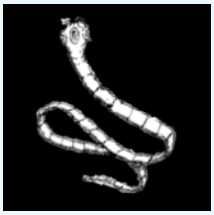
Yes, ringed seals are eating less Arctic cod and more saffron cod than in the past. This was predicted as waters warm and Arctic cod move northward and become less available to seals.





Is that a worm in my seal?

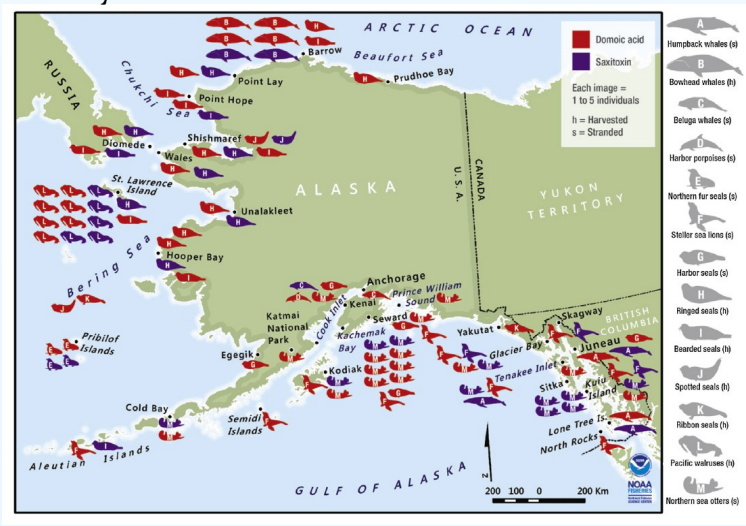
- Yes, there are many worms (parasites) that live in seal tissues. Most are harmless but some are harmful to seals. We compared the species of worms found in ice seals from 2006-2015 to what was found previously in this region.
- As of 2015, there were no new species of parasites found in seals, and the occurrence has not changed.



Harmful algal bloom toxins

- Domoic acid (DA) and saxitoxin (STX) are algae-produced toxins responsible for amnesic shellfish and paralytic shell fish poisoning, respectively.
- They have been detected in ice seals, more often in bearded seals.
- The highest concentrations were below regulatory limits for seafood, and no clinical signs of acute neurotoxicity have been reported.
- Exposures to DA and SXT are expected to increase with changes in climate.

DA (in red) and STX (in blue) have been found in many marine mammals in Alaskan waters.



Lefebvre et al. 2016

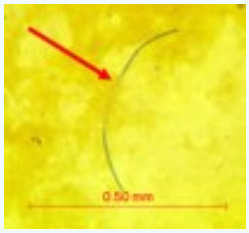
Contaminants

Organochlorines (OCs) and trace elements (TEs) were tested in subsistence-harvested ringed and bearded seals during two study periods, 2003-2007 and 2011-2016.

- Concentrations of both OCs and TEs were similar or lower than elsewhere in the Arctic.
- OCs declined between periods and bearded seals had the lowest concentrations.
- Methylmercury concentrations were low in all species.

Microplastics in seals

- Microplastics are plastic fragments less than 5 mm long, about the size of a pencil eraser. They have been found in tissues of subsistence-harvested seals from Alaska.
- This is a new research topic; microplastics are being found in many animals (including humans) all around the world.



Disease Screening

- We are screening ice seals for both bird flu and Covid.
- Neither have been detected.
- We will continue screening for these diseases.

How many ugruks are there?

- We estimate bearded seal population size using harvested seals.
- Using muscle (for genetics) and teeth (to determine age) from bearded seals we determine genetically related ugruks (kin pairs) and how they are related (e.g., parent/offspring or siblings).
- Using the number of kin pairs identified, we can estimate adult abundance and survival.

So far, we have examined 1,484 bearded seals and found:

- 19 to 25 half-sibling pairs.
- 2 parent-offspring pairs.
- No full sibling pairs, suggesting females mate with different males each year.

Preliminary results estimate there are 409,000 ugruks in Alaska.

Why does this matter?

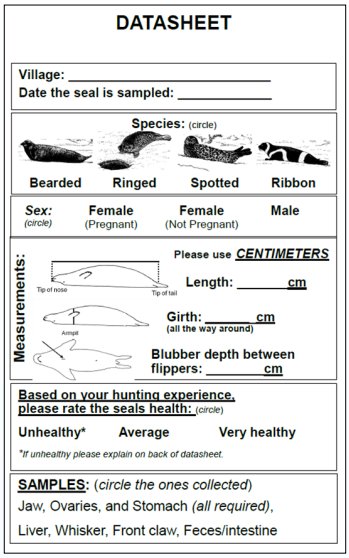
- A reliable population estimate and trend are needed to monitor the number of bearded seals into the future.
- More samples are needed to refine the estimate of population size and assess trends.

You can help by collecting jaws from all harvested bearded seals!

(See the following section for details)

How to Contribute Seal Samples

Datasheet



DATASHEET

Village: _____
Date the seal is sampled: _____

Species: (circle)

Bearded Ringed Spotted Ribbon

Sex: (circle) Female (Pregnant) Female (Not Pregnant) Male

Measurements:

Please use CENTIMETERS

Length: _____ cm (Tip of nose to Tip of tail)

Girth: _____ cm (all the way around) (Armpit)

Blubber depth between flippers: _____ cm

Based on your hunting experience, please rate the seals health: (circle)

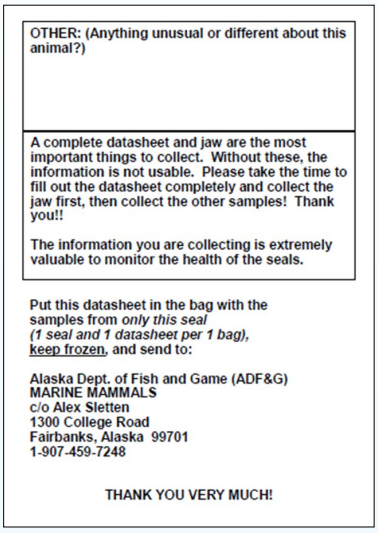
Unhealthy* Average Very healthy

*If unhealthy please explain on back of datasheet.

SAMPLES: (circle the ones collected)
Jaw, Ovaries, and Stomach (all required),
Liver, Whisker, Front claw, Feces/intestine

A datasheet is needed for each seal. Please provide as much information about the seal as you can, including species, sex, body measurements, general seal health and which tissue samples are included.

If the seal appears unhealthy, please provide details on the back of the datasheet.



OTHER: (Anything unusual or different about this animal?)

A complete datasheet and jaw are the most important things to collect. Without these, the information is not usable. Please take the time to fill out the datasheet completely and collect the jaw first, then collect the other samples! Thank you!!

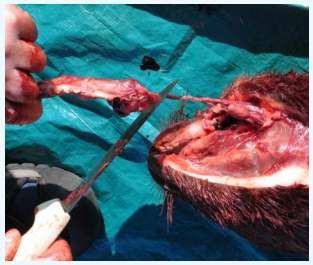
The information you are collecting is extremely valuable to monitor the health of the seals.

Put this datasheet in the bag with the samples from *only this seal (1 seal and 1 datasheet per 1 bag)*, keep frozen, and send to:

Alaska Dept. of Fish and Game (ADF&G)
MARINE MAMMALS
c/o Alex Sletten
1300 College Road
Fairbanks, Alaska 99701
1-907-459-7248

THANK YOU VERY MUCH!

Jaw



Teeth from the lower jaw are used to determine seal age. Cut from the neck to the chin where the jaw is jointed in the middle as shown in the left photo above. Then separate the lower jaw at the hinge as in the right photo above.

Measurements

3 measurements that help us examine seal body condition are pictured in this section:

Standard Length—measure in a straight line from the tip of the nose to the tip of the tail when the seal is belly up. Separate the hind flippers if needed to find the tail.

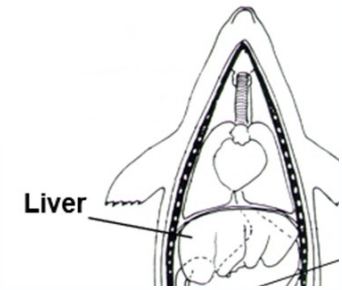
Armpit (axillary) girth—measure all the way around the seal at the armpit.

Blubber depth— with the seal on its back, measure depth of blubber between flippers from outer skin down to the bone using a knife and measuring tape. Take this measurement before you cut the seal open, otherwise the blubber will stretch.

*****All measurements should be taken in centimeters*****

How to Contribute Seal Samples

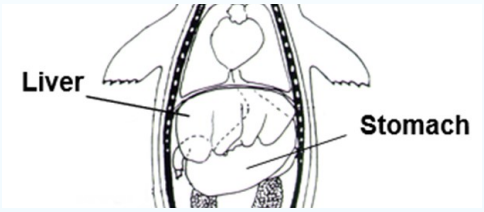
Liver



The liver is tested for contaminants. Collect a fist–sized piece as shown in the right photo above.

Stomach

The stomach tells us what the seal has eaten recently. When removing the stomach, be sure to keep the stomach intact so that its contents are not lost.

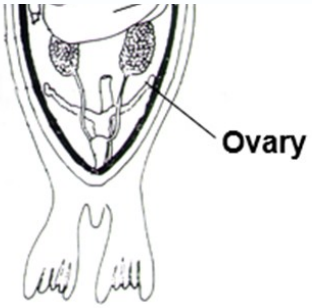


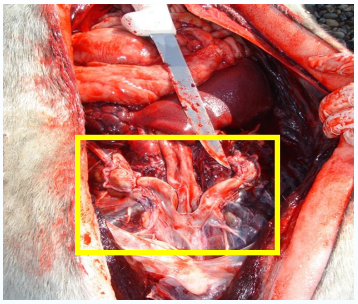
Whisker and Claw

Whiskers are used for chemical analysis of seal diet. They can be pulled from the cheek with pliers or can be sent attached to the cheek patch as shown in the left photo above. Claws are used to estimate seal age. Collect a single front claw or whole front flipper.

Reproductive Tract

The reproductive tract provides information about seal reproductive history. To find the ovaries in a young seal, look for the kidneys and follow the urine ducts down toward the bladder, they follow the same path as the reproductive tract. Collect both ovaries and the uterine horn as shown in the right photo below.





Feces

Feces are used to test for exposure to toxic algae. Collect a 1-foot piece of intestine with its contents, starting at the anus. Use zip ties to secure the contents and place in the plastic bag provided with the seal sampling kit.

If you are interested in providing seal samples and would like more information, please contact Alex Sletten (alexandria.sletten@alaska.gov) at 907-459-7248 or Anna Bryan (anna.bryan@alaska.gov) at 907-459-7247.

Thank You!

This research would not be possible without your willingness to contribute ice seal samples from your subsistence harvest and the support of your communities and Tribal Councils. We thank you for your collaboration and your hospitality when we come to your communities to collect ice seal samples.

ADF&G Arctic Marine Mammal Program Crew

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Alex Sletten

Drikus Kuyper

Jaide Phelps

Tony Blade

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Data Sources

- Quakenbush, L., Bryan, A., Crawford, J., Olnes, J., and Stimmelmayr, R. 2024. Ice Seals of Alaska. Arctic Report Card 2024. NOAA. doi: 10.25923/4488-8843.
- Lefebvre, K.A., Quakenbush, L., Frame, E., Huntington, K.B., Sheffield, G., Stimmelmayr, R., Bryan, A., Kendrick, P., Ziel, H., Goldstein, T., Snyder, J.A., Gelatt, T., Gulland, F., Dickerson, B., and Gill, V. 2016. Prevalence of algal toxins in Alaskan marine mammals foraging in a changing arctic and subarctic environment. Harmful Algae 55: 13-24. doi: 10.1016/j.hal.2016.01.007.
- Walden, S.W., Bryan, A.B., McIntosh, A., Tuomi, P., Hoover-Miller, A., Stimmelmayr, R., and Quakenbush, L. 2020. Helminth fauna of ice seals in the Alaskan Bering and Chukchi seas, 2006–15. Journal of Wildlife Diseases 56(4): 863–872. doi: 10.7589/2019-09-228.
- Sletten, A., Bryan, A., Iken, K., Olnes, J., and Horstmann, L. 2025. Microplastics in spotted seal stomachs from the Bering and Chukchi seas in 2012 and 2020. Marine Pollution Bulletin 214: 117770. doi: 10.1016/j.marpolbul.2025.117770.
- Olnes, J., Quakenbush, L., Bryan, A., and Stimmelmayr, R. 2025. Trace elements in Alaska's ice seals in the 2000s and 2010s. Science of the Total Environment 958: 178126. doi: 10.1016/j.scitotenv.2024.178126.
- Olnes, J., Bryan, A., Stimmelmayr, R., and Quakenbush, L. 2025. Organochlorine concentrations in ice seals in Alaska in the 2000s and 2010s. Marine Pollution Bulletin 215: 117843. doi: 10.1016/j.marpolbul.2025.117843.
- Taras, B.D., Conn, P.B., Bravington, M.V., Kilian, A., Lang, A.R., Bryan, A., Stimmelmayr, R., and Quakenbush, L. 2024. Estimating Demographic Parameters for Bearded Seals, *Erignathus barbatus*, in Alaska using Close-Kin Mark-Recapture Methods. Evolutionary Applications 17(11): e70035. doi: 10.1111/eva.70035 .

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