



# Non-invasive genetic sampling of polar bears (*Ursus maritimus*) along the Chukchi Sea coast of Alaska

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## Background

1. The Alaska-Chukotka polar bear subpopulation (also known as the Chukchi Sea subpopulation) is shared between the USA and the Russian Federation.
2. The status of the Chukchi Sea subpopulation is "unknown" according to the IUCN Polar Bear Specialist Group. There is no currently accepted abundance estimate for Chukchi Sea polar bears – the U.S. Fish and Wildlife Service has an abundance estimate in peer review that should be available in 2017.
3. The subpopulation is managed under an agreement (treaty) between the USA and Russia – known as the *Bilateral Agreement*.
4. Since 2010, the Bilateral Commission has set an annual human-caused mortality (nearly all subsistence harvest) quota of 58 polar bears to be split among the 2 countries.
5. Polar bears are harvested annually by Alaska Natives under allowances of the Marine Mammal Protection Act and the Endangered Species Act.

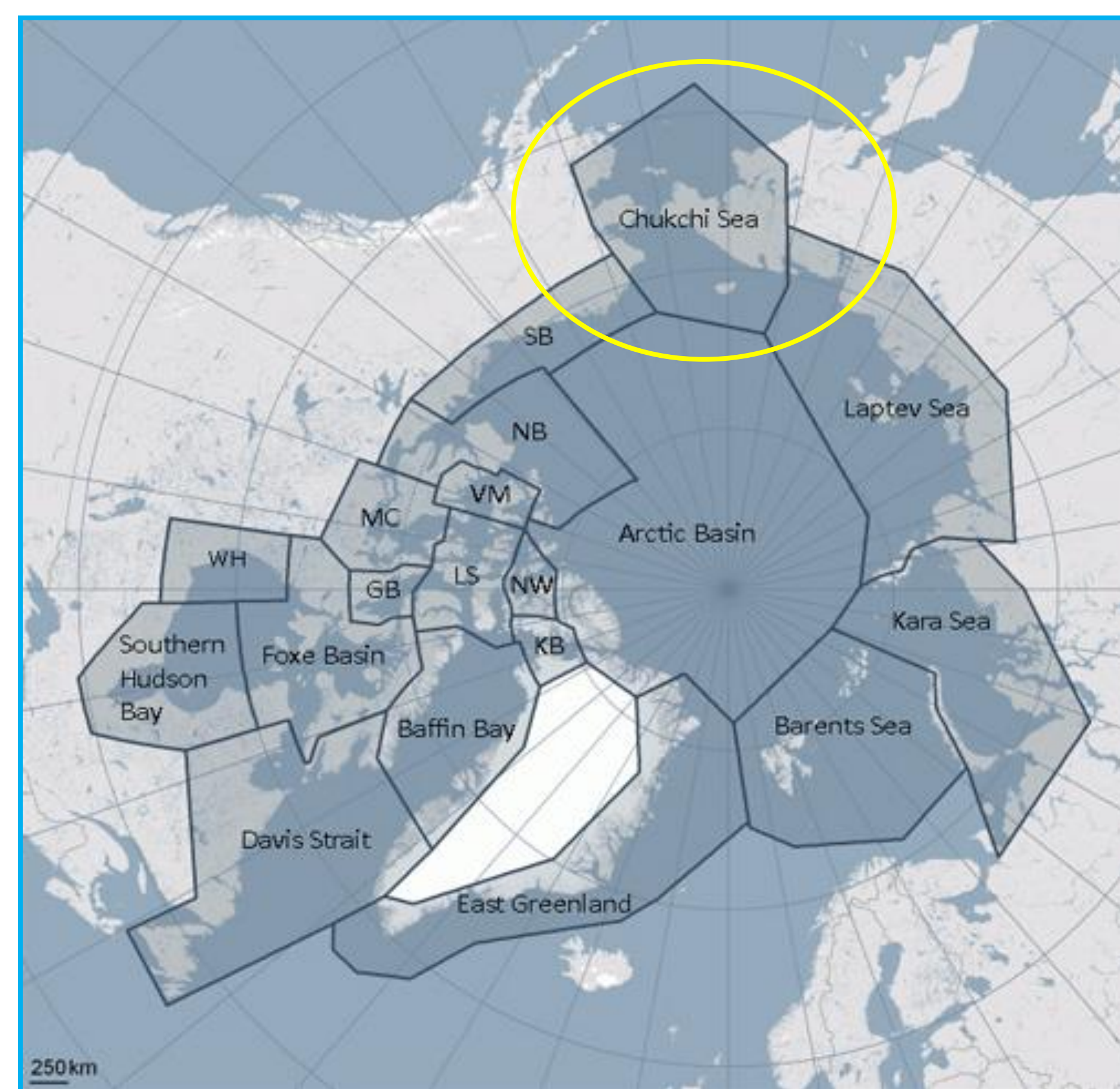


Fig. 1 Map of polar bear global distribution and subpopulation boundaries. Taken from IUCN Polar Bear Specialist Group. Source: <http://pbsg.npolar.no/en/status/population-map.html>

## Issues

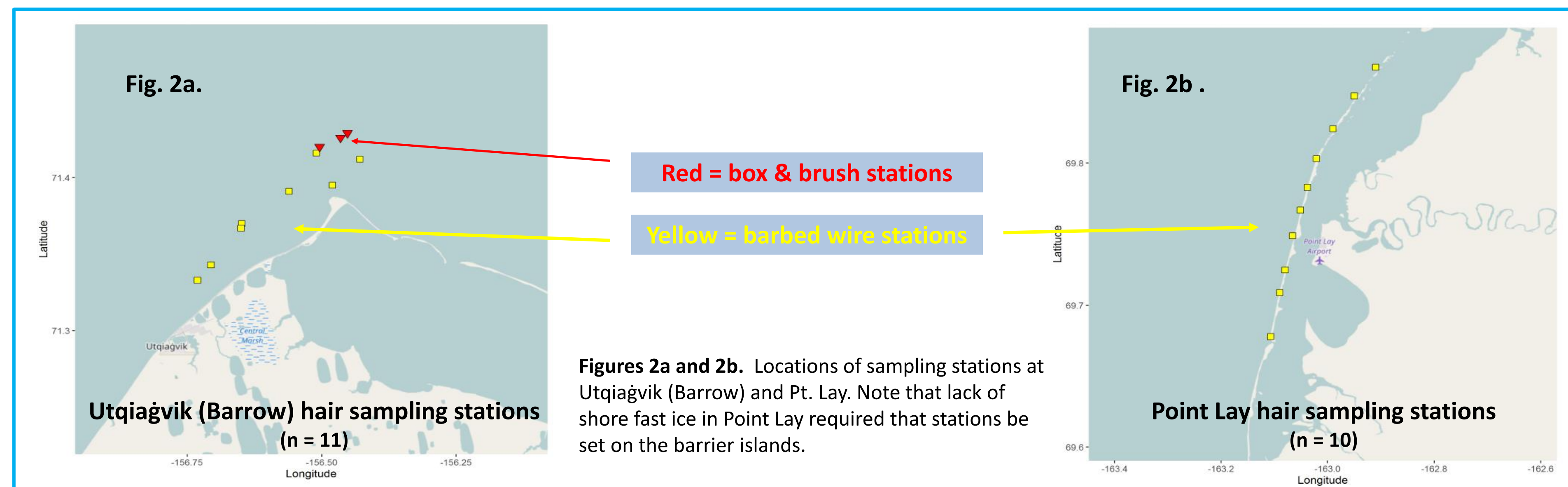
- ❖ Controversy over setting annual harvest limits as required by the Bilateral Agreement with Russia
- ❖ Controversy about the boundary boundary for establishing the quota – Point Barrow (Bilateral Agreement) vs. Icy Cape (PGSG)
- ❖ Quota is based on qualitative abundance estimate of 2,000
- ❖ Quota has still not been put into regulation
- ❖ Now lower cost method exists for estimating abundance
- ❖ Desire active participation by native hunters and residents

## Objectives

1. Assess the viability of non-invasively collecting and analyzing polar bear DNA for genetic identification (ID).
2. Develop cooperative partnerships with local villages and hunters that harvest polar bears.
3. Work with spring whaling crews and other marine mammal hunters to avoid conflicts.
4. Determine success rates from hair sample → to genetic ID.
5. Evaluate cost.
6. Provide genetic ID's to interagency efforts to determine the status of the Chukchi Sea subpopulation.
7. Support a science-based sustainable harvest.

## Methods

1. Discuss project with hunters, community leaders, Alaska Eskimo Whaling Commission, Barrow Whaling Captains' Association, Alaska Nanuuq Commission, U.S. Fish and Wildlife Service, and the Scientific Working Group of the US-Russia Polar Bear Commission.
2. Construct portable hair snare stations that could be easily deployed via snow machine.
3. Deploy hair sampling stations near Utqiagvik / Barrow and Point Lay (Figure 2).
4. Two types of hair sampling stations deployed: barbed-wire and wire-brush (Figure 3).
5. Check sampling stations and collect hair as weather permitted; preferably about 2 times per week.



Figures 2a and 2b. Locations of sampling stations at Utqiagvik (Barrow) and Pt. Lay. Note that lack of shore fast ice in Point Lay required that stations be set on the barrier islands.

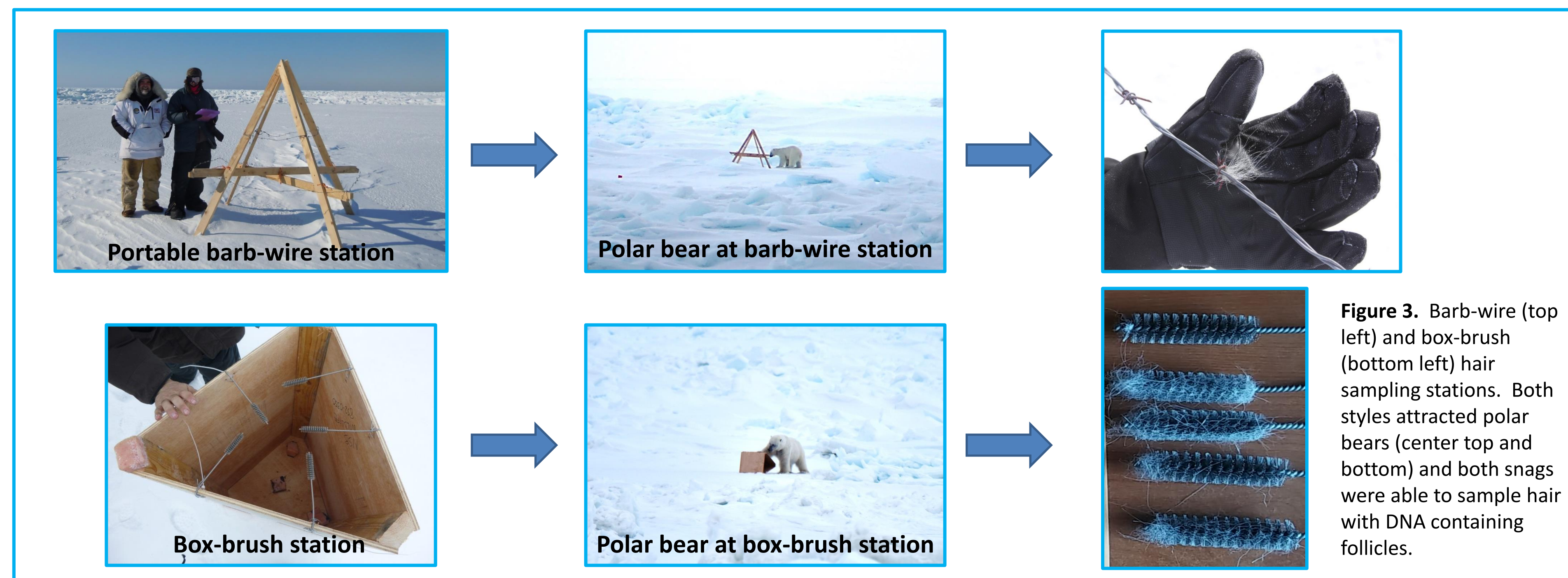


Figure 3. Barb-wire (top left) and box-brush (bottom left) hair sampling stations. Both styles attracted polar bears (center top and bottom) and both snags were able to sample hair with DNA containing follicles.

## Results

### Field work

1. Local cooperation was obtained in support of the project
2. Utqiagvik (Barrow) (11 stations)
  - Shorefast ice fair was poor, but workable
  - 340 Trap nights (11 March – 15 May)
  - 22 capture events; 45 total samples – likely duplicates
3. Point Lay (10 stations)
  - Lack of sea ice restricted sampling to beach
  - 127 trap nights (14 April – 5 May)
  - No polar bear samples, but 6 brown bear samples

### Genetics (preliminary)

1. In 28 of 46 samples (60%), >75% of 13 loci were amplified
2. Barb-wire:
  - Snagged both guard hairs and under-fur
  - 22 of 26 (84%) guard hair samples with visible follicles amplified at >75% of the loci
3. Wire-brush:
  - Snagged mostly under-fur
  - 2 of 2 (100%) guard hair samples amplified at >75% of the loci
4. Early results suggest the presence of ~ 21 individual polar bears at the Utqiagvik (Barrow) hair sampling stations, and the repeated sampling of a single brown bear (*Ursus arctos*) at the Point Lay hair sampling stations.
5. Overall, results seem promising for subsequent work

## Conclusions

1. Approach holds significant promise to remotely sample polar bears for genetic ID
2. Barbed wire
  - Fewer hairs/sample but more guard hairs
  - Difficult to collect samples in wind/cold
  - Bears appeared to learn to avoid barbs, got bait but left little/no hair
  - Heavy and difficult to work with
  - Poor public perception
3. Wire brushes
  - More hairs/sample, but also more underfur than guard hairs
  - Brushes easily replaces with no DNA cross-contamination
  - May be more difficult for bears to take bait without leaving hair sample
  - Light weight, easy to deploy
  - Better public perception

## Next steps...

1. Project continuing – funding in place
2. Project has been accepted in additional communities for 2017
  - Gambell, Savoonga, Wales, Point Hope, Shishmaref (maybe Diomedea)
  - Proposing to also sample in Utqiagvik (Barrow), Wainwright, and Point Lay
3. Offshore deployment on sea ice west of Red Dog Mine Port Facility – cooperation with FWS
4. Continue to evaluate sampling efficiency, build sample library, resample?

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- ❖ State of Alaska Coastal Impact Assistance Program
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- ❖ State of Alaska Coastal Impact Assistance Program
- ❖ Alaska Department of Fish and Game
- ❖ World Wildlife Fund

## Cooperators

- ❖ U.S. Fish and Wildlife Service – E. Regehr – Polar Bear Program
- ❖ S. Talbot – USGS
- ❖ Communities of Utqiagvik and Point Lay
- ❖ Barrow Whaling Captains' Association
- ❖ Alaska Eskimo Whaling Commission
- ❖ Many Alaska Native Co-Management Partners

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