



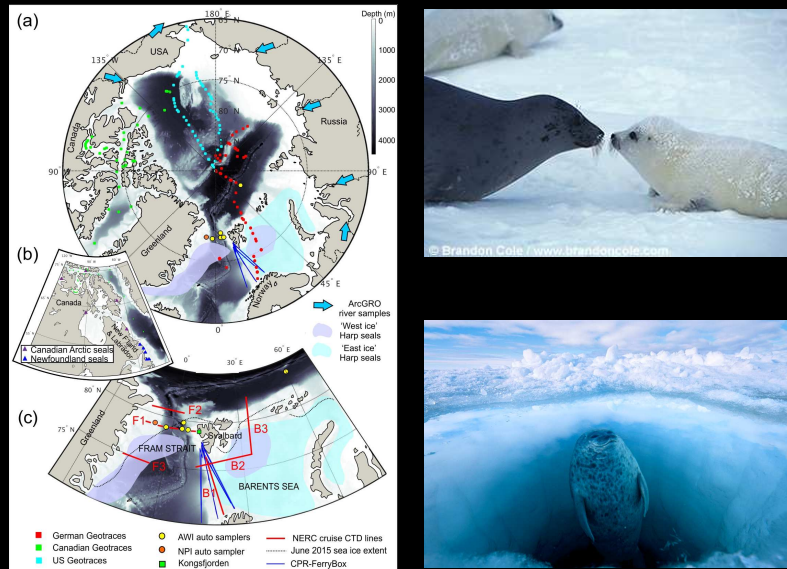
## **Arctic Predators as Indicators of Environmental Change**

Use Arctic Predators (Seals) to achieve 3 deliverables

1. Quantify the magnitude of seasonality and spatial variability in the isoscape and seal trophic position and compare to the isoscape from M1b.
2. Determine the seasonal and spatial contribution of sea-ice production to seal diet.
3. Use telemetry to assess the spatial extent over which seals are exposed to a varying isoscape.



## The Predators

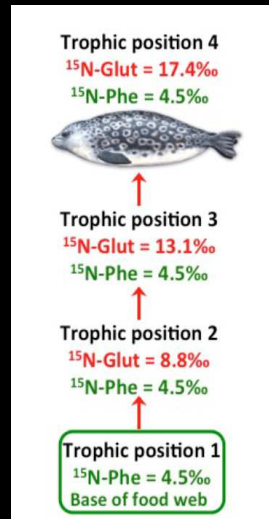


**Deliverable 1:** Quantify the magnitude of seasonality and spatial variability in the isoscape and seal trophic position and compare to the isoscape from M1b.



- Determine  $^{15}\text{N-AA}$  in predators tissues i.e. Harp seal, *Pagophilus groenlandicus* and ringed seal, *Pusa hispida*.
- Completed with project partners via existing projects and commercial (Barents Sea pop<sup>NS</sup>/subsistence hunts (Canadian pop<sup>NS</sup>).
- Use a variety of tissue types e.g. blood, liver, muscle and tagged seal tissues.

## Our approach: Compound specific stable isotopes



$\delta^{15}\text{N}$ -amino acids

$\delta^{15}\text{N}$ -phenylalanine (Phe):

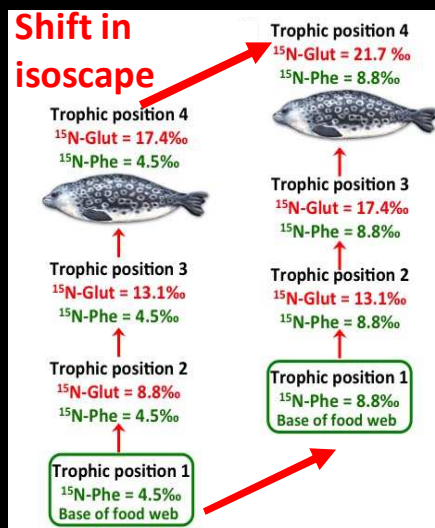
represents the baseline, conservative

$\delta^{15}\text{N}$ -Glutamic acid (Glut):

enriched with each trophic level along with trophic discrimination factor, used to estimate the trophic position

**Arctic seals as integrators of ecosystem change**

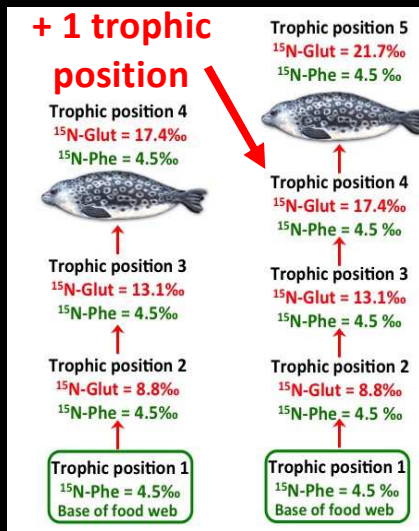
## Integrators of 'change'



Increase in the  $^{15}\text{N}$  at the base of the food web would cause increase in  $^{15}\text{N}$  throughout the food chain

But trophic position of predator and food chain length would remain the same

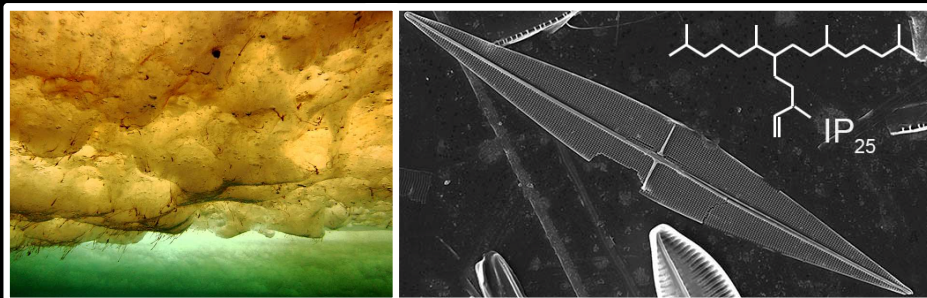
## Integrators of 'change'



Introduction of another species as a new trophic position would cause the  $^{15}\text{N-Phe}$  to remain the same but would increase  $^{15}\text{N-Glut}$

Trophic position of predator and food chain length would increase

**Deliverable 2:** Determine the seasonal and spatial contribution of sea-ice production to seal diet.

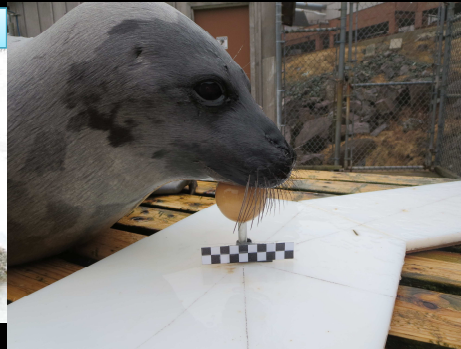


- Determine bulk  $^{13}\text{C}$  and H-Print in seal tissues.
- Tom Brown will determine H-print; on same samples as for D1.
- Make use of existing data sets e.g. Steve Ferguson and David Yurkowski, Tore Haug SI cruise data sets.



## Seal Facility: Memorial University: Kiersten Cormier

<http://www.mun.ca/osc/seal-lab/profiles.php>



### Deliverable 2

- Are whiskers a seasonal record for biomarkers?
- Determine whisker growth rates: answer NO!
- Whisker, blood and hair samples for comparison with tagged seals: determination of TDFs.
- Pulsed feeding experiments with sea ice algae pellets.

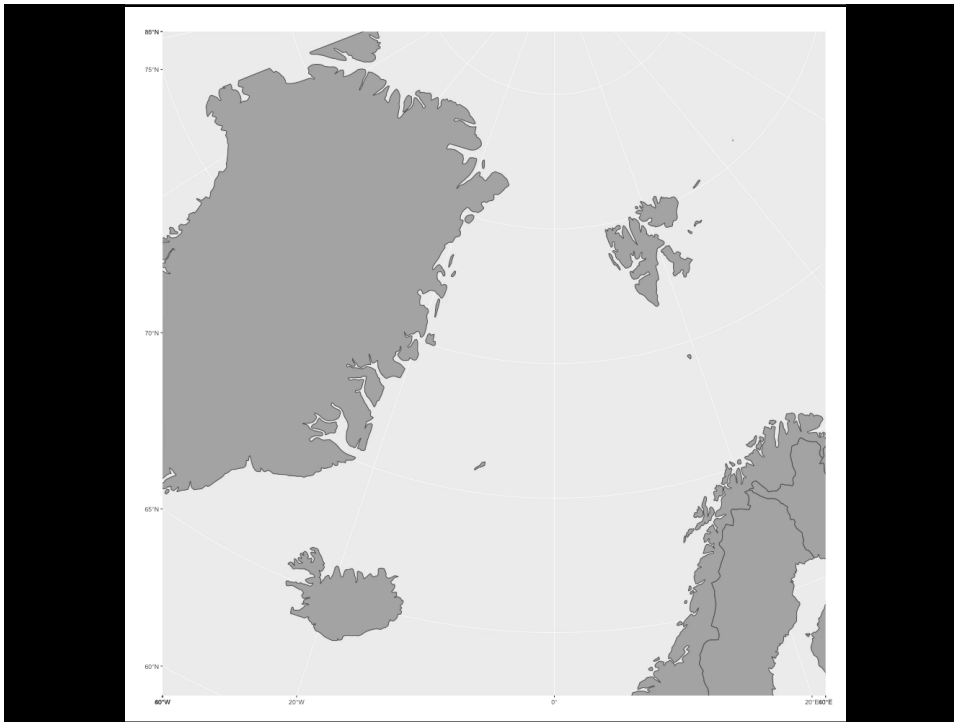
Kiersten Cormier



**Deliverable 3:** Use telemetry to assess the spatial extent over which seals are exposed to a varying isoscape.



- Argos-satellite telemetry with CTD sensors.
- East and west ice harp seals in Greenland Strait and Barents Sea (Haug and Biuw) + PRIZE
- Seals tracked for 11 months.
- Seal exposure to the isoscape: combination of seal tracks, modelling and data from M1.
- Comparison with biomarker results from D1 will allow exploration of biomarkers e.g. do they reflect changes in diet or the isoscape experienced during seasonal migrations.



## Progress to Date

- Seal tissue samples collected by partners from 2017 in West Atlantic and Greenland populations.
- Blood samples from captive harp seals collaboration currently with Tom Brown. Growing ice algae to determine uptake and turnover of ice algae in seals.
- 3 seals were tagged and released winter 2016 by Biuw and Blanchet. Blood and whisker samples from these.
- Tagging of adults under ARISE. Tagging of pups on Uni Tromso research cruise this March/April (PRIZE funded).

## Module 2 Team

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