

# Measuring seasonal fluctuations in the body condition of polar bears

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## Objective:

Track polar bear **body condition** (i.e. overall fatness) **throughout the year** using harvest-based samples

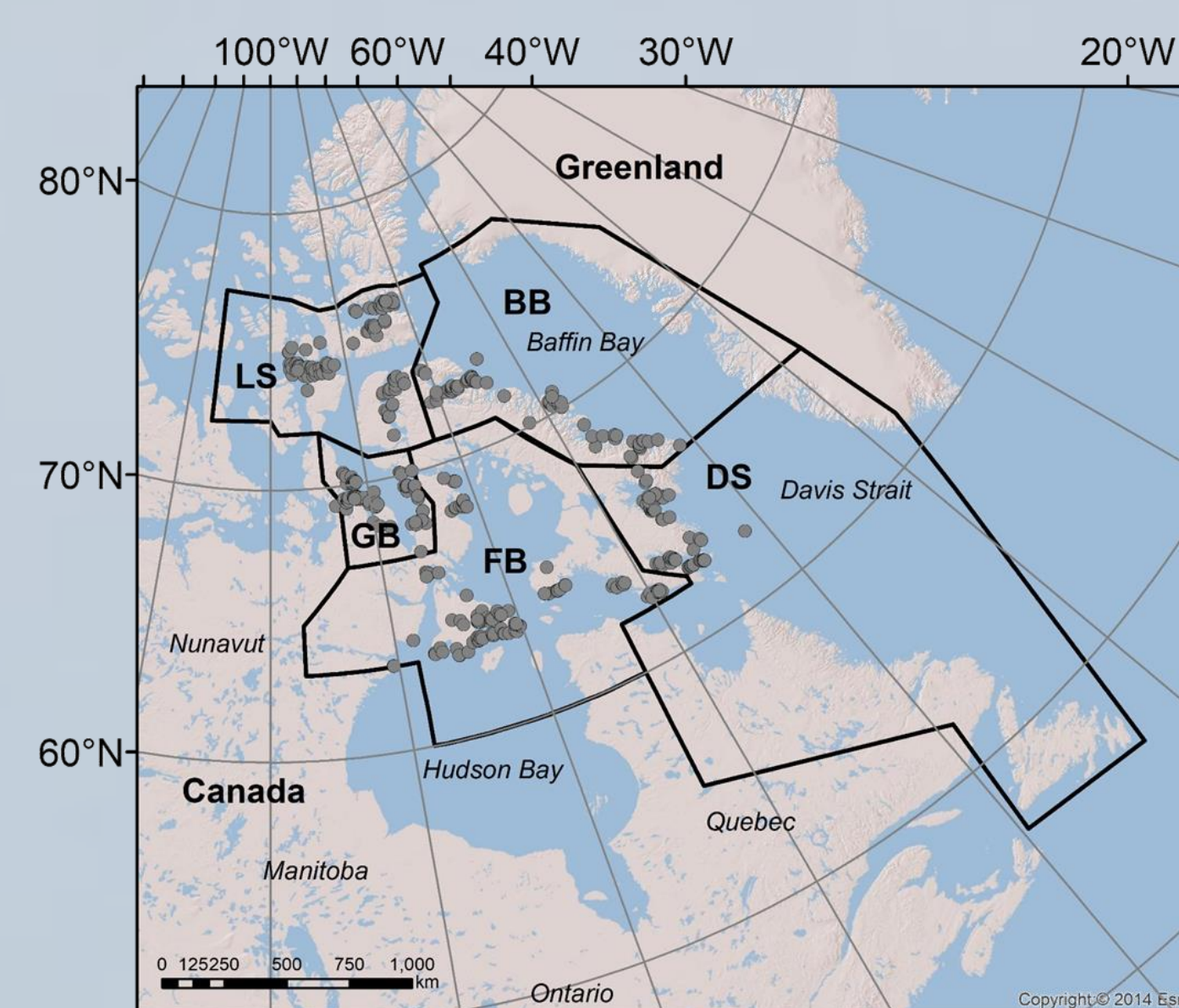
## Rationale:

- Body condition **can shift** in relation to environmental variability and **access to prey**
- Long-term declines in body condition have been observed in polar bears, e.g., Western Hudson Bay (1) and Southern Hudson Bay (2)
- Studies have been reliant on the capture of free-ranging polar bears, and a **lack of data** exists **across the species' geographic range** and during **winter and summer months**
- An individual's adipose tissue **lipid content** can be **used** as an index of **overall fatness** (3)

## Methods:

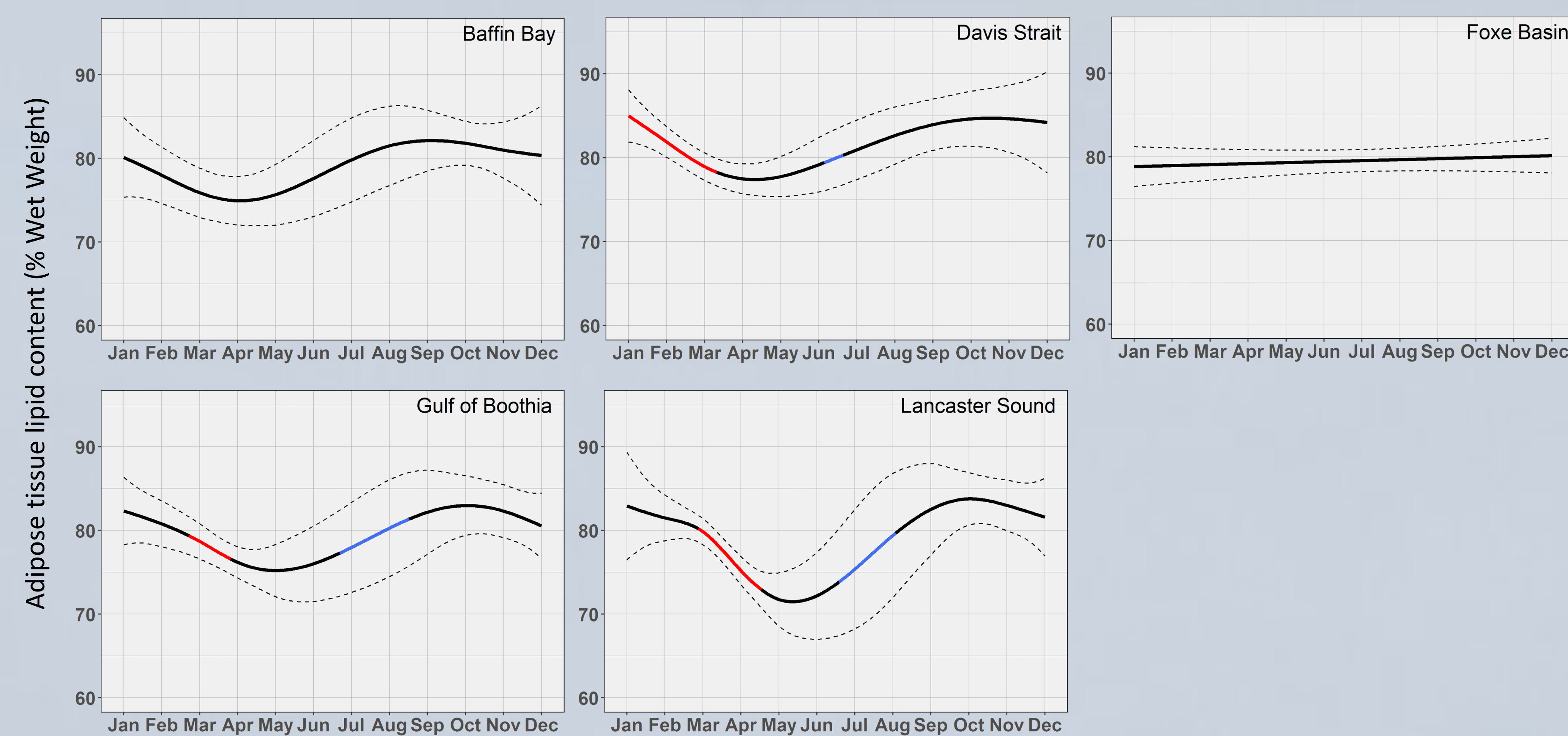
- We **quantitatively measured lipid content** of adipose tissue samples from subsistence-harvested bears (expressed as % total sample wet weight)
- Polar bears were harvested in 2010 – 2016 in five Canadian subpopulations: Baffin Bay, Davis Strait, Foxe Basin, Gulf of Boothia, and Lancaster Sound (**Figure 1**)

**Figure 1.** Location of polar bears ( $n = 1071$ ) harvested by local Inuit hunters 2010 – 2016 in five Canadian subpopulations: Baffin Bay (BB,  $n = 147$ ), Davis Strait (DS,  $n = 144$ ), Foxe Basin (FB,  $n = 287$ ), Gulf of Boothia (GB,  $n = 200$ ), and Lancaster Sound (LS,  $n = 293$ ).



## Results:

- Polar bear body condition in Davis Strait, Gulf of Boothia, and Lancaster Sound began to decrease in September/October, but significantly **decreased from January** (Davis Strait), **February/March** (Gulf of Boothia and Lancaster Sound), reached the **lowest body condition in April/May** and then significantly **increased after May** (**Figure 2**)
- Baffin Bay showed a similar seasonal trend in body condition with no statistically significant change and Foxe Basin showed no seasonal trend



**Figure 2.** Modelled trends in seasonal body condition of polar bears (using generalized additive model). Periods of significant increase and decrease are denoted by blue and red lines, respectively on the fitted trend; where the first derivative of the fitted trend is statistically greater or less than zero at the 95% level. The dashed lines are a 95% point-wise confidence interval on the fitted trend.

## Conclusion:

- Study provides a first look at the fluctuations in body condition experienced by polar bears during the year and harvest-based monitoring may help facilitate the prediction of polar bear responses to climatic change across their Canadian range
- Polar bears are **losing fat from early fall** (September/October) **through to spring** (April/May) and then begin to **accumulate fat May/June**. This trend suggests that the **spring feeding period** when prey species are most vulnerable to predation is **crucial for bears to accumulate enough fat reserves** to rely on for much of the rest of the year
- The seasonal trends in body condition we observed suggest that polar bears are actively foraging throughout late spring and early summer. Ongoing advances in the timing of sea ice breakup should therefore reduce polar bear feeding opportunities