

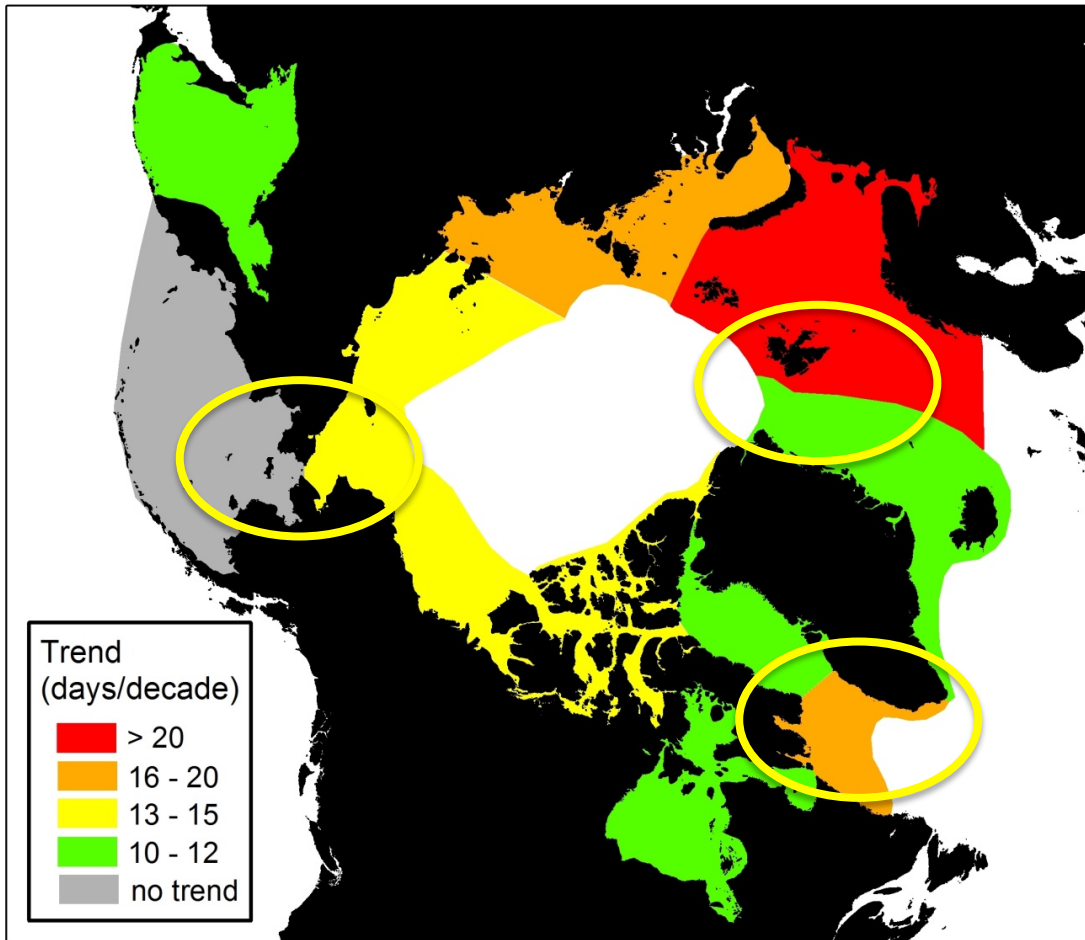


Large whales at Arctic gateways: what AON data can tell us about the “new normal” Arctic

K Stafford, K Laidre, S Moore

Other collaborators: Malene Simon, Craig Lee, Jason Gobat Rebecca Woodgate, Kit Kovacs, Christian Lydersen, Øystein Wiig





Sea ice cover and thickness changing everywhere in the Arctic but not equally so

From 1979-2013 increase in open water season:

Bering Strait ~ 9 weeks

Davis Strait ~5 weeks

Fram Strait ~6 weeks



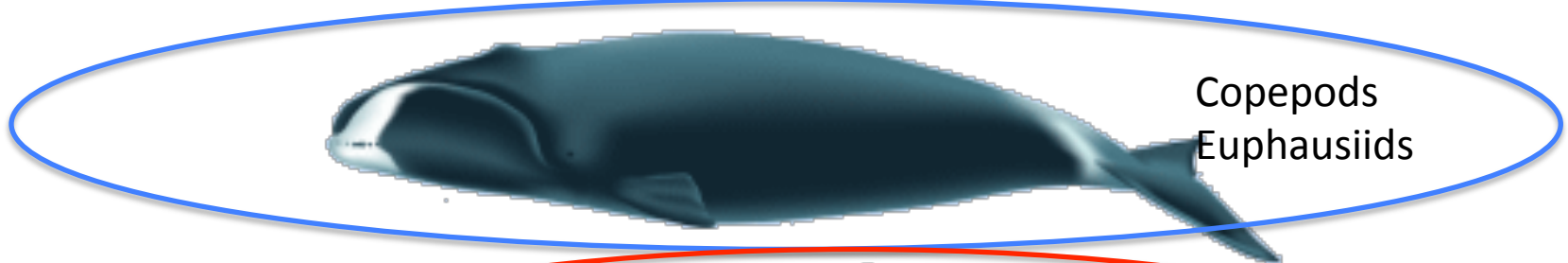
Ecosystem changes

- Increases in primary productivity
- Changing food web structure
- Increasing industrial use of the Arctic
- Decreasing food security for Native peoples
- Opening new habitat for zooplankton (advection), fish, mammals

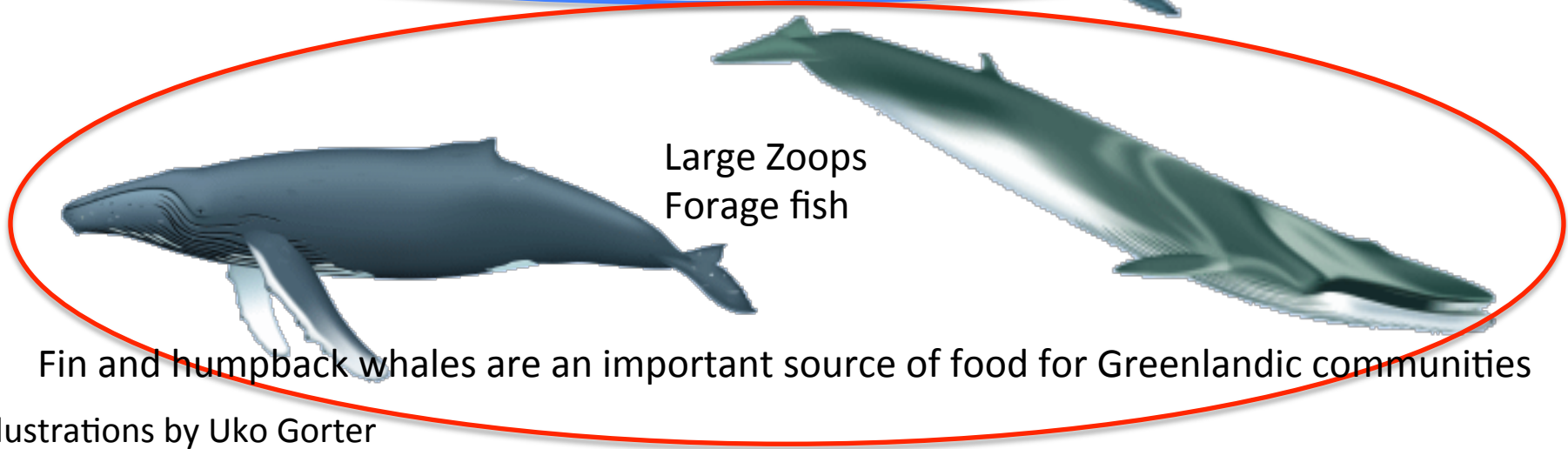


Summer and winter large whales in the Pacific and Atlantic Arctic

Bowhead whales are an important source of food for Pacific Arctic communities



Copepods
Euphausiids



Large Zoops
Forage fish

Fin and humpback whales are an important source of food for Greenlandic communities

Illustrations by Uko Gorter

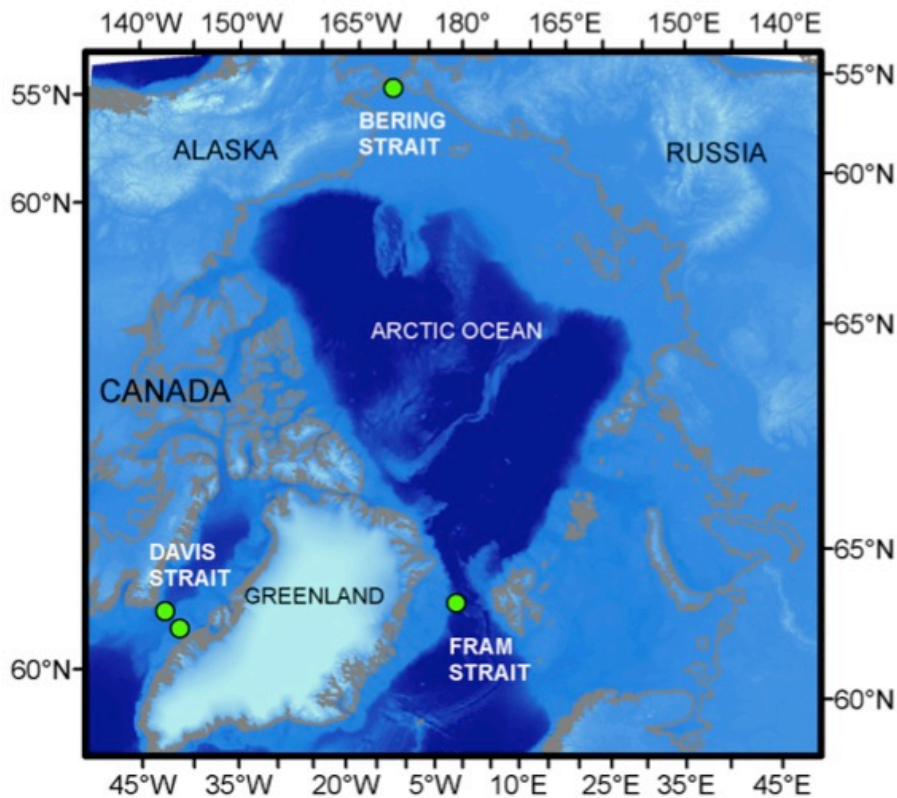


What can we say about large whales in Arctic straits?

- How long (and when) are summer and winter whales in the Straits in fall?
- How do the straits compare?
 - Are changes similar across the Arctic?
- Predictions for a future with less ice?



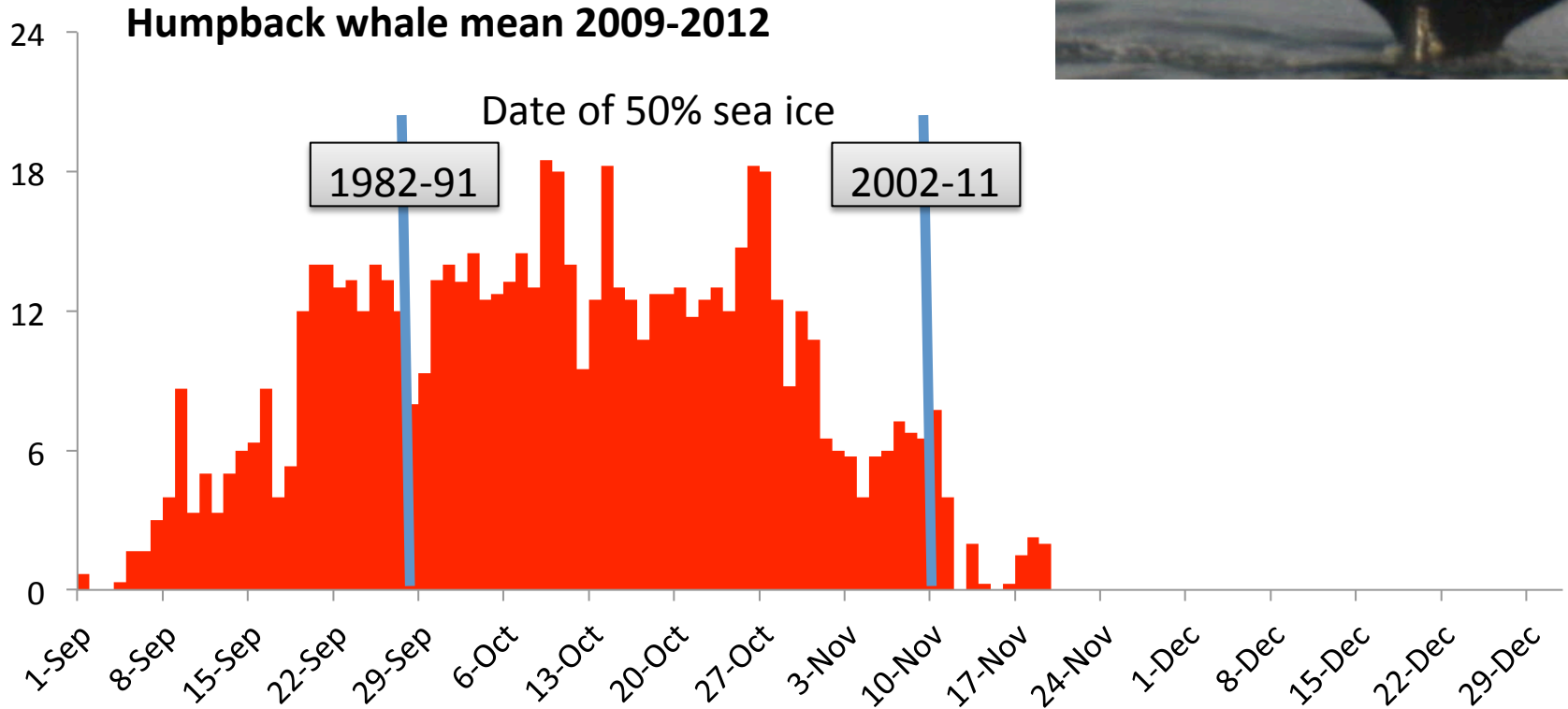
Passive acoustic monitoring



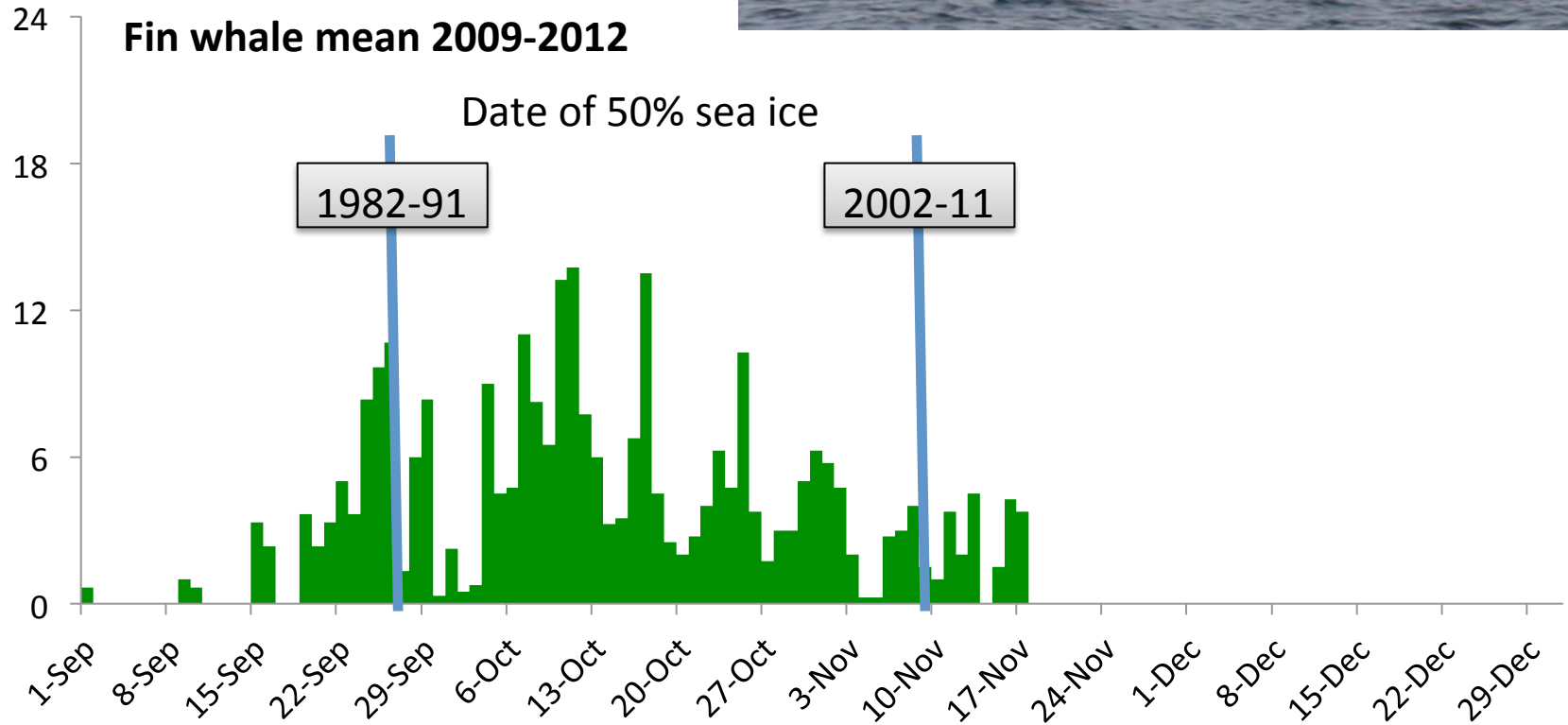
- Hydrophones deployed on oceanographic moorings in each Strait
- Sampled 15 min/h
- Frequency range up to 8 kHz
- Examined data for occurrence of Arctic and sub-Arctic species from 1 Sep-31 Dec



Bering Strait



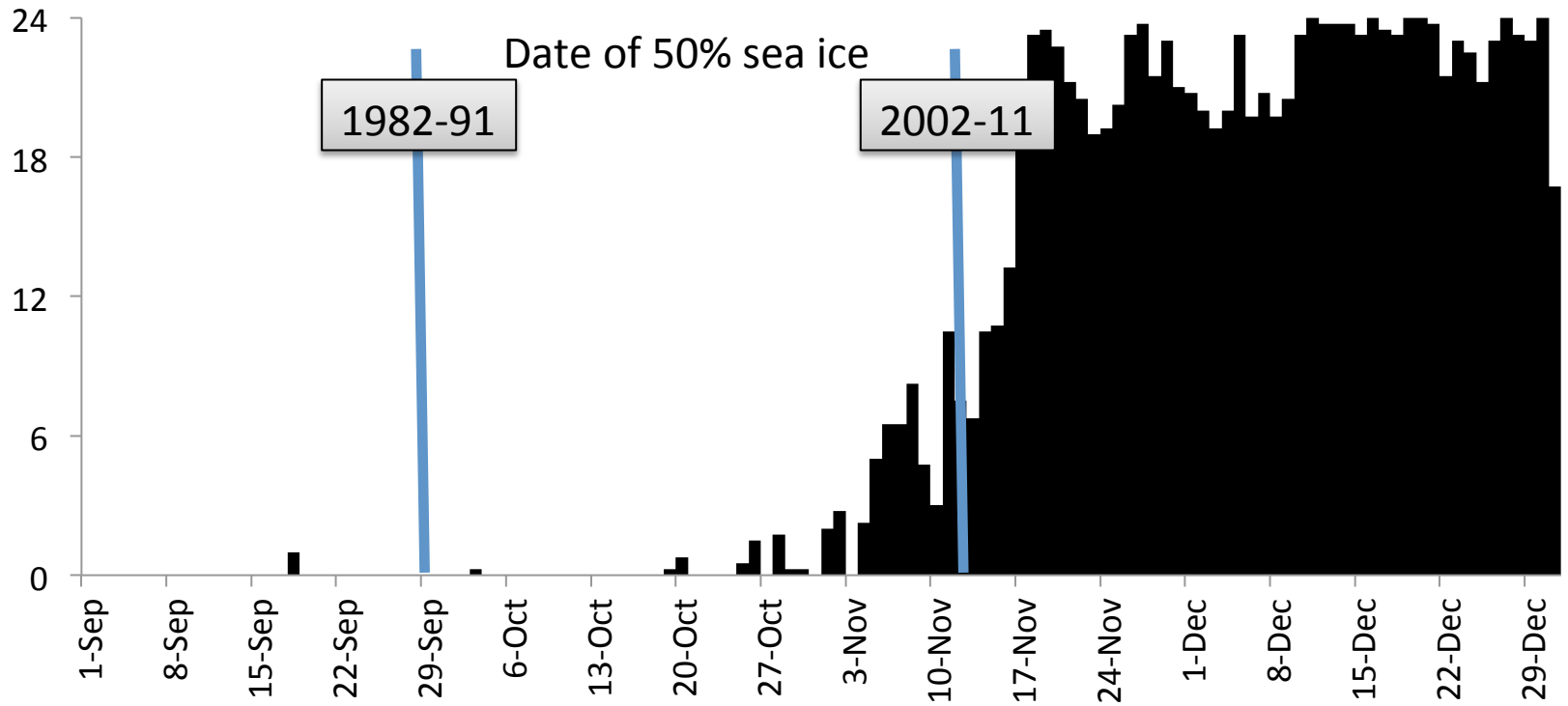
Bering Strait



Bering Strait

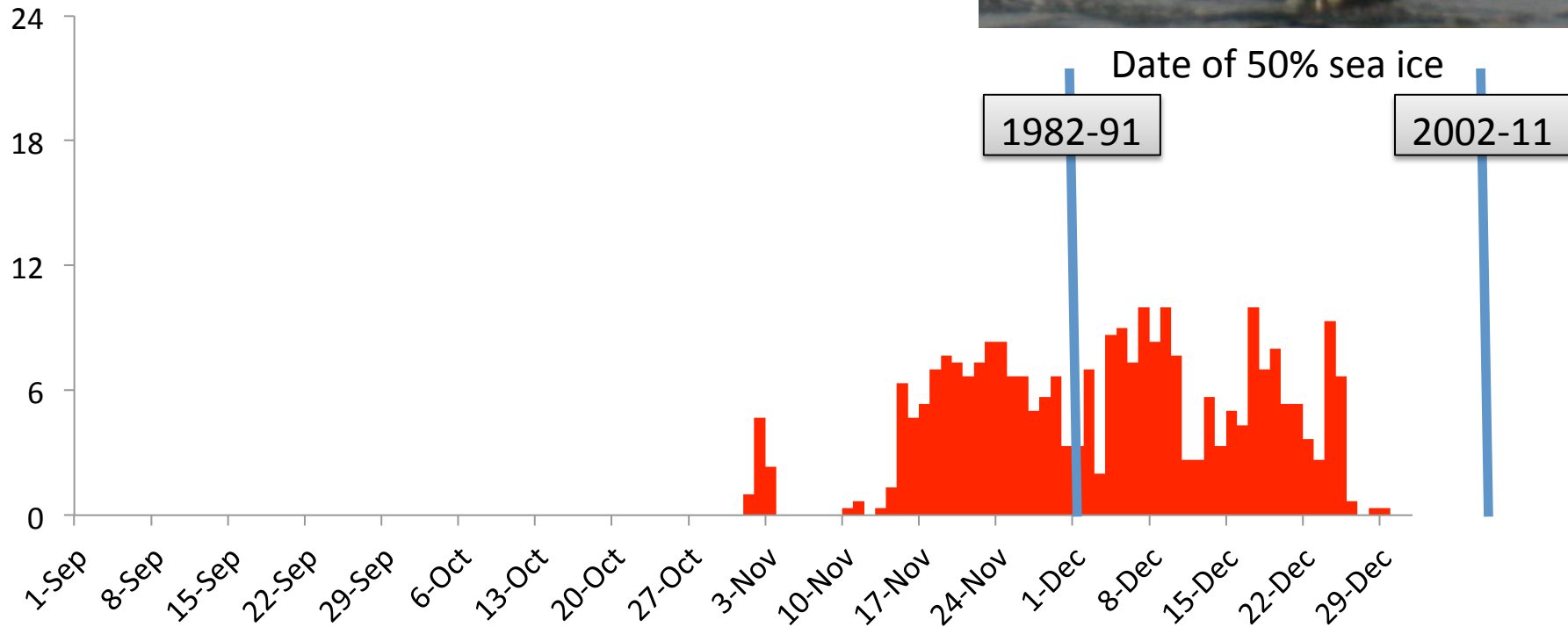


Bowhead whale mean 2009-2012

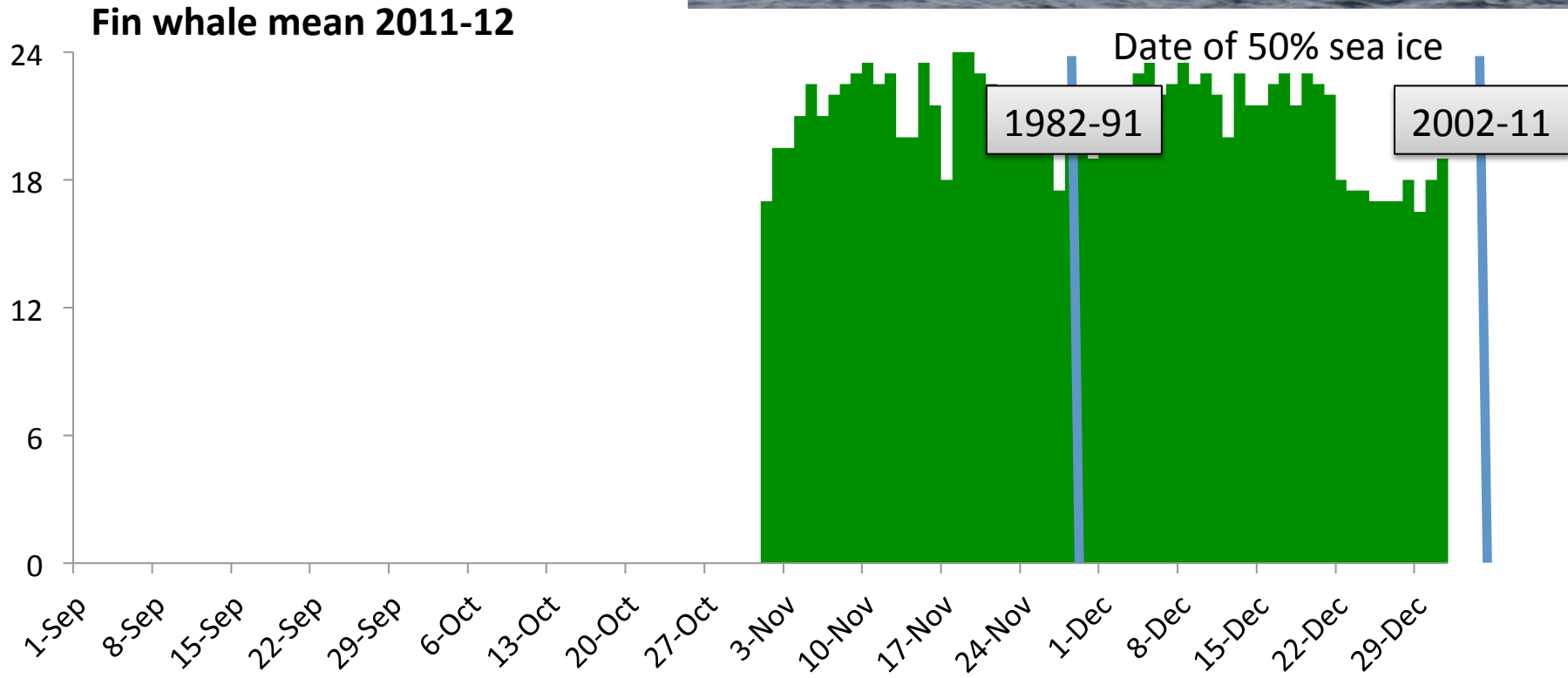


Davis Strait

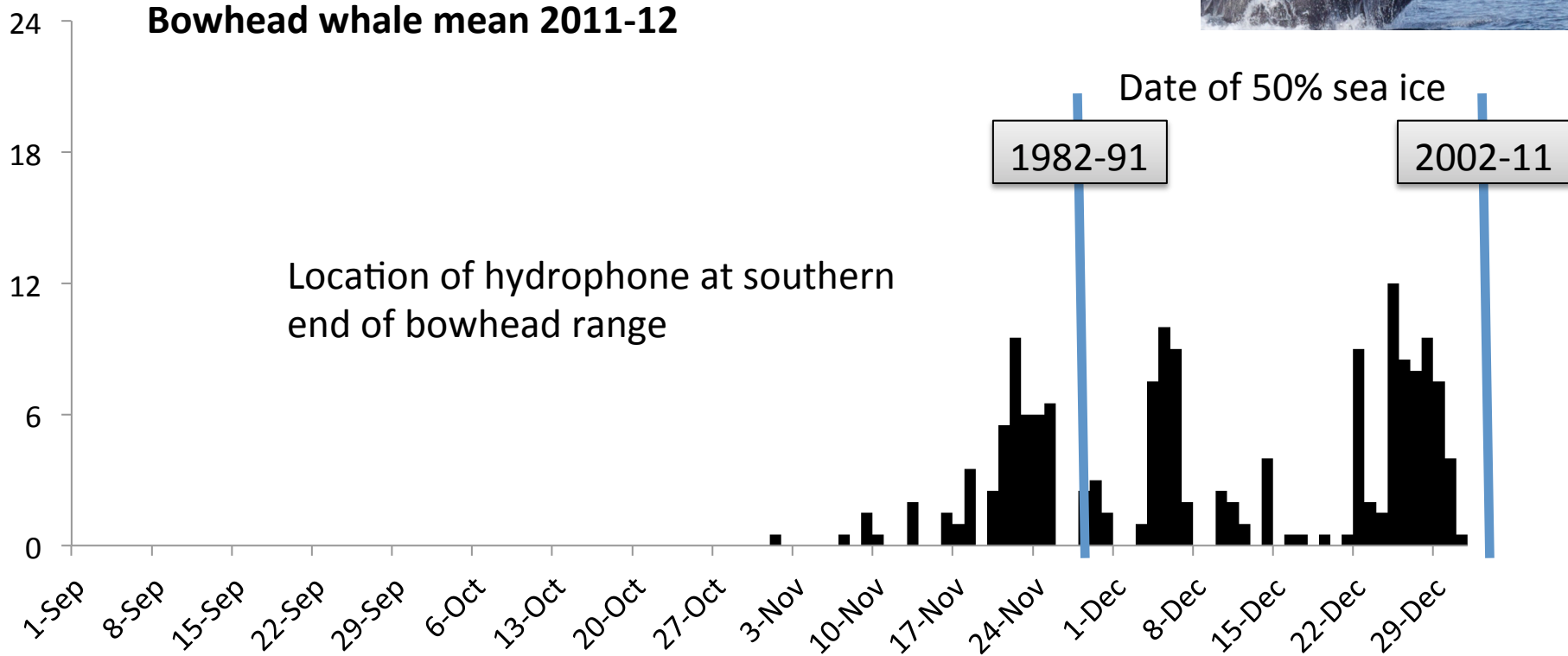
Humpback whale mean 2006, 2007, 2010



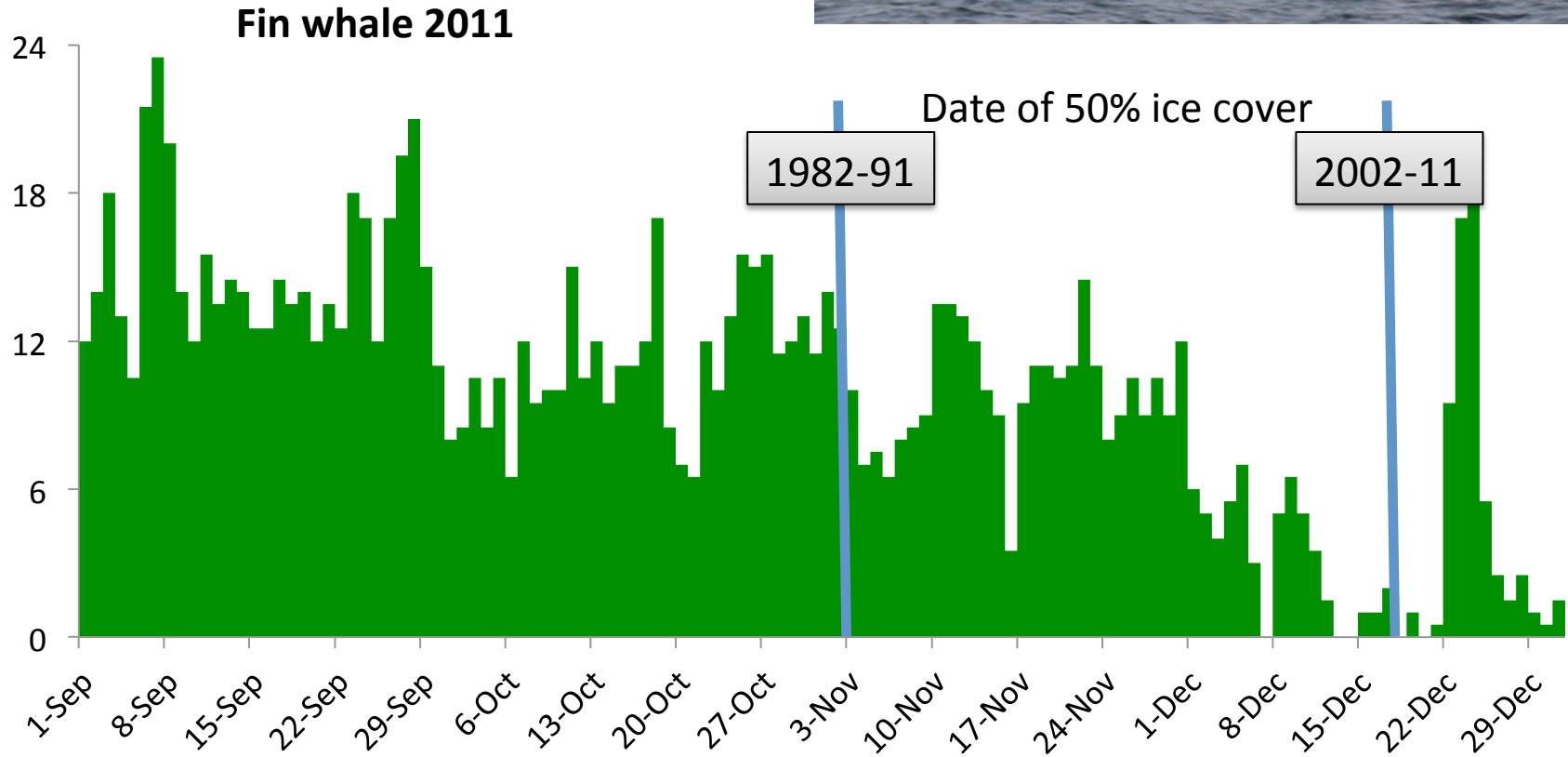
Davis Strait



Davis Strait

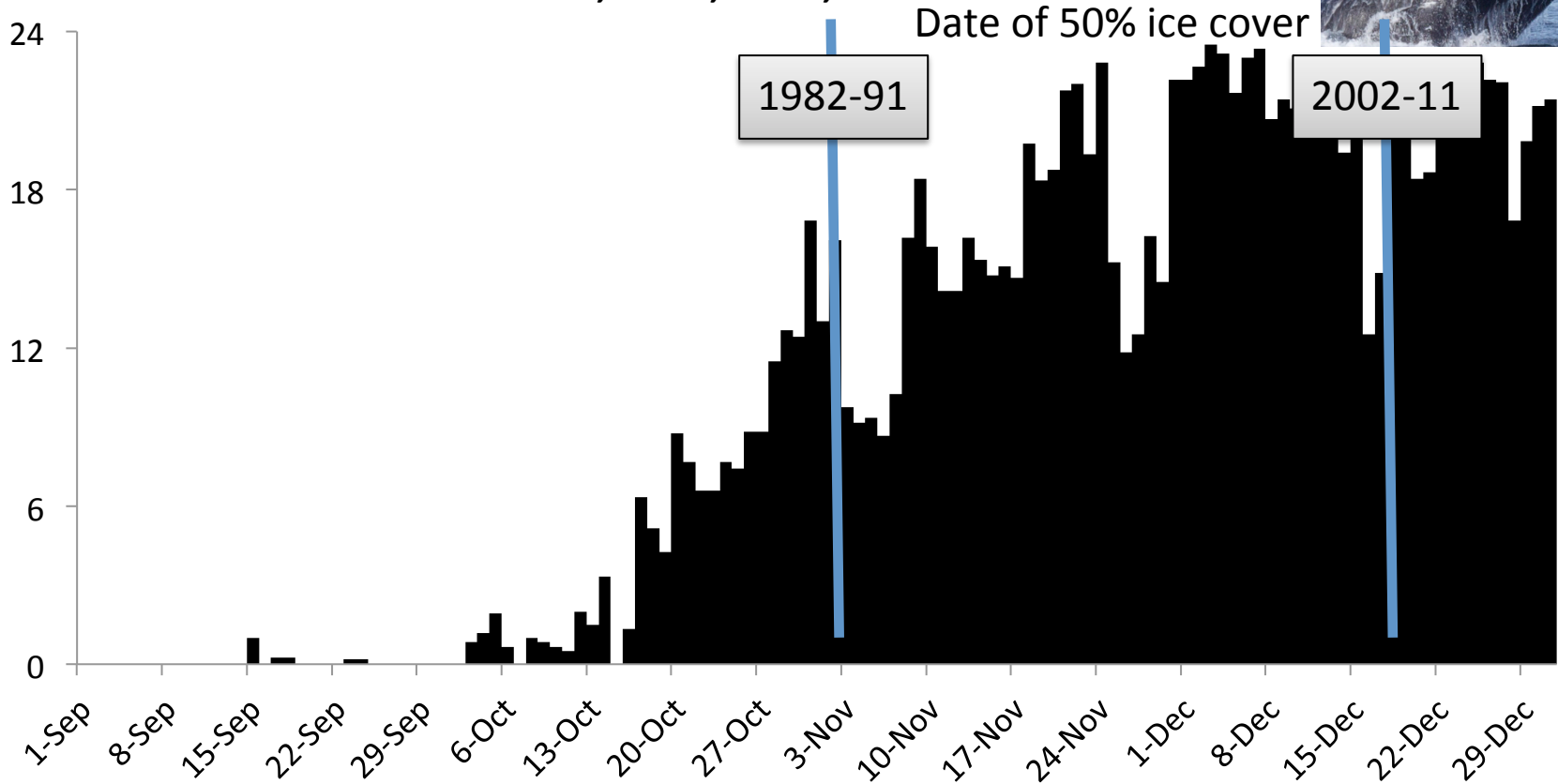


E Fram Strait- fin whales



W Fram Strait

Bowhead whale mean 2008, 2010, 2012, 2013

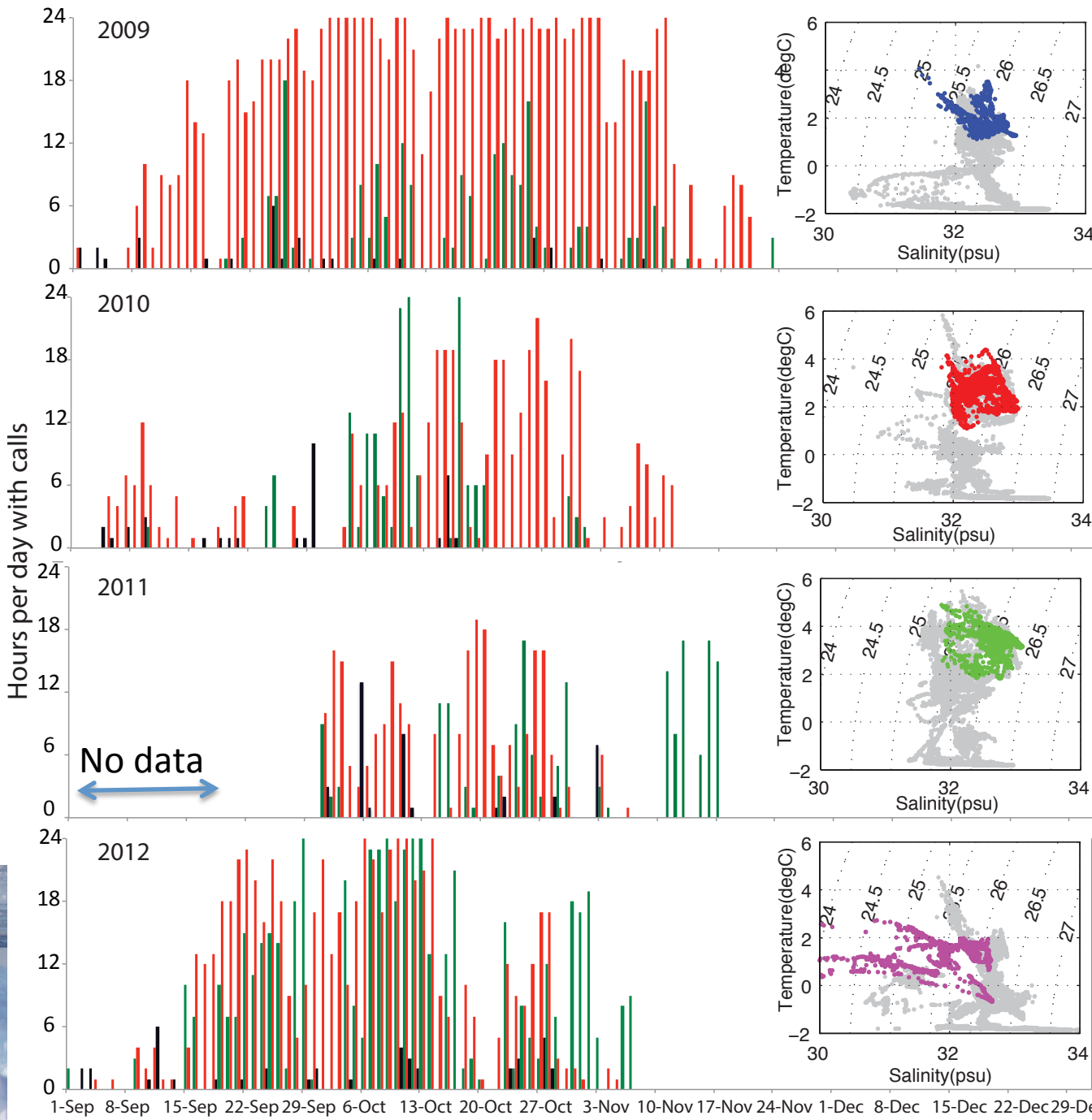


In all three Straits, sub-Arctics now occur in late summer through fall in seasons that used to be ice covered

- Likely due to increased open water (and population increases)
- Presently there is spatial but not temporal overlap between summer and winter whales (enough food to go around?)
- No obvious trend in relative abundance from the limited (2-4 years) passive acoustic data

Interannual variability is common= linked to annual environmental variability





Colder years =

-More summer whales

-More euphausiids (Ershova et al. 2015)

-Bigger zooplankton, forage fish in cold, nutrient rich H₂O (Eisner et al. 2013)

Predictions for a future with less ice?

- Increased spatial AND temporal overlap between Arctic and sub-Arctic species
 - Increased competition for prey?
 - Increased competition for “acoustic space”?
- Increased potential for anthropogenic impacts on species and the environment





For now, large whales are not necessarily on “thin ice”

